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Thursday, 2 April 2026

Melton Christian College
152-156 Brooklyn Road
Brookfield, Victoria, 3338

Attention: **Matthew Gulli** (Cotter Reid Architects)

Our Reference: 260107

Re: **Letter – Land Capability Review**
Stage 4-6 Toolern Vale Campus Expansion for Melton Christian College
674-740 Coburns Road, Toolern Vale

Dear Matthew,

McClellands Consulting Engineers (MCE) have been engaged to review the performance and capacity of the existing wastewater treatment and disposal system at the Melton Christian College Toolern Vale campus, located at the above address. The purpose of the review is to assess whether the currently operating system has existing capacity to treat and manage wastewater on-site with respect to the proposed Stage 4-6 expansion and forecast increases in student and staff attendance at the school over the coming years.

As part of the assessment, MCE have been provided the following documentation to review:

- Melton Christian College Toolern Vale Masterplan, 18/09/2025, Rev D, Cotter Reid Architects.
- Melton Christian College Toolern Vale Masterplan Supporting Document, October 2025, Rev A, Cotter Reid Architects.
- Land Capability Assessment 19L458LCAv3, 14/01/2020, Revised 03/02/2022, AGR Geosciences.
- Proposed Staging/Site/Neighbourhood Plan, TP-002, Revision TP3, 15/11/2021, Cotter Reid Architects, Endorsed by Melton City Council 10/12/2021
- Septic Site Plan As Constructed, drawn and annotated on TP-002, Revision TP3, 15/11/2021, Cotter Reid Architects. Septic Systems Australia
- Building Site Set-Out Plan (North), TP-005, Revision TP3, 15/11/2021, Cotter Reid Architects, Endorsed by Melton City Council 10/12/2021.
- Building Site Set-Out Plan (South), TP-006, Revision TP3, 15/11/2021, Cotter Reid Architects, Endorsed by Melton City Council 10/12/2021
- Installation Completion Report, REP-54030, 29/07/2022, Septic Systems Australia.
- Consultant's Advice Notice for MCC Toolern Vale Stage 3, 25169 CAN-01 Septic System Review, 29/05/2025, CPS Vargaconsult.
- Letter, 26/5/2025, Septic Systems Australia.
- Analysis of Septic Effluent ex 80917-10 report, N126183, 02/12/2025, EML (CHEM) Pty Ltd.

- General Service – AWTS report, REP-79086, 25/02/2026, Septic Systems Australia.

This report presents findings of the review, an assessment of the original disposal system design, an assessment of the existing treatment plant and disposal system capacity, and recommendations for servicing the proposed Stage 4-6 school expansions.

Original System Design

The original Land Capability Assessment (LCA) and concept design for wastewater disposal was undertaken by AGR Geosciences (AGR) in 2020 and revised in 2022. The LCA proposed an option for wastewater disposal to **2400m²** applied at a rate of **1.7mm/day** via pressure compensating sub-surface drip irrigation. The design was based on a total site occupancy of **200 people** (students and staff), covering the initial development and forecast growth up to Stage 3 of the development.

Irrigation area sizing was based on a water balance principle incorporating the following parameters:

- Mean monthly rainfall and pan evaporation data from **Melton Reservoir**
- A peak daily flow rate of **20L/person/day** in accordance with the recommended rates provided in EPA Code of Practice 891.4 (2016) for day pupils and staff in schools.
- Peak occupancy of **200 people**.
- A maximum daily wastewater flow of **4000L/day**.
- A design **seepage rate** of **1.7mm/day** based on a measured saturated hydraulic conductivity (Ksat) of 0.016m/day, based on the principle that seepage equates to approximately 10-14% of Ksat.
- A **crop factor of 0.8** for evapotranspiration assuming installation of fescue turf grass.
- Assumed retained rainfall of **80%**.
- A design **application rate** of **2.0mm/day** (or less) for a Category 6 Heavy Clay soil.

As a measure of risk mitigation, the LCA also recommended soil improvement using gypsum at the time of system installation to address dispersion, high sodicity and low permeability. AGR calculated a gypsum requirement of 4.6kg/m² of gypsum to suitably ameliorate soil chemistry and improve colloidal stability for better long term soil permeability and disposal system performance.

Installed and Existing Treatment Plant and Disposal System

Hydraulic design and system installation was undertaken by Septic Systems Australia under the approved Melton City Council Permit to Install an Onsite Wastewater System, Permit No. W2022/0040. The installed treatment plant consisted of **2 x 5,000L** Taylex Aerated Wastewater Treatment Systems (AWTS), each consisting of 2 concrete tanks, with a combined daily **hydraulic flow** of **10,000L** and **BOD loadings** of **4,662g/BOD/day**. The treatment system also contained a primary **10,000L BOD Reduction Tank** and a **10,000L Dosing Tank**.

The disposal field consists of **4 x 600m²** zones of sub-surface drip irrigation with Waste-Flow Drip-Line irrigation pipe installed **150mm below surface spaced 1m apart**. Each zone contains an air-valve at the highest point and a flush point at the lowest point, contained within a lilac valve box. The irrigation zones are dosed on an alternating schedule.

All sanitary and wastewater fixtures in the school complex drain sewerage and wastewater to a collection point on the north side of Building A where it is then pumped to the BOD tank for primary settling and BOD reduction. From the BOD tank wastewater moves into the dosing tank where it is transferred to each of the primary tanks of the Taylex AWTS separately. Wastewater passes

from the each of the primary tanks into secondary tanks before being pumped out to the irrigation zones. Each of the Taylex AWTS directly dose 2 irrigation zones on alternating schedules.

MCE visited the Toolern Vale Campus on Monday 16/03/2026 to inspect the installed treatment and disposal system. All system components described and shown in the "As Constructed" schematics were observed on-site as depicted and were observed to be in working order. At the time of the inspection irrigation zones 1 and 3 were in use and were observed to have a healthy green covering of grass. Zones 2 and 3 had a slightly patchier grass covering consisting mostly of brown dormant grass with patches of green. The observed grass covering the irrigation area was identified as a turf grass species Bermuda (couch) Grass or similar. All zones featured regular and sometimes extensive open desiccation cracks implying significant soil shrinkage during the preceding summer months and a deficit of water in the soil despite regular irrigation.

The installed system includes water flow metres on each of the distribution lines connecting the 4 irrigation zones to the outflow of the two secondary tanks to the AWTS. The flow meters measure all flow being pumped from the AWTS to the irrigation zones. Between 22/02/2024 and 28/02/2025, Melton Christian College staff collected wastewater flow data from all four flow meters in 34 separate readings over a 12-month period, mostly as weekly and fortnightly readings with two three weekly readings and a single reading taken two months from the previous.

During the monitored period the following data was collected:

Annualised Data

- Total annual wastewater flow from treatment plant to irrigation field **241,230L**
- Average annualised daily wastewater flow **661L**
- Total school occupants during the period (staff and students) **168 people**
- Average annualised daily wastewater flow per person **4.0L/person**

Daily flow rate data collected over the 12-month period demonstrates a significant difference in water usage habits and generated wastewater flow compared to the advised figure of 20L/person/day published by the EPA (2016).

The above data represents an average over the entire 12-month period. MCE analysed the flow data over 33 flow monitoring periods to produce average weekly flow data and calculated the average daily flow rate from the weekly data for comparison with the annualised data and look for weekly and daily variances or surge flows.

Average Weekly Data

- Total annual wastewater flow from treatment plant to irrigation field **241,230L**
- Average weekly wastewater flow **4,880L**
- Max. daily flow from weekly data **1322L**
- Min. daily flow from weekly data **128.6L**
- Average daily flow from weekly data **697.3L**
- Total school occupants during the period (staff and students) **168 people**
- Average daily wastewater flow per person **4.2L/person**

Breaking down the flow data into weekly averages indicates the average daily flow rate is more realistically closer to 700L/day. Average daily wastewater flow peaked at 1322L in November 2024, and average daily flow exceeded 1000L/day during five of the monitoring periods which accounts for approximately 16% of the year. These peak flow periods did not exceed the design daily flow rate or the flow capacity of the installed treatment plant.

Overall, the monitoring data appears to indicate an average daily wastewater flow per person of between 4.0-4.2L/person is representative of water usage habits throughout the year and is well below design flow and may be adopted as a more representative flow rate for further analysis of wastewater disposal.

Proposed Stage 4-6 Expansions

During the next phase of expansion, the Toolern Vale campus is expected to grow with a forecast maximum occupancy as follows:

Development	Students	Staff	Total
Stage 4 (establishment of Year 7)	416	75	491
Stage 6 (establishment of Year 10	676	111	787

Revised Wastewater Disposal Land Application Assessment

Assessment of the required land application area to cater for stage 4 and stage 6 increases in school occupancy draws on the site and soil assessment completed by AGR with their Land Capability Assessment in 2022. This revised assessment uses a water balance method to assess the minimum area required for sub-surface drip irrigation based on the forecast increase in occupancy provided for both Stage 4 and Stage 6 expansions.

The following parameters have been used in the revised sizing using the water balance method:

- Mean monthly rainfall and pan evaporation SILO data derived for the Toolern Vale area.
- A peak daily flow rate of **4.2L/person/day** based on 12-month wastewater flow rate monitoring from installed meters between February 2024 and February 2025.
- Peak occupancy of **491 people** for **Stage 4** expansion.
- Peak occupancy of **787 people** for **Stage 6** expansion.
- A maximum daily wastewater flow of **2062L/day** for **Stage 4** expansion.
- A maximum daily wastewater flow of **3305L/day** for **Stage 6** expansion.
- A design **seepage rate** of **1.7mm/day** based on a measured saturated hydraulic conductivity (Ksat) of 0.016m/day based on the principle that seepage equates to approximately 10-14% of Ksat.
- A variable **crop factor of 0.8** for evapotranspiration for existing turf grass assumed Bermuda Grass (couch) or Kikuyu Grass.
- Assumed retained rainfall of **80%**.
- A design **application rate** of **2.0mm/day** (or less) for a Category 6 Heavy Clay soil.

The results of revised water balance analysis are summarised in the following table:

Development	Design Occupants	Design Flow	Minimum LAA[1]	Design Application Rate	Existing LAA[1]
Stage 4 (establishment of Year 7)	491	2062L/d	1451m^2	1.4mm/d	2400m^2
Stage 6 (establishment of Year 10	787	3305L/d	2325m^2	1.4mm/d	

According to the revised water balance analysis, existing sub-surface drip irrigation disposal system exceeds the minimum area required to manage average daily wastewater disposal at both the Stage 4 and Stage 6 expansion points.

[1] Land Application Area for sub-surface irrigation

Revised Wastewater Treatment Capacity Assessment

Using a revised design daily flow rate of **4.2L/person**, the daily BOD loading is adjusted to approximately **4g BOD/person/day**.

Based on the forecast occupancy increases in the Stage 4 and Stage 6 expansions respectively, the following table summarises the minimum capacity requirements for the treatment plant:

Development	Design Occupants	Design Hydraulic Flow	Minimum BOD[2]	Existing BOD Capacity
Stage 4 (establishment of Year 7)	491	2062L/d	1964 g BOD/d	4662 g BOD/d
Stage 6 (establishment of Year 10	787	3305L/d	3148 g BOD/d	

The existing treatment plant set up includes a **10,000L septic tank** for BOD reduction and primary settlement. Septic tanks are used for primary settlement of solids and accumulate sludge over time requiring periodic removal. Most tanks require a minimum volume of at least 1/3 the tank capacity for daily hydraulic flow to operate effectively. The BOD reduction tank has a capacity to store up to **6,000L of sludge** before requiring pump out which means the tank has a minimum capacity for up to **4,000L of hydraulic flow** per day.

As previously discussed, the actual flow rate data collected between February 2024 and February 2025 has been analysed by MCE to provide average daily flow rates based on weekly averages, specific to each of the 33 monitoring periods. Using these average daily flow rates, variations in overall daily flow can be modelled throughout the year using the forecast occupancy figures. Considering the **Stage 4** expansion, the **maximum** average daily flow rate is predicted to be around **3,900L**, whereas after the **Stage 6** expansion, the **maximum** average daily flow rate is predicted to be around **6,200L**. Modelling data estimates that following the **Stage 6** expansion, average daily flow rates are predicted to **exceed 4,000L/day** around **16%** of the year.

BOD loading roughly equates to daily wastewater flow according to BOD estimates and proportions for day students and staff in schools provided in the Guideline for onsite wastewater management (EPA, 2024). BOD loading is not expected to exceed the capacity of the existing treatment plant during the Stage 4 expansion but **may exceed the treatment capacity** 16% of the year following the **Stage 6** expansion.

Conclusions

- The existing **wastewater treatment and disposal system** is suitably sized to accommodate the proposed **Stage 4** expansion and associated forecast increase in school occupancy.
- The existing **wastewater disposal system** is suitably sized to accommodate the proposed **Stage 6** expansion and associated forecast increase in school occupancy.
- The existing **treatment plant** has a capacity to treat up to 10,000L and 4,662 g/BOD per day. The treatment plants hydraulic flow capacity is not expected to be exceeded by the proposed **Stage 6** expansion and associated forecast increase in school occupancy. Following the **Stage 6** expansion, the capacity of the treatment plant to process BOD loading may be stretched or even exceeded up to 16% of the year.
- The existing **10,000L BOD reduction tank** has capacity to accommodate average and peak **daily flow** following the **Stage 4** expansion and associated forecast increase in school occupancy providing sludge accumulation does not exceed 2/3 of the tank volume (6,000L).

[2] Biological Oxygen Demand

- Daily **hydraulic flow** through the existing **10,000L BOD reduction tank** is expected to exceed the minimum capacity of the tank following the **Stage 6** expansion around 20% of the year once sludge accumulation has reached 2/3 the volume of the tank volume (6,000L).

Recommendations for Future Wastewater Management

- MCE recommend there is no need to alter or expand the existing wastewater treatment and disposal system at the Toolern Vale campus to accommodate the proposed Stage 4 expansion and forecast increase in occupancy.
- MCE recommend there is no need to alter or expand the existing wastewater disposal system at the Toolern Vale campus to accommodate the proposed Stage 6 expansion however the treatment plant may need upgrading to accommodate increases in BOD loadings.
- MCE recommend installing a second 10,000L BOD reduction tank to accommodate increased BOD loadings prior to the Stage 6 development and expansion. An additional 10,000L BOD (septic) tank will increase BOD reduction prior to wastewater entering the AWTS, increase the daily hydraulic flow capacity, increase the wastewater holding capacity of the system to manage high volume surge flows and minimise sludge pump out frequency with increased sludge accumulation capacity.

If you have any questions, please feel free to contact Senior Engineering Geologist, Dave Horwood on 03 5333 3030.

Yours sincerely,

Digitally Signed by
Dave J Horwood

Dave J Horwood
Senior Engineering Geologist
BAppSc (Geology), Dipl. NRM, MAusIMM CP(Geo), RPGeo

APPENDIX A WATER AND NUTRIENT BALANCE

Refer attached

APPENDIX B ANALYSED WEEKLY WASTEWATER FLOW DATA

Refer attached

COMPUTATION SHEET

McCLELLANDS
CONSULTING ENGINEERS

Project: Stage 4-6 School Expansion
674-740 Coburns Road
Toolern Vale
Client: Melton Christian College
Subject: Land Application Area Sizing Using Water Balance & Storage Calculations: **Stage 4**

Project No.: 260107
Comp: LCA
Date: 2.04.26
Attendee: DJH
Review: PMO'N

INPUT DATA

Design Wastewater Flow	Q	2,062	L/day	Refer report
Design Seepage Rate	DSR	1.7	mm/day	Refer report
Trial Land Application Area	LAA	2400	m^2	
Crop Factor	C	0.8	unitless	Refer report
Rainfall Runoff Factor	RF	0.8	unitless	Refer report
Effective Void Ratio	N	0.3	unitless	
Minimum Freeboard Topsoil Layer	F	150	mm	
Mean Monthly Pan Evaporation Data	Lat, Long: -37.60 144.60			Extracted from SILO Data
Mean Monthly Rainfall Data	Lat, Long: -37.60 144.60			Extracted from SILO Data

Standard Comp No.: CSLCA1
Version: 1.01
All Formulae Standard: Yes

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days in month	D		days	31	28	31	30	31	30	31	31	30	31	30	31	**365**
Evaporation	E		mm/month	81.5	51.5	35.4	40.5	57.5	81.2	116.4	142.1	177.5	196.7	162.1	132.3	1274.7
Rainfall	R		mm/month	48.1	42.8	46.2	44.6	52.1	55.3	61.7	55.8	45.7	42.4	41.8	42.4	578.9
Crop Factor	C		unitless	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
OUTPUTS																
Evapotranspiration	ET	E x C	mm/month	65.2	41.2	28.3	32.4	46.0	65.0	93.1	113.7	142.0	157.4	129.7	105.8	**1020**
Seepage	S	DSR x D	mm/month	52.7	47.6	52.7	51.0	52.7	51.0	52.7	52.7	51.0	52.7	51.0	52.7	**620.5**
Total Outputs		ET+S	mm/month	117.9	88.8	81.0	83.4	98.7	116.0	145.8	166.4	193.0	210.1	180.7	158.5	**1640.3**
INPUTS																
Retained Rainfall	RR	R x RF	mm/month	38.5	34.2	37.0	35.7	41.7	44.2	49.4	44.6	36.6	33.9	33.4	33.9	**463.1**
Applied Effluent	W	QxD	L/month	63922	57736	63922	61860	63922	61860	63922	63922	61860	63922	61860	63922	**752630**
Total Inputs		RR+W	mm/month	102.4	92.0	100.9	97.5	105.6	106.1	113.3	108.6	98.4	97.8	95.3	97.8	**1215.8**
DISPOSAL RATE																
Disposal Rate	DR	(ET+S)-RR	mm/month	79.4	54.6	44.1	47.7	57.0	71.7	96.5	121.7	156.4	176.1	147.2	124.6	
LAND AREA REQUIRED FOR ZERO STORAGE			m^2	805	1058	1451	1296	1121	863	663	525	395	363	420	513	

MINIMUM AREA REQUIRED FOR ZERO STORAGE: 1451 m^2
ADOPTED LAND APPLICATION AREA: 2400 m^2
DESIGN APPLICATION RATE: 0.9 mm/day

STORAGE CALCULATION

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Application Rate	AR	Q/L	mm/month	26.6	24.1	26.6	25.8	26.6	25.8	26.6	26.6	25.8	26.6	25.8	26.6
Storage For The Month	ST	AR-DR	mm/month	-52.8	-30.5	-17.4	-21.9	-30.4	-45.9	-69.8	-95.1	-130.7	-149.5	-121.5	-98.0
Increase In Depth Of Stored Effluent	ΔH	ST/N	mm/month	-176.0	-101.7	-58.1	-73.2	-101.3	-153.2	-232.8	-317.0	-435.6	-498.4	-404.9	-326.6
Storage Remaining From Previous Month			mm/month	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumulative Storage At End Of Month	CS		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
Cumulative Storage From Previous Year	CS		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
Maximum Storage Depth for Nominated Area	MS			0 mm											

DESIGN DIMENSIONS SUMMARY

Land Application Area	LAA	2400	m^2
Maximum Storage Height	MS	0	mm
Minimum Freeboard Topsoil Layer	F	150	mm
Min Depth Of Land Application System	Z		mm

COMPUTATION SHEET

McCLELLANDS CONSULTING ENGINEERS

Project:	Stage 4-6 School Expansion	**Project No.:**	260107
	674-740 Coburns Road	**Comp:**	LCA
	Toolern Vale	**Date:**	2.04.26
Client:	Melton Christian College	**Attendee:**	DJH
Subject:	Land Application Area Sizing Using Nitrogen Balance Calculations: **Stage 4**	**Review:**	PMO'N

INPUT DATA[1]

Wastewater Loading		
Hydraulic Load	2,062	L/day
Effluent N Concentration	30	mg/L
% N Lost to Soil Processes (Geary & Gardner 1996)	0.2	Decimal
Total N Loss to Soil	12372	mg/day
Remaining N Load after soil loss	49488	mg/day

Nutrient Crop Uptake					
Crop N Uptake	220	kg/ha/yr	which equals	60.27	$mg/m^2/day$

NITROGEN BALANCE BASED ON ANNUAL CROP UPTAKE RATES

Minimum Area required with zero buffer		
Nitrogen	821	m^2

Determination of Buffer Zone Size for a Nominated Land Application Area (LAA)		
Nominated LAA Size	2400	m^2
Predicted N Export from LAA	-34.74	kg/year
Minimum Buffer Required for excess nutrient	0	m^2

SUMMARY - LAND APPLICATION AREA REQUIRED BASED ON NITROGEN BALANCE 821 m^2

NOTES

[1] Model sensitivity to input parameters will affect the accuracy of the result obtained. Where possible site specific data should be used. Otherwise data should be obtained from a reliable source such as:

- *EPA Guidelines for Effluent Irrigation*
- *Appropriate Peer Reviewed Papers*
- *Environment and Health Protection Guidelines: Onsite Sewage Management for Single Households*
- *USEPA Onsite Systems Manual*

COMPUTATION SHEET

McCLELLANDS CONSULTING ENGINEERS

Project: Stage 4-6 School Expansion
674-740 Coburns Road
Toolern Vale
Client: Melton Christian College
Subject: Land Application Area Sizing Using Water Balance & Storage Calculations: **Stage 6**

Project No.: 260107
Comp: LCA
Date: 2.04.26
Attendee: DJH
Review: PMO'N

INPUT DATA

Design Wastewater Flow	Q	3,305	L/day	Refer report
Design Seepage Rate	DSR	1.7	mm/day	Refer report
Trial Land Application Area	LAA	2400	m^2	
Crop Factor	C	0.8	unitless	Refer report
Rainfall Runoff Factor	RF	0.8	unitless	Refer report
Effective Void Ratio	N	0.3	unitless	
Minimum Freeboard Topsoil Layer	F	150	mm	
Mean Monthly Pan Evaporation Data	Lat, Long: -37.60 144.60			Extracted from SILO Data
Mean Monthly Rainfall Data	Lat, Long: -37.60 144.60			Extracted from SILO Data

Standard Comp No.: CSLCA1
Version: 1.01
All Formulae Standard: Yes

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days in month	D		days	31	28	31	30	31	30	31	31	30	31	30	31	**365**
Evaporation	E		mm/month	81.5	51.5	35.4	40.5	57.5	81.2	116.4	142.1	177.5	196.7	162.1	132.3	1274.7
Rainfall	R		mm/month	48.1	42.8	46.2	44.6	52.1	55.3	61.7	55.8	45.7	42.4	41.8	42.4	578.9
Crop Factor	C		unitless	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
OUTPUTS																
Evapotranspiration	ET	E x C	mm/month	65.2	41.2	28.3	32.4	46.0	65.0	93.1	113.7	142.0	157.4	129.7	105.8	**1020**
Seepage	S	DSR x D	mm/month	52.7	47.6	52.7	51.0	52.7	51.0	52.7	52.7	51.0	52.7	51.0	52.7	**620.5**
Total Outputs		ET+S	mm/month	117.9	88.8	81.0	83.4	98.7	116.0	145.8	166.4	193.0	210.1	180.7	158.5	**1640.3**
INPUTS																
Retained Rainfall	RR	R x RF	mm/month	38.5	34.2	37.0	35.7	41.7	44.2	49.4	44.6	36.6	33.9	33.4	33.9	**463.1**
Applied Effluent	W	QxD	L/month	102455	92540	102455	99150	102455	99150	102455	102455	99150	102455	99150	102455	**1206325**
Total Inputs		RR+W	mm/month	140.9	126.8	139.4	134.8	144.1	143.4	151.8	147.1	135.7	136.4	132.6	136.4	**1669.4**
DISPOSAL RATE																
Disposal Rate	DR	(ET+S)-RR	mm/month	79.4	54.6	44.1	47.7	57.0	71.7	96.5	121.7	156.4	176.1	147.2	124.6	
LAND AREA REQUIRED FOR ZERO STORAGE			m^2	1290	1696	2325	2078	1797	1382	1062	842	634	582	673	822	

MINIMUM AREA REQUIRED FOR ZERO STORAGE:	2325	m^2
ADOPTED LAND APPLICATION AREA:	2400	m^2
DESIGN APPLICATION RATE:	1.4	mm/day

STORAGE CALCULATION

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Application Rate	AR	Q/L	mm/month	42.7	38.6	42.7	41.3	42.7	41.3	42.7	42.7	41.3	42.7	41.3	42.7
Storage For The Month	ST	AR-DR	mm/month	-36.7	-16.0	-1.4	-6.4	-14.3	-30.4	-53.8	-79.1	-115.1	-133.5	-105.9	-81.9
Increase In Depth Of Stored Effluent	ΔH	ST/N	mm/month	-122.4	-53.3	-4.6	-21.4	-47.8	-101.4	-179.2	-263.5	-383.8	-444.8	-353.1	-273.1
Storage Remaining From Previous Month			mm/month	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumulative Storage At End Of Month	CS		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
Cumulative Storage From Previous Year	CS		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
Maximum Storage Depth for Nominated Area	MS			0 mm											

DESIGN DIMENSIONS SUMMARY

Land Application Area	LAA	2400	m^2
Maximum Storage Height	MS	0	mm
Minimum Freeboard Topsoil Layer	F	150	mm
Min Depth Of Land Application System	Z		mm

COMPUTATION SHEET

McCLELLANDS CONSULTING ENGINEERS

Project:	Stage 4-6 School Expansion	**Project No.:**	260107
	674-740 Coburns Road	**Comp:**	LCA
	Toolern Vale	**Date:**	2.04.26
Client:	Melton Christian College	**Attendee:**	DJH
Subject:	Land Application Area Sizing Using Nitrogen Balance Calculations: **Stage 6**	**Review:**	PMO'N

INPUT DATA[1]

Wastewater Loading		
Hydraulic Load	3,305	L/day
Effluent N Concentration	30	mg/L
% N Lost to Soil Processes (Geary & Gardner 1996)	0.2	Decimal
Total N Loss to Soil	19830	mg/day
Remaining N Load after soil loss	79320	mg/day

Nutrient Crop Uptake					
Crop N Uptake	220	kg/ha/yr	which equals	60.27	$mg/m^2/day$

NITROGEN BALANCE BASED ON ANNUAL CROP UPTAKE RATES

Minimum Area required with zero buffer		
Nitrogen	1316	m^2

Determination of Buffer Zone Size for a Nominated Land Application Area (LAA)		
Nominated LAA Size	2400	m^2
Predicted N Export from LAA	-23.85	kg/year
Minimum Buffer Required for excess nutrient	0	m^2

SUMMARY - LAND APPLICATION AREA REQUIRED BASED ON NITROGEN BALANCE 1316 m^2

NOTES

[1] Model sensitivity to input parameters will affect the accuracy of the result obtained. Where possible site specific data should be used. Otherwise data should be obtained from a reliable source such as:

- *EPA Guidelines for Effluent Irrigation*
- *Appropriate Peer Reviewed Papers*
- *Environment and Health Protection Guidelines: Onsite Sewage Management for Single Households*
- *USEPA Onsite Systems Manual*

Analysed Weekly Wastewater Flow Data

Date	Days in monitoring period	Percent of monitoring period	Meter 1	Flow over period	Meter 2	Flow over period	Meter 3	Flow over period	Meter 4	Flow over period	Ave. weekly flow m3	Ave. weekly flow L	Ave. daily flow m3	Ave. daily flow L	Ave. daily flow/person	Average Stage 4 forcast daily flow L	Average Stage 6 forcast daily flow L	Percent of year
22/02/2024			125.9		194.43		77.76		203.19									
29/02/2024	7	2	126.36	0.46	197.87	3.44	82.1	4.34	203.19	0	8.24	8240.00	1.18	1177.14	7.0	3440.3	5514.4	2
7/03/2024	7	2	126.44	0.08	199.78	1.91	85.29	3.19	203.19	0	5.18	5180.00	0.74	740.00	4.4	2162.7	3466.5	
28/03/2024	21	6	127.01	0.57	207.78	8	91.39	6.1	203.26	0.07	4.91	4913.33	0.70	701.90	4.2	2051.4	3288.1	
18/04/2024	21	6	128.28	1.27	216.06	8.28	100.87	9.48	203.33	0.07	6.37	6366.67	0.91	909.52	5.4	2658.2	4260.7	6
24/04/2024	6	2	128.28	0	218.44	2.38	101.66	0.79	203.33	0	3.70	3698.33	0.53	528.33	3.1	1544.1	2475.0	
6/05/2024	12	3	128.38	0.1	222.49	4.05	106.16	4.5	203.33	0	5.05	5045.83	0.72	720.83	4.3	2106.7	3376.8	
20/05/2024	14	4	129.34	0.96	226.85	4.36	111.97	5.81	203.33	0	5.57	5565.00	0.80	795.00	4.7	2323.5	3724.2	
27/05/2024	7	2	129.35	0.01	229.45	2.6	112.55	0.58	205.17	1.84	5.03	5030.00	0.72	718.57	4.3	2100.1	3366.2	
3/06/2024	7	2	129.59	0.24	232.08	2.63	112.55	0	207.8	2.63	5.50	5500.00	0.79	785.71	4.7	2296.3	3680.7	
11/06/2024	8	2	129.6	0.01	234.95	2.87	112.55	0	211.05	3.25	5.36	5363.75	0.77	766.25	4.6	2239.5	3589.5	
24/06/2024	13	3	129.78	0.18	238.43	3.48	112.55	0	213.91	2.86	3.51	3510.77	0.50	501.54	3.0	1465.8	2349.5	
1/07/2024	7	2	129.78	0	240.07	1.64	112.55	0	215.77	1.86	3.50	3500.00	0.50	500.00	3.0	1461.3	2342.3	
15/07/2024	14	4	129.91	0.13	242.79	2.72	112.55	0	218.47	2.7	2.77	2775.00	0.40	396.43	2.4	1158.6	1857.1	
22/07/2024	7	2	130.11	0.2	244.43	1.64	112.55	0	219.47	1	2.84	2840.00	0.41	405.71	2.4	1185.7	1900.6	
29/07/2024	7	2	130.31	0.2	246.78	2.35	112.55	0	220.97	1.5	4.05	4050.00	0.58	578.57	3.4	1690.9	2710.3	
5/08/2024	7	2	130.44	0.13	249.73	2.95	112.55	0	223.7	1.73	4.81	4810.00	0.69	687.14	4.1	2008.3	3218.9	
12/08/2024	7	2	130.53	0.09	251.9	2.17	112.55	0	225.04	2.34	4.60	4600.00	0.66	657.14	3.9	1920.6	3078.4	
19/08/2024	7	2	130.53	0	254.57	2.67	112.55	0	227.75	2.71	5.38	5380.00	0.77	768.57	4.6	2246.2	3600.4	
26/08/2024	7	2	130.79	0.26	258.5	3.93	112.55	0	230.84	3.09	7.28	7280.00	1.04	1040.00	6.2	3039.5	4871.9	2
2/09/2024	7	2	131.16	0.37	261.55	3.05	112.55	0	233.22	2.38	5.80	5800.00	0.83	828.57	4.9	2421.6	3881.5	
9/09/2024	7	2	131.25	0.09	264.17	2.62	112.55	0	235	1.78	4.49	4490.00	0.64	641.43	3.8	1874.7	3004.8	
16/09/2024	7	2	131.45	0.2	266.82	2.65	112.55	0	236.64	1.64	4.49	4490.00	0.64	641.43	3.8	1874.7	3004.8	
30/09/2024	14	4	131.55	0.1	269.06	2.24	112.55	0	238.89	2.25	2.30	2295.00	0.33	327.86	2.0	958.2	1535.9	
7/10/2024	7	2	131.55	0	269.61	0.55	112.55	0	239.24	0.35	0.90	900.00	0.13	128.57	0.8	375.8	602.3	
14/10/2024	7	2	131.81	0.26	271.96	2.35	112.55	0	241.09	1.85	4.46	4460.00	0.64	637.14	3.8	1862.1	2984.7	
21/10/2024	7	2	131.9	0.09	275.37	3.41	112.55	0	243.45	2.36	5.86	5860.00	0.84	837.14	5.0	2446.6	3921.6	
28/10/2024	7	2	131.99	0.09	278.15	2.78	112.55	0	245.39	1.94	4.81	4810.00	0.69	687.14	4.1	2008.3	3218.9	
6/11/2024	9	2	131.99	0	280.55	2.4	112.55	0	247.44	2.05	3.46	3461.11	0.49	494.44	2.9	1445.1	2316.2	
11/11/2024	5	1	132.09	0.1	284.31	3.76	112.55	0	250.19	2.75	9.25	9254.00	1.32	1322.00	7.9	3863.7	6192.9	1
18/11/2024	7	2	132.36	0.27	287.09	2.78	112.55	0	253.15	2.96	6.01	6010.00	0.86	858.57	5.1	2509.3	4022.0	2
26/11/2024	8	2	132.47	0.11	290.4	3.31	112.55	0	255.71	2.56	5.23	5232.50	0.75	747.50	4.4	2184.7	3501.7	
9/12/2024	13	3	133.29	0.82	296.4	6	112.55	0	261.97	6.26	7.04	7043.08	1.01	1006.15	6.0	2940.6	4713.4	3
28/02/2025	81	22	136.45	3.16	314.8	18.4	112.61	0.06	278.65	16.68	3.31	3309.88	0.47	472.84	2.8	1381.9	2215.0	
	372	100	10.55	10.55	120.37	120.37	34.85	34.85	75.46	75.46	4.88	4880.73	0.70	697.25	4.15	3863.7	6192.9	16
	Total	%	Total	Total	Total	Total	Total	Total	Total	Total	Average	Average	Average	Average	Average	Max	Max	%

2024 Occupants	168
Stage 4 Occupants	491
Stage 6 Occupants	787

>4000L