DECENTRALISED WATER CONSULTING

Murrindindi Shire Domestic Wastewater Management Plan

Prepared for Murrindindi Shire Council

Murrindindi Shire Council

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DOCUMENT CONTROL SHEET

Decentralised Water Australia Pty Ltd trading as Decentralised Water Consulting Unit 2, 12 Channel Rd MAYFIELD WEST NSW 2304 0408 023 265 enquires@decentralisedwater.com.au	Document	R.0249.002.03_Final_Dwmp_V4
	Title	Murrindindi Shire Domestic Wastewater Management Plan
	Project Manager	Ben Asquith
	Author(s)	Ben Asquith, Jack Sharples, Deni Hourihan
	Client	Murrindindi Shire Council
	Client Contact	Natalie Stewart
	Client Reference	

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1 Introduction

Murrindindi Shire Council ('Council') are responsible for the approval and on-going oversight of on-site wastewater management systems (traditionally described as 'Septic Tanks' and more recently described as 'On-site Systems') within the Shire. On-site systems are the traditional method for managing sewage and other forms of wastewater on properties that are not connected to a Goulburn Valley Water reticulated (or town) sewerage system. They are also the preferred method of wastewater management for new developments in Low Density Residential, Rural Living and Rural land use zonings.

When designed, constructed and operated correctly, on-site systems can provide a safe, cost effective and sustainable wastewater management service. Unfortunately, not all on-site systems meet community expectations in this regard. This can occur due to a variety of factors including;

- Topography, soil and climate constraints (land capability constraints);
- Small lot size associated with older subdivisions;
- Older septic systems that discharge sewage off-site;
- A lack of management and maintenance;
- Septic systems incorrectly installed; and
- Wastewater load exceeding septic system capacity.

In some circumstances the impact of failing on-site systems can be significant, particularly with regards to risk to human health. Under the State Environment Protection Policy (Waters) Council are required to prepare and implement a Domestic Wastewater Management Plan (DWMP). The State Environment Protection Policy (Waters) requires a DWMP to identify and prioritise wastewater risks in a local government area and develop actions to manage those risks.

1.1 Purpose

This is a revision of the Murrindindi DWMP which was first developed and adopted in 2006. It also coincides with a recent update of the EPA *Code of Practice: On-site Wastewater Management* (2016) and a current review of the SEPP (Waters). In the thirteen years since the initial DWMP, there have also been a range of new technologies and approaches to on-site wastewater management.

The primary purpose of this DWMP is to:

- identify, assess and manage cumulative risks of onsite domestic wastewater systems discharging waste beyond allotment boundaries;
- engage with the Victorian Environmental Protection Authority (EPA) and Goulburn Valley Water to identify existing unsewered allotments for inclusion in the domestic wastewater management

plan, which do not retain wastewater on site or are not capable of preventing the discharge of wastewater beyond allotment boundaries, or preventing impacts on groundwater beneficial uses; and

- identify, cost, prioritise and evaluate options to —
    - provide solutions to prevent discharge of wastewater beyond allotment boundaries;
    - provide for the compliance assessment and enforcement of on-site domestic wastewater systems in accordance with the plan; and
    - where applicable have regard to the Guidelines for Planning Permit Applications in Open, Potable Water Supply Catchments and any relevant guidelines authorised by the EPA.

2 What do Residents need to know about this Plan?

- Council are required to prepare a Domestic Wastewater Management Plan (DWMP) under the State Environment Protection Policy (Waters). This DWMP must assess domestic wastewater (often referred to as on-site wastewater or septic tank) risks in the municipality and develop prioritised actions to address potential impacts.
- Specifically, Council are required to identify properties where wastewater is discharging off-site and develop actions to prevent this discharge from occurring.
- This DWMP includes on-site wastewater hazard mapping that identifies the risk associated with on-site wastewater management on each property based on land capability and lot size.
- A number of townships / localities have previously been identified by Council as high risk. Of these, Flowerdale, Kinglake, Thornton and Buxton have been identified (via a risk based prioritisation process) as key areas identified as in need of improved or potentially alternative wastewater management strategies.
- There are a number of additional high risk areas along with isolated small lots that may also pose a risk of off-site discharge as there is insufficient land available for full on-site wastewater management (e.g. Kinglake, Buxton).
- The majority of unsewered areas in Murrindindi Shire are moderately to poorly suited to on-site wastewater management subject to meeting the requirements of the EPA Code of Practice for On-site Wastewater Management. This is driven by land capability constraints across the Shire, in particular lot size (in certain areas), climate, slope, and the presence of dams and incised watercourses.
- Domestic Wastewater Management Planning has included an evaluation of existing and potential future lot sizes in unsewered residential areas in conjunction with the broader Planning Controls.
- It is recommended that higher levels of scrutiny are applied to proposed unsewered developments proposing new allotments that are less than one hectare in size. The presence of constraints such as slope, gullies and watercourses can increase risk and limit options on lots below this size.
- The DWMP proposes a set of "Minimum Standards" for Land Capability Assessment and design information that needs to be submitted with Septic Tank or Planning Permits in unsewered areas classified as high risk.
- The DWMP also recommends that consideration be given to potential funding mechanisms for increased on-going oversight of on-site wastewater management system compliance.

3 Background

Council is responsible under the *Environment Protection Amendment Act (2018)* for the approval of on-site wastewater management systems (on-site systems or 'septic systems'). This includes the approval of alterations to existing systems and consideration of wastewater management risks associated with new unsewered development. The Murrindindi Shire Planning Scheme include reference to the relevant provisions of the *Environment Protection Amendment Act* and require consideration of the capability to contain wastewater within property boundaries when approving new development.

Council are also required to ensure existing on-site systems to not adversely impact on human health or the environment under the *Health and Wellbeing Act (2008)* and *State Environment Protection Policy (Waters)*. This has historically proven to be a challenging outcome for local councils to achieve due to constraints in the ability to resource oversight and enforce upgrades to failing or inappropriate systems.

3.1 Victorian Context

The following legislation is relevant to Domestic Wastewater Management in Victoria and has been considered in the development of this plan.

Local Government Act 1989

The Local Government Act (1989) provides a framework for the establishment and operation of Councils. This includes planning and providing services and facilities to local communities (including domestic wastewater management), making and enforcing local laws and exercising, performing and discharging the duties, functions and powers of Councils under this Act and other Acts.

Environment Protection Amendment Act 2018

The Environment Protection Amendment Act 2018 (EPAA 2018) has recently been passed which will repeal the previous Environment Protection Act 1970 (EPA 1970). The EPAA 2018 is currently planned to come into effect in July 2021. The purpose of the EPA 1970 was to create a legislative framework for the protection of the environment in Victoria which are to be enacted upon by the Environment Protection Authority (EPA). Some of these duties are delegated to local councils. The Act provides the basis of the regulatory framework for septic tank systems which from July 2020 will be known as on-site wastewater management systems and identifies the requirement for a permit to construct, install or alter a septic system. Permit application requirements, grounds for application refusal and septic tank maintenance requirements are also outlined under the Act.

The EPAA 2018 has introduced a range of changes including, but not limited to, stronger regulations and duties for parties engaging in operations that may have the potential to risk human health or the environment. This includes the on-site management of wastewater, in which on-going five-yearly

review of all new (but not existing) on-site wastewater permits has been mandated. Council are required to provide up to date details of new permits to EPA.

Importantly the General Environmental Duty (GED) is a key aspect of the amendment and is criminally enforceable. It requires that reasonably practicable steps are to be taken by all individuals to ensure that risk to human health and the environment are managed and eliminated or minimised. However, a strong focus of EPAA 2018 is on the regulation and duty to notify EPA regarding business and commercial operations, including the management of wastewater.

Water Act 1989

This Act provides a formal means to protection and enhancement of the environmental qualities of waterways and catchments and aims to eliminate inconsistencies in the treatment of surface and groundwater resources and waterways. Part 3 (Assessment of and Accounting for Water) of the Act identifies that the water resources assessment program must include an analysis the disposal of wastewater. This includes the collection, collation, analysis and publication of information about on-site wastewater management systems.

Planning and Environment Act 1987

The key legislation relating to land development in Victoria is the Planning and Environment Act 1987. The two objectives of the planning framework under the Act are;

- To enable land use development and planning and policy to be easily integrated with environmental conservation and resource management policies; and
- To ensure that the effects on the environment are considered when decisions are made about the use and development of land.

Public Health and Wellbeing Act 2008

The objective of this Act is to achieve the highest attainable standard of public health and wellbeing by;

- Protecting public health and preventing disease, illness, injury, disability or premature death;
- Promoting conditions in which persons can be health; and

Reducing inequalities in the state of public health and wellbeing. Under Division 1, Part 6 of the Act, Councils have a duty to remedy as reasonably possible all existing nuisances, whereby nuisances are (or a liable to be) dangerous to health or offensive. As such, if an on-site wastewater system is or has the ability to cause/become a nuisance, Council has a duty to rectify the existing / possibly threat to human health.

State Environmental Protection Policy (Waters)

This Policy provides a framework to protect and improve the quality of Victoria's waters with regard to the environmental protection principles set out in the Environment Protection Act (1970). Where reticulated sewerage is not reasonably practical (for singular and subdivision sites), Council must ensure that sewage can be sustainably managed within property boundaries. Under Part III (Division 1) of the Policy, Councils are to develop a Domestic Wastewater Management Plan that identifies the public health and environmental risks associated with on-site domestic wastewater management and outlines strategies to manage those risks. The policy also directs municipalities to utilise the Environment Protection Authority Code of Practice for Onsite Wastewater Management (EPA Publication 891.4 Dec 2016).

The Environment Protection Authorities Code of Practice for Onsite Wastewater Management provides standards and guidance to ensure the management of on-site wastewater protects public health and the environment for wastewater flows up to 5,000L/day. This code is the Victorian guideline for best practice management of on-site wastewater systems and land capability assessments. The code states that Councils need to assess the suitability of land for on-site wastewater management to ensure that permits are consistent with the guidelines of the code and outlines key obligations for Councils and occupiers of premises.

The State Environment Planning Policy (SEPP) *Waters of Victoria* has recently undergone a review and has recently been gazetted (now known as SEPP – Waters). Therefore there is a need to review the domestic wastewater management elements of the SEPP in relation to Murrindindi Shire. This review involves a consolidation of the current SEPP (Waters of Victoria) and SEPP (Groundwaters of Victoria).

The design, operation and management of on-site systems are supported by a number of standards and guidelines. Namely:

- EPA Code of Practice – Onsite Wastewater Management, Publication 891.4 (2016);
- MAV Land Capability Assessment Framework (2014) – replacing EPA Publication 746.1;
- AS/NZS 1547:2012 Onsite Domestic Wastewater Management (updated since last DWMP);
- AS/NZS 3500:2003 Plumbing and Drainage; and
- Guidelines – Planning Permit Applications in Open, Potable Water Supply Catchment Areas (DSE, 2012) – released since last DWMP.

Note: Since July 2016 EPA no longer award a Certificate of Approval to individual on-site wastewater systems. EPA now approves four system types in line with Australian Standards;

- AS/NZS 1546.1 Septic tanks
- AS/NZS 1546.2 Waterless composting toilets

- AS/NZS 1546.3 Aerated wastewater treatment systems
- AS/NZS 1546.4 Domestic greywater treatment systems

Council Officers can only approve the installation of an on-site wastewater system that is certified to comply with the relevant Australian Standard by an accredited conformity assessment body (CAB). As part of a permit application to council, the applicant will need to include a copy of the certificate of conformity from a CAB.

3.1.1 VAGO Audit of Domestic Wastewater Management

In September 2018 the Victorian Auditor General's Office (VAGO) released the report titled *Managing the Environmental Impact of Domestic Wastewater*. This audit focused on two metropolitan councils and water authorities as case studies. However, many of the outcomes are relevant state wide and specifically to Murrindindi Shire Council (MSC). Key outcomes included.

- an overly complex, onerous and duplicative regulatory framework
- a continued lack of clarity around roles and responsibilities
- regulatory barriers and gaps in governance and approval processes are hindering the timely imple mentation of alternative management approaches to sewer.
- regulatory tools that do not adequately drive property owners' compliance with planning permits and legislation
- significant information gaps across a whole range of important on-site wastewater management strategies
- lack of a consistent, robust and transparent risk assessment process.
- Lack of systematic inspection / oversight program
- councils not being held to account for their role in domestic wastewater management.

These outcomes coincided with the changes to the SEPP requiring councils to address some of these issues. The DWMP Risk Assessment and developed Action plan have been described and incorporated into the documents.

3.2 Status of Domestic Wastewater Management in Murrindindi Shire

Council's Environmental Health Coordinator is responsible for the regulatory oversight of Domestic Wastewater within MSC. This includes working with strategic and statutory planning to ensure wastewater risks are adequately considered during land use planning and approval processes.

Consideration has been given to the following MSC plans and policies during this DWMP review.

- Murrindindi Shire Council Plan 2017-2021

- Strategic Resource Plan 2017 – 2021
- Community and Structure Plans for key unsewered townships / villages.

How Are On-site Wastewater Systems Currently Managed in Murrindindi Shire?

3.2.1 Approval of New Unsewered Development / On-site Systems

Currently, on-site systems that manage or are designed to manage flow rates of more than 5,000 litres per day are regulated by EPA through works approvals and, in some cases, operating licences.

Systems with flow rates less than 5,000 litres a day are the responsibility of Council which issue permits for the construction, installation, and alteration of on-site systems. Council may refuse a permit if the site of the proposed system or proposed effluent land application is considered unsuitable and must refuse if the type of system is not approved by EPA.

Land use planning context is discussed below.

3.2.2 Management of Existing On-site Systems

Council are to enforce action for any system in which a permit was not obtained or if the conditions of the permit have been breached. Servicing reports for existing systems are obtained from service agents and compiled by Council. Council focus on high priorities such as significant non-compliances and failures, however this is contingent on the information provided by the service agents.

Council collect data and information on existing on-site systems across the Shire to help identify issues (particularly in higher risk areas) that require action. These include;

- Septic Permit register (refer Section 0)
- Service reports and complaints from residents (system failures)

Council do not currently have a formal on-site system inspection / audit program and this is a key action that Council wish to see implemented as part of this DWMP. An intention of this DWMP is to provide guidance on higher priority localities for collection of data as part of a Council System Audit Program.

3.3 Land Use Planning Context

The Murrindindi Shire Planning Scheme has been considered in developing this DWMP with a focus on areas identified for current and future residential development.

For Council to consider a planning permit application for development including subdivision in the absence of a reticulated sewerage system, a land capability assessment proving that the land is capable of treating and retaining wastewater within the allotment boundaries is required.

The Murrindindi Shire Planning Scheme prescribes minimum lot size thresholds for development within particular zones as follows;

- Low Density Residential Zone (LDRZ) – 4,000m^2
- Rural Living Zone (RLZ) – 1-4 hectares (depending on area/schedule – 2 hectares if unspecified)
- Farming Zone (FZ) – 40 hectares
- Rural Conservation Zone (RCZ) – 40 hectares

The Township Zone (TZ) requires any subdivision to meet a number of requirements / clauses based on the number of lots proposed. Minimum lot size within this zone would be subject to what is being proposed and how the applicant plans to ensure all wastewater can be managed on-site for each proposed lot. The RLZ requires a permit to subdivide land regardless of the minimum lot size (unlike other Council areas). However, smaller lot sizes may be permitted under specific circumstances (including the re-subdivision of existing lots where the number of lots is not increased).

The whole Murrindindi Shire is located within mapped Groundwater Management Areas (GMAs) and therefore these have been considered as part of land capability mapping and high risk village assessment outlined in this DWMP.

The Bushfire Management Overlay (BMO) is a constraint across the Shire, which has potential impacts for on-site wastewater management systems on unsewered properties. The key purpose of the BMO is to ensure the development of land prioritises the protection of human life and strengthens community resilience to bushfire. The land capability hazard mapping (discussed in Section 5.2) provides an indication of overall constraints to on-site wastewater management and therefore provide supporting information to be considered in combination with BMO.

An Erosion Management Overlay (EMO) is also present within the Shire. Areas of slope and landslip risk can have the potential to significantly influence the ability of a lot to contain on-site. The EMO hazard has been included in the on-site hazard mapping and is present across the north west portion of the Shire. This hazard is considered a key factor and appears to primarily encompass large FZ lots. While the EMO is considered a major constraint, the areas of concern appear to primarily encompass very large lots.

3.4 Integrated Water Management

Integrated Water Management (IWM) aims to provide a holistic and forward thinking approach to all elements of the water cycle (movement of water through its various phases) including wastewater in addition to stormwater, potable / non-potable water supply and local watercourses. The intention is for this approach to be adaptive to temporal changes over the long-term and designed in conjunction with end users (community) with a place based element to design.

The recently developed IWM Framework (DELWP, 2017) is aimed at assisting government agencies and the community in planning and implementation of these IWM concepts / options in the future. This includes the establishment of a number of new Victorian IWM Forums of which Murrindindi Shire is a member of the 'Goulburn Broken' IWM Forum.

4 Review of 2006 Domestic Wastewater Management Plan

The 2006 draft DWMP was a more generalised management plan for wastewater management that was developed during early implementation of the previous SEPP (Waters of Victoria – 'WoV') provisions requiring Councils to prepare Domestic Wastewater Management Plans. Furthermore, there have been significant changes in the following areas in the ensuing 13 years. On-site and decentralised wastewater management technologies and management approaches.

- On-site and decentralised wastewater management technologies and management approaches.
- Victorian and national guidelines and standards pertaining to on-site wastewater management.
- Victorian and national policy and research into Integrated Water Management and Water Sensitive development.
- The availability of funding through the Victorian Country Towns Water Supply and Sewerage Program has since ceased.

MSC did not formally adopt the previous DWMP and as a result, Council has decided that a wholesale re-write of the DWMP is warranted. As such, no formal review process has taken place to date (DWC do not currently have a copy of the DWMP).

5 Revised Wastewater Management Risk Assessment

The risk assessment completed in 2006 was a largely qualitative evaluation based on limited available data. Best practice DWMP risk assessment involves a number of more quantitative methods to identify the presence, likelihood and magnitude of any risk factors associated with on-site wastewater management. Council have recently been actively working to review and collate Septic Tank Permit data into their Environmental Health and property databases which has improved issues around data availability.

In addition, the availability of more comprehensive Geographical Information System (GIS) data has also created opportunity for a spatial risk assessment to be undertaken. This includes consideration of cumulative impacts from both existing on-site wastewater systems and potential unsewered subdivisions.

There are two components to the DWMP Risk Assessment. The assessment has been completed using a Land Capability Hazard / Containment Framework developed by DWC in conjunction with Yarra Valley Water that applied the legislative and EPA Code of Practice definition and principles for on-site containment in a spatial (GIS) framework. The Framework has been slightly modified in the context the Murrindindi Shire DWMP but remains consistent with other DWMP risk mapping prepared for other councils.

The first component is the preparation of a broad scale land capability hazard or risk map;

- to ensure future development is sustainable;
- to recognise where past development practices prevent safe and sustainable DWM; and
- to identify areas where the environment may be sensitive to DWM impacts and requires special protection.

The second component is an infrastructure based assessment (looking at existing on-site systems);

- to identify risks associated with older, inappropriate DWM technologies or approaches (such as direct off-site discharge);
- to geographically identify areas where there are a high number of off-site discharge or failing systems.

Data availability has limited the coverage and accuracy of the existing system risk assessment to some degree. The DWMP includes Actions to facilitate data collection and incorporation in to the risk framework as part of implementation.

There are some areas in the Shire where both land capability constraints (such as slope, poor soils or proximity to waterways) and the presence of older off-site discharge systems combine to create significant immediate risks and place limits on the feasibility of achieving adequate levels of health

and environmental protection with on-site systems. Examples of this include the Kinglake and Thornton townships.

The DWM risk assessment process has identified these high risk areas and developed recommended strategies for alternative wastewater management. This can range from traditional reticulated sewerage to improved / managed DWM programs.

5.1 Review of Available Data and Information

Data were sourced from both Murrindindi Shire Council and the Victorian Government online data portal for undertaking the onsite hazard mapping for the Murrindindi Shire. These data are summarised in the following table.

Table 1 Summary of Available Data and Sources

Data	Description	Source
Topographic / Elevation Data	Vicmap 10m Digital Terrain Model (DTM) was obtained and which provides consistent coverage across the entire Shire.	Victorian Government
Ortho-photography	-	-
Soil type (landscape) data	Soil Type layer provides a spatial map layer of the Australian Soil Classification for Victoria. A soil hazard class was developed based on the Australian Soil Classification for each land unit. Geomorphology (GMU) layer for Victoria	Victorian Government data portal
Watercourses (All)	State-wide watercourse (hydroline) layer – 1:25,000 scale trimmed to Shire. Used to define both partially vegetated / rehabilitated intermittent drainage lines and permanent watercourses.	Victorian Government data portal
Hydroareas (waterbodies)	State-wide waterbodies layer trimmed to Shire. Used to define farm dams and other larger waterbodies.	
Groundwater bores	Groundwater bore locations and available data (potable / non-potable).	BoM Australian Groundwater Explorer online mapping (http://www.bom.gov.au/water/groundwater/explorer/map.shtml)
Groundwater Management Areas (GMAs)	Whole of Shire within mapped GMAs.	Victorian Government data portal
Land Systems	Land System types clipped to the Shire. Provides a landform description which was used to determine the drainage hazard class.	Victorian Government data portal

Data	Description	Source
Planning Overlay	Planning overlay used to isolate Environmental Significant Overlay (ESO), Floodways / Land Subject to Inundation, Erosion Management Overlay (EMO) and Bushfire Management Overlay (BMO).	Victorian Government data portal
Bio Region Conservation Areas	Bio-conservation vegetation layer used to define environmentally significant vegetation (in combination with ESO layer). *Native Vegetation - Modelled 2005 Ecological Vegetation Classes (with Bioregional Conservation Status)* - NV2005_EVCBCS layer utilised.	Victorian Government data portal
Property boundaries	Cadastral boundaries for current properties across Murrindindi Shire.	Victorian Government data portal
Stormwater Drainage	Stormwater drainage data available (largely located within sewered areas).	Murrindindi Shire Council
Drinking Water Supply Catchments	Potable Water Supply Catchments layer (PWSC100) was used to identify properties within designated drinking water catchments.	Victorian Government data portal
Sewer alignment	Alignment data provided to determine sewered / unsewered allotments (as best as possible based on data provided).	Goulburn Valley Water

Key guidelines and sources of criteria for the mapping are summarised in Table 2.

Table 2 Guidelines / Standards: On-site Wastewater Risk Framework

Organisation	Resource	Purpose
Victorian government	SEPP (Waters)	Overarching regulatory performance objectives relating to protection of surface waters. Regulatory performance objectives with respect to protection of groundwater beneficial uses.
EPA Victoria	EPA Code of Practice (CoP) – On-site Wastewater Management (2016)	Sets out specific means of compliance recognised as "deemed to comply" with the SEPP. Setback distances adopted for risk classification Framework.
MAV	Victorian Land Capability Framework (2014)	Documents the state government endorsed land capability hazard framework for on-site wastewater management in Victoria. Used as the basis for the land capability elements of the risk classification.
Standards Australia	ASNZS1547:2012 On-site domestic wastewater management	Provides additional design, siting and operational guidance that has been applied within the risk classification Framework.

5.2 On-site Containment / Land Capability Hazard Mapping

DWC has previously developed an agreed definition of on-site containment as part of the Park Orchards Trial project (on behalf of Yarra Valley Water). This definition took the legal terminology from the SEPP (Waters of Victoria) "*containment of effluent within the boundaries of the allotment and protection of any beneficial uses of groundwater*" and translated that initially into measurable hydraulic, nutrient and pathogen performance targets that can be validated through field monitoring and numerical modelling. This work confirmed that an effluent Land Application Area (LAA) that has been sized to the most limiting of a water, nitrogen or phosphorus balance (as per the MAV Land Capability Assessment Framework – 2014) and meets standard setback distances to sensitive receptors (from the EPA Code of Practice) can be considered capable of on-site containment.

As part of this DWMP, DWC has evaluated a range of on-site LAA design scenarios in addition to typical levels of development on unsewered properties to nominate a series of property size ranges that represent increasing levels of containment on-site (CoS) potential. These on-site containment criteria are proposed as a *conservative benchmark* to ensure on-site systems do not pose a risk to human health and the environment with all wastewater contained on-site. Appendix C outlines previous minimum lot size and cumulative impact data analysis undertaken by DWC which has been utilised to support these lot ranges.

Table 3 On-site Containment Lot Size Criteria

Lot Size Criteria	On-site Containment Capacity
<2,000 m^2	**Generally not capable of on-site containment:** Properties under 2,000 m^2 do not typically have sufficient available area to fit an adequately sized on-site system for a contemporary dwelling (e.g. a 4-5 bedroom house) whilst meeting recommended setback distances to waterways, groundwater bores and other sensitive receiving environments. Partial or full off-site wastewater management is the preferred strategy for these properties (e.g. reticulated sewerage, cluster system or centrally / authority managed on-site systems). Where owner managed on-site systems are the only available option, specialist design will be required along with increased oversight in order to achieve containment.
2,001 m^2 – 3,999 m^2	**Detailed Land Capability Assessment required to confirm ability to contain on-site:** Properties in this size range are likely to have sufficient available area to fit an adequately sized on-site system for a contemporary dwelling (e.g. 4-5 bedroom house). However, this will be highly dependent on-site specific land capability constraints and proximity to sensitive receiving environments. A more detailed LCA and design process is likely to be required to ensure full containment in addition to higher level treatment and greater construction and operational oversight. Where possible these properties should be considered for partial or full off-site wastewater management (e.g. reticulated sewerage, cluster system or centrally / authority managed on-site systems). Where owner managed on-site systems are the only available option, increased regulatory oversight is strongly recommended in order to ensure containment.
≥ 4,000 m^2	**Generally capable of full on-site containment:** Owner managed on-site systems are the appropriate wastewater servicing strategy for most properties of this size (subject to site specific land capability constraints). Cumulative impacts are negligible where EPA setback distances are met.

These definitions relate to the *long-term sustainability* of on-site wastewater management. For properties greater than 2,000 m^2, consideration must also be given to land capability constraints such as soil characteristics, slope, landslip and proximity to creeks, drains and groundwater bores. To address this, DWC have also completed a GIS based broad scale Land Capability Assessment (LCA) of unsewered properties in the Murrindindi Shire.

This LCA is consistent with the EPA CoP (2016) and the MAV Land Capability Assessment Framework (2014) with a detailed methodology provided in Appendix A. A summary of the hazard classes and what they mean is provided in Table 4 below.

Table 4 Land Capability Hazard Map Summary

Classification	CoS?	EPA CoP?	Derivation	Description
Low Risk / Hazard	Likely (Refer Table 3)	Yes	Final Risk Score<1	Few/minor constraints to on-site wastewater management and low risk receiving environment. Periodic (e.g. 3 years) oversight as per current Septic Tank Permit conditions likely to manage risk.
Medium Risk / Hazard			Final Risk Score 1<>2	Individual and/or cumulative hazards slightly elevate the likelihood and/or consequence of on-site system failure. A higher level of design, construction, maintenance and oversight (e.g. annual inspection) input may be necessary to manage risk and meet regulatory objectives for health and ecosystem protection.
High Risk / Hazard	TBC On-site (Refer Table 3)		Final Risk Score >3	Individual and/or cumulative hazards significantly elevate the likelihood and/or consequence of on-site system failure. Best practice design, construction, maintenance and oversight essential to manage risk and meet regulatory objectives for health and ecosystem protection.
Very High Risk / Hazard		Very constrained (MAV, 2014)	Slope >30% (on average) / landslip risks	Significant Land Capability constraints (steep slope / landslip risk) across the majority of suitable land available within the property. On-site containment may be possible subject to advanced engineering and oversight where the provision of an off-site solution is cost prohibitive.
Non CoS	Unlikely (Refer Table 3)	No	Lot size < 2,000m^2	Generally no suitable land available for CoS. Full off-site solution is highly likely to meet the objectives of the SEPP.

After the development of the broad scale land capability hazard map, lot size was utilised to determine likely potential for containment on-site (CoS) for each property as outlined in Table 3. This resulted in an overall Land Capability Hazard Class for each lot.

The following logic was applied to all unsewered lots to develop the final Land Capability Hazard Class.

- Lot size <2,000m^2 = Non CoS Classification (regardless of land capability);
- Lot size 2,001 m^2 – 3,999 m^2 = Greater of High Hazard or land capability hazard (as per mapping);
- ≥ 4,000 m^2 = Land capability hazard used (as per mapping).

The Wastewater Land Capability Hazard Map is presented below along with close up maps of key unsewered areas across Murrindindi Shire. The mapping is currently based on property (not parcel) boundaries as the intention of the DWMP is to focus on existing on-site systems within properties and the potential risks they pose.

Table 5 presents a breakdown of the hazard class for unsewered lots in Murrindindi Shire. These numbers are approximate as they may include some unsewered lots that are currently vacant / undevelopable. It was identified during groundtruthing that there were collections of undeveloped lots which was due to insufficient lot size (e.g. Narbethong, Granton). These are included in the land capability map statistics and may need to be consisted and reviewed as part of DWMP adoption.

Sewerage alignment data was utilised to isolate properties that are serviced by reticulated sewer. However, the odd sewered property may still be present in the hazard mapping of unsewered lots. The majority of properties are classified medium to high hazard across the Murrindindi Shire.

Table 5 Land Capability Hazard Breakdown

Hazard Class	Murrindindi Shire
Low Hazard	424 (5%)
Medium Hazard	2,979 (36%)
High Hazard	3,432 (42%)
Very High Hazard	329 (4%)
Non CoS	1,092 (13%)
Total	**8,256**

It can be seen that the majority of the unsewered properties in Murrindindi Shire are capable of achieving on-site containment *subject to design, installation and operation of an on-site wastewater management system that meets the EPA CoP.* Approximately 42% of properties are likely to be capable of on-site containment but feature one or more significant constraints that may require more detailed LCA, design, installation and operational input. Approximately 4% of properties are classified as very high and have significant land capability constraints including slope and landslip risk. These properties may be able to contain on-site, however, this is subject to advanced engineering and oversight. Additionally, approximately 13% of properties are considered highly constrained or highly unlikely to be capable of safe and sustainable on-site wastewater management in the long-term.

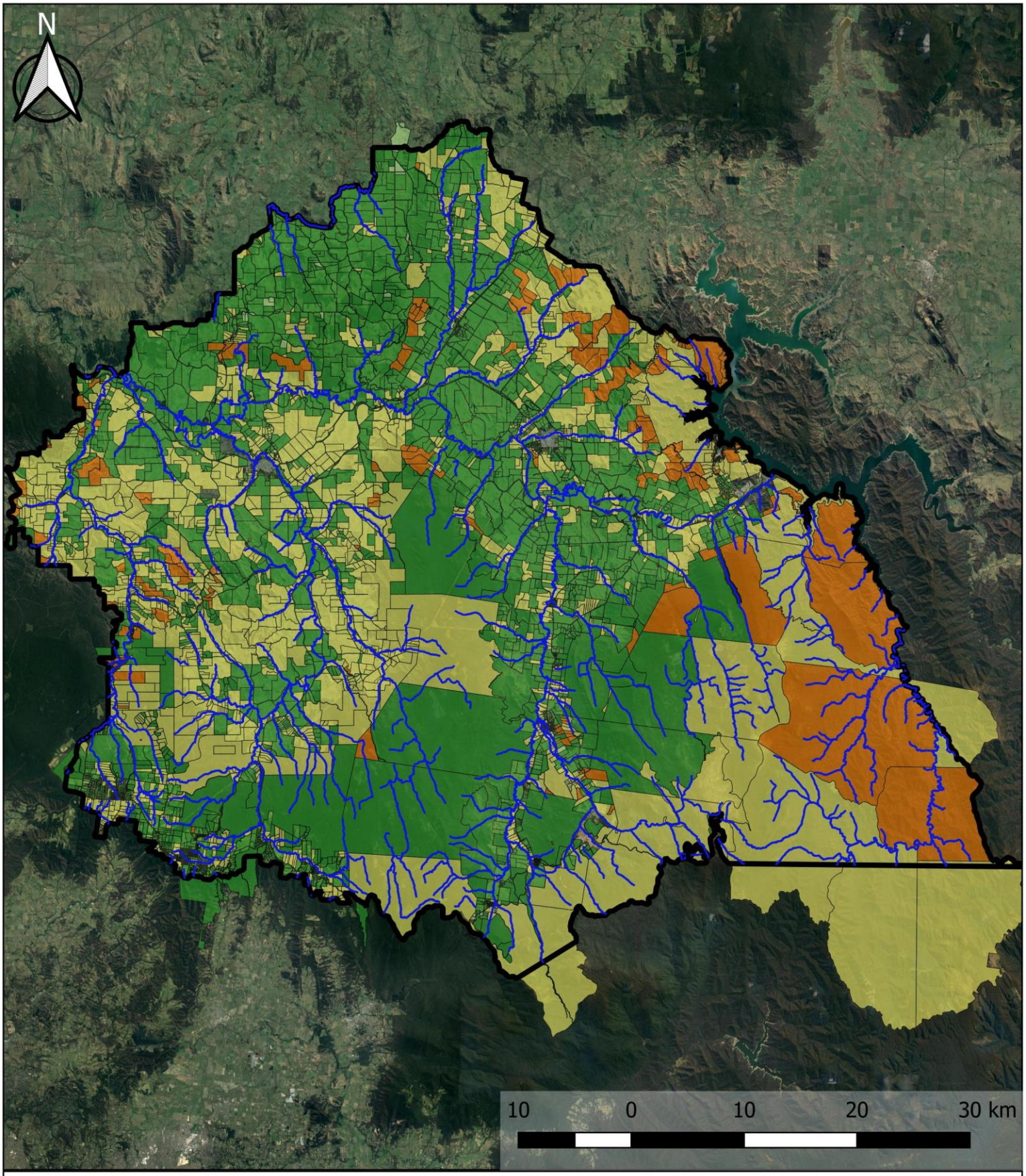


Figure 1: Murrindindi Land Capability Hazard Classification Map

LGA
Watercourse

LC Risk Classification

- Non CoS
- Very High Hazard
- High Hazard
- Medium Hazard
- Low Hazard

DECENTRALISED WATER CONSULTING

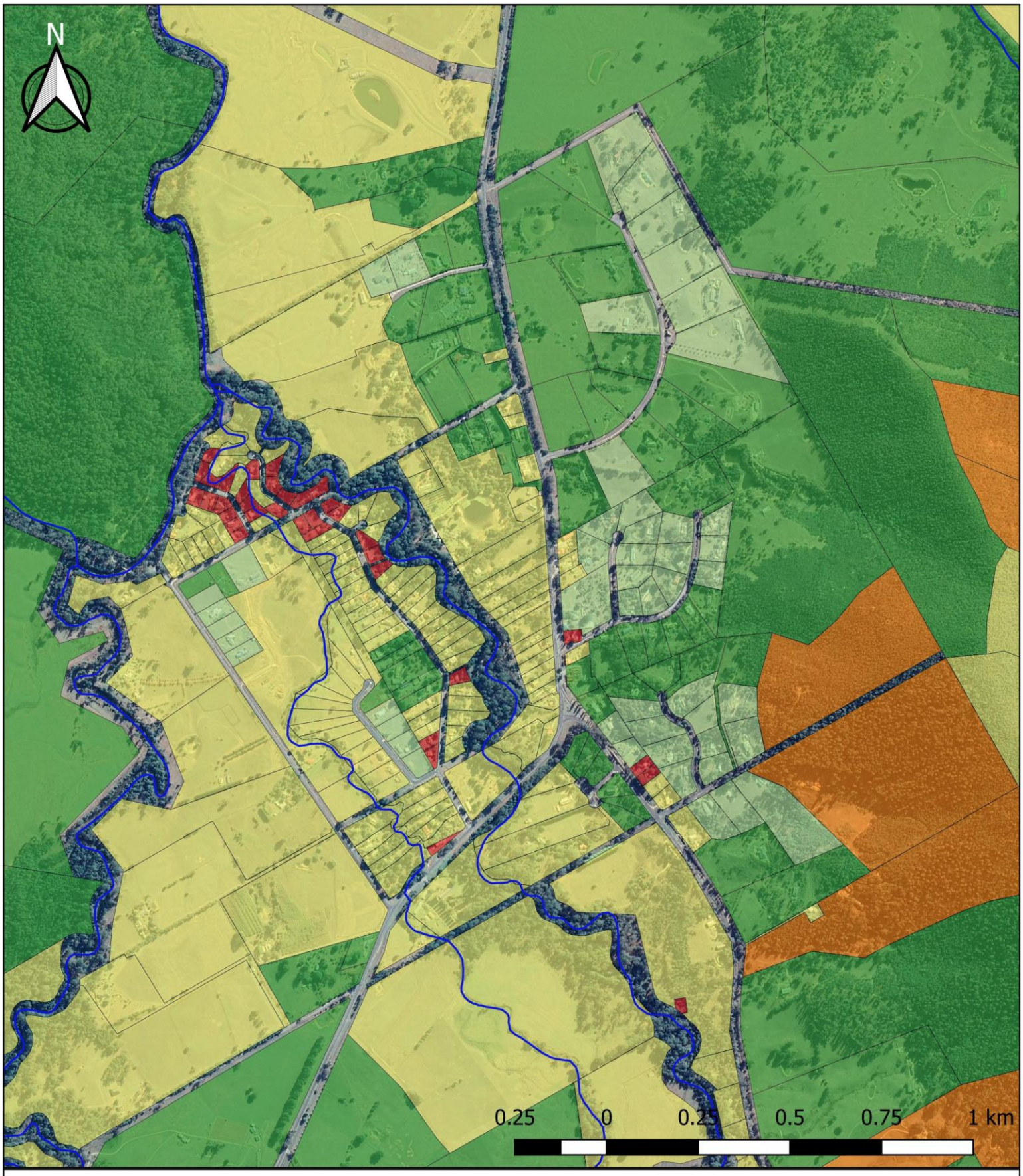


Figure 2: Land Capability Hazard Classification Map - Buxton

LGA
Watercourse

LC Risk Classification

- Non CoS
- Very High Hazard
- High Hazard
- Medium Hazard
- Low Hazard

DECENTRALISED WATER CONSULTING

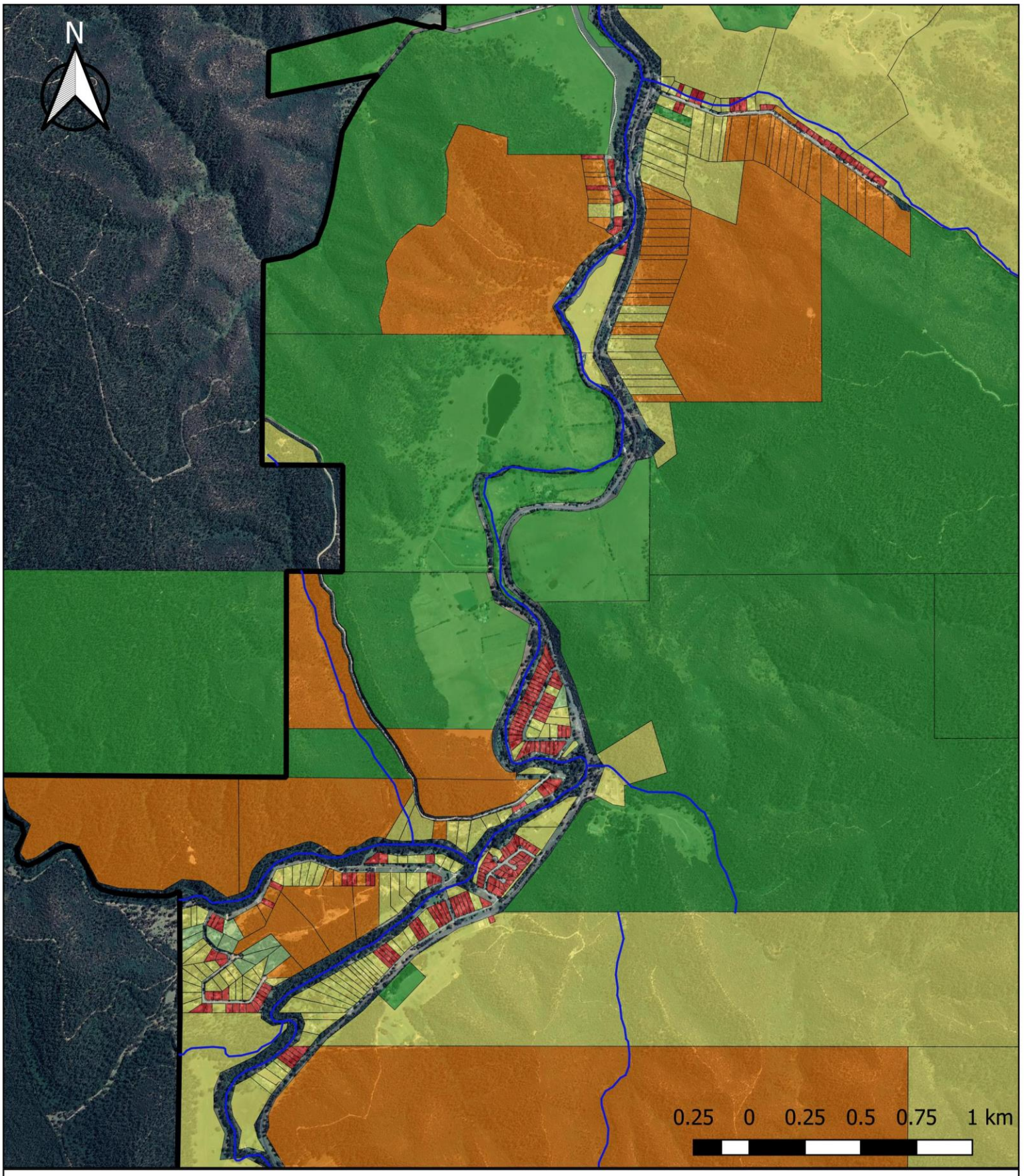


Figure 3: Land Capability Hazard Classification Map - Flowerdale

LGA
Watercourse

LC Risk Classification

- Non CoS
- Very High Hazard
- High Hazard
- Medium Hazard
- Low Hazard

DECENTRALISED WATER CONSULTING

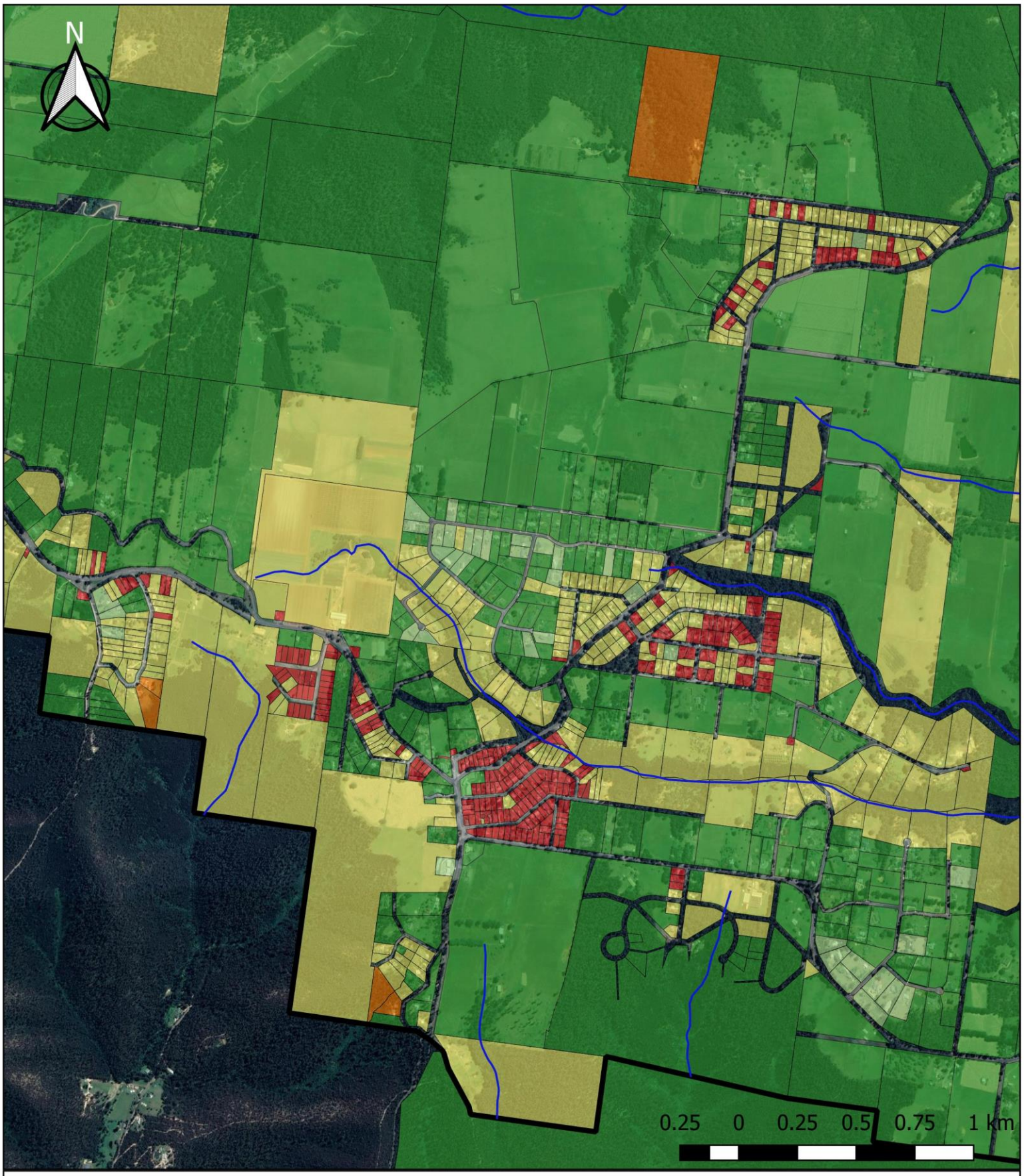


Figure 4: Land Capability Hazard Classification Map - Kinglake

LGA
Watercourse

LC Risk Classification
Non CoS
Very High Hazard
High Hazard
Medium Hazard
Low Hazard

DECENTRALISED WATER CONSULTING

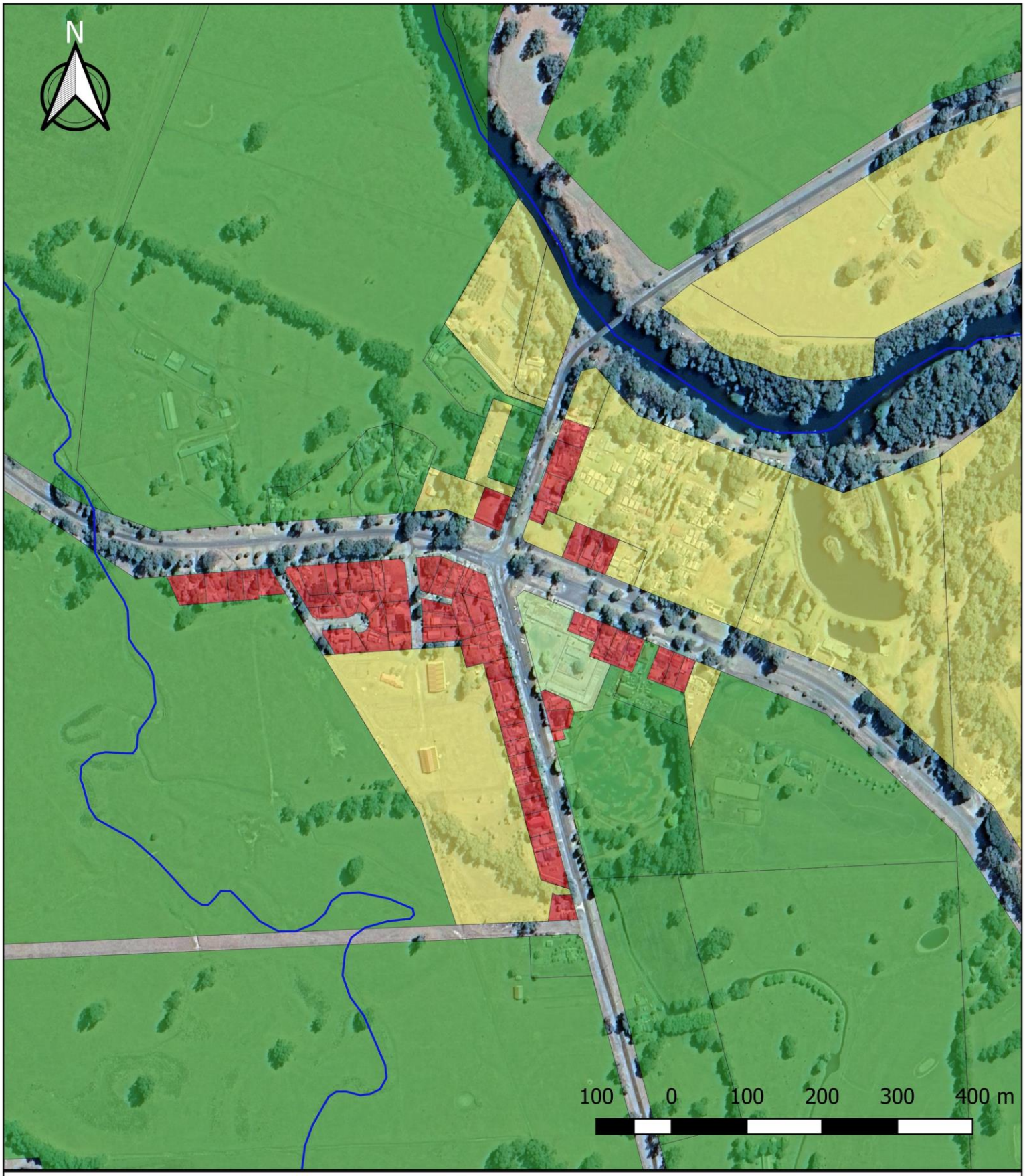


Figure 5: Land Capability Hazard Classification Map - Thornton

LGA
Watercourse

LC Risk Classification
Non CoS
Very High Hazard
High Hazard
Medium Hazard
Low Hazard

DECENTRALISED WATER CONSULTING

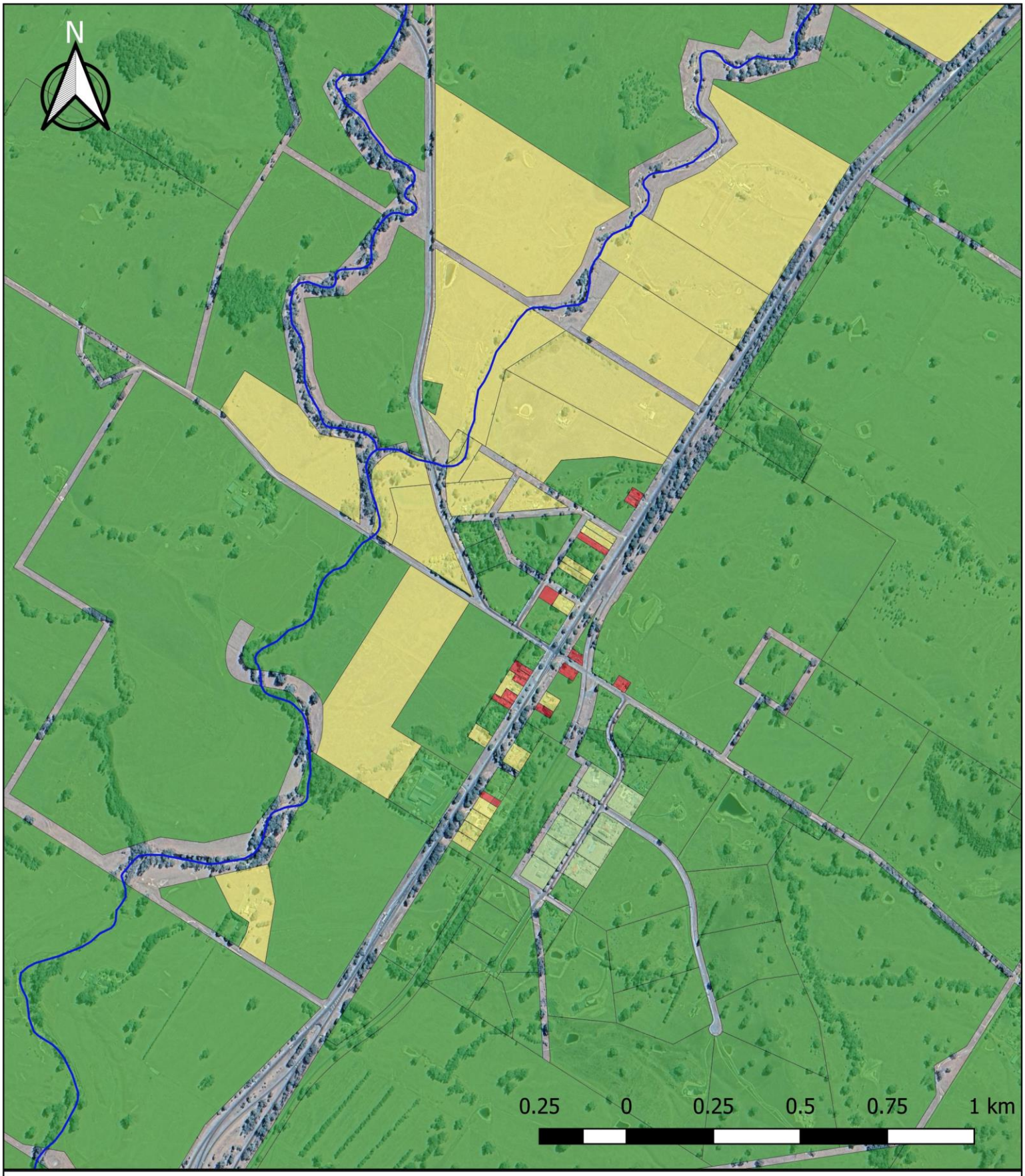


Figure 6: Land Capability Hazard Classification Map - Yarck

LGA

Watercourse

LC Risk Classification

- Non CoS
- Very High Hazard
- High Hazard
- Medium Hazard
- Low Hazard

DECENTRALISED WATER CONSULTING

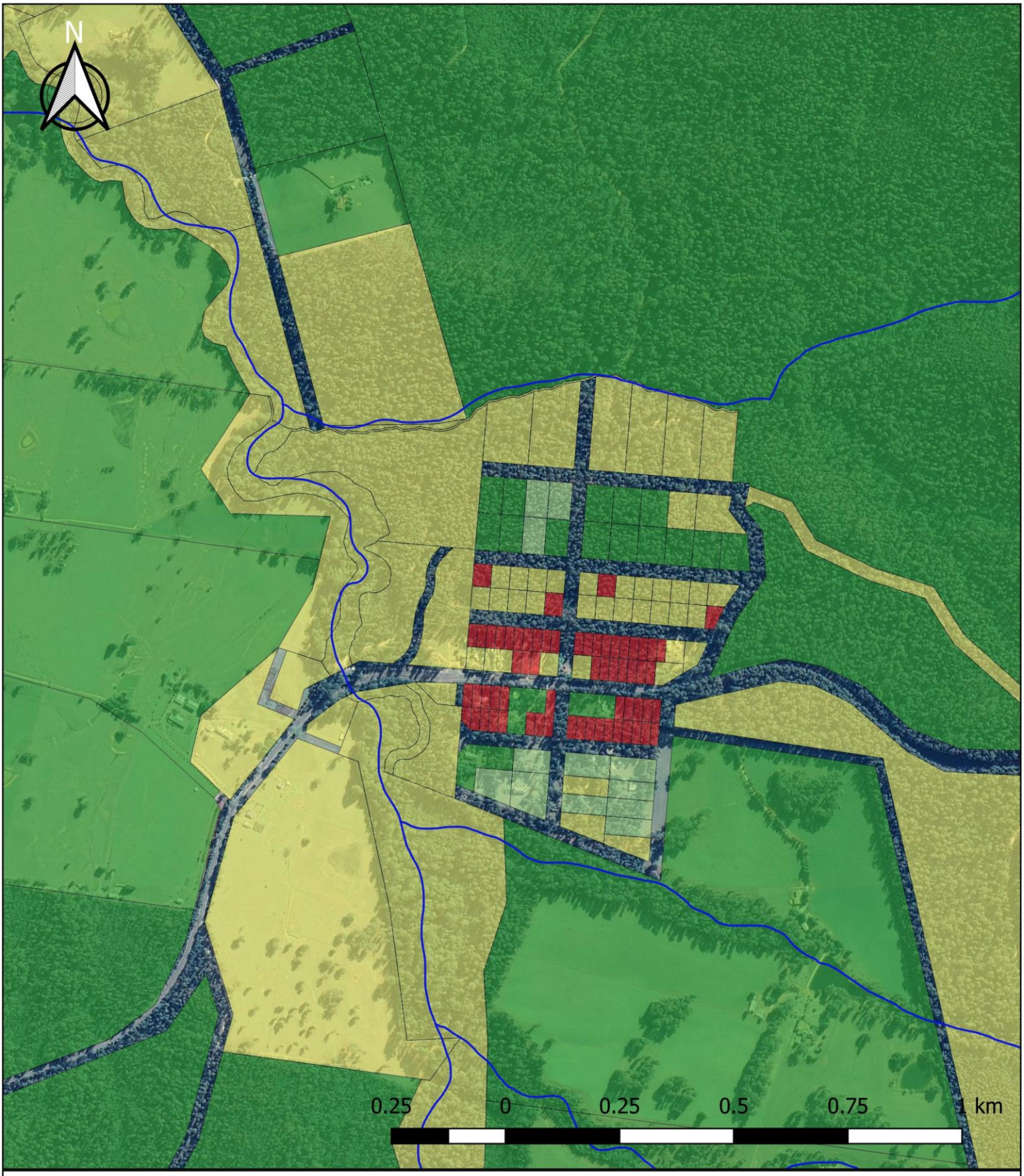


Figure 7: Land Capability Hazard Classification Map - Granton

LGA
Watercourse

LC Risk Classification

- Non CoS
- Very High Hazard
- High Hazard
- Medium Hazard
- Low Hazard

DECENTRALISED WATER CONSULTING

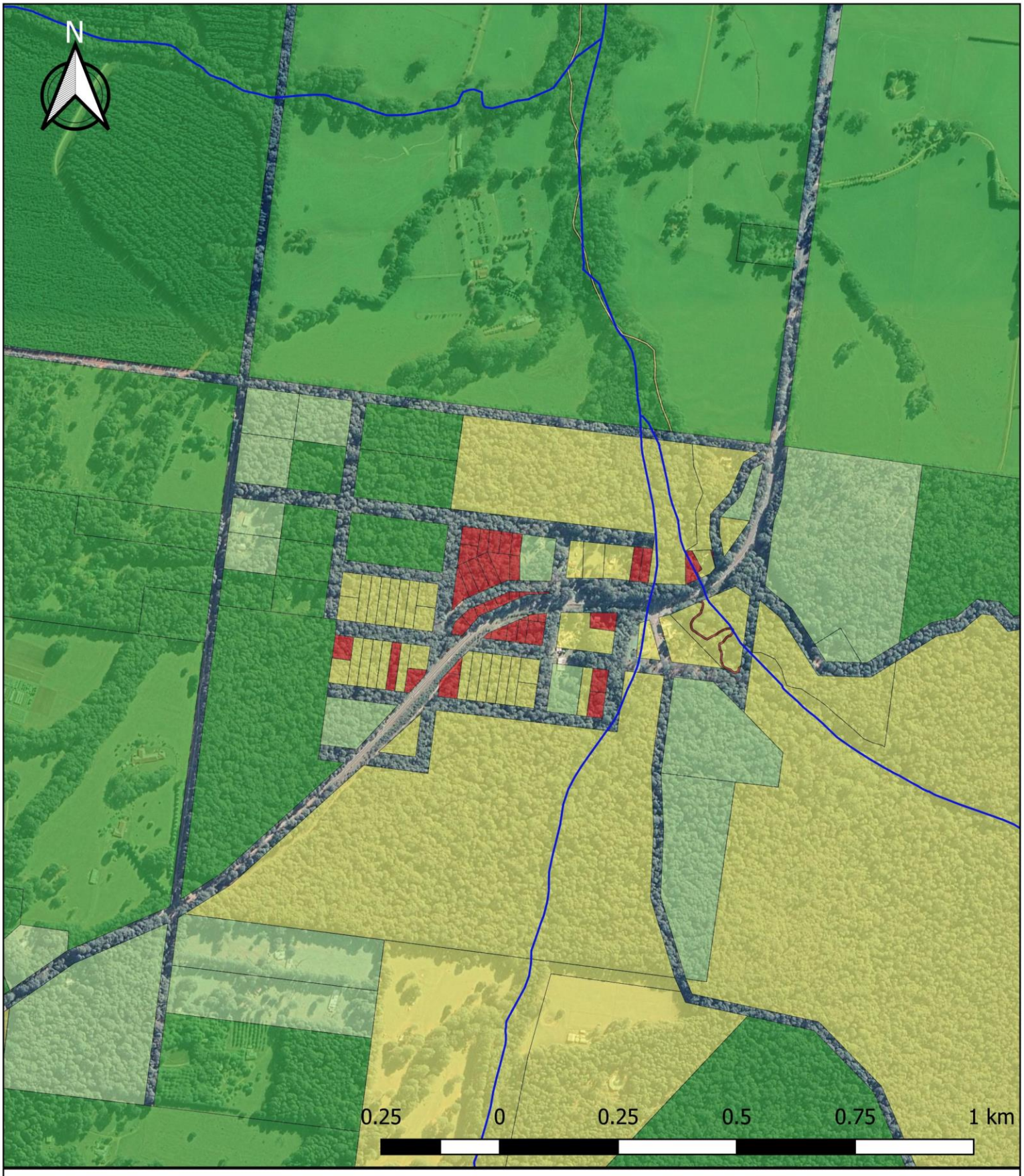


Figure 8: Land Capability Hazard Classification Map - Narbethong

LGA
Watercourse

LC Risk Classification

- Non CoS
- Very High Hazard
- High Hazard
- Medium Hazard
- Low Hazard

DECENTRALISED WATER CONSULTING

5.3 On-site Wastewater System (Management) Hazards

DWC have undertaken analysis of available data on the type, age and spatial distribution of the various types of on-site wastewater management systems in the Murrindindi Shire. Council are currently in the process of importing permit data into their health and property data management systems, however Councils attempts to extract existing STEMS data has been unsuccessful. The DWMP includes a recommend actions relating to both on-going data collection and analysis.

Septic Tank Permit records (from year 2000 to present) for approximately 2,460 on-site systems (including 311 'altered' systems) have been entered into the Council database (with duplicate properties removed by DWC as best possible). This is the best Council available data, however this is likely to be approximately 40% of total systems and no information has been provided regarding the effluent land application / disposal type. Table 6 summarises the breakdown of on-site system types in Murrindindi Shire based on available permit data. Table 7 summarise permit on-site system types for some of the key unsewered townships and localities. These breakdowns may change as the coverage and accuracy of data improves.

Table 6 Summary of Existing On-site Wastewater Management Systems in Murrindindi (40% data coverage)

System Types	Number	Percentage
Secondary Treatment Unit	826	38%
Septic Tank	1,230	57%
Composting Toilet	12	1%
Worm Farm	47	2%
Yarra Valley Water Treatment System	28	1%
Septic Tank and Sand Filter	1	0%
Worm Farm and Sand Filter	1	0%
Commercial Treatment System	1	0%
Unknown	2	0%
Total	**2,148**	

Table 7 On-site Wastewater Management System Permit Information for Localities

Suburb/Locality	Composting System	Yarra Valley Water Treatment System	Septic Tank	Secondary Treatment	Unknown	Alterations	Total
Acheron	0	0	20	4	0	4	28
Alexandra	3	0	51	38	0	15	107
Buxton	5	0	73	92	0	33	203
Castella	3	0	22	9	0	3	37
Cathkin	0	0	4	1	0	0	5
Caveat	0	0	13	0	0	2	15
Devils River	0	0	3	4	0	0	7
Dropmore	0	0	1	1	0	0	2
Eildon	3	0	47	29	0	10	89
Fawcett	1	0	16	4	0	0	21
Flowerdale	2	0	50	48	0	11	111
Ghin Ghin	0	0	8	1	0	0	9
Glenburn	1	0	58	12	0	6	77
Gobur	0	0	16	13	0	1	30
Granton	0	0	1	0	0	2	3
Hazeldene	5	0	25	52	0	16	98
Highlands	3	0	11	0	0	6	20
Homewood	0	0	2	1	0	1	4
Kanumbra	1	0	3	0	0	0	4
Kerrisdale	0	0	10	3	0	1	14
Killingworth	0	0	15	6	0	2	23
Kinglake	11	28	340	321	0	112	812
Koriella	0	0	6	6	0	0	12
Limestone	0	0	7	5	0	1	13
Maintongoon	2	0	4	1	0	1	8
Marysville	0	0	14	6	0	2	22
Merton	0	0	4	0	0	0	4
Mitta Mitta	0	0	0	0	0	1	1
Molesworth	1	0	9	2	0	2	14
Murrindindi	1	0	22	5	0	4	32
Narbethong	1	0	42	15	0	16	74
Pheasant Creek	0	0	35	6	0	7	48

Suburb/Locality	Composting System	Yarra Valley Water Treatment System	Septic Tank	Secondary Treatment	Unknown	Alterations	Total
Rubicon	0	0	6	2	0	2	10
Ruffy	1	0	2	0	0	1	4
Seymour	0	0	4	0	0	0	4
Strath Creek	3	0	39	5	0	6	53
Taggerty	5	0	50	24	2	13	94
Taylor Bay	0	0	3	19	0	5	27
Terip Terip	1	0	10	3	0	3	17
Thornton	0	0	22	17	0	3	42
Toolangi	0	0	37	12	1	2	52
Whanregarwen	0	0	10	4	0	4	18
Yarck	1	0	27	27	0	4	59
Yea	6	0	87	27	0	9	129
Unknown	0	0	2	1	0	0	3
Total							**2459**

It can be seen that the majority of systems are traditional septic tank and adsorption trench systems. More recently, new Permit to Installs have included a higher proportion of secondary treatment systems. Based on advice from Council, it is understood that a larger proportion of Permits issued prior to 2000 will include older septic tank systems (mostly more than 30 years old) and are expected to include a reasonable number of split systems with some level of direct off-site discharge.

While more traditional septic tank to absorption trench / bed systems can be a reliable and effective on-site wastewater management option, land capability characteristics in a number of unsewered areas in Murrindindi do not favour this approach. Specifically, the combined impact of low permeability soils, climate, topography and presence of watercourses (permanent and intermittent) combine to make both the constructability and operational reliability of septic tank to trench / bed system challenging. Comprehensive Land Capability Assessment (LCA) and on-going oversight are therefore critical to their effective performance.

The number and proportion of secondary treatment systems (including sand filters) will continue to grow in Murrindindi as existing on-site systems are replaced and new unsewered development occurs. While these technologies are necessary on many sites to meet EPA Code of Practice requirements and overcome land capability constraints, they do inevitably require higher levels of maintenance to ensure effective operation. Scheduled maintenance and three yearly inspections are a condition of approval for secondary treatment systems.

It is recommended that on-site wastewater management system (on-site system) data continue to be refined and developed to enable Council to maintain an active register of higher risk existing on-site systems. Ideally, this should be linked with a spatial (GIS) mapping layer that enables Council to clearly identify hotspot areas that may warrant higher levels of operational oversight. As inspection data for existing systems grow, it can also be incorporated into this database.

This work will also enable operational risk to be overlayed with land capability risk to highlight the areas where the two types of hazard have the potential to create very high risk conditions. The most significant of these areas based on this DWMP Risk Assessment is Flowerdale and Kinglake with an alternative wastewater management solution likely for meeting regulatory requirements.

5.4 Unsewered Development and Septic Tank Permit Approvals

DWC have been consulting with Council's Strategic Planning staff to ensure the DWMP adequately aligns with current Planning Scheme and relevant Structure Plans.

The DWMP work discussed in Sections 5.2 and 5.3 will inform the development of recommended minimum standards for both subdivision and future Septic Tank Permit applications in relation to;

- Land Capability Assessment (LCA) standards;
- Cumulative impacts in constrained and/or sensitive areas;
- Potential for deemed to comply rules that could be applied to Low Risk properties; and
- Standards to ensure systems are constructed as per Permits.

The DWMP contains example Minimum Standards in Appendix B for LCAs and Septic Tank Permit applications that are risk based and applicable to the on-site wastewater risk classification assigned to each unsewered property in Murrindindi Shire. This will provide Council with a consistent framework and clear expectations for applicants to follow when preparing Permit applications for both unsewered subdivision or individual systems.

5.4.1 Lot Size

Statistics were developed for allotment size across Murrindindi Shire and these are summarised below in Table 8. The typical lot size across Murrindindi Shire is moderate to large with a median lot size of ~2.5 hectares. It appears the lot size statistics presented below are skewed by a small number of very large properties, as can be seen from the significant difference between the average and median lot sizes. This aligns with the moderate to high land capability hazard observed across the majority of the Shire (~90%) which is driven by small lots (in certain areas) along with slope, climate and presence of dams and incised waterways.

DWC consolidated comprehensive minimum lot data (for sustainable on-site system installation) from previous projects undertaken for areas similar to Murrindindi Shire (large rural properties). Details of the data are provided in Appendix C.

The extensive data collated / analysed consistently indicates that lot sizes greater than 4,000 m^2 are likely to be capable of fitting a sustainable on-site sewage management system within the allotment assuming aspects such as native vegetation protection can be managed through site specific design and communication between relevant Council staff. This equates to the ~25th Percentile lot size across Murrindindi Shire, however as stated above this appears to be skewed by a number of very large lots.

Table 8 Murrindindi Shire Unsewered Allotment Size Statistics

Statistics	Approximate Lot Size
10%ile	1,610 m^2
Median	2.5 hectares
Mean	50.4 hectares
95%ile	149.4 hectares

5.5 Risk Based Prioritisation Process

A risk based prioritisation process has been undertaken by DWC to identify and rank higher risk villages / townships within Murrindindi Shire. This process was utilised to rank villages / townships into "bands" of priority for further actions. These actions could include prioritised inspection / rectification areas or development of alternative wastewater management solutions.

The limited availability of data confirming the type, age and condition of on-site systems in Murrindindi Shire limits the ability to incorporate 'Management Hazard' (existing on-site system data) into the risk based prioritisation process. A prioritisation process based on best available data has been undertaken and consists of a multi-criteria analysis (MCA) including the following elements;

- land capability using the proportion of properties classified as not able to Contain on Site (Non-CoS) in addition to the average land capability hazard class across the specific area;
- receiving water sensitivity, which included proximity of properties to named or intermittent waterways. Drainage within potable water / groundwater catchments was also considered;
- available on-site system type and age information from available permit data. Given the current data available Septic Permit age has been used as general indicator of older (pre 2007) and higher risk legacy systems, likely to be near the end of the operational life (typically ~15 years).

The intention is the risk assessment could be updated as further inspection data is collected by Council on system non-compliance and failure.

A simple scoring system was utilised for each sub-measure, ranging from Lower Risk (1) to High Risk (5). The score of each sub-measure was then combined to provide a final risk score. The higher the final risk score the higher the ranking and priority for consideration as part of the DWMP. All sub-measures were weighted equally i.e. no sub-measure was considered more important than the others. Details of the scoring measures are summarised in the table below.

Table 9 Prioritisation Process Summary

Category	Sub-measure	Details
Sustainability of On-site Wastewater Management	Properties that are too small to contain all wastewater on-site (Non CoS).	Both the number and % of Non CoS systems were determined for the respective area, based on the land capability and lot size analysis undertaken (refer Section 5.2).
	Land capability hazard for on-site containment.	Average land capability hazard for the area in addition to the average Final CoS Hazard (includes lot size constraints) was calculated for respective area.
Receiving Environment Sensitivity	Proximity to sensitive waterways and potable water catchments / Groundwater Management Areas (GMAs).	A desktop assessment of the proximity of high risk properties to sensitive waterways (permanent and intermittent), potable catchments and GMAs was undertaken and scored accordingly.
Existing and Legacy System Performance Issues *(to be Finalised)*	Major and critical non-compliance system issues (as data becomes available). Could be based on general Septic Permit age.	Both the number and % of major and critical non-compliant systems could be determined from Council's future inspection data (as data becomes available).
	Split system and known off-site discharge (OSD) systems (as data becomes available). Could be based on general Septic Permit age	Both the number and % of split system and known OSD systems could be determined from Council's future inspection data (as data becomes available).

The results of this analysis are presented in Section 5.6.4. Further details of the Prioritisation scoring and process is provided in Appendix E. The MCA scoring process has been developed based on the existing on-site data available. As the recommended inspection audit program becomes implemented (and any other on-site property data becomes available), the MCA ranking can be easily updated. .

5.6 Key Outcomes of Risk Assessment

5.6.1 Land Capability Hazards

- Land Capability in Murrindindi Shire is generally moderately to highly constrained with respect to safe and sustainable on-site wastewater management. Allotment size (in certain areas), climate, slope, dams and incised watercourses do pose a greater constraint across the Shire.
- Constraints can typically be managed through;

- adequate minimum lot size (2ha is a recommended benchmark with 0.4 and 1ha by exception and with consideration of cumulative impacts);
- increased Land Capability Assessment (LCA) and design detail on constrained properties to support Septic Tank and Planning Permit applications;
- provision of secondary treatment to enable a wider array of land application options on more constrained lots with respect to soil, slope and watercourses; and
- implementation of adequate performance auditing (currently constrained by resources and regulatory powers).

5.6.2 Existing On-site Wastewater Management System Risks

Council estimate there are approximately 5,000 existing On-site Wastewater Management Systems in the Shire. An initial compilation and cleaning of historical Septic Tank Permit (~2,460 properties) data has been undertaken that identifies some gaps in understanding of the nature and condition of systems in Murrindindi Shire. In particular, there is no available information on the number of known systems with some form of off-site discharge (full discharge or split / greywater only).

Council are continuing to improve the accuracy and completeness of the on-site system dataset by updating permit data as it is collected. Additionally, this DWMP recommends the implementation of an On-site Wastewater Management Oversight Program (See Section 6.1.1) to collect accurate data on the type and overall condition and performance of existing on-site wastewater systems within the Shire. In particular, this will allow the identification of any "split" and full off-site discharge systems or damaged treatment systems / disposal areas which pose a high risk to the community and sensitive receptors.

It is recommended that the implementation of the on-site wastewater inspections initially targets key unsewered areas with high risk properties, specifically Kinglake, Flowerdale and Thornton. The existing permit data indicates that 30-60% of properties in these areas are non-containment and the average hazard class is high to very high, indicating that a large portion of these properties have the potential to pose a risk to sensitive receiving environments.

The majority of existing systems in Murrindindi Shire are more traditional septic tank (primary treatment) systems which likely drain to an absorption or Evapo-transpiration / absorption (ETA) trench or bed (no data is currently available regarding effluent land application / disposal type). This approach remains a reliable option for larger properties (indicatively greater than 1ha) due to the lack of moving parts and reduced reliance on maintenance. However, some soils and climate in Murrindindi Shire pose challenges to the design and construction of trench / bed systems in accordance with the EPA Code of Practice and *AS1547:2012*. It is recommended that Council consider the development of a clear and consistent set of minimum standards for the design and

construction of primary treatment to trench / bed systems to ensure that good quality outcomes are achieved for Council and the property owner. This should include clear guidance on when septic tank to trench / bed systems will be considered and when they are not considered an acceptable long-term solution.

Notwithstanding, the primary risk factor associated with existing on-site systems is consistently the level of management and oversight applied to them on an on-going basis. Almost any on-site system will fail to meet community standards in the absence of an on-going operation, maintenance and monitoring program. Under current legislation, responsibility for operation and maintenance rests with the property owner whilst regulatory oversight rests with Council (for systems <5,000 L/day).

Under the recent revision of the SEPP (WoV), a DWMP is to "provide for the compliance assessment and enforcement of on-site domestic wastewater systems in accordance with the plan." It is recommended that Council investigate opportunities and funding mechanisms and potential legal options for establishment of a more comprehensive operational oversight program for on-site systems.

5.6.3 New Unsewered Developments

There have been approximately 90-100 new unsewered allotments created per annum in Murrindindi Shire based on the current Septic Permit register as a general indicator. This is a relatively high number compared to other jurisdictions (however it is an indicator only). However, many of these applications relate to township zoned properties that are below the recommended 4,000 m^2 property size and require Land Capability Assessment and careful design and installation.

Council staff have raised concern about challenges associated with small undeveloped parcels of land in township zones. Some of these undeveloped lots have been classified as unable to contain on site or highly constrained for sustainable on-site wastewater management. Specific Minimum Standards are recommended for these properties that seek to minimise risk to human health and the environment

The evaluation of sustainable lot sizes for on-site wastewater management conducted as part of this DWMP support the current minimum lot size in Rural Living zone of 2 ha. While sustainable on-site wastewater management is achievable on lots that are 0.4 - 1ha in size, past experience in Murrindindi Shire and other jurisdictions has shown that site specific constraints and a greater reliance on diligent owner management can increase the risk of human health and environmental impact.

As such, planning permit applications for new unsewered development proposing lot sizes less than 1 ha should be subject to a higher degree of scrutiny with respect to Land Capability Assessment and potential for cumulative / off-site impacts. They may also warrant a higher level of operational accountability. This is to ensure domestic wastewater risks that have arisen from historical planning

decisions are not repeated and a safe, sustainable benchmark for unsewered subdivision and rezoning is established.

DWC have previously applied the concept of "Useable Land" to provide a basis for increased levels of scrutiny and assessment for unsewered development. Useable Land can be defined as:

total allotment area excluding dams, intermittent and permanent watercourses, wetlands or waterbodies and open stormwater drains and pits in addition to the relevant buffer distances to those objects prescribed in the EPA Code of Practice for On-site Wastewater Management.

Where a proposed allotment can demonstrate 4,000 m^2 of Useable Land, Council can be comfortable that the objectives of the SEPP (Waters) will be achieved subject to typical on-site system design, construction and operational practices. Where this cannot be demonstrated, a higher level of assessment detail and Council scrutiny may be warranted. When used in conjunction with the Land Capability Risk Class, Useable Land enables constrained sites in close proximity to receiving environments to be targeted for this higher level of assessment including cases where site constraints render large portions of an allotment unavailable for effluent management.

It is recommended that the Risk Mapping be used to inform further investigations into land capability and minimum lot sizes for any future development areas.

5.6.4 Risk Based Prioritisation

The results of this risked based assessment are summarised in Figure 9 and Table 9. Further details of the Prioritisation scoring and process is provided in Section 5.5 and Appendix E. The focus of the figure below is ranking of the key high risk areas which have already been flagged by Council.

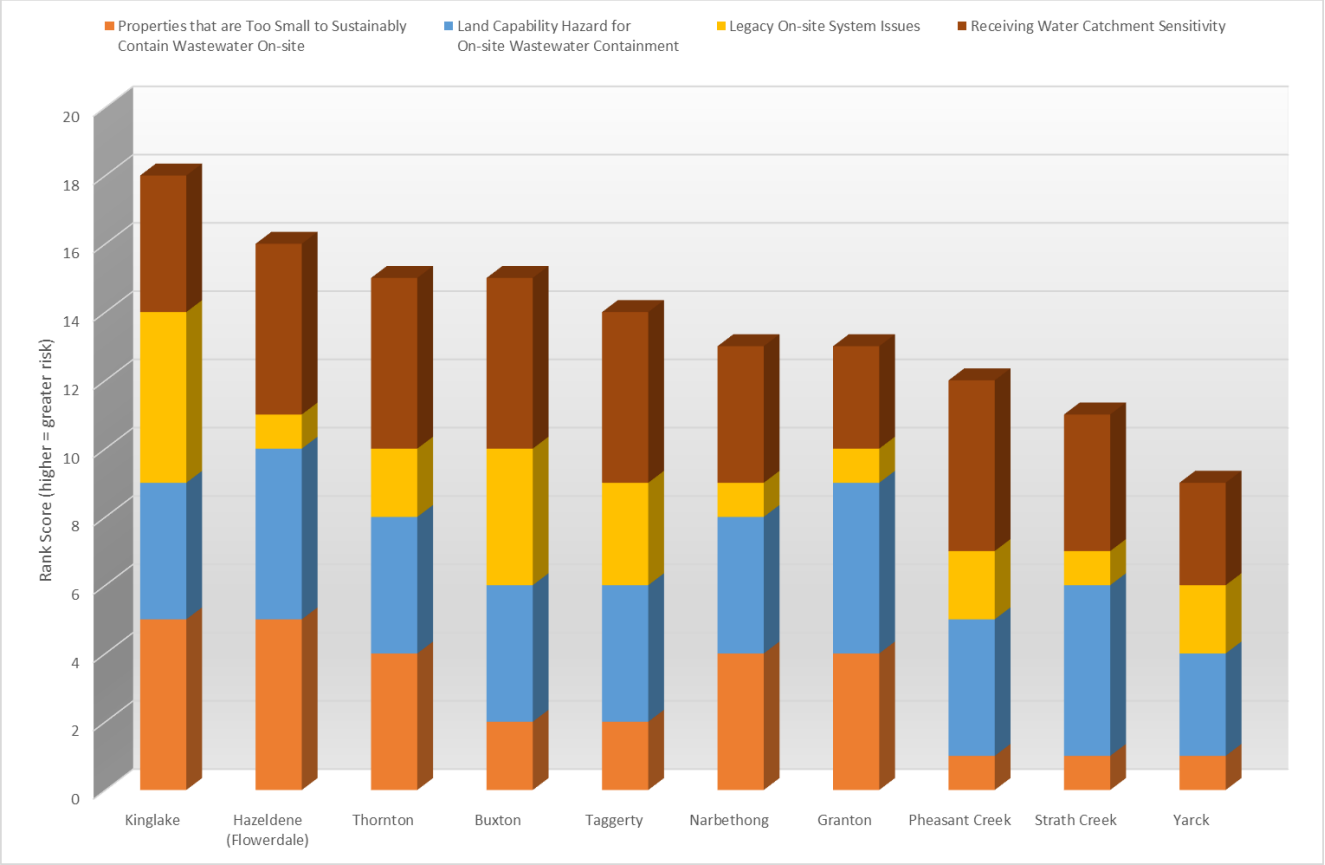


Figure 9 Results of Risk Based Prioritisation Assessment

It can be seen that Kinglake, Flowerdale, Thornton and Buxton have ranked highest overall. This is based on a range of land capability constraints including small lot size (in certain areas), slope, climate and dams / waterways.

This prioritisation process has also been applied to other localities across the Shire to help guide the investment of resources in the inspection of remaining on-site systems in the Shire. The key data used in this process was the Land Capability hazard mapping and historical permit / inspection data available. Refer to Table 9 for initial outcomes from this process.

Table 10 Prioritisation of Domestic Wastewater Risk Management Actions

Priority Band	Township / Locality	Key Actions in this DWMP Period
Very High	Flowerdale Kinglake Thornton Buxton	Inspection ASAP to confirm existing system type and condition. Investigate alternative wastewater management solutions or pursue rectification / mitigation of off-site discharge. Potential follow up inspection in next 1-2 years. Seek rectification of failures to maximise containment (where possible). Potential water quality monitoring of impact zones.

Priority Band	Township / Locality	Key Actions in this DWMP Period
High	Taggerty Narbethong / Granton Isolated Non-containment (Non-CoS)	Inspection to confirm existing system type and condition. Seek rectification of failures to maximise containment (where possible). Implement finalised Minimum Standards in Appendix B for new Permits and require 3-yearly reports.
Medium	Pheasant Creek Strath Creek Yarck All other properties <4,000m^2.	Inspection to confirm existing system type and condition. Implement finalised Minimum Standards in Appendix B for new Permits and require 3-yearly reports.
Low	All other localities	Inspect if resources permit. Implement finalised Minimum Standards in Appendix B for new Permits and require 3-yearly reports.

These priority bands are considered an indicative guide to risk priority which can be strongly influenced by the age, type and condition of the existing systems present. A Priority Action has been put forward in Section 6 to investigate options for resourcing an on-going risk based inspection and oversight program.

The outcomes of the Domestic Wastewater risk assessment (as documented in Section 5.5) have identified a number of clear priority townships in terms of managing off-site wastewater impact risks as can be seen in the table above. In addition, there are some more isolated non-containment properties dispersed throughout other areas that should be inspected as a priority to confirm actual on-site system performance. It is estimated that approximately 15-20% of unsewered properties in Murrindindi Shire would be failing to contain wastewater on-site or pose a high risk of non-containment. This is comparable to other council areas and these properties are almost entirely located in the priority townships.

The remaining ~80-85% of unsewered properties are likely to be able contain on-site subject to adequate on-going management and consideration of site specific land capability constraints. It is recommended that a risk based on-site system inspection program and Minimum Standards are developed for Septic Tank and Planning Permit applications (initial examples of Minimum Standards are provided in Appendix B) to address this. In addition, establish a system to ensure Permit conditions requiring a 3-yearly inspection by a licenced plumber and report to Council would be a relatively simple mechanism for overseeing on-going compliance in these areas.

6 Domestic Wastewater Management Action Plan

The revised risk assessment documented in Section 5 has been used to identify priority areas and properties for improved wastewater management. Where high proportions of properties are at risk of not containing wastewater on-site, priority actions focus on progressing strategies, potential management frameworks and funding models for some form of managed wastewater service. This Action Plan has been developed within the existing constraints of legislation and state government policy relating to on-site systems, water authorities and land use planning.

In accordance with the SEPP (Waters), where it is not feasible for reticulated sewerage to be provided to a town or area that has been identified as high risk of non-containment, alternative risk management or mitigation strategies should be considered. They form a key component of this Action Plan.

For medium and lower risk areas / properties, actions focus on resourcing and implementing improved levels of oversight for on-site system operation and management. In addition, it is proposed to establish risk based Minimum Standards for Land Capability Assessment, system design and assessment of potential cumulative impacts for new systems and unsewered development to ensure future impacts are avoided.

6.1 Priority Actions

The following Actions are the 'highlight' or priority actions that have been identified through the DWMP process.

6.1.1 Develop and Implement an On-site Wastewater Oversight Program

Of primary importance throughout most of Murrindindi Shire's unsewered areas is the need for on-going compliance oversight of on-site systems. The intention would be for a grading of inspection frequency and degree of enforcement action based on the broader priority bands presented in this DWMP (Table 10). It is recognised that this oversight regime would need to focus on higher risk properties as per the CoS Hazard Class developed from the land capability mapping layer and existing on-site inspection data (where available).

It is recommended that an initial inspection of all properties is completed in order of risk priority (see Table 10) for the following purposes.

- To obtain accurate data on type, age, condition, location and size of each system; and
- (Where possible) to engage with the resident on the importance of managing their system, guidance on the 'do's and don'ts' and why Council are conducting inspections.

Once this initial inspection has been completed, Table 11 summarises a recommended inspection / oversight program for MSC.

Table 11 Proposed On-site Wastewater Oversight Program

Inspection Frequency	Priority Band (See Table 10)	Follow Up on Required Works
Annual	Very High (excluding Non-containment properties[1]). Any property identified as having a major non-compliance requiring rectification[2].	Follow up within 3 months to ensure completion of required works.
Two-yearly	High Risk (excluding Non-containment properties[1]).	Follow up within 6 months to ensure completion of required works (minor non-compliances only).
Three-yearly	Medium Risk Any system with Permit condition requiring a 3-yearly inspection.	Follow up within 12 months to ensure completion of required works (minor non-compliances only).
Five-yearly	Low Risk[3]	

1. *Non-containment properties will be considered as part of development of any whole town solution or mitigation strategy.*
2. *Major non-compliances typically involve the failure of land application areas and off-site discharge of wastewater that was not originally approved or major structural / operational failure.*
3. *Where a new system is approved and installed on a Low Risk property, it may be adequate to rely on a 3-5 yearly check by a licenced plumber or drainlayer.*

The biggest challenge for all Victorian council's is the establishment of a long-term funding mechanism for this oversight and enforcement capability. This DWMP includes a small number of potential options for resourcing of the oversight program that will require further examination to confirm feasibility and acceptability to Council and the community.

It is recommended that Council prepare a business case for increased Domestic Wastewater Management oversight that strikes a balance between cost burden on the community, management of risk and fulfilment of Council's legislative obligations. This should include community engagement on both the risks / impacts of on-site systems and seeking feedback on community willingness to pay for improved oversight.

While this business case may not progress to implementation, as a minimum it enables Council to demonstrate it has actively sought to meet its domestic wastewater management obligations under the SEPP (Waters).

Three potential DWMP funding models are currently being considered for Murrindindi Shire (noting these are to be finalised as part of DWMP implementation).

- Utilise general Council revenue based on the human health and environment protection benefits to the community.

- Increase in Septic Tank Permit fees to allow for oversight of Permit condition compliance.
- Potential establishment of a Local Law to enable a levy to be charged.

There are other, external funding mechanisms that may also be available such as application of a charge associated with septic tank desludging and disposal. Additionally, systems approved since (approximately) 1999 typically have a condition on their Permit requiring three yearly checks by a licenced drainlayer. For these systems, the cost of this inspection would be borne by the property owner. This approach does not always provide the community with the best value for money and can be challenging to enforce and oversee (resulting in higher costs also).

6.1.2 Ensuring Future Unsewered Development is Safe and Sustainable

There are a number of localities and areas where on-site containment can be achieved subject to management of constraints. Constraints include slope, incised watercourses and soils with poor suitability for effluent land application.

Section 5.4 and 5.6.3 of this DWMP utilised the DWM Hazard Mapping prepared as part of risk assessment activities to set risk based Minimum Standards for the following (but not limited to) elements of DWM. Example proposed Minimum Standards are provided in Appendix B and will be refined and finalised as part of DWMP implementation.

- Investigation, design and impact assessment requirements for unsewered Planning Permit and Septic Tank Permit applications.
- Triggers for completion of Cumulative Impact Assessments for new unsewered development that considers the impact of land capability of the amount of "useable land" on a site for DWM (as discussed and defined in Section 5.6.3).
- Additional requirements for non-residential DWM systems approved under the Septic Tank Permit system (<5,000 L/day).
- Policy positions for common challenges / constraints that impact on the ability to contain wastewater on-site (e.g. water supply catchments, land stability, bushfire management, flood risk, vegetation protection overlays)
- Risk based Septic Tank Permit conditions for on-going operational compliance requirements.
- Risk based requirements for designer certification of new DWM systems.

Use of the broad scale risk mapping completed as part of this DWMP enables Council to apply consistent requirements with respect to information required to support Permit applications. The risk class from the mapping should not be used to apply prescriptive technology or construction requirements because the mapping remains broad scale. Rather, it can be used to justify higher

levels of investigation and design analysis to ensure any potential constraints are detected and addressed.

6.1.3 Alternative Wastewater Management Investigation and Pilot Study

The risk assessment documented in Section 5 has identified a number of key areas where the risks of off-site discharge and system failure are elevated. This is the result of smaller lot sizes combined with land capability and receiving environment constraints (including groundwater). For Kinglake, this has been compounded by bushfire recovery and development pressure. For these towns / areas, owner managed on-site wastewater management is highly unlikely to meet regulatory requirements or community expectations for sanitation and environmental protection. Consequently, some form of alternative wastewater management strategy is likely to be required to meet requirements.

Given the isolated nature of these communities, the viability of connection to the Goulburn Valley Water sewerage network is likely to be low. Goulburn Valley Water confirmed during stakeholder engagement for this DWMP that external funding would be required to enable reticulated sewerage to be provided to these towns. This DWMP does not exclude conventional reticulated sewerage as an option for Very High Risk towns as it remains a highly effective (albeit high cost) solution. However, the recently revised SEPP (Waters) contains a specific requirement for Councils to consider and investigate alternative solutions beyond just reticulated sewerage including non-engineering (i.e. management based) solutions such as centralised management of on-site and cluster wastewater management systems.

Simultaneously, the establishment of the Victorian Integrated Water Management (IWM) Forums across Victoria creates opportunities for local councils, water authorities and other stakeholders to implement IWM solutions and approaches where beneficial. There are a number of local and decentralised approaches to wastewater management and provision of recycled water that fit within the sphere of IWM.

A current project being undertaken by Barwon Water in Forrest is an example where a combination of on-site and cluster technologies in addition to a small reticulation system are being used to maximise management of wastewater within the town, provide a recycled water source and improve liveability (currently constrained by the off-site discharge of greywater). The preferred solution being considered in Forrest involves secondary treatment and subsurface irrigation on each property, with a small 'effluent' sewer directing excess effluent to a local water reuse facility, for further treatment and controlled irrigation. Importantly it was identified that management of both on-property and off-property infrastructure must be undertaken by a Responsible Management Entity (e.g. potentially Barwon Water) and not the home owners. The project is highly contingent on external funding given the limited capacity for the community to fund the solution.

There are similarities between the challenges facing each of the Very High Risk towns in Murrindindi that lend themselves strongly to a more pragmatic, adaptable, IWM approach. This can range from risk mitigation (e.g. capture and treat stormwater containing greywater) through to decentralised solutions that are centrally managed by public and/or private organisations. These challenges are consistently faced by many other local governments not only in Victoria but nationally.

The risk assessment has identified Kinglake, Flowerdale, Thornton and Buxton as high priority areas for improved wastewater management. Initial desktop evaluation as part of the DWMP by DWC indicates that these areas are likely to be well suited to a decentralised solution that may involve partial management on site with excess recycled water managed as a communal facility. This Integrated Water Management approach is consistent with the recent VAGO Audit (2018), in which alternative options are to be investigated where provision of traditional sewerage is not viable. This investigation could be undertaken as a pilot study, similar to that currently underway as part of the Park Orchards Trial Project (via Yarra Valley Water) and in Blackwood (via Moorabool Shire Council).

Yarra Valley Water have currently been trialling upgrade of ~100 on-site systems within Park Orchards as a potential alternative servicing solution. The Blackwood Septic Program involved Moorabool Shire Council and Central Highlands Water funding the upgrade of on-site systems across a number of constrained, high risk properties (within a potable water catchment). This was due to the lack of provision of reticulated sewerage in the area and concern with potential failure of on-site systems.

A pilot scheme would assist in developing a model for the provision of an alternative wastewater management scheme to these high risk areas (and potentially others in the future).

It is recommended that investigations be undertaken in relation to these areas to;

- Design a suitable Pilot Project that achieves the multiple objectives of improved wastewater management and IWM outcomes;
- Investigate and identify potential funding, management opportunities, how public health and environmental health risks will be mitigated;
- Develop and implement monitoring and evaluation system/program of the alternative wastewater management pilot scheme;
- Pursue grants and other funding sources made available to implement an alternative wastewater management pilot scheme. This would require development of a business case to demonstrate to Government Agencies how this scheme might be implemented.
- Appendix D contains an outline of potential alternative wastewater management strategies and management models that may warrant further investigation as part of DWMP implementation.

Murrindindi Shire Council is currently a project partner on a Goulburn Broken IWM Forum project that aims to develop an evaluation framework for alternative small town wastewater solutions. Buxton and Thornton have been included as case studies in this project.

6.1.4 Education and Engagement Program

As previously mentioned in this DWMP, the previous 2006 draft DWMP was not formally adopted. As such, no formal education or engagement program has been implemented.

Council's website has been updated since the previous DWMP to outline the Septic Tank Permit Process.. Copies of the Application to Install/Alter Septic Tank and a general Information Sheet for Septic Tank Application or Alterations is provided to the Septic Permit applicant, owner, plumber and Building Certifier.

The intention of this DWMP is to coordinate a number of additional education and engagement initiatives as part of a set Program. This could include;

- Develop a Stakeholder Engagement Plan, which outlines how stakeholders are to work to together to better manage domestic wastewater impacts with Murrindindi Shire Council (refer Appendix G).
- Develop and deliver wastewater management system maintenance and good land management practices education material via Council's website, pops up and printed information.
- Promote wastewater management education and septic system data availability to ratepayers, renters, solicitors, real estate agents, building certifiers, architects, engineers, plumbers, builders and other relevant parties.
- Develop and implement documentation to enable these community members to obtain information on properties they have interest in and status of a potential wastewater management system for the site.

6.1.5 DWM Information Collection and Management

Council have undertaken internal audits every 5 years in order to determine potential options to develop DWMPs and risk assessments. Council currently have Septic Tank Permit data imported into the Environmental Health System, however as discussed previously the data is currently only from year 2000 to present. This process is critical to improved management of Domestic Wastewater Management (DWM) risks. The DWMP puts forward options to streamline information collection and management for DWM as new Permit Applications are submitted or system inspection is undertaken in the future.

As a starting point it is proposed to investigate the developing of a Council user group to facilitate the integration of Open Office Health Manager wastewater management system data with Council GIS system. It is essential this is integrated with any inspection data collected as part of a future System Audit Program.

The DWM Hazard Mapping can potentially form the basis for an Area wide information management system for DWM systems. As information is input into Health Manager, it could be also directly updated in a mapping layer on intranet mapping.

6.2 Full Action Plan

At present, resourcing for Domestic Wastewater Management (DWM) obligations is limited primarily to Septic Tank Permit application assessment, response to complaints and addressing high risk on-site system failures that pose an immediate health risk. The following Action Plan has been developed with a view to balancing cost of implementation against Council's DWMP obligations under the SEPP (Waters) and the outcomes of the DWM Risk Assessment documented in Section 5.6.
Implementation of the Action Plan will require resourcing beyond the existing situation. Consequently, investigations into potential long-term funding models is identified as a High Priority Action under the DWMP.

Table 12 Murrindindi Domestic Wastewater Management Action Plan

Action	Action Steps	Responsibility	Resourcing	Timing
Action 1 **High Priority** Develop Funding Models for On-site Wastewater Oversight / Compliance Program and Implement (refer to Section 6.1.1)	1. Evaluate potential funding models and make recommendation to MSC. 2. Seek approval for funding model. 3. Implementation (prioritised based on On-site System Inspection data analysis and risk).	MSC Environmental Health	Approx. 1 FTE staff + vehicle (approx. $120k p.a. including overheads)	DWMP Year 1 DWMP Year 1 DWMP Year 2
Action 2 **High Priority** Pilot alternative wastewater management strategies for **Kinglake and/or Flowerdale / Thornton / Buxton**	1. Design a suitable Pilot Project. 2. Develop and implement monitoring and evaluation system/program. 3. Engagement between Council, Victorian Government Agencies and Community Stakeholders to identify potential funding and management opportunities. 4. Pursue grants and funding made available to implement an alternative wastewater management pilot study. Requires development of a business case to demonstrate how this scheme may be implemented.	MSC MSC, EPA, Goulburn Valley Water, DELWP	TBC	DWMP Year 1 DWMP Year 1-2 DWMP Year 3-5?
Action 3 **High Priority** Establish Minimum Standards for Septic Tank and Planning Permit Applications	1. Refine, finalise and adopt the Minimum Standards Tables in Appendix B. 2. Engage with neighbouring Councils to work towards consistent septic tank and planning permit application standards. 3. Conduct Consultant and Installer Information Sessions 5. Implement and Update as Required	DWC MSC Environmental Health	As part of DWMP Existing budget	DWMP Finalisation DWMP Year 1 DWMP Year 1
Action 4 **High Priority** DWM Information Collection and Management	1. Investigate developing user group to facilitate the integration of Open Office Health Manager wastewater management system data with Council GIS system. 2. Create a baseline Septic Tank Permit GIS mapping layer.	MSC Environmental Health MSC Environmental Health / IT (+possibly other Councils)	No additional	DWMP Year 1

Action	Action Steps	Responsibility	Resourcing	Timing
	3. Establish procedure for direct input of all new Permits' data as they are approved.			
Action 5 **High Priority** Education and engagement program	1. Develop a Stakeholder Engagement Plan, which outlines how stakeholders are to work to together to better manage domestic wastewater impacts. 2. Develop and deliver wastewater management system maintenances and good land management practices education material via Council's website, pops up and printed information. 3. Promote wastewater management education and septic system data availability to all relevant community members. 4. Develop and implement documentation to enable these community members to obtain information on properties they have interest in and status of a potential wastewater management system for the site. 5. Develop and deliver information guide on how to consolidate lots.	Decentralised Water Consulting MSC Environmental Health MSC Environmental Health MSC Planning	TBC ($5k-$10k)	DWMP Finalisation DWMP Year 1
Action 6 **Low Priority** DWM Impact Monitoring Program	1. Evaluate potential for an on-going water quality monitoring program in high risk areas.	MSC Environmental Health	TBC (monitoring program indicatively $10k-$40k p.a.)	DWMP Year 3
Action 7 **Low Priority** DWMP Action Plan Review	1. On-going evaluation against Action Plan 2. Adapt DWMP Actions as required based on available funding and previous action outcomes. 3. Full DWMP Review	MSC Environmental Health	Existing	Annually Annually DWMP Year 5
Indicative Budget Estimate for DWMP Action Plan Implementation	**TBC**			

7 References

BMT WBM (2012) *Assessment of On-site Containment: Park Orchards Case Study*. Yarra Valley Water.

BMT WBM (2015a) *Park Orchards Trial Project: Preliminary Design Package Volume 1*. Yarra Valley Water.

BMT WBM (2015b) *Integrated Water Cycle Planning for Community Sewerage Areas Case Study – Monbulk*. Yarra Valley Water.

BMT WBM (2016) *Park Orchards Trial Project: Baseline Monitoring Program Technical Review*. Yarra Valley Water.

DELWP (2017) Integrated Water Management Framework for Victoria.

EPA Victoria (2016) *Code of Practice for Onsite Wastewater Management*. Publication 891.4.

Municipal Association of Victoria (2014) Victorian Land Capability Assessment Framework.

Murrindindi Shire Council Planning Scheme (Online)

Standards Australia (2012) *AS/NZS1547:2012 On-site domestic wastewater management.* Standards Australia.

Victorian Auditor-General's Office (2018) *Managing the Environmental Impacts of Domestic Wastewater.*

Appendix A On-site Containment and Land Capability Risk Assessment Methodology

A1 Weighted Hazard Score for Land Capability

Properties with potential for containment on-site (CoS) were classified based on the potential risks and impacts associated with on-going on-site wastewater management. A detailed description of the weighted hazard scoring system is provided in the following tables. There are three Head Criteria used to calculate the overall Land Capability Hazard Score. These scores are determined through direct GIS queries and analysis with the land capability hazard calculated using four sub-criteria.

The methodology has been applied within Victoria as well as NSW for a variety of projects. It is consistent with best practice, the EPA CoP and MAV Land Capability Framework.

A1.1 Primary Land Capability Hazard Criteria and Risk Framework

*Land Capability Hazard / Risk = (Land capability hazard*0.5) +(Receiving Environment: Proximity*0.25)+(Receiving Environment: Sensitivity*0.25)*

Head Criteria	Classification	Hazard	Score	Weight	Description
Land capability hazard	Hazard score <0.95 in Land Capability hazard score	Low	0	50%	Few / minor land capability constraints to on-site wastewater management.
	Hazard score >=0.95 and <2 in Land Capability hazard	Medium	1		Some moderate land capability constraints to on-site sewage with potential to increase failure rates
	Hazard score >=2 in Land Capability hazard score	High	2		Significant land capability constraints which have a high potential to increase failure rates
Receiving Environment: Proximity	Property outside of setback area	Low	0	25%	Limited to no proximity risk
	Receiving environment setback intersects boundary	Medium	2		Risk may be elevated, particularly where other constraints exist or COS is marginal
	Receiving environment itself intersects boundary	High	3		High risk - careful design and oversight required as likelihood of impact high in failure event
Receiving Environment: Sensitivity	None present / >setback distance	Low	0	25%	Self-explanatory – acceptable risk
	Stormwater drain				Typical swale drains on street or piped system
	Degraded or cleared intermittent drainage line.				Gully lines with predominantly grass cover and some scattered trees and shrubs.
	Dam / small waterbody (Upslope)	Medium	2		Farm dams possibly used for irrigation of edible crops or watering livestock
	Partially vegetated / rehabilitated ephemeral waterways (Upslope)				Some ecosystem value, seeking to not degrade further.
	Open stormwater drains in public places				Adjacent to and within parks, reserves, schools, shops.
	ESO vegetation communities (non-riparian)				Non-riparian ESO (or bioregion) polygons
	Non-potable groundwater bore				Domestic stock and irrigation bores from available data
	Potable water supply catchment	High	3		Protection of human health (priority)
	Potable groundwater bore				Protection of human health (priority)
	Permanent watercourse / waterbody (Upslope)				Perennial or near perennial streams and rivers, or large lakes and reservoirs.
	ESO (high value) aquatic ecosystems				Riparian polygons of ESOs and bioregions

ESO = Environmental Significance Overlay; LAA=Land Application Area

A1.2 Land Capability Hazard Sub-criteria

Land capability hazard score equation is as follows and is used to calculate this hazard as per the table above (Low, Medium or High Hazard).

*(Slope hazard*0.4)+(Soil hazard*0.3)+(Drainage Hazard*0.1)+(Climate*0.2)*

Criteria	Value	Hazard	Score	Weight	Notes
Slope (area weighted average)	<10%	Low	0	40%	No impact on design or function
	10-15%	Medium	2		Some constraints to land application, breakout risks
	15-30%	High	3		High risk of design failure or effluent breakout
	>30%	Prohibitive	Prohibitive		Land application prone to failure regardless of management (Very High Hazard)
Soil	<1.5	Low	0	30%	Soil hazard was assessed and calculated as per BMT WBM (2012, 2015a & 2015b).
	1.5-2.5	Medium	2		
	>2.5	High	3		
Climate	≤3 months where RF > PET	Low	0	20%	Monthly average rainfall exceeds potential evapotranspiration only for a small number of months.
	4 to 5 months where RF > PET	Medium	1		Rainfall exceeds potential evapotranspiration for close to half of the year.
	≥6 months where RF > PET	High	2		Rainfall exceeds potential evapotranspiration for half or greater of the year (soils expected to be consistently moist).
Drainage Class	>Mod. well	Low	0	10%	Free draining soils, ridges, upper and mid slopes
	Imperfect	Medium	1		Imperfectly drained soil profiles, lower slopes (footslopes)
	<Poor	High	2		Poorly drained landscapes, depressions, water accumulation, swamps, floodplains

A1.3 Red flags

The need for a number of "red flags" was identified during groundtruthing and development of the Framework. Red flags represent more significant or extreme conditions associated with a specific criterion that have a significant and in some cases prohibitive impact on the ability to CoS.

Table 13 CoS Hazard Red Flags

Occurrence	Outcome	Purpose
Land capability = High	CoS Hazard Class = High automatically assigned.	Avoid significant and extreme (e.g. steep slopes and shallow soils) constraints on large lots that are not close to sensitive environments from being diluted.
Lot size <4,000m^2 = High		These sites will be highly dependent on site specific land capability constraints and proximity to sensitive receiving environments. A more detailed LCA and design process is likely to be required to ensure full containment in addition to higher level treatment and greater construction and operational oversight.
Receiving environment proximity = High		Capturing otherwise unconstrained lots that either contain or are immediately adjacent to sensitive receiving environments (i.e. if failure occurred there is limited assimilative capacity).
Receiving environment sensitivity = High		As above but capturing the need for greater vigilance where an on-site system is close to a high value or highly sensitive receiving environment (e.g. potable water supply catchment).

A2 Receiving Environment Analysis

Receiving Environment hazards were assigned the relevant Sensitivity hazard (as defined above) and applied to each of the unsewered properties within the LGA which contained the individual hazard. A Receiving Environment Proximity hazard of 3 (high) was applied to each property in which the relevant hazard polygon or line intersected the property boundary. If the Receiving Environment (RE) hazard buffer (setback) area intersected the property boundary, a RE Proximity hazard of 2 (medium) was assigned. The flooding and ESO hazard layers were not buffered and therefore were assigned a uniform RE Proximity hazard of 2 (medium). For very large lots >40ha, the hazard for any watercourses, waterbodies and high value ESOs within these lots was reduced (to medium) given the very high likelihood that a land application area could be installed with sufficient setback to these hazards. Details of each of the specific RE constraints which were considered are discussed below.

A2.1 Watercourses

The watercourse layer ('Hydroline') was found to correlate quite well with intermittent waterways and drainage lines across the LGA. Therefore, these were buffered by 30 metres (EPA CoP setback distance) and given the appropriate Receiving Environment Sensitivity hazard (Medium). The watercourse layer also correlated well with permanent waterways within the LGA and this was buffered by 60 metres and given an increased RE Sensitivity hazard (High). For properties ≥4,000m^2 in which an intermittent watercourse is within the property boundary a Medium RE Proximity hazard was assigned to capture the improved ability for a land application area to be located on larger lots

with sufficient setback to this constraint. The standard High RE Proximity hazard was assigned if the property was <4,000m^2.

A2.2 Waterbodies

Dams and other waterbodies were mapped within the 'Hydroarea' layer provided by Council. A large number of drainage depressions and low lying areas were also mapped within the waterbodies data. As these low lying areas would periodically be flooded and filled with water they were included within the hazard mapping. Small waterbodies (e.g. farm dams) were buffered by 30 metres and assigned a Medium RE Sensitivity hazard whilst larger waterbodies were buffered by 60 metres and assigned a High RE Sensitivity hazard. For properties ≥4,000m^2 in which a small waterbody (farm dam) is located within the property boundary a Medium RE Proximity hazard was assigned (as discussed above for watercourses). High RE Proximity hazard was assigned if the property was <4,000m^2.

A2.3 Groundwater

Groundwater bore locations were sourced from the Victorian Government online data portal ('NGIS_Bores'). All bores known to be potable water sources were buffered by 100 metres and assigned with a High RE Sensitivity hazard. There is uncertainty around currency, accurateness and completeness of groundwater bore data and therefore bores assigned as non-potable or unknown were not included (given the board-scale nature of the mapping). The whole of Murrindindi Shire is mapped with the Groundwater Management Areas and therefore these were not included directly within the land capability mapping. They were considered as part of the risk based prioritisation for high hazard towns (as documented in DWMP).

A2.4 Environmentally Significant Vegetation

The Council planning overlay was used to extract areas classified specifically as part of the 'Environmental Significant Overlay' (ESO). This was combined with the 'Native Vegetation – Bioregional Conservation' layer obtained from Vic Gov data portal. No buffer was applied to this combined ESO / Bio-conservation region and therefore it is assigned a uniform RE Proximity hazard of 2 (medium).

In order to identify high value (Riparian) ESO / Bio-conservation areas, permanent watercourses (with 30m buffer applied) was used to identify these areas and assign a High (3) RE Sensitivity hazard to any properties within this region. All other ESO / Bio-conservation areas were assigned a Medium (2) RE Sensitivity hazard.

A2.5 Flooding

Flood risk areas were identified via the Council planning overlay to determine properties within the 'Floodway' or 'Land subject to inundation' planning regions. Properties that were within these areas were assigned a medium RE Proximity hazard (and therefore minimum Medium Hazard classification)

to flag this potential land capability constraint for installation of a suitably sized on-site wastewater management system.

A2.6 Stormwater

Stormwater drainage infrastructure data was available, however the coverage was largely within sewered areas. Therefore the data had minimal overall influence within the land capability hazard mapping.

A3 Soil Hazard

Soil hazards relevant to on-site wastewater management have been evaluated using the parameters / system documented in the tables below.

A Land Capability Analysis report for Murrindindi Shire was previously prepared in December 2001 and the report and spatial / GIS data was provided to DWC. However, upon review it was determined that there was no way to reconcile the Land Capability Analysis document with the spatial data, leaving no way to spatially identify different soil hazard classes.

In order to develop a soil hazard class, DWC utilised the best available data in the form of the 'Soil Type' GIS dataset provided by the Victorian Government Data Portal. The soil landscape (Landunit) classification present in this layer could currently not be correlated with the Victorian Resources Online Soil Resource Mapping landscapes. However, DWC were able to develop a representative soil hazard class based on the Australian Soil Classification present within the GIS dataset. This soil landscape data was based on 3,300 land units across Victoria derived from 100 soil and land surveys undertaken over the last 70 years.

Groundtruthing field verification includes completion of soil investigations across Murrindindi at a number of representative locations. The focus was on the key / dominant soil landscapes and areas where there was uncertainty around soil characteristics and/or soil hazard was important for the overall Hazard Class. This also included collection of soil samples for laboratory analysis for a number of key soil landscapes (including data previously obtained for Kinglake).

Table 14 Parameters for Soil Hazard Derivation

Hazard Type	Parameter	Hazard Class	Description	
Depth Hazard	Profile Depth	Low	Greater than 1.5 metres profile depth	Greater depths of unsaturated soil provide increased treatment of effluent and reduced potential for lateral water movement.
		Medium	0.8 – 1.5 metres profile depth	
		High	Less than 0.8 metre profile depth	
Hydraulic Hazard	Texture	Low	Pedal loam to clay loam soils with mid-range permeability and moderate to free drainage.	
	Structure	Medium	Generally imperfectly drained, weakly structured clay loams and light clays or deep, rapidly drained sands (e.g. sand hills).	
	Indicative Permeability	High	Generally, shallow, structureless clays and sands in either very rapidly or very poorly drained landscapes.	
	Drainage			
Pollution Hazard	Nutrient Retention	Low	Generally, soils with high cation exchange (CEC) and / or phosphorus sorption capacity, no sodicity potential and good organic content in topsoil.	
	Sodicity	Medium	Generally, soils with moderate CEC, phosphorus sorption capacity, minor sodicity potential and moderate organic content in topsoil.	
	Organic Content	High	Generally, soils with low CEC, phosphorus sorption capacity, sodicity potential and/or limited organic content.	

Table 15 Weighted Average Logic for Soil Hazard Class

Hazard Score	Hazard Type	Weighting	Calculation
Low=1	Depth	1.5	**Final Hazard Class** = [(Depth HS x w) + (Hydraulic HS x w) + (Pollution HS x w)] / 3 **Weighted average hazard classes** 1 – 1.5 = Low Soil Hazard 1.5 – 2.5 = Medium Soil Hazard 2.5 – 3 = High Soil Hazard
Medium=2	Hydraulic	1	
High=3	Pollution	0.5	

A4 Slope and Drainage Hazard

Contours and slope grid were created within QGIS based on the Vicmap 10m Digital Terrain Model (DTM) available for the entire area. This assisted with evaluation of topographical, hydrologic and landscape constraints. The slope grid created from the DTM provided a broad desktop assessment of variability in slope, from which assumptions were evaluated and verified during groundtruthing. Slope was found to be a moderate to major constraint for a large portion of the Shire.

The drainage hazard was inferred from the general geomorphology (GMU and Land Systems of Victoria datasets - Victoria Gov. data) data layers based on identifying board areas in which poor drainage was likely to be a constraint to effluent management. The High Drainage Hazard areas predominately consisted of low-lying floodplains with incised watercourses present.

A5 Climate Hazard

A general climate analysis across the study area was undertaken to provide an assessment of the degree to which climate limits or enhances opportunities for the land application of effluent. The Climate Hazard analysis classifies the Shire based on the number of average climate months where rainfall exceeds potential evapo-transpiration (PET).

This provides a general spatial representation of periods where enhanced deep drainage or surface surcharging of effluent is more likely to occur because evapo-transpiration is providing limited or no assistance in assimilating wastewater. Conversely areas (grid cells) with limited or no average months where PET is greater than rainfall generally represent sites with good evapo-transpiration capacity available for effluent assimilation.

The baseline data layers used include;

- 2.5 km^2 grid of mean monthly rainfall (Bureau of Meteorology Climate Atlas) www.bom.gov.au/climate/averages/climatology/gridded-data-info/metadata/md_ave_rain_1961-90.shtml
- 10 km^2 grid of mean monthly areal Potential Evapo-transpiration (BoM Climate Atlas)

http://www.bom.gov.au/climate/averages/climatology/gridded-data-info/metadata/md_ave_et_1961-90.shtml

The rainfall and evapotranspiration data for each month were converted from lat/long co-ordinates to an MGA projection and then converted to a 40m grid cell size for consistency.

The final output of the RF minus PET monthly grid analysis was an approximation of excess rainfall for each month of an average statistical year. The results of this were used to determine an appropriate spatial climate hazard level across the LGA.

The climate hazard layer was created through classification of grid cells in accordance with the following conditions.

Low hazard: ≤3 months where RF > PET

Medium hazard: 4 to 5 months where RF > PET

High hazard: ≥6 months where RF > PET

A6 Groundtruthing

DWC conducted field groundtruthing of the land capability hazard mapping in March 2019. Twenty-one sites were assessed based on the risk / hazard classification Framework detailed above. Sites were selected to maximise benefits of field checking by;

- concentrating on locations where land capability inputs (i.e. the inputs subject to the most uncertainty) had the potential to influence the final Land Capability Hazard Class (e.g. soil landscapes which covered a large proportion of the Shire);
- identifying sites where there was observed uncertainty in the individual parameters used to assign a hazard class (e.g. near a soil landscape boundary or area of variable slope); and
- concentrating on areas with higher densities of on-site systems or known performance issues.

Groundtruthing involved visual checking of each site against the tables in Section A1 above. It also involved checking of soil hazard class against key criteria set out in Section A3. Soil hazard was a key focus of the groundtruthing given the limited data available for the Shire. Hazard mapping was then checked via a laptop and GPS at each site with results recorded with supporting photography.

The results found no significant discrepancies in the Land Capability Hazard Class for the groundtruthing sites. General comments / limitations were as follows.

- As discussed previously, limited consolidated soil landscape information for the Shire means that the Soil Hazard is general in nature and therefore it is recommended that at least one soil test pit is recorded for any site being assessed by a land capability assessor.
- Slope Hazard is based on the best available and most consistent data across the Shire, however as it is based on 10m DTM grids it will not necessarily pick up subtle changes across sites. It is appropriate for broad-scale mapping such as this.
- The Native Vegetation (Bioregional Conservation) data utilised as part of the ESO vegetation hazard has variable accuracy regarding actual vegetation location, however is it sufficient given the broad-scale nature of the mapping and is the best data available.

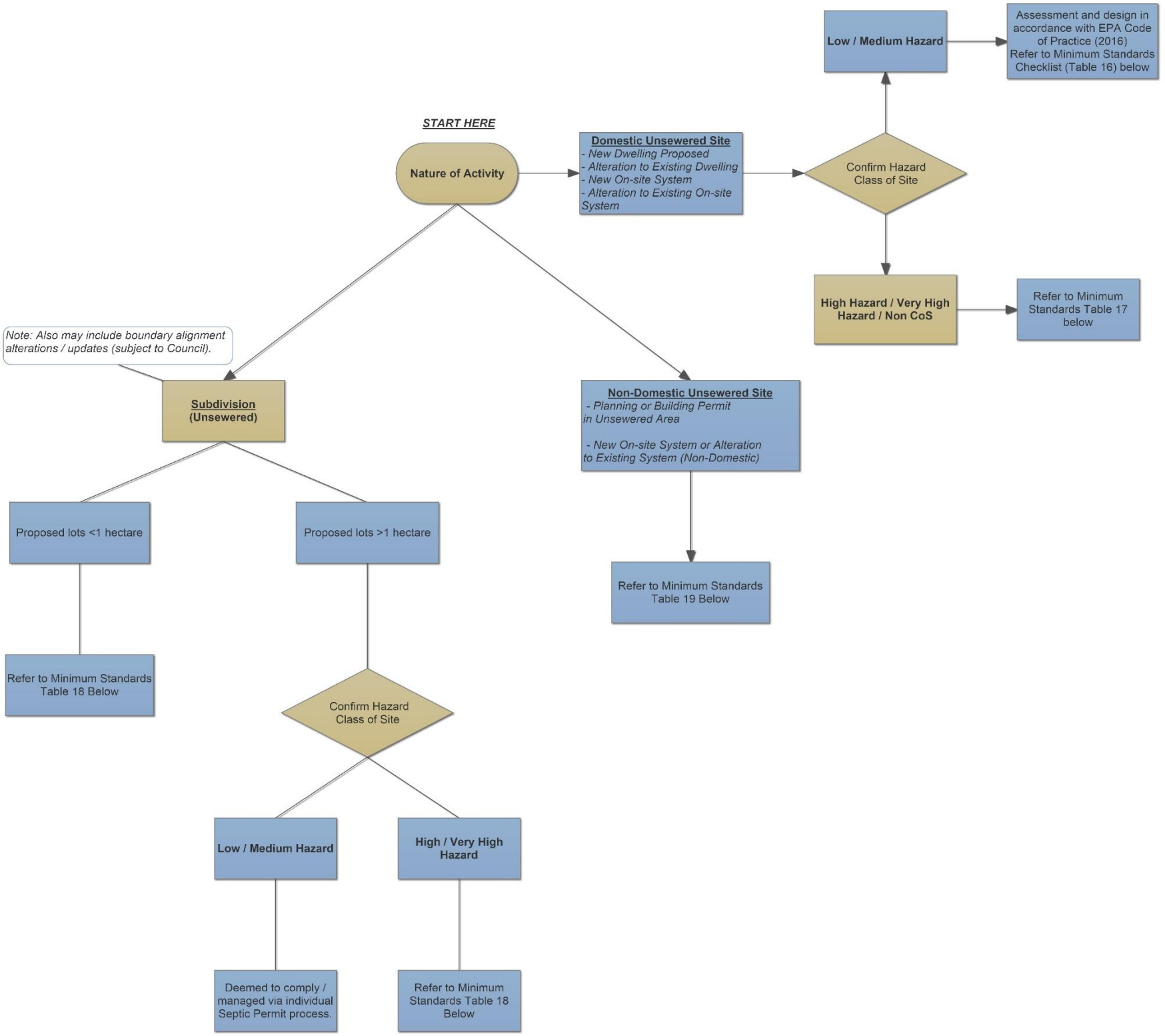
Appendix B Minimum Standards – Septic Tank Permits & Subdivision

Council plan to introduce a number of Minimum Standards to provide greater transparency and consistency in Permit information required by applicants in accordance with these regulations discussed. This will be determined by the relative scale of the development, size of existing or proposed lot(s) and presence of constraints and potential risks from wastewater management.

This risk based approach means additional details and design effort are only required where land capability risks may be elevated (as per the Land Capability Hazard Mapping).

The flow chart below outlines the general pathway for information and reporting requirements based on key activities on unsewered sites, specifically Permit applications involving;

- Domestic Sites
- Non-Domestic Sites
- Proposed Subdivision


START HERE
Nature of Activity
Domestic Unsewered Site
- New Dwelling Proposed
- Alteration to Existing Dwelling
- New On-site System
- Alteration to Existing On-site System
Confirm Hazard Class of Site
Low / Medium Hazard
Assessment and design in accordance with EPA Code of Practice (2016) Refer to Minimum Standards Checklist (Table 16) below
High Hazard / Very High Hazard / Non CoS
Refer to Minimum Standards Table 17 below
Note: Also may include boundary alignment alterations / updates (subject to Council).
Subdivision (Unsewered)
Proposed lots <1 hectare
Refer to Minimum Standards Table 18 Below
Proposed lots >1 hectare
Confirm Hazard Class of Site
Low / Medium Hazard
Deemed to comply / managed via individual Septic Permit process.
High / Very High Hazard
Refer to Minimum Standards Table 18 Below
Non-Domestic Unsewered Site
- Planning or Building Permit in Unsewered Area
- New On-site System or Alteration to Existing System (Non-Domestic)
Refer to Minimum Standards Table 19 Below

Domestic Septic Tank (On-site System) Permit

The flow chart above outlines the general pathway for assessing a septic tank permit for a new domestic on-site system or alternation to an existing system. The Minimum Standards for assessment and design are dependent on the Land Capability Hazard Class for the specific unsewered domestic site. An **example** Minimum Standards checklist is presented below in Table 16 for **Low to Medium Hazard** sites. The intention is that a consultant can undertake a simple domestic wastewater system design and report provided the Minimum Standards are achieved. This must accompany the Permit Application Form and other required information as stipulated on the Form. In addition, **example** minimum standards for properties classified as **High / Very High Hazard or Non CoS** (and where Low / Medium minimum standards are not achieved) is presented below in Table 17.

Table 16 Low / Medium Hazard Minimum Standards

1. Site Assessment	Low / Medium Hazard	
	Limit	**Comply (tick or cross)**
Aspect/exposure of disposal area (sun and wind)	**Moderate/High**	
Slope of disposal area	**<20%**	
Flooding – is the property flood prone?	**> 1 in 20 year ARI**	
Depth to bedrock or hardpan? (below point of effluent application)	**> 0.6metres**	
Depth to groundwater? (below point of effluent application)	**> 0.6metres**	
Dam, lake, reservoir or bore (potable water supply catchment) – *LAA upslope*	**> 300metres**	
Groundwater bore – distance to effluent application area?	**> 60 metres**	
Permanent waters (potable water supply) – distance to disposal area?	**> 100 metres**	
Permanent waters (non-potable water supply) – distance to disposal area?	**> 60 metres**	
Dams, drains, intermittent watercourses – distance to disposal area?		
Vegetation - removal for disposal area?	**No**	
Any other health or environmental constraints specific to the property?	**No**	
Soil classification (*AS/NZS 1547:2012)*	**Cat. 1-5**	

Applications must be assessed under the High Hazard Minimum Standards where site specific investigations confirm a failure to meet any of the criteria in this table.

1. Slope may be estimated visually.
2. Subsurface criteria must be assessed through excavation of at least one soil test pit within the proposed land application area(s).
3. Soil classification shall be conducted through textural analysis as described in Appendix E of *ASNZS1547:2012*.
4. Failure to declare obvious property constraints may trigger additional investigation requirements.

Table 17 Minimum Standard for Wastewater Management Reports: High / Very High Hazard and Non CoS Lot

SINGLE ALLOTMENT (Domestic) Minimum Standard for Wastewater Management Reports		
Report Element	**Minimum Standard**	**Nominal Level of Detail** (Provided for guidance only)
Introduction and Background	• Name, contact details and qualifications of author(s). • Site location and owner. • Allotment size (m^2 or ha). • Proposed / existing water supply. • Number of bedrooms and occupants. • Availability of sewer.	One page of text and tables.
Site and Soil Assessment	• Broad overview of locality and landscape characteristics. • Details of the date and time of assessment in addition to statements confirming the methods used to complete the assessment. • Site and soil assessment accordance with MAV Land Capability Assessment Framework (2014), *AS/NZS 1547:2012* and EPA Code of Practice 2016 (CoP). • Summary of available published soils information for the site. • Detailed explanation of the implications of observed site and soil features for system design and performance. • Assessment of the existing condition of the receiving environment and sensitivity to on-site system impacts. Setbacks to be met as per EPA CoP.	• Paragraph and locality map. • Paragraph or table • Table(s) • 1-2 paragraphs • Up to 1 page of explanation and recommended design elements to overcome constraints. • Up to one page.
System Selection	• Summarise potential treatment and land application systems considered including advantages and limitations. • Brief statement justifying selection of treatment and land application system.	• Table. • Paragraph.

Design	• Site specific calculation of design wastewater generation rates in accordance EPA CoP.
	• Certification details for the selected treatment system.
	• Land Application Area (LAA) sizing in accordance with EPA CoP and MAV (2014);
	  ○ Trench / Bed: most limiting of monthly water balance and annual nutrient balance calculations (EPA CoP).
	  ○ Surface / Subsurface Irrigation: most limiting of hydraulic sizing equation (Eq. L1 *AS/NZS 1547:2012*) and annual nutrient balance calculations (EPA CoP).
	• Summary of hydraulic design calculations for all pressurised pipework (including drip irrigation).
	• Design drawings of all non-certified system components.
		• Tables and paragraph justifying calculations.
		• Attach Certificate
		• Table summarising inputs and assumptions accompanied by a summary table of results.
		• A4 schematic (not to scale).
		• A4 schematic (not to scale).

Site Plan	• Nominated Effluent Management Area (EMA) to be clearly shown to ensure construction does not occur over this area at any time; • Location of soil test pits; • Location of tank(s); • Location of boundaries, buildings, swimming pools, paths, groundwater bores, dams and waterways; • Location of primary and reserve effluent Land Application Areas; • Location of stormwater diversion drains and earth bunds (if applicable); • Setback (buffer) distances to the above features; • No greater than ten (10) metre elevation contours; • Location of drainage pipework (centreline).	• A4 Site Plan (1:500 scale maximum).

Appendices	• Soil bore logs for all test pits (Permeability test results). • Raw laboratory results for soil analysis. • All design calculations and assumptions.	-

Subdivision

The same Minimum Standards would be required for all new subdivision regardless of the specific properties Land Capability Hazard Class. An example table is presented below.

Table 18 Minimum Standard for Wastewater Management Reports (Subdivision)

INCREASE IN BUILDING ENTITLEMENTS Minimum Standard for Wastewater Management Reports		
Report Element	**Minimum Standard**	**Nominal Level of Detail** (Provided for guidance only)
Introduction and Background	• Name, contact details and qualifications of author(s). • Site location and owner. • Allotment size (m^2 or ha). • Proposed / existing water supply. • Number of new building entitlements. • Availability of sewer.	One page of text and tables.
Site and Soil Assessment	• Broad overview of locality and landscape characteristics. • Details of the date and time of assessment in addition to statements confirming the methods used to complete the assessment. • Site and soil assessment accordance with MAV Land Capability Assessment Framework (2014), *AS/NZS 1547:2012* and EPA Code or Practice 2016 (CoP). • Detailed review of available published soils information for the site. • Where multiple soil facets are present the site plan should show the approximate boundary between facets. • Detailed explanation of the implications of observed site and soil features for system design and performance. • Assessment of the existing condition of the receiving environment and sensitivity to on-site system impacts. Confirm setbacks are met as per EPA CoP.	• Paragraph and locality map. • Paragraph or table • Table(s) • 1-2 paragraphs • Minimum 3 soil test pits per soil facet. • Up to 1 page of explanation and recommended design elements to overcome constraints. • Up to one page.
System Selection and Design	• Summarise potential treatment and land application systems considered including advantages and limitations. • Brief statement justifying selection of potential treatment and land application systems. • Sizing of land application systems using the most limiting of monthly soil water and annual nutrient balances (EPA CoP / MAV 2014 and *AS/NZS 1547:2012*).	• Table. • Paragraph. • Table summarising inputs and assumptions accompanied by a summary table of results and paragraph justifying calculations.
Site Plan	• Survey plan; • Proposed allotment boundaries, dimensions and area; • Location of soil test pits; • Location of existing buildings, swimming pools, paths, groundwater bores, dams and waterways; • Location of exclusion zones (e.g. setback distances and unsuitable site and soil conditions); • Location of EMAs capable of containing LAAs and reserves (where applicable); • Useable Land to be clearly identified; • Preferred two metre elevation contours (10m max.); and • Location of existing and proposed drainage pipework (centreline).	• Scale dependent on size of development.

Off-site Impacts (Where required)	• Confirm Useable Land (UL) and if Setbacks are achieved for each new lot (as per EPA CoP). ○ ≥4,000m^2 UL within each new lot and all setbacks achieved – **No further works required** ○ <4,000m^2 UL within a new lot or EPA CoP setbacks cannot be achieved – **Site specific Land Capability Assessment will be required** in accordance with MAV (2014) and EPA CoP at time of Septic Tank Permit.	• Up to 1 page.
Appendices	• Soil bore logs for all test pits. • Raw laboratory results for soil analysis. • All design calculations and assumptions including screenshots of off-site impact spreadsheets/models (if required).	-

Non-Domestic System (<5,000 L/day)

The same Minimum Standards would be required for all non-domestic systems regardless of the specific properties Land Capability Hazard Class. An example table is presented below.

Table 19 Minimum Standard for Wastewater Management Reports (Non-Domestic System)

NON-DOMESTIC SYSTEMS (ADWF <5,000 L/day) Minimum Standard for Wastewater Management Reports		
Report Element	**Minimum Standard**	**Nominal Level of Detail**
Introduction and Background	• Name, contact details and qualifications of author(s). • Site location and owner. • Allotment size (m^2 or ha). • Proposed / existing water supply. • Description of proposed facility (including equivalent persons). • Availability of sewer.	One page of text and tables.
Site and Soil Assessment	• Broad overview of locality and landscape characteristics. • Details of the date and time of assessment in addition to statements confirming the methods used to complete the assessment. • Summary of available published soils information for the site. • Site and soil assessment accordance with MAV Land Capability Assessment Framework (2014), *AS/NZS 1547:2012* and EPA Code or Practice 2016 (CoP). • Brief and clear explanation of the implications of observed site and soil features for system design and performance. • Assessment of the existing condition of the receiving environment and sensitivity to on-site system impacts. Confirm setbacks are met as per EPA CoP.	• Paragraph and locality map. • Paragraph or table • 1-2 paragraphs • Table(s), minimum 3 soil test pits per soil facet. • Bullet point list of recommended design elements to overcome constraints. • 1-2 paragraphs
System Selection	• Summarise potential treatment and land application systems considered including advantages and limitations. • Brief statement justifying selection of potential treatment and land application systems.	• Table. • Paragraph.
Design	• Site specific wastewater characterisation based on best available published or local information including consideration of seasonal / monthly variation. • Establish site specific design criteria based on typical / published performance. • Brief treatment process design outlining rationale, assumed performance and capacity to manage design flows and loads. Process performance should be supported by published data or information that demonstrates the suitability of the process to the site and development[1]. • Sizing of land application systems using the most limiting of monthly soil water and annual nutrient balances (EPA Code and *AS/NZS 1547:2012*). • Off-site impacts assessment **may be required** if setbacks (as per EPA Code and *AS/NZS 1547:2012*) cannot be achieved – at discretion of Council. • Preliminary hydraulic design of collection, treatment and land application components.	• Seasonal / monthly time series of flow and loads and 1-2 paragraphs + table justification. • Paragraph and bullet points. • 1-2 pages including supporting tables and figures. • Tables summarising inputs, assumptions and results and paragraph justifying calculations. • Tables and process schematic.

Site Plan	• Nominated Effluent Management Area (EMA) to be clearly shown to ensure construction does not occur over this area at any time; • Location of soil test pits; • Location of tank(s); • Location of boundaries, buildings, swimming pools, paths, groundwater bores, dams and waterways; • Location of primary and reserve effluent Land Application Areas; • Location / extent of all system components (including any reserve areas); • Location of stormwater diversion drains and earth bunds (if applicable); • Setback (buffer) distances to the above features; • Preferred two metre elevation contours (10m max.); and • Location of existing and proposed drainage pipework (centreline).	• Site Plan (1:500 scale maximum).
Appendices	• Soil bore logs for all test pits. • Raw laboratory results for soil analysis. • All design calculations and assumptions including screenshots of off-site impact spreadsheets/models (if required).	-

Note 1: Treatment process information may be limited to elements not covered by certification where non-domestic treatment system is certified under AS1546.3:2017 for the influent volume and constituent concentrations proposed at specific site.

Appendix C Minimum Property Size Analysis

A review was undertaken of sustainable minimum property sizes for on-site sewage management based on collated data for a number of unsewered regions across Victoria and New South Wales, some which are similar to Murrindindi Shire. Sustainable minimum property size was previously considered to allow for typical levels of site development (based on applicable land use zoning) in addition to a conservatively sized land application system (using hydraulic and nutrient balances) and provision of adequate separation distances from sensitive receptors.

The intention of these previous assessments was to establish a conservative property size (or some other measure) that was considered adequate to provide Council with a high degree of confidence that an effective, safe and sustainable on-site sewage management service can be accommodated (with factors of safety).

C1 Methodology

Based on previous studies and experience, a conservative land area requirement for sustainable on-site sewage management has been calculated by the following procedure. The procedure was applied using rainfall from local stations and gridded potential evapo-transpiration data from Bureau of Meteorology (BoM).

- A design occupancy of 6 persons for a 4 bedroom house (using reticulated water) was adopted to represent the typical design residential development scenario.
- A typical system configuration of secondary treatment and subsurface irrigation was assumed. This scenario also allowed for primary dosed trenches and beds (discussed further below).
- Hydraulic and annual nutrient balance was undertaken based on the above occupancy assuming a Design Loading Rate (DLR) of 3 mm/day (Category 5 – light clays). This DLR was selected on the basis that it strikes an appropriate balance between conservatism and realism.

The outcomes of these water and nutrient balance calculations were then used to examine minimum Effluent Management Areas (EMA) required for the majority of typical sites and dwellings likely to be encountered.

An assessment was then undertaken of a sample of properties within unsewered zones of the LGA's. Properties were assessed to determine the capacity to provide available area for sewage management in addition to area occupied by development and separation distances from objects such as;

- building structures;
- driveways and paths;
- swimming pools and other dedicated recreational areas (e.g. tennis courts);

- land occupied by livestock or horses;
- property boundaries; and
- dams, intermittent and permanent watercourses.

The assessment was undertaken through orthophoto investigations and GIS creation of buffers around the abovementioned objects. Statistics on the area of land and proportion of total property area occupied by each component (inclusive of buffers) were recorded for analysis. The properties assessed were selected to provide a representative sample of typical development across a variety of unsewered areas. The data also consists of ~800 lots in Monbulk in which site specific available area for effluent management was measured on-property.

Statistics obtained from the assessments were analysed to identify any patterns or relationships between property size, land use zones and area available for EMA's. Multiple scatter plots of property size and the average area available for effluent management were created. This was completed for a number of property size ranges to determine relationships for these ranges that could be applied region wide. Data were utilised from many previous assessments across Victoria and New South Wales and provided a consistent relationship.

C2 Data Analysis

Based on the outcomes of previous water (checked against annual nutrient balances) balance assessments, an LAA of 650 – 850 m^2 has typically been required. The "design" estimate (outlined in points 1 – 3 above) based on the more conservative climate zone resulted in a minimum land application area of approximately 850 m^2. Allowing for treatment tanks, required zoning of LAAs and other infrastructure required for an on-site system, a typical EMA was found to be **~1,000 m^2**. Primary dosed trenches and beds (which are not always suitable for observed site and soil conditions) occupy approximately half the land area of a secondary dosed irrigation system. However, allowance for a reserve area must be made for primary dosed subsurface systems which results in a comparable land area requirement to that of a secondary dosed irrigation system.

The larger footprint is considered appropriate for planning purposes and allows for situations where issues such as irregular shaped areas and slope limit the proportion of available land that can actually be occupied by a land application system. It is important to note that the outcomes of this minimum property size assessment should not be used in a prescriptive or deterministic fashion. Individual applicants should be able to undertake additional site specific investigations to confirm the appropriateness of Council's general minimum lot size for their site.

The relationship between Lot Size and Available Area for Effluent Management for the various areas assessed was compared based on adoption of an average available area approach which was found to be more applicable and more adaptable to the study areas considered. This involved determining

the relationship between average available area and property size at property size ranges. The figure below contains the results of this consolidated analysis.

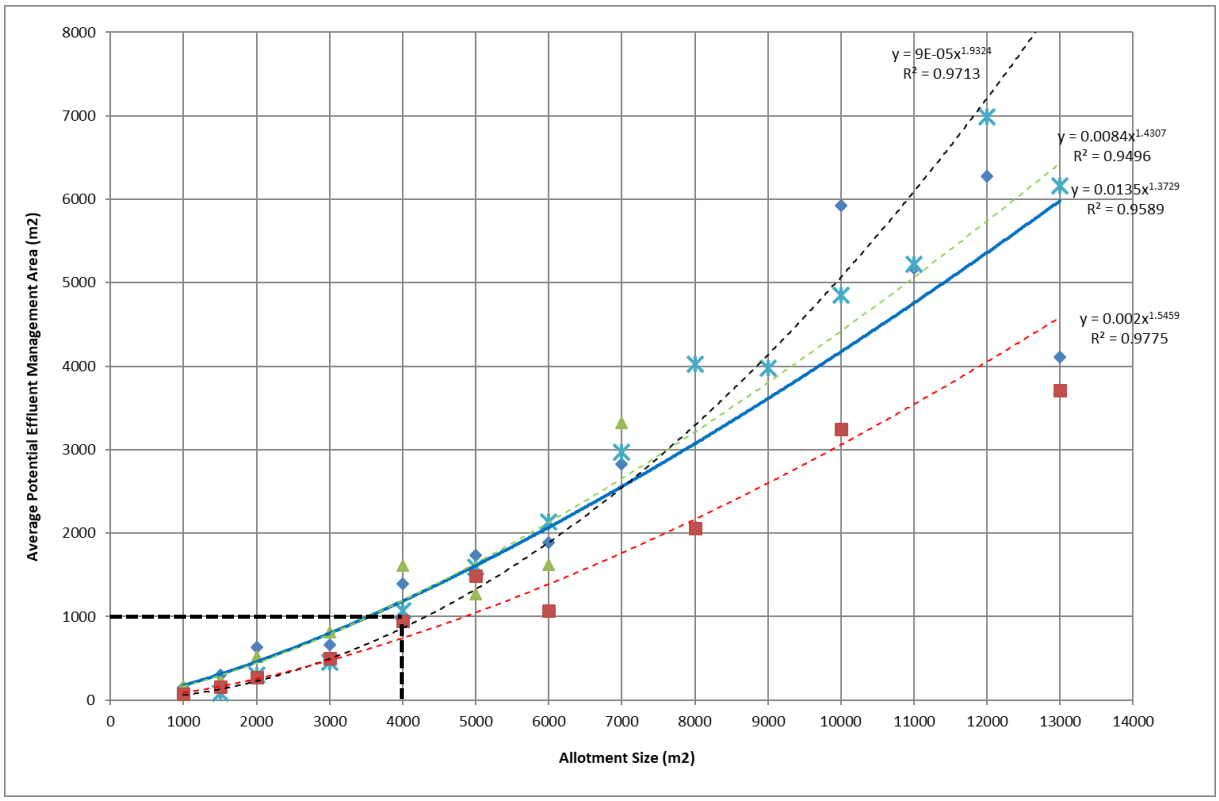


Figure: Average Available Area and Property Size Evaluation

The extensive data collated consistently indicated that lot sizes at or greater than 4,000 m^2 are likely to be capable of fitting a sustainable on-site sewage management system within the property, assuming aspects such as native vegetation protection can be managed through site specific design and communication between relevant Council staff.

Appendix D Potential Wastewater Management Strategies / Models

Strategy / Model	Description
Managed On-site Wastewater Management Systems	On-site Wastewater management systems upgraded and managed / operated (also potentially owned) by a Responsible Management Entity (RME) such as a Council or private utility, as discussed in Section 3.6 of the VAGO report (2018) based on US EPA governance model.
Decentralised / Cluster Wastewater Management System	System to collect treated effluent from on-property systems for polishing (potentially Class B) and irrigation across community / public open space. Cluster systems are typically set up at a precinct scale to treat wastewater from a group of properties within the vicinity of the nominated community / public open space. Allows opportunities for on-property reuse of treated wastewater to reduce downstream infrastructure / irrigation requirements. To be operated and managed by RME.
Monitoring and Inspection Program	Program for collection of on-site system type and performance data to guide priority of inspection and compliance assessment.
Integrated Water Management	Water management approach that aims to provide a holistic and forward thinking approach to all elements of the water cycle (movement of water through its various phases) including wastewater in addition to stormwater, potable / non-potable water supply and local watercourses. The intention is for this approach to be adaptive to temporal changes over the long-term and designed in conjunction with end users (community) with a place based element to design. Examples include Best Practicable Option upgrades to existing on-site systems with any excess wastewater not able to be contained on-lot sent to upgraded stormwater infrastructure (biofilters / constructed wetlands).
Funded on-site system upgrade grants.	Seek external funding to assist home owners in system upgrades. Operation and management of systems continues to be home owner responsibility.
Reticulated Sewerage (Conventional)	Delivery of low pressure sewer, pump stations and rising main to existing sewerage network or central Water Recycling Plant. Would be delivered and managed by Goulburn Valley Water (currently no plans to extend network).

Appendix E Risk Based Prioritisation

Appendix F Potential On-site System Risk and Management Hazard Methodology

This appendix includes details for a potential methodology for developing an onsite system 'Management' Hazard Class and final 'Domestic Wastewater Management' Class for the entire Shire. This is based on combining the Land Capability Hazard mapping class with a separate 'Management' hazard class based on On-site System (inspection data) for each property. This overall 'Domestic Wastewater Management' (DWM) Hazard Class would ultimately dictate the inspection frequency for each property and the time allowance for ensuring compliance issues (if any) are addressed and rectified.

The potential DWM / Management Risk Class is summarised in the table below for feedback from Council.

The intention would be for MSC to develop a consistent, clearly defined set of criteria for what constitutes as minor, moderate, major and critical non-compliance from the on-site system inspection data.

Where on-site system inspection data is not available, some additional criteria may include;

- Systems older than 30 years - automatic major non-compliance until inspected
- Systems 10-30 years old - automatic moderate non-compliance until inspected
- Systems <10 years old - automatic low risk (Management) until inspected

Another aspect for consideration is a potential reduction in the assigned Land Capability Hazard for a property based on inspection information. For example, following an inspection it may be determined that the existing on-site system achieves all minimum setbacks to sensitive environmental receptors and therefore the onsite hazard is being adequately managed.

Domestic Wastewater Management (DWM) Risk Map / Class

Land Capability Hazard + Existing On-site System (Management) Hazard = DWM Risk Class

DWM Risk Class	Description	Land Capability Hazard Class	Management Class	Inspection Frequency	Indicative Timeframe for Rectification of Non-compliance
Low	Few or no constraints to sustainable on-site wastewater management. Traditional technology approaches, routine maintenance and 3-5 yearly oversight likely to be adequate to manage risk. No known off-site discharge or major - critical non-compliance.	Low	Low risk or minor non-compliance	5 Yearly	1 Year
		Medium	Low risk		
Medium	There may be some moderate to major constraints to sustainable on-site wastewater management that require consideration in the approval of new systems. Higher levels of treatment and land application may be required in addition to more frequent oversight (2-3 years). No known off-site discharge or major - critical non-compliance.	Low	Moderate non-compliance (no OSD)	3 Yearly	9 Months
		Medium	Low or Minor non-compliance		
		High	Low risk		
High	Property will either a) possess significant constraints to sustainable on-site wastewater management that require specialist land capability assessment and design to mitigate; or b) contain an existing on-site system that has a known non-compliance. No known off-site discharge (critical non-compliance).	Low	Major non-compliance (no OSD)	2 Yearly	6 Months
		Medium	Moderate or major non-compliance (No OSD)		
		High	Minor non-compliance (no OSD)		
Very High	Properties with a known off-site discharge (either a legacy system or discharge due to a critical non-compliance) or too small to be able contain wastewater on-site in the long-term. Rectification of non-compliance and/or provision of an alternative wastewater management service should be a priority.	Non CoS & Very High	All	1 Yearly	3 Months
		Medium	Major non-compliance (no OSD)		
		High	Known off-site discharge (legacy system or due to a critical non-compliance)		

OSD = Off Site Discharge

Appendix G Stakeholder Engagement Plan

G1 Purpose

This is a Stakeholder Engagement Plan (DWMP Engagement Plan) prepared to support the Murrindindi Shire Council (MSC) Domestic Wastewater Management Plan (DWMP). The purpose of this Plan is to identify the key stakeholders in relation to domestic wastewater management in Murrindindi Shire and develop an appropriate program to inform, consult and involve stakeholders in the implementation of the DWMP.

This DWMP Engagement Plan will need to be reviewed throughout DWMP implementation to ensure it remains applicable and appropriate as information on and understanding of domestic wastewater risks and actions increases.

The engagement plan is presented in Table 20. Reference has been made to the International Association of Public Participation (IAP^2) Engagement Spectrum as a guide for the level of engagement proposed for each stakeholder group.

Table 20 MSC DWMP Stakeholder Engagement Plan

Stakeholder	Role	Engagement Points	IAP2 Spectrum	Engagement Activities
Relevant Council staff	- Septic tank permitting and oversight - Development Planning - Customer Service	- Staff training / understanding of DWMP - DWMP Risk mapping and classification - Minimum Standards for Permits - Information / data management	- Collaboration	- Procedure development - Training
IWM Forum	- IWM Implementation within region	- Coordinate with Council on opportunities for IWM implementation as part of DWMP.	- Collaboration	- Attendance at meetings - Potential development of Pilot Project
Goulburn Valley Water and Goulburn Murray Water	- Sewerage planning and delivery - Potable water catchment protection - IWM implementation	- DWMP Actions for High Priority areas. - Pilot Project implementation - Referrals for Permits in potable catchments - IWM Forum activities	- Collaboration	- Procedure development - Potential development of Pilot Project - Collaborate on solutions for High Priority towns
EPA Victoria	- Oversight of EP Act and SEPP (Waters) implementation. - Approval and regulation of systems >5,000 L/day	- DWMP implementation progress - Referrals for >5,000 L/day systems	- Consult	- 6-monthly meetings - Procedure development
Other Councils	- DWMP implementation in adjacent areas	- Coordination and sharing on DWMP implementation	- Consult - Collaborate?	- Quarterly meeting - Information sharing
DELWP	- Country towns water supply and sewerage.	- DWMP implementation progress	- Consult	- 6-monthly meetings (with EPA?)
Land Capability Assessors / Designers	- LCAs and design reports for Permit applications to install or alter Septic Systems.	- Understanding of DWMP Actions - Risk mapping and classification - Minimum Standards and Useable Land - Inspection and oversight program	- Consult - Collaborate?	- Training - 3-6 monthly meetings? - Reference site visits?
System installers and service agents	- Installation, rectification and alteration of systems. - Servicing and maintenance			
Unsewered property owners	- Operation and performance of their on-site system. - Obtaining planning or Septic Tank Permits as necessary.	- Understanding their on-site system - Take home DWMP outcomes and what they mean for them.	- Consult	- Education material / newsletter - Online / written surveys - Drop in sessions / pop ups - On-site inspections / meetings
General community	- Be aware of general risks and system functions	- General education on DWM.	- Inform	- Education material / newsletter

DECENTRALISED WATER CONSULTING

enquiries@decentralisedwater.com.au

0408 023 265

www.decentralisedwater.com.au