Site and Soil Assessment

for

On-Site Wastewater Management

Commercial System

Lot 4 DP865818

110-112 Mount Vernon Road, Mount Vernon NSW 2178

Penrith City Council

3rd September 2020

Roberts Resources – September 2020

Report Reference: SJDSSE_0002

This Wastewater Management Report has been prepared by Roberts Resources for the owners of Number 110-112 Mount Vernon Road, Mount Vernon NSW 2178 (Lot 4 – DP865818) for purpose and to the scope stated in this report. The services undertaken by Roberts Resources in connection with preparing this report are limited to those specifically detailed in the report.

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This report is not a Certificate of Compliance with the requirements of any Act, Regulation, Ordinance or by-law.

This report has been developed based on agreed requirements as understood by Roberts Resources at the time of the investigation. It only applies to a specific task on the nominated lands. This task and accompanying report are a ‘Wastewater Management Study ‘only.

This report is based on a single site inspection. The entire property was not assessed and the assessment is limited to those areas and sections of the property requested as well as reasonably accessible and visible to the inspector at the time of the inspection. The inspection did not include earthworks or excavation, mechanical, soil pit sampling, removing or moving objects including but not limited to, vegetation, infrastructure, debris or refuse. The inspector did not dig, gouge, force or perform any other invasive procedures to the area or any part of the property grounds other than hand auger soil testing.

 The sole purpose of this report and the associated services performed by Roberts Resources is to prepare a Wastewater Management Study in accordance with the relevant Australian Standards and Guidelines relevant to Wastewater Management Studies.

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1.0 Introduction

Roberts Resources Pty Ltd in accordance with AS/NZS 1547:2012 (On-site domestic wastewater management), Penrith City Council 'On-Site Sewage Management and Greywater Reuse' 2014 and the Environment and Health Protection Guidelines 'On-site Sewage Management for Single Households' 1998 as well as other relevant documentation where cited; was commissioned to undertake a Site and Soil Assessment (referred to as 'Wastewater Management Study') in the Penrith City Council Local Government Area.

This Wastewater Management Study has been completed to investigate whether on-site effluent treatment and disposal can be sustainably accommodated and managed within Lot 4 (110-112), DP865818; Mount Vernon Road, Mount Vernon, NSW 2178 for the proposed wastewater producing building and infrastructure for Development Application 19/0886.

Development Application and proposed building on this site is for a Childcare Facility.

The site is currently undeveloped and zero infrastructure exists on-site.

All work associated with this report was undertaken by Roberts Resources Principal; D. Roberts.

Site assessment was conducted on the 3rd of September 2020.

It must be noted that although all standards listed in the AS/NZS 1547:2012 has been adhered too, it is impossible to ascertain the exact soil profiles/classifications and relationship to bedrock across the entire site without conducting a more thorough exploration project.

2.0 Site Assessment

2.1 Consultant Details

Company:	**Roberts Resources – Independent Geoscience Consultants**
Disciplines:	**Geomorphology – Geology – Soil Science – Hydrogeology**
Service Areas:	**Civil – Environmental – Exploration – Agricultural**
Address:	**'Somerton' Duke Street, Mittagong, NSW 2575**
PH:	[redacted]
Site Assessor:	**Dave Roberts**
Email:	[redacted]
Field Work Date:	**3rd September 2020**
Assessment Ref:	**SJDSSE_0002**

2.2 Site Details

Owner:	Vladimir Vanovac and Mark Toma
Email:	N/A
Phone:	N/A
Address:	110-112 Mount Vernon Road, Mount Vernon, NSW 2178
Postal Address:	N/A
Lot / DP:	4 / 865818
Report Commissioned By:	Owners

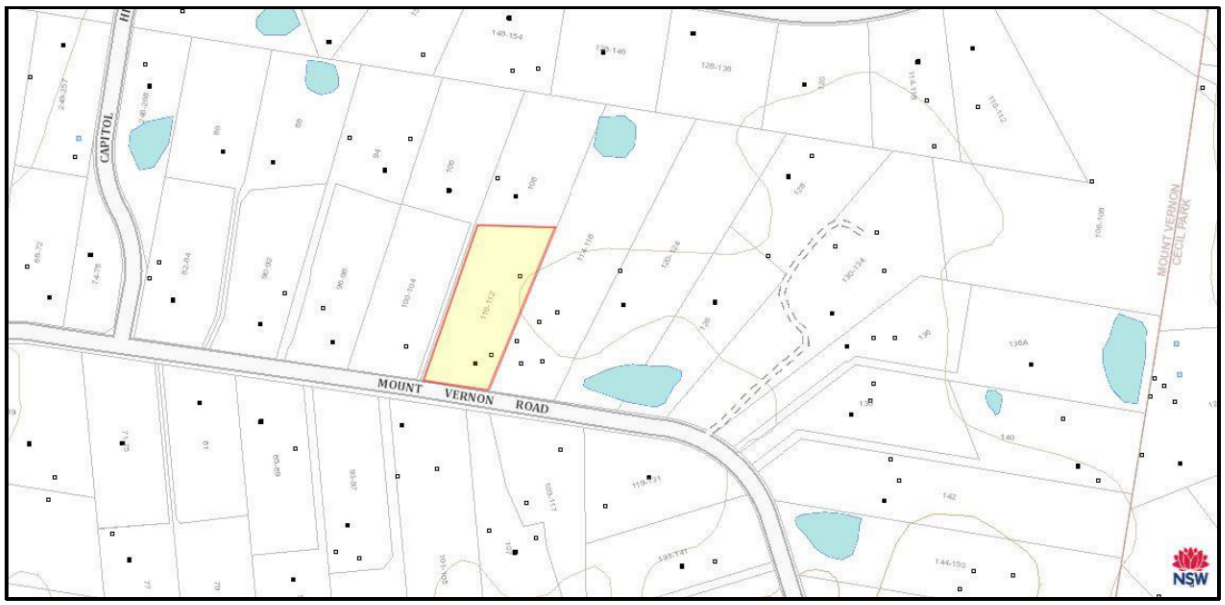


Figure 1: Site Location – 110-112 Mount Vernon Road, Mount Vernon (Sixt Maps Image)

GPS (if known):

Allotment Size:	1.033ha
Local Government Authority:	Penrith City Council
Topographic Map:	Penrith 1:25,000

Photograph 1: Existing Property Condition - zero infrastructure

Proposed Development: Childcare Facility - New On-site Wastewater Management System.

Figure 2: Proposed Infrastructure Location on Property

Existing Wastewater Type:	None
Water Supply:	Town (Reticulated)
Current Bedrooms:	N/A
Potential Bedrooms:	N/A
Proposed Pool:	No
Sydney Catchment Area:	No
Neighboring System Types:	Septic Tank / AWTS – Irrigation surface and subsurface, absorption bed type

2.3 Land Application Area - Site Information

Assessment Criteria:

Penrith City Council Development Control Plan – 'On-Site Sewage Management and Greywater Reuse' 2014

AS/NZS 1547:2012 On-site Domestic wastewater management

NSW Government Health: Sewage Management Facility Vessel Accreditation Guideline February 2016

NSW Health Department: Septic Tank and Collection Well Accreditation Guideline – Part 4, December 2001

Australian Standard – AS/NZS 1546. 1:2008

Environment and Health Protection Guidelines 'On-site Sewage Management for Single Households' 1998

Design Wastewater Loading:

- Maximum Children per day = 96 @ 23 litres per child per day. Total per day maximum for children = 2,208 litres
- Maximum Staff per day = 16 @ 40 litres per staff member. Total per day maximum for staff = 640 litres.

Total per day wastewater loading = 2,848 litres

5% fluctuation contingency capacity of total = 142 litres

Grand Total = 2,990 litres per day maximum flow

Climate:	N/A
Height Above Sea Level:	95 meters
Evaporation > Rainfall:	Yes (source BOM, as at December 2011)
Flood Potential:	Flood studies have not been consulted for this assessment. On-site inspection has concluded the following; Proposed treatment system location is above 1:100-year flood level. Proposed Land Application Area (LAA) is above 1:20-year flood level. Both areas are considered a low limitation.
Frost Potential:	This locality is not known to endure long and sustained frosts and as such is considered a low limitation.
Exposure:	East to West. Low limitation
Slope:	~1-2 across LAA. Minor Limitation
LAA Landform:	LAA on open flat ground (Linear divergent / planar). Minor Limitation
Run on:	Low potential. Minor Limitation

Run off & Seepage:	Low potential if designed properly. Minor Limitation
Springs or Seeps:	None observed. Minor Limitation
Erosion/Movement:	None observed. Minor Limitation
Drainage:	Well drained. Minor Limitation
Evidence of Fill:	None. Minor Limitation
Outcrop/Surface Rock:	None observed.
Domestic Groundwater:	No Domestic Water Bore on property. Minor Limitation
Watercourses/body's	LAA > 40 meters from drainage depression / dam. LAA > 100 meters from permanent/intermittent water stream/river. LAA > 150 meters from named river.

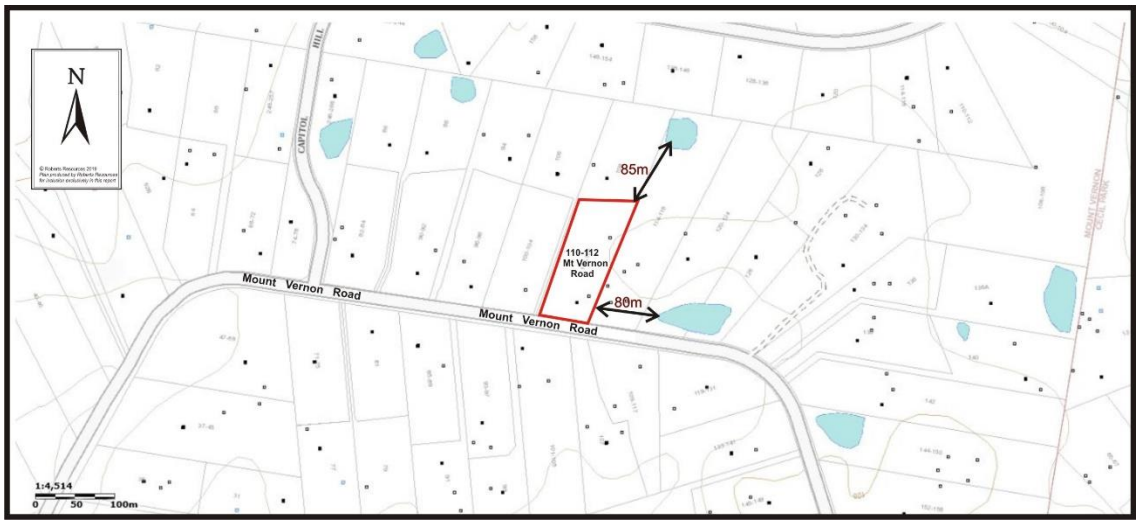


Figure 3: Hydro mapping surrounding property

Vegetation:	LAA present vegetation cover – Managed Lawn. Low Limitation
Property Use:	Rural-Residential. Low Limitation
Previous Property Use:	Rural. Low Limitation
Soil Compaction:	No cracks or compaction observed. Low Limitation
Salinity:	Not observed.
LAA Availability:	Extremely low due to intended property use. Very High Limitation.
Geology:	Sedimentary (Wianamatta Group)
Soil Landscape:	Blacktown
Geological/Geotech Hazards:	Unknown in this area.
Environmental Areas:	None known. Low Limitation
Ground Water:	Not intersected. Low Limitation
Mains Sewer Potential:	No known plans.
System Access:	Excellent. Low Limitation

3.0 Soil Assessment

3.1 Method

Auger holes were drilled across the site and Land Application Area. Soil type and profile is believed to be continuous across the property.

Representative soil samples were taken and sent to an approved NATA laboratory for testing. Test results are listed in Appendix 1.

A soil classification summary log for the drill holes is presented in Table 1. Table 2 outlines any limitations to the site soils for wastewater disoposal by chemical analysis. An overall soil classification summary relating to the soil horizon/s to be utilized in the LAA, Table 3.

With the exception of the Modified Emerson Aggregate Test, there are no limitations for treated effluent application to the site. The Modified Emerson Aggregate presents a moderate limitation. This limitation is addressed in Section 4.2 'Land Application Area Disposal Method Design' with the recommended design modifications allowing for this moderate limitation.

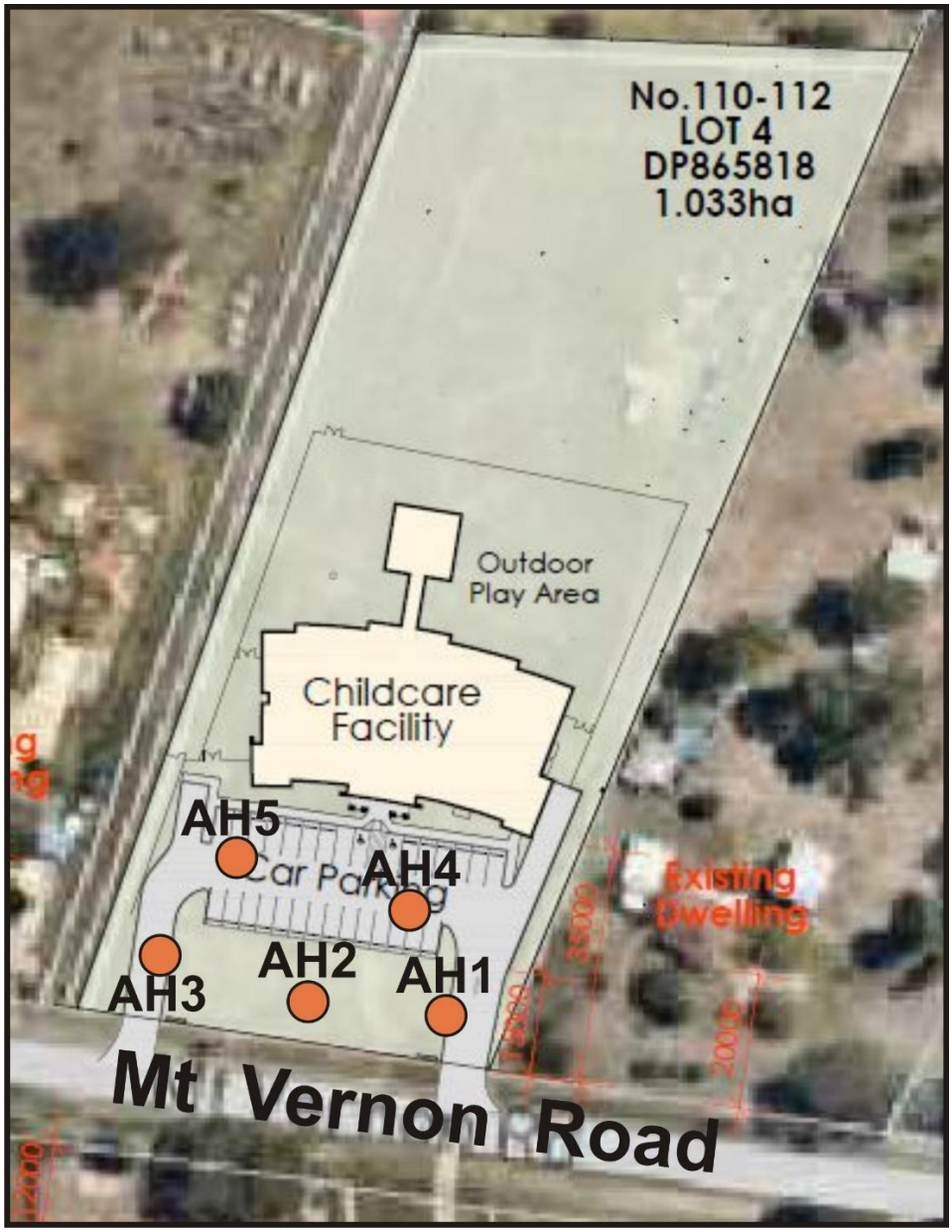


Figure 4: Proposed building and site layout relative to Drill Hole locations

3.2 Soil Classification

Table 1: Soil Classification Log

Layer	Horizon	Test Type	Depth to (mm)	Texture	Moisture	Colour	% Frags	Structure	Consistency	Mottling	Sample Taken	Emerson	PH	EC	Category	Photo	Comment
1	A11	AH	260	SL	D	DB	15	S	2	No	Yes	NR	6.0	N/A	2	Yes	
2	A12	AH	330	LS	M	DB	15	S	2	No	Yes	NR	6.0	N/A	2	Yes	
3	B11	AH	490	SCL	M	B	15	S-M	2	No	Yes	NR	6.0	N/A	4	Yes	Common Floaters
4	B12	AH	1129	LC	M-VM	B-LB-O	20	S	3	At Base	Yes	NR	5.5	N/A	5	Yes	Common Floaters

Photograph 2: Auger Hole 1

Table 2: Soil Chemistry Tests and Limitations

Test	Limitiation
pH (1:5)	Minor
Electrical Conductivity	Minor
Emerson Aggregate Test	Moderate
Exchangeble Cations	Minor
Psorption Index & Psorption Capacity	Minor

Table 3: Soil Classification Summary – Land Application Area

Horizon/s Most Impacted - Utilised in LAA	B11 / B12
Soil Category Adopted	5
Indicative Drainage	Strong / Moderate
Structure	Strong / Moderate
Texture	Light Clay
Indicative Permeability P(m/d) as Ksat	0.12 - 0.5
Recommended DLR (mm/d) (AS/NZS 1547:2012)	12

4.0 System Design and Specifications

4.1 Treatment Plant

The required minimum standard the treatment plant is to be capable of processing is a minimum of 2990 litres of effluent per day, treated to 'secondary' class or higher.

The treatment plant will require a 'multi-tank' treatment system. Essential to this design is surge capability incorporated into Tank 1. This is required due to the intended operating times and subsequent hydraulic loading expected from the Childcare Facility. This being; a surge in wastewater production between the hours of approximately 7am to 7pm (Childcare Facility operating hours). Tank 1 should be baffled or meshed to act as first stage separation. Tank 1 will also require an alarm and flashing light to indicate high water level has been reached or a blockage has occurred. Childcare Facilities are at risk from non-disposable or inappropriate items flushed down toilets occasionally and it is essential that these are picked up in the first tank rather than making their way into the main treatment tank and causing breakdowns.

A second tank should be part of the treatment process to cause further separation of solids and liquids. This could be baffled and/or grated/meshed. Initial stage aeration can also be introduced.

The next tank or series of tanks should fully treat the wastewater to 'secondary class' and will ideally incorporate a series of aeration chambers, clarification chamber, chlorine chamber and pump well to output/distribution pipe.

The final tank requires a timed dose/pump capability ensuring treated effluent is distributed to the Land Application Area in 'timed' increments across a 24-hour period. The more common demand dosing found in domestic treatment plant applications is not suitable for this site and the buildings daily uses. It is essential the treated effluent is pumped to and introduced into the disposal area in timed increments across a 24-hour daily period to ensure the Land Application Area does not get overloaded.

Immediately after the treated wastewater exits the treatment plant a 100-150-micron filter should be installed and as this is a commercial sized system a daily flow meter to record and track daily flow amounts. There should also be a valve or outlet so treated effluent samples can be easily obtained for testing as required.

The treatment plant will take the effluent produced by the Childcare Facility during its operating hours. Hold the effluent, treat it to secondary class and then distribute the effluent across that day and night ready for the next surge of effluent to begin again the next day when the Facility opens. Even though the Facility is expected to operate Monday to Friday, the system is capable of operating 7 days per week 365 days per year.

All works associated with system manufacture and installation must be completed by a suitably licensed and certified person and comply with all relevant statutory regulations and standards.

Roberts Resources recommends the treatment plant to be an ECONOCYCLE MAXI 35; studies have shown this treatment plant is suited to the site and treatment requirements. Mesh/grates, alarms and flashing light require fitting to Tank 1.

It is critical that a flow meter is fitted to the main treated effluent distribution line in order to gain 'hard data' on the daily flows occurring at the Childcare Facility. This way if for any reason the daily loadings are different to the nominated design loadings proactive design changes can be undertaken to ensure the continued sustainability of the On-Site Wastewater Management System.

Treatment Plant summary specifications are listed below.

Model:	**Econocycle Maxi 35**
Capability:	**2500 – 7000 litres per day**
Treatment Class:	**Secondary**
Configuration:	**3 Tank System**
Tank 1:	**Septic, 7000 litres total (1500 litres min sludge allowance) and (5500 litres min capacity)**
Tank 2:	**Chamber 1: Septic-Baffled (4000 litres)** **Chamber 2: Aeration Section 1 (3000 litres, 80 l/p/m air supply, 1600mm diffusers, 120sqm growth media)**
Tank 3:	**Chamber 1: Aeration Section 2 (3000 litres, 80 l/p/m air supply, 1600mm diffusers, 120sqm growth media)** **Chamber 2: Aeration Section 3 1 (3000 litres, 80 l/p/m air supply, 1600mm diffusers, 120sqm growth media, 0.42sqm / 500 litres capacity clarifier, twin bath chlorination, pump well – irrigation pump, timer)**
Effluent Quality:	**BOD (<20 mg/l)** **SS (<30 mg/l)** **Free Chlorine (>0.2 & <2.0 mg/l)** **Coliforms (<30 cfu/100ml)**

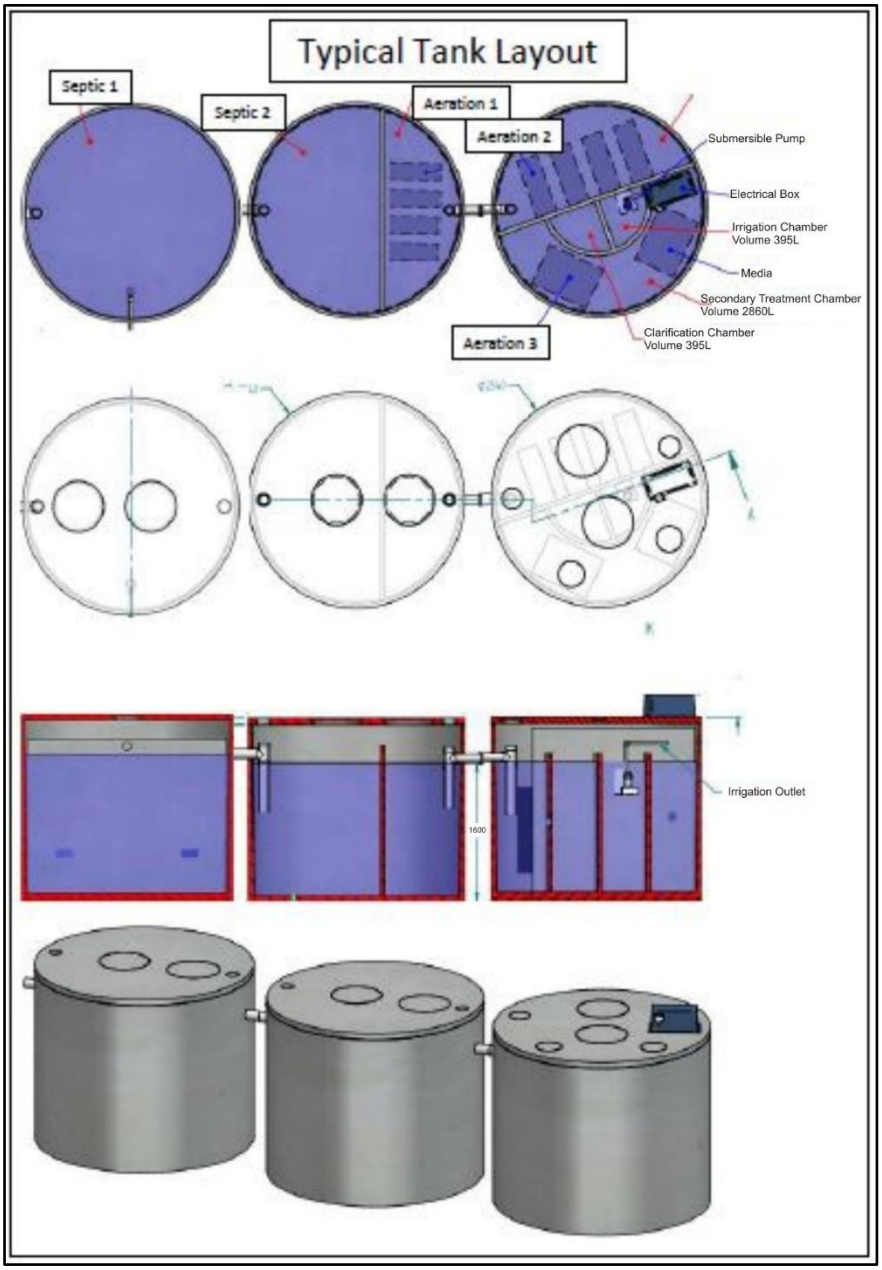


Figure 5: MAXI 35 (Diagramme courtesy of Econocycle Pty Ltd)

4.2 Land Application Area Disposal Method Design

The serviceable life of the Land Application Area (LAA) will be compromised if the prescribed daily calculated design flow of 2990 litres is exceeded.

Any changes to the proposed Building Envelope, Land Application Areas, Design Sizing Calculations, proposed buildings, prior to or post building and installation will require a re-assessment of this site. Adjustments or changes to the wastewater management system must be reviewed and approved by Roberts Resources.

Due to planned infrastructure, property use and future property plans available land for wastewater disposal is extremely limited. There is not enough available land for surface or subsurface irrigation. Wisconsin Mounds or Amended Soil Mounds are suitable however, again the site layout, development requirements and lack of available space inhibit this as a suitable disposal method.

Soil characteristics when considered alongside intended property use, site layout and characteristics dictate that conventional absorption methods are not suitable and for efficient and for effective wastewater disposal a combination of absorption and evapotranspiration methods are necessary.

The LAA is best suited to Subsurface Absorption and Evapotranspiration methods. This is best delivered via ETA Bed (Evapotranspiration Absorption Bed) Distribution.

Site and soil characteristics require all top soil and growth medium associated with the ETA Bed and vegetation to be imported. Zero existing soils from the site are suitable for constructing any part of the ETA Bed. All soils / layering materials used in the build must be imported and of appropriate industry quality.

Due to the moderate limitation imposed by the Emerson Aggregate test results the ETA Bed base will require excavation deeper than the usually prescribed 500mm from ground surface. The ETA Bed base will need to be excavated to a total depth of 800mm from ground surface. 400mm of high-quality Sandy Clay Loam is to be imported and used to build the bed base back up from 800mm depth to 400mm depth from surface ensuring a total of 400mm thick Sandy Clay Loam layer is created. This layer will require even compaction to an industry standard compaction rate for this soil type to ensure zero subsidence of this layer occurs over time. The regular ETA Bed design and layering can then be installed on top of this 400mm Sandy Clay Loam layer.

Penrith City Council DCP requires a 100% reserve area available relative to the primary Land Application Area. The prescribed primary Land Application Area is 250m². An additional 293m² of usable reserve area is available for ETA Bed disposal type. This is split across 3 zones.

Design Sizing Calculations are provided and tabulated in Table 4. The ETA Bed specifications are detailed in Table 5 and Figure 6.

Table 4: Design Sizing Calculation – Evapotranspiration Absorption Bed (ETA Bed)

	ETA - Bed
DLR (mm/day)	12
Design wastewater loading	Town (Reticulated)
Design Flow (lt/day)	2990
Disposal Area - Bed width required (metres)	10.5
Disposal Area - Bed length required (metres)	23.9
Total Area Required (m²)	250
Reserve Area Required (m²)	250
Reserve Area Available (m²)	293 (Split across 3 separate areas)
Reserve Area 1 Available (m²)	127
Reserve Area 2 Available (m²)	96
Reserve Area 3 Available (m²)	70

Photograph 3: Example of wide ETA Bed with multiple distribution pipes

Table 5: System Type and Disposal Method Specifications

Treatment Plant	3 Tank System
Treatment Class	Secondary
Tank Size (minimum)	Each Tank 7000 litres
Minimum Daily Flow Capability (lt/d)	2990
DLR (mm)	12
Timed Dose Rate	124.5 (litres per hour)
Disposal Method	Evapotranspiration (ETA) Absorption Bed
Disposal Area Required (m²)	250
ETA Bed Configuration - Length & Width	23.9 metres long X 10.5 metres wide
Manifold	Can be located at end of Bed or through the centre distibuting to pipes either side
Dosing Pipe - From Tank	100mm
Distribution Pipe in beds	100mm slotted (can use smaller to achieve required pressure through system if required)
Distribution Pipe distance from bed edges	1000mm
Distribution Pipes separation distance within bed	1000mm
Bed Base	Entire area of Bed area to be excavated out to a depth of 800mm from ground surface. Bed then built up with Sandy Clay Loam to 400mm from surface. This 400mm layer must be compacted to industry standard compaction rates that guarantee zero subsidence will occur. This layer is not to be over compacted which will destroy permeability rates and must act as a natural occuring soil horizon of this soil type. Explicit direction from a Geotechncial Engineer must be sought for this Layers installation. First Layer (Layer 1) detailed below then starts immediately on top of this 400mm thick Sandy Clay Loam layer
1st layer from base - Fine Sand Layer	50mm thick layer of fine sand (0.1mm) immediately on top on bed base
2nd layer from base - Aggregate	150 mm thick layer of 40mm Blue Stone immediately on top of 1st layer (can use 20mm if 40mm not available)
3rd layer from base - Aggregate	50mm thick layer of 10mm Blue Stone immediately on top of 2nd layer
4th layer from base - Fine Sand Layer	150mm thick layer of fine sand (0.1mm) immediately on top of 3rd layer
Aggregate and Sand Quality	Ensure aggregate is of even size. No smaller or larger aggregates, fines or dust is to be incorporated - sieve and wash aggregate first to ensure only the specified aggregate size is installed. All sand is to be of uniform size. Zero dust, particles, forign materials or smaller or larger sand grains to be included.
5th layer from base - Imported top-soil	100mm thick layer of premium top soil (fine sandy loam to loam) immediately on top of 4th layer. Subsidence potential must be calculated. This may mean the initial thickness of this layer maight be 150-200mm thick with subsidence expected to occur over time. Geotechncial consultation may be required to calculate subsidence.
Distribution Pipe Base Depth	Centre of 2nd layer
Geotextile Cloth Required	No
Depth of bed from natural surface (bed base depth)	400mm
Total Bed Thickness	500mm
Height above natural surface	100 - 150mm minimum raised above (allow for settling)
Batter	1 to 3
Gypsum Required	At maximum application rate for clay on bed base (800mm depth from ground surface)
Air Flow Vents Required	Yes (must be insect proof)
Inspection Ports Required	Yes (must be insect proof)
System Flush	Flush return line must be incorporated
Field Flush Vale	Required
Non-Return Valves / pressure reducing valves	Required
Air/Vacume Release Valves	Not essential but preferable to have at least one
Filter Required	Yes; must be 100-150 micron positioned immediately after final tank outlet
Filter Flush Valve	Required
Sample Port Required	Yes; must be positioned after final treatment tank and before ETA Bed Manifold
Grass Required	By time of certification (or compatable vegetation - Detailed in Appendix 2)
Upslope Diversion Drains Required	Yes
Hydraulic Capacity	Pump must be sized correctly to deliver required head and flow rate throughout entire bed. Successful testing must be undertaken prior to signoff. This means the system must be run with clean water for a period equivalent to the 'timed dose'. The installer or certifier must document and photograph the process. The entire system must work as required meaning all distribution pipes are delivering the required flow evenly across all dispribution pipes at the prescribed dosage for the timed-dose period.
Additional Comments 1	During installation; if any changes in ground conditions are encountered that are different to recorded in this report. Contact Roberts Resources for discussion and further planning prior to finalising the installation
Additional Comments 2	Do not operate machines in trench/bed. This will compact the soil and inhibit efficient trench/bed wokings. Do not construct beds during rain or immediately after rains.
Additional Comments 3	All infrastructure and materials used in the system must comply with all relevant standards and guidelines I.E. they must be effluent quality specific
Additional Comments 4	Test workings of system throughout installation. Make sure pipes are loading and distributing evenly before adding layers 3, 4 and 5.
Additional Comments 5	Water NSW notes that drilling holes within PVC pipe makes them non-compliant with the AS/NZS 3500 as it impacts the structural integrety of the pipe
Additional Comments 6	Ensure the ETA Bed is not positioned under any canopy of existing or planned trees and roots can not encroach into the Bed area
Additional Comments 7	Fully document all stages of build and infrastructure installation with notes and photographs. This is required for documentation and certification procedure
Additional Comments 8	AWTS must not allow any suspended soilids or organic material into main distribution line leading to ETA Bed infrastructure
Additional Comments 9	entire system to be serviced every 3 months minimum
Additional Comments 10	Ensure grass coverage across the bed area to encourage evapotranspiration. Seeding of topsoil (top dressing) recommended yearly followed by oversowing

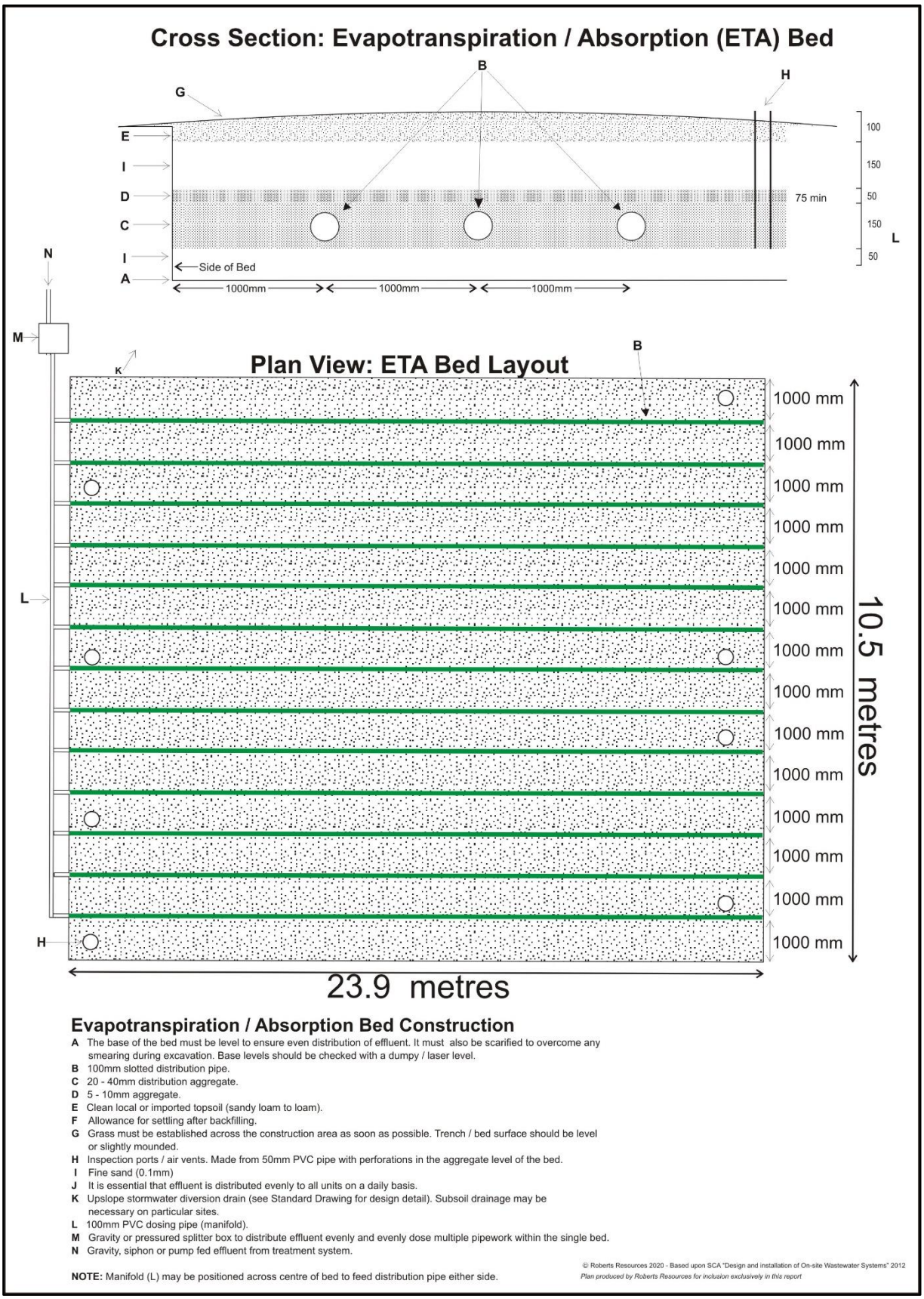


Figure 6: Evapotranspiration Absorption Bed Design

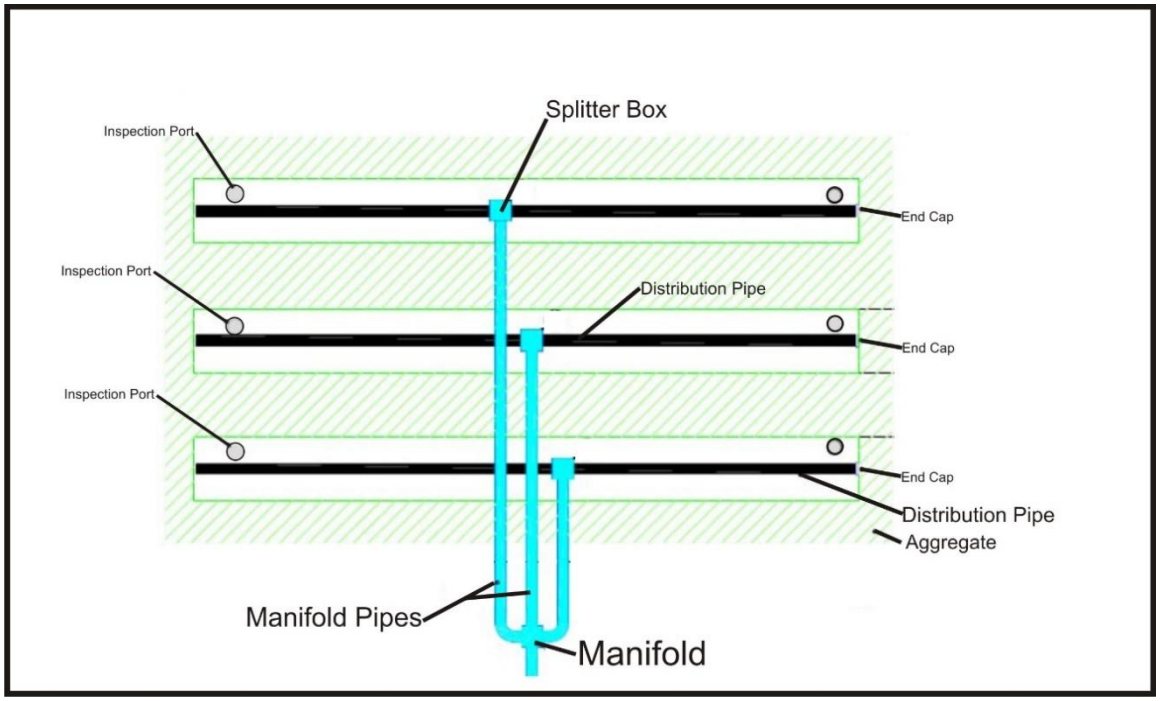


Figure 7: Example of ETA Bed using a Central Manifold System

4.3 Wastewater Management System Location

The location of the nominated Land Application Area (LAA) that will accommodate the ETA Bed and internal infrastructure is shown in Figure 8.

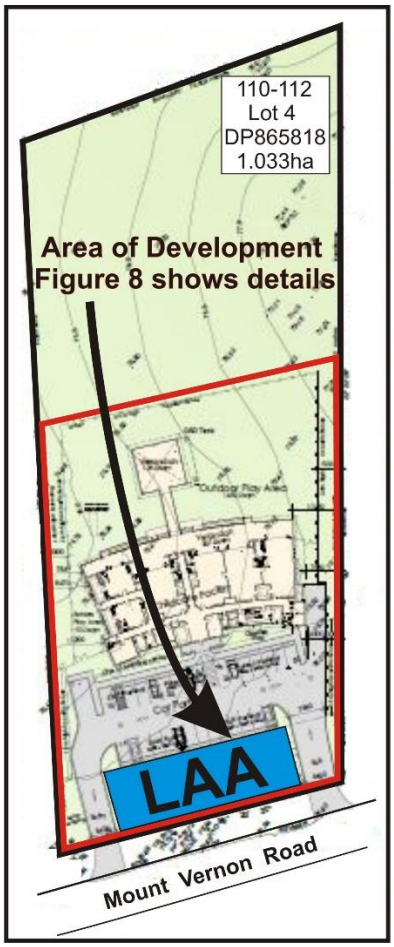


Figure 8: LAA Location

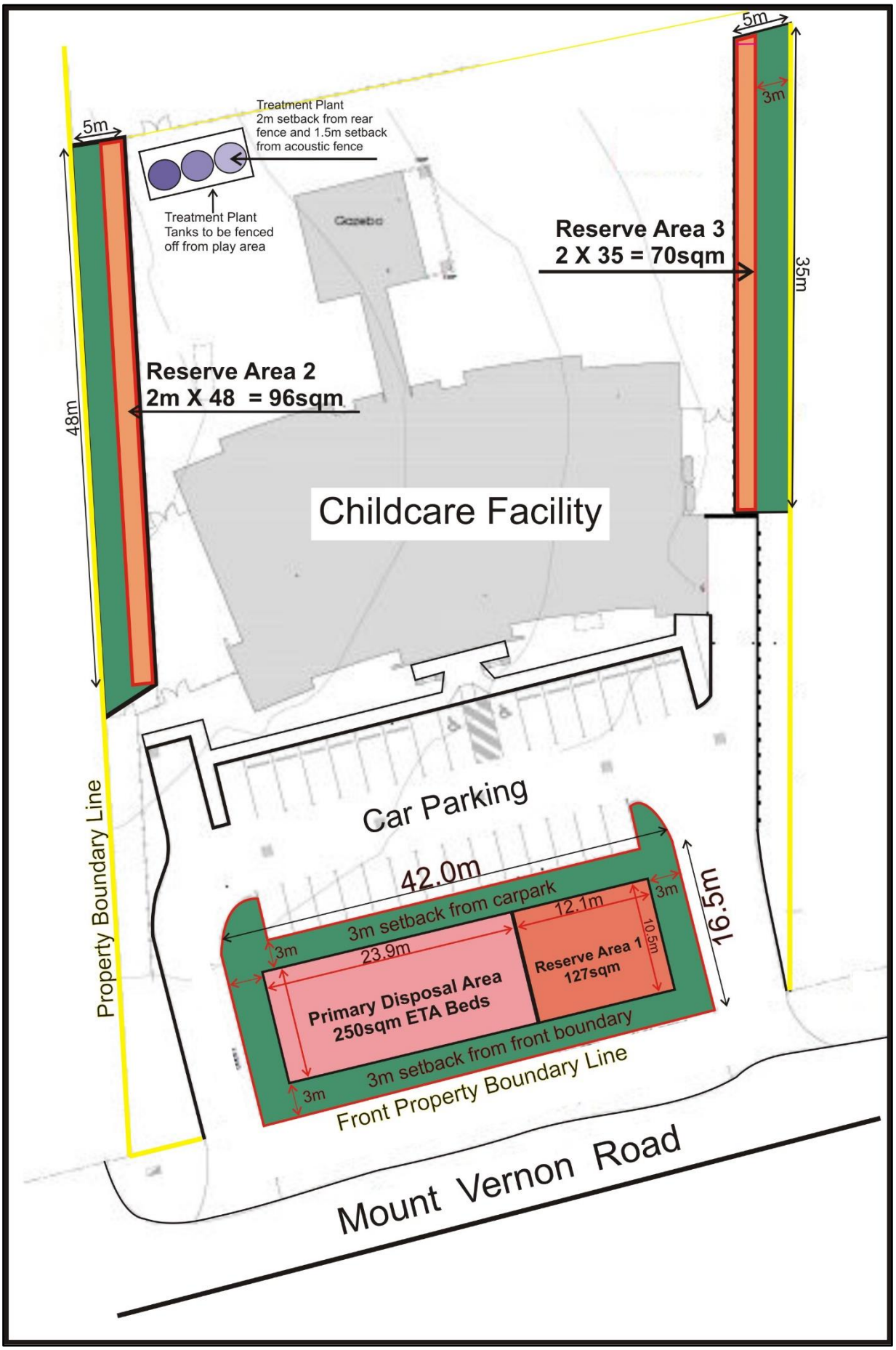


Figure 9: Land Application Area and Site Design

It is proposed in the design calculations that the ETA Bed be designed at a 10.5-meter width with appropriate batter grades along the outer regions. At this configuration outlined in Table 3 the minimum disposal area length when adopting the ETA Bed disposal method is 23.9 meters' bed length.

The 23.9-meter-long, 10.5-meter-wide ETA Bed will give a total of 250m² disposal area.

293m² of Reserve Area split across 3 zones is available and can be configured with standard or raised ETA Beds. 293m² represents greater than 100% land available than the Primary disposal area that will be utilised.

Reserve Area 1 is 127m² and is located immediately adjacent to the Primary disposal area that will hold the ETA Bed. At 127m² this is approximately 50% of the Primary ETA Bed area size. If additional room is ever required utilising Reserve Area 1 first will be easily fitted out with the additional ETA infrastructure.

Reserve Area 2 is 96m² and Reserve Area 3 70m². Both areas are set 3m inside from the eastern and western boundaries and inside the 5-metre-wide land to be vegetated behind the Acoustic Fence. Both reserve areas are 2 metres wide and run for the full length of the vegetated area. If ever required, the ETA Beds that can be installed in this location would be 2 meters wide and 48 metres long in Reserve Area 2 and 30 metres long in Reserve Area 3. As required in the Primary disposal ETA Bed area vegetation used in this location (once ETA Beds are installed) would be required from the Specific List of species nominated in Appendix 2 for ETA Bed plantings and the chosen species must not have root systems that can destroy the disposal infrastructure.

Reserve Areas 2 and 3 have the acoustic fence running north-south on the play area of the facility. The fence is approximately 2.1 metres high. The vegetation to be planted inside the Reserve Areas will not be blocked or shaded and growth of plants unaffected by the fence. Both reserve areas will receive full northern sun throughout the day. Reserve Area 3 will also receive the full eastern morning sun and Reserve Area 2 will receive the full afternoon western sun.

ETA Bed surface to be mounded (150mm minimum) above the adjacent land surface to shed rainwater away from area. Suitable mounding should also consider any potential short and long-term subsidence affects.

The site requires an adequately sized retention mound/diversion drain on all upslope areas surrounding the ETA Bed area and Tank infrastructure. This may not be required as the existing land surface is extremely level and it is understood that post landscaping levels will also be flat. With this in mind the mounded ETA Bed surface will suffice for minimizing any surface flow encroachment. A diversion drain on the up slope side of the treatment plant must be large enough to stop all potential ingress of rainwater surface flow into the Tank areas. It is recommended that the diversion drain be adequately 'keyed' into the subsoil to reduce the risk of percolation of water under the mound itself and tracking/flowing at the interface of soil horizons or soil/bedrock.

The Land Application Area / ETA Bed area is not to be used for any other means and should remain separate from the rest of the property. For example; it should never be driven over and used as a vehicle access path. Warning signs are required around and across the ETA Bed area in order to keep pedestrian traffic off this space.

Discussion with the installer as to the intended usual use of the area will help establish appropriate distribution pipe depths.

The Land Application Area must at all times remain open to the natural climate, ensuring the required amount of sun and wind is captured. Building on top of or immediately adjacent to this area will lessen the positive effects the sun and wind has on the plants and area itself.

Land Application Area is to be planted with compatible grasses of suitable vegetation by time of certification.

Figure 10 shows the basic design for the Diversion Drain.

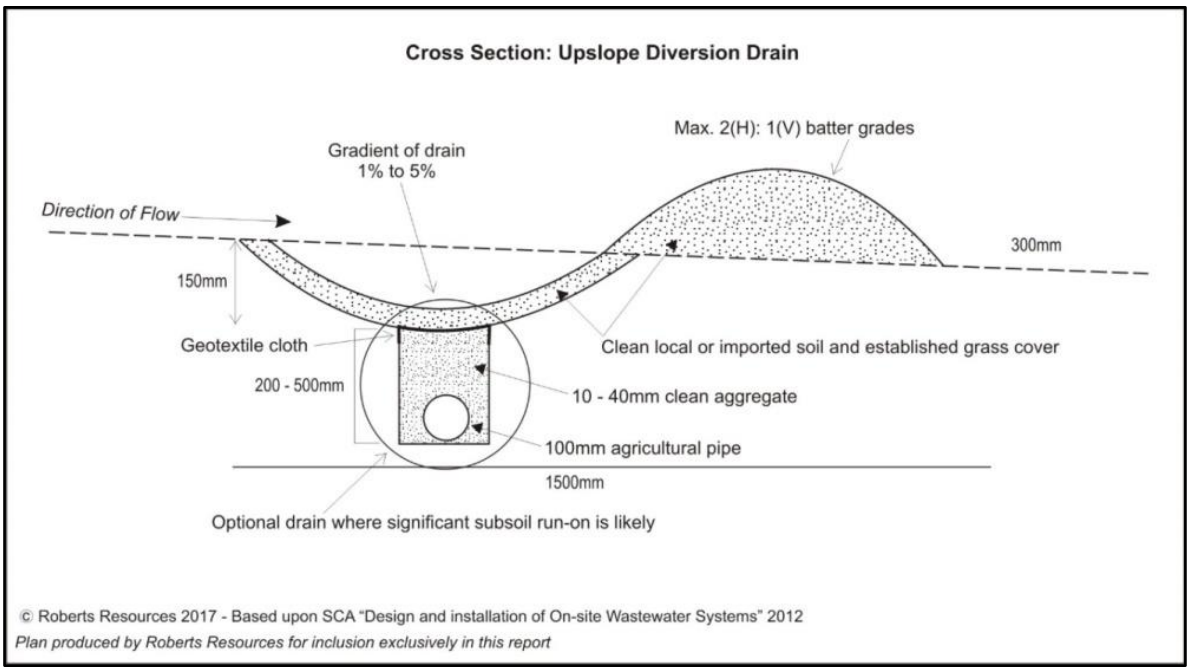


Figure 10: Diversion Drain Design

5.0 Setback Requirements

All regulations and set back requirements can be met on this site. There is no need to encroach into any on-site wastewater infrastructure positioning to either the AS/NZS 1547:2012 or other relevant guidelines or standards.

Table 6: Recommended Setback Distances

SITE FEATURE	SETBACK DISTANCES (m) AS/NZS 1547:2012 Table R1	Comment
Property Boundary	1.5 – 50	-
Buildings / Houses	2.0 - >6.0	-
Surface Water	15 – 100	-
Bore / Well	15 – 50	-
Recreational Areas	3.0 – 15	-
In-ground Water Tank	4.0 – 15	-
Retaining Wall	3.0 or 45° angle from toe of wall	-
Embankments, escarpments, cuttings	3.0 or 45° angle from tow of wall	-
Groundwater	0.6 – 1.5	-
Hardpan or bedrock	0.5 - ≥1.5	-

NOTE: The local government authority may upon considering the public health and environmental risks reduce or increase the distances in the above table.

6.0 Comments and Conclusions

This Wastewater Management Report concludes that it is possible to treat wastewater produced by the proposed Childcare Facility with on-site disposal to the guidelines, parameters and recommendations stipulated within this report. This can be undertaken in a sustainable and environmentally compliant process.

This site is suitable for an on-site wastewater treatment through Commercial Scale AWTS Treatment Plant system utilizing ETA Bed disposal method as detailed in this report.

The ETA Bed must be kept within the nominated Land Application Area.

Design calculations have shown 250m² disposal area is required. Penrith DCP stipulates the same amount of reserve area as the primary disposal area must be available. This site has 293m² reserve area available for future application purposes if required.

Disposal method designs should remain within the stipulated design guidelines in this report.

System installer to provide home owner with complete instruction manual that demonstrates best practice when owning an AWTS / ETA Bed System. This will aid the home owner to ensure the system operates efficiently, cleanly and reduces risk of overloading and contamination.

A flow meter must be fitted to the treatment plant and flow rates recorded in the servicing schedule and presented to council along with the quarterly servicing records.

This is a commercial sized system and it is expected the system manufacturer and installer provided the system owner with a maintenance schedule for reference and compliance. This should also be help on the Local Council database for this property.

The recommendations included in this report assume that at least three-star plumbing fixtures are used throughout the updated dwelling.

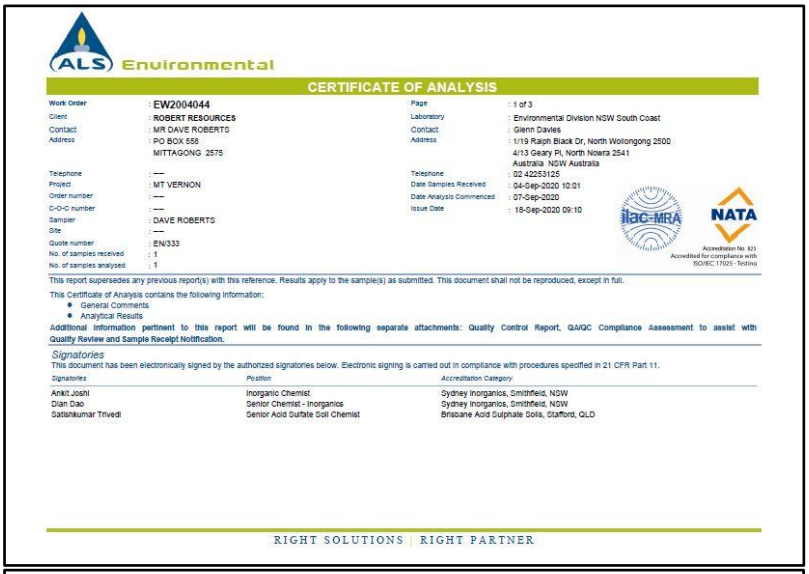
Regular servicing and maintenance of the system must be adhered too.

It is advised to check the condition of the Treatment Plant and LAA at least monthly for the first 12 months' post installation. It is essential to identify any negative issues prior to them becoming an environmental hazard.

7.0 References

- Australian/New Zealand Standard – On-site domestic wastewater management (AS/NZS 1547:2012)
- NSW Government (Sydney Catchment Authority) Designing and Installing On-site Wastewater Systems "A Sydney Catchment Authority Current Recommended Practice" 2012.
- Penrith City Council Development Control Plan – 'On-Site Sewage Management and Greywater Reuse' 2014
- NSW Government Health: Sewage Management Facility Vessel Accreditation Guideline February 2016
- NSW Health Department: Septic Tank and Collection Well Accreditation Guideline – Part 4, December 2001
- Australian Standard – AS/NZS 1546. 1:2008
- Environment and Health Protection Guidelines 'On-site Sewage Management for Single Households' 1998

Appendix 1



ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: EW2004044	Page	: 1 of 3
Client	: ROBERT RESOURCES	Laboratory	: Environmental Division NSW South Coast
Contact	: MR DAVE ROBERTS	Contact	: Glenn Davies
Address	: PO BOX 558 MITTAGONG 2575	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ---	Telephone	: 02 42253125
Project	: MT VERNON	Date Samples Received	: 04-Sep-2020 10:01
Order number	: ---	Date Analysis Commenced	: 07-Sep-2020
C-O-C number	: ---	Issue Date	: 18-Sep-2020 09:10
Sampler	: DAVE ROBERTS		
Site	: ---		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

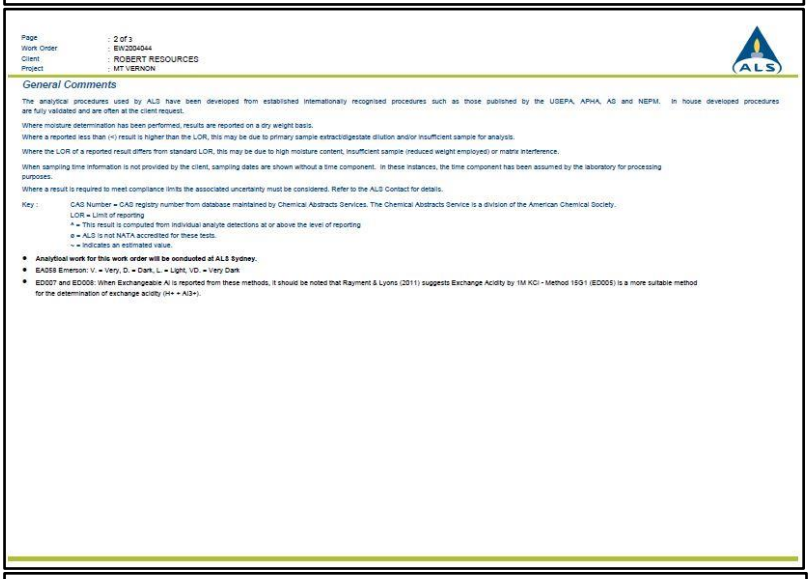
Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dlan Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

RIGHT SOLUTIONS | RIGHT PARTNER



Page : 2 of 3
Work Order : EW2004044
Client : ROBERT RESOURCES
Project : MT VERNON

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

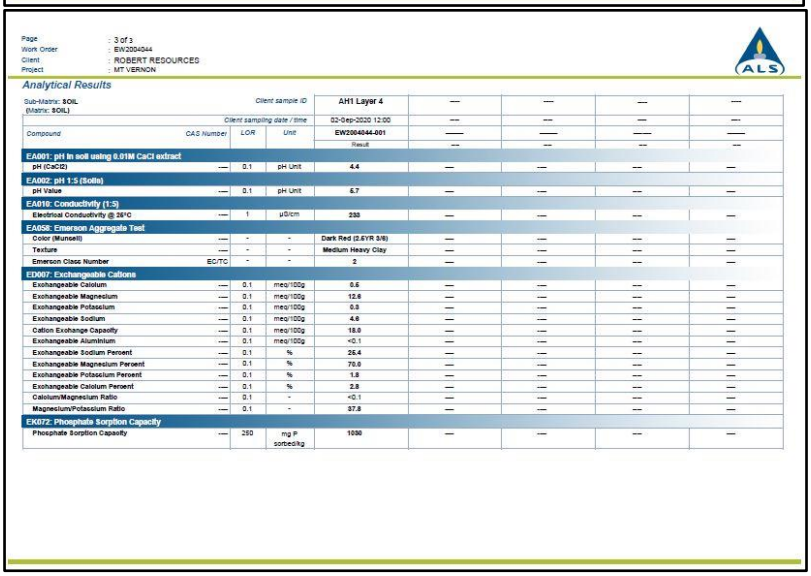
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
a = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EA058 Emerson: V. = Very, D. = Dark, L. = Light, VD. = Very Dark
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).



Page : 3 of 3
Work Order : EW2004044
Client : ROBERT RESOURCES
Project : MT VERNON

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AH1 Layer 4	---	---	---	---
				Client sampling date / time	02-Sep-2020 12:00	---	---	---	---
Compound	CAS Number	LOR	Unit		EW2004044-001	-----	-----	-----	-----
					Result	---	---	---	---
EA001: pH in soil using 0.01M CaCl extract									
pH (CaCl2)	---	0.1	pH Unit		4.4	---	---	---	---
EA002: pH 1:5 (Soils)									
pH Value	---	0.1	pH Unit		6.7	---	---	---	---
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	---	1	µS/cm		233	---	---	---	---
EA058: Emerson Aggregate Test									
Color (Munsell)	---	-	-		Dark Red (2.5YR 3/6)	---	---	---	---
Texture	---	-	-		Medium Heavy Clay	---	---	---	---
Emerson Class Number	EC/TC	-	-		2	---	---	---	---
ED007: Exchangeable Cations									
Exchangeable Calcium	---	0.1	meq/100g		6.6	---	---	---	---
Exchangeable Magnesium	---	0.1	meq/100g		12.6	---	---	---	---
Exchangeable Potassium	---	0.1	meq/100g		0.8	---	---	---	---
Exchangeable Sodium	---	0.1	meq/100g		4.6	---	---	---	---
Cation Exchange Capacity	---	0.1	meq/100g		18.8	---	---	---	---
Exchangeable Aluminium	---	0.1	meq/100g		<0.1	---	---	---	---
Exchangeable Sodium Percent	---	0.1	%		25.4	---	---	---	---
Exchangeable Magnesium Percent	---	0.1	%		70.8	---	---	---	---
Exchangeable Potassium Percent	---	0.1	%		1.8	---	---	---	---
Exchangeable Calcium Percent	---	0.1	%		2.8	---	---	---	---
Calcium/Magnesium Ratio	---	0.1	-		<0.1	---	---	---	---
Magnesium/Potassium Ratio	---	0.1	-		57.5	---	---	---	---
EK072: Phosphate Sorption Capacity									
Phosphate Sorption Capacity	---	250	mg P sorbed/kg		1030	---	---	---	---

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: EW2004044	Page	: 1 of 3
Client	: ROBERT RESOURCES	Laboratory	: Environmental Division NSW South Coast
Contact	: MR DAVE ROBERTS	Contact	: Glenn Davies
Address	: PO BOX 558 MITTAGONG 2575	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ---	Telephone	: 02 42253125
Project	: MT VERNON	Date Samples Received	: 04-Sep-2020
Order number	: ---	Date Analysis Commenced	: 07-Sep-2020
C-O-C number	: ---	Issue Date	: 18-Sep-2020
Sampler	: DAVE ROBERTS		
Site	: ---		
Quote number	: EN/333		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dan Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

RIGHT SOLUTIONS | RIGHT PARTNER

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL

						Laboratory Duplicate (DUP) Report			
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA001: pH in soil using 0.01M CaCl extract (QC Lot: 3249216)									
EB2031005-021	Anonymous	EA001: pH (CaCl2)	---	0.1	pH Unit	7.6	7.6	0.00	0% - 20%
EA002: pH 1:5 (Soils) (QC Lot: 3243058)									
EW2004044-001	AH1 Layer 4	EA002: pH Value	---	0.1	pH Unit	5.7	5.7	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3243057)									
EW2004044-001	AH1 Layer 4	EA010: Electrical Conductivity @ 25°C	---	1	µS/cm	233	221	5.33	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3246732)									
EB2030762-060	Anonymous	ED007: Calcium/Magnesium Ratio	---	0.1	-	4.7	4.6	3.82	0% - 20%
		ED007: Magnesium/Potassium Ratio	---	0.1	-	12.6	12.5	0.859	0% - 20%
		ED007: Exchangeable Calcium Percent	---	0.1	%	79.7	79.3	0.570	0% - 20%
		ED007: Exchangeable Magnesium Percent	---	0.1	%	16.9	17.3	2.09	0% - 20%
		ED007: Exchangeable Potassium Percent	---	0.1	%	1.3	1.4	0.00	0% - 50%
		ED007: Exchangeable Sodium Percent	---	0.1	%	2.0	2.0	0.00	0% - 20%
		ED007: Exchangeable Calcium	---	0.1	meq/100g	8.0	7.7	3.05	0% - 20%
		ED007: Exchangeable Magnesium	---	0.1	meq/100g	1.7	1.7	0.00	0% - 50%
		ED007: Exchangeable Potassium	---	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED007: Exchangeable Sodium	---	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED007: Cation Exchange Capacity	---	0.1	meq/100g	10.0	9.7	2.48	0% - 20%
		ED007: Exchangeable Aluminium	---	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
EK072: Phosphate Sorption Capacity (QC Lot: 3242251)									
EB2022761-006	Anonymous	EK072: Phosphate Sorption Capacity	---	250	mg P sorbed/kg	552	709	24.9	No Limit
EB2023170-009	Anonymous	EK072: Phosphate Sorption Capacity	---	250	mg P sorbed/kg	2000	1990	0.652	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: SOIL

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA010: Conductivity (1:5) (QCLot: 3243057)								
EA010: Electrical Conductivity @ 25°C	---	1	µS/cm	<1	1412 µS/cm	99.3	92.0	108
ED007: Exchangeable Cations (QCLot: 3246732)								
ED007: Exchangeable Calcium	---	0.1	meq/100g	<0.1	1 meq/100g	89.0	76.8	120
ED007: Exchangeable Magnesium	---	0.1	meq/100g	<0.1	1.67 meq/100g	96.2	74.9	116
ED007: Exchangeable Potassium	---	0.1	meq/100g	<0.1	0.51 meq/100g	116	80.0	120
ED007: Exchangeable Sodium	---	0.1	meq/100g	<0.1	0.87 meq/100g	102	80.0	120
ED007: Cation Exchange Capacity	---	0.1	meq/100g	<0.1	---	---	---	---
ED007: Exchangeable Aluminium	---	0.1	meq/100g	<0.1	---	---	---	---
ED007: Exchangeable Calcium Percent	---	0.1	%	<0.1	---	---	---	---
ED007: Exchangeable Magnesium Percent	---	0.1	%	<0.1	---	---	---	---
ED007: Exchangeable Potassium Percent	---	0.1	%	<0.1	---	---	---	---
ED007: Exchangeable Sodium Percent	---	0.1	%	<0.1	---	---	---	---
ED007: Calcium/Magnesium Ratio	---	0.1	-	<0.1	---	---	---	---
ED007: Magnesium/Potassium Ratio	---	0.1	-	<0.1	---	---	---	---

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

Appendix 2

Botanical Name	Approximate Height	Common Name of Variety
Grasses		
Carex spp.		
Lomandra longifolia		
Microlaena stipoides		
Oplismenus imbecillis		
Pennisetum alopecuroides	40 - 80cm	Available as lawn turf
Poa lab		
Stipa spp.		
Ground cover / climbers		
Hibbertia scandens		Snake Vine
Hibbertia stellaris		
Isotoma fluviatalis	Prostrate	
Kennedia rubicunda	Climber	Dusky coral pea
Scaevola albida		
Scaevola ramosissima		
Veronica plebeia		
Viola hederacea		Native Violet
Sedges/grasses/small plants		
Anigozanthus flavidus	2m	Kangaroo Paw
Baumea acuta		
Baumea articulata	Sedge	
Baumea juncea	Sedge	
Baumea nuda	Sedge	
Baumea rubiginosa	Sedge	
Baumea teretifolia	Sedge	
Blandfordia grandiflora	30-90cm	Christmas Bell
Blandfordia nobilis	30-90cm	Christmas Bell
Brachyscome diversifolia	Clump	Native Daisy
Carex appressa	Sedge	
Cotula coronopifolia	10-20cm	Waterbutton
Crinum pedunculatum	<2m	Swamp Lilly
Cyperus polystachyos	Sedge	
Dianella caerulea	Low Plant	Blue Flax Lilly
Epacris microphylla	50cm - 1m	
Ferns		
Gahnia spp.	Tall grass	
Juncus spp.	0.5m Rush	
Lobelia trigonocaulis	5-10cm	
Lomandra spp.	Grass	
Patersonia fragilis		Native Iris
Patersonia glabrata		Native Iris
Patersonia occidentalis		Native Iris
Ranunculus graniticola	5cm	
Restio australis	Reed	
Restio tetraphylius	1m	
Sowerbaea juncea	Sedge	Rush Lily
Tetratheca juncea	<30cm	
Xyris operculata	<1m	Tall Yellow Eye

Shrubs		
Agonis flexuosa nana		
Baekea linifolia	1-2.5m	
Baekea utilis	1-2.5m	
Baekea virgata	<4m	
Banksia aemula	1-7m	
Banksia robur	0.5-2m	
Bauera ruboides	0.5-1.5m	
Callistemon	2-3m	Burgundy
Callistemon	2-4m	Eureka
Callistemon	3-4m	Harkness
Callistemon	3-4.5m	Kings Park Special
Callistemon	2-3m	Mauve Mkist
Callistemon	1-2.5m	Red Clusters
Callistemon	2-3m	Reeves Pink
Callistemon citrinus	50-80cm	Austraflora Firebrand
Callistemon citrinus	2-4m	Splendens
Callistemon citrinus	60cm - 1m	White Ice
Callistemon linearis	1-3m	
Callistemon macropunctatus	2-4m	
Callistemon pachyphylius	2-3m	
Callistemon pallidus	1.5-4m	
Callistemon paludosus	3-7m	
Callistemon pinifolius	1-3m	
Callistemon rigidus	1.5-2.5m	
Callistemon salignus	3-10m	
Callistemon shiresii	4-8m	
Callistemon sieberi	1.5-2m	
Callistemon sieberi	50-80cm	Austraflora Little Cobber
Callistemon subulatus	1-2m	
Callistemon viminalis	1-2m	Captain Cook
Callistemon viminalis	5-10m	Dawson River
Callistemon viminalis	3-5m	Hannah Ray
Callistemon viminalis	50cm-1m	Little John
Callistemon viminalis	1.5-2m	Rose Opal
Callistemon viminalis	2-3m	Western Glory
Goodenia ovata	1-1.5m	
Hibiscus diversifolius	1-2m	Swamp hibiscus
Kunzea capitata	1-2m	
Leptospermum flavescens	<2m	Tea-tree
Leptospermum juniperinum	1m	Tea-tree
Leptospermum lanigerum	1-2m	Woolly tea-tree
Leptospermum squarrosum	<2m	Tea-tree
Melaleuca alternifolia	4-7m	
Melaleuca decussata	1-2m	Cross-leaved honey myrtle
Melaleuca lanceolata	4-6m	
Melaleuca squamea	1-2m	
Melaleuca thymifolia		