Pyrenees Shire:

Domestic Wastewater Management Plan 2015 - 18

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Glossary of Terms

AS: Australian Standard

AWTS: Aerated Wastewater Treatment Systems

CHW: Central Highlands Water

DWMP: Domestic Wastewater Management Plan

EHO: Environmental Health Officer

Effluent: Liquid flowing out of a treatment process

Effluent reuse: Effluent reuse is a process where treated wastewater is recycled for useful purposes and is not discharged to a natural waterway.

EPA: Environmental Protection Authority

Grey water: Domestic wastewater from sources other than toilets - for example, water from washing machines, dishwashers, showers and basins.

Groundwater: Water that is found below the earth surface; usually in porous rock or soil or in underground aquifers.

GMW: Goulburn-Murray Water

GWMW: Grampians Wimmera Mallee Water

LCA: Land Capability Assessment

OWTS - Onsite wastewater treatment system: a treatment system that treats up to 5,000 L/day of wastewater on the allotment where it was generated.

Runoff: Water that flows across the land surface and does not soak into the ground.

SEPP: State Environment Protection Policy

Septic tank: Underground tank used for treatment of wastewater through bacterial activity.

Sewage: The waste and wastewater produced by residential, commercial and industrial sources and discharged into sewers

Sludge: Solid matter that is removed during wastewater or water treatment. It can be processed into a material that can be beneficially used (bio solids).

Sullage: domestic wastewater other than that which comes from the toilet.

1. Executive Summary

The Pyrenees Shire Domestic Wastewater Management Plan (DWMP) aims to provide a strategy for effectively reducing the environmental, public health and economic risks associated with the management of domestic waste water across the Shire.

Under the provisions of the State Environment Protection Policy (Waters of Victoria) (SEPP), local Councils are required to develop a Domestic Wastewater Management Plan (DWMP) in conjunction with relevant water authorities and the community. The key issues addressed within the Plan include:

- Development and implementation of appropriate risk management strategies for Declared Potable Water Supply Catchments;

- Implementation of a risk based septic tank compliance inspection program for the auditing of existing septic tank systems;

- Development of an education program for residents on the maintenance and management requirements for septic systems;

- Ensure that domestic wastewater management systems are operated in a sustainable manner and that appropriate risk management procedures are in place – including specifying land capability assessment requirements.

The plan considers key physical parameters which are significant in the ability of existing properties to be able to treat and contain wastewater from standard septics onsite. Most of these risks can be managed and potentially reduced through the use of secondary treatment systems.

The DWMP includes strategies for inspecting and assessing the condition of existing septic systems and managing their on-going operational performance. The report and accompanying action plan provides a risk based merits process for the assessment of future development applications and determining requirements for Land Capability Assessments.

The DWMP includes a supplementary addendum addressing the management of existing septics and processes to be followed in assessing new development applications within Potable Water Supply Catchments and how the requirements of Guideline 1 - *Planning permit applications in open, potable water supply catchment areas* (November 2012) have been met.

2. Introduction

Pyrenees Shire is located in the Central West of Victoria, about 150 kilometres North West of Melbourne and comprises an area of approximately 3,500 square kilometres. The Shire has a population of around 6,920 residents with the major population centres being the towns of Beaufort and Avoca which are serviced by reticulated sewerage systems. The smaller settlements of Snake Valley and Waubra have also recently been connected to reticulated sewerage.

There are an estimated 1400 septic tanks within the Shire, of which 412 are located within declared potable water supply catchments. Domestic wastewater management is one of the primary public health functions delegated to the management of local government.

As the licensing authority Council has a responsibility for managing risks, including the enforcement of legislative requirements and the issuing of approvals for the installation of on-site wastewater treatment systems.

The Action Plan which forms part of this DWMP outlines the implementation actions, timeframes and resources required to successfully deliver on the plan.

3. Objectives and Purpose

The development of the DWMP has provided an opportunity to strategically assess wastewater issues within the municipality and initiate appropriate strategies and actions to manage existing problems.

The aim of the Pyrenees Shire Domestic Wastewater Management Plan (DWMP) is to reduce the environmental, health and economic risks posed by domestic wastewater and provide a range of practical action strategies and planning tools for the management of septic systems. The implementation of the DWMP will provide the Pyrenees Shire Council with:

- A strategic planning tool for regulating wastewater management in accordance with current legislative requirements and EPA Guidelines;
- A risk based framework for determining the requirements and situations in which a Land Capability Assessment will be required;
- Implementation of a septic system compliance inspection and audit program which will focus resources on potable water supply catchments and unsewered townships;
- A consistent framework for on-going reporting and liaison between council and water authorities;
- A range of education and public awareness initiatives for the compliance inspection program and the basic septic tank system maintenance requirements;
- Development of procedures to deal with the range of issues associated with the assessment and on-going management of septic system permit approvals.

4. DWMP Steering Committee

Along with the external stakeholders, the Pyrenees Shire internal steering committee is responsible for developing the DWMP. Once adopted the internal steering committee will play the lead in ensuring its implementation in accordance with the timeframes outlined within the Action and Resource Plan:-

DWMP internal steering committee:

- Environmental Health Officer
- GIS Officer
- Town Planner
- Director of Assets and Development Services
- Assets Manager

External Stakeholders

- Central Highlands Water
- Goulburn Murray Water
- Grampians Wimmera Mallee Water
- Environment Protection Agency (EPA)
- Southern Rural Water

External Consultants

- Mr Paul Williams (Paul Williams and Associates)
- Dr Robert Van De Graaff

5. Risks Associated with Domestic Wastewater

Domestic wastewater is waste water generated by household activities including toilet, bathroom, clothes washing and kitchen cleaning activities, and contains high levels of micro-organisms, organic matter and chemicals capable of causing illness and impacting upon the environment.

The principal groups of organisms found in natural waters and wastewater include bacteria, fungi, protozoa, rotifers, algae and viruses. The organisms which pose a threat to human health are called pathogens and can be classified into the following broad categories:-

a) Bacteria - domestic wastewater contains a wide variety and concentration of pathogenic and non-pathogenic bacteria. There are many waterborne infectious diseases e.g. typhoid and cholera. Infective doses of disease causing bacteria in water can lead to illness.

b) Parasites – (Protozoa and Helminths). The two dominant protozoan parasites of concern in the treatment of wastewater are *Cryptosporidium*; and *Giardia*. These are resistant to standard disinfection methods and pose risks to susceptible members of the community.

c) Viruses – contamination of domestic wastewater by viruses may also lead to major outbreaks, such as Hepatitis A (referred to as infectious hepatitis).

d) Nutrients - Phosphorus (P) and Nitrogen (N) are the principal nutrients of concern and in excess, they may encourage nuisance growth of algae and aquatic plants in sensitive surface water systems, and in some cases nitrates may pose a threat to human health.

6. Wastewater Treatment Options

On-site domestic wastewater is treated by a variety of treatment systems, including but not limited to:

- Septic tanks with conventional effluent disposal fields;
- Sand Filters;
- Aerated Wastewater Treatment Systems;
- Composting Systems.

Following treatment, depending on the type of system used, the effluent is then dispersed on-site via either absorption trenches or sub-surface irrigation.

7. Stakeholder Roles and Responsibilities

7.1. Pyrenees Shire:

The statutory responsibilities for on-site domestic wastewater systems in Victoria are based on a hierarchical system under the ultimate direction of the State Government. While the Water Authorities, CMA's and other agencies determine the broader context for management of domestic wastewater, it is local government that must ensure these requirements are met.

A summary of the legislation and its requirements relevant to the regulation of septic systems is detailed in the DWMP. This legislation includes:

- *Local Government Act 1989;*
- *Environment Protection Act 1970;*
- *Public Health and Wellbeing Act 2008;*
- *Planning and Environment Act 1987;*
- *Water Act 1989;*
- State Environmental Protection Policy Waters of Victoria; and
- State Environmental Protection Policy Groundwater of Victoria.

Pyrenees Council Plan:
In early 2013 Council commenced the process of developing the new Council Plan 2013 – 2017. For the first time the Council plan also includes reference to the objectives of the recently completed Municipal Health and Wellbeing Plan.

The Council Plan outlines goals and objectives with an annual action plan to achieve them which includes:

- Utilising Councils Health and Wellbeing Plan to improve the health of the community
- Review land use planning strategies as part of the Planning Scheme review
- Implement the Environmental and Sustainability Strategy
- Prepare and Implement Councils flood plain management plan

Municipal Public Health & Wellbeing Plan:
The purpose of the Municipal Public Health & Wellbeing Plan is to protect, improve and promote public health and wellbeing throughout the Shire.

The Plan identifies priority issues and needs of the Pyrenees community and outlines a plan of action for the next four years.

The plan recognizes that Council provides for a diverse range of health and wellbeing needs of the community through all of its service areas; many of which are statutory responsibilities.

7.2. External Authorities

Within the Pyrenees Shire there are a number of external agencies that play either a direct or indirect role in domestic wastewater management. Whilst not all encompassing, major stakeholders have been listed as follows:

- Environment Protection Authority
- Central Highlands Water, Goulburn Murray Water & Grampians Wimmera Mallee Water
- Glenelg Hopkins, North Central and Wimmera Catchment Management Authorities
- Department of Environment and Primary Industries.
- Landholders

Environment Protection Authority
The Environment Protection Authority (EPA) is responsible for the protection of the Victorian environment. The EPA's responsibilities for the management of domestic wastewater include:

- Administration of the Environment Protection Act 1970;
- Referral Agency (in the case of an application for offsite discharge);
- Development of guidance documents providing information on specific aspects of best practice in relation to onsite wastewater treatment;
- Establishing standards for discharge to surface water and off-site;
- Approving the design and type of septic tank systems;
- The publication and updating of the Septic Tank Code of Practice;
- Endorsing the design of domestic wastewater treatment systems via the Certificate of Approval process;
- Approval and regulation of systems discharging more than 5,000 litres per day.

Water Authorities
Water and reticulated sewerage services across the municipality are provided and maintained by Central Highlands Water, a regional urban water authority.

Central Highlands Water has a lead role in the planning and implementation of appropriate infrastructure developments, such as the connection of urban areas to the reticulated sewerage system.

Rural Water Corporations provide water services comprising non-potable water supply, for irrigation and domestic and stock purposes. The authorities within the Shire with responsibilities in this area are:

- Goulburn-Murray Water

- Southern Rural Water

Urban Water Corporations are responsible for managing and providing potable and non-potable water supply to customers within their respective service districts:

- Central Highlands Water;
- Grampians Wimmera Mallee Water

Both Rural and Urban Water Corporations variously have responsibility for managing potable water as well as water supply bore fields within the Shire and for assessing and responding to all referred applications under clause 66 of local planning schemes for Declared Water Supply Catchments.

<u>Catchment Management Authorities</u>
The core functions of catchment management authorities include the coordination of the preparation and implementation of regional catchment management strategies. Catchment Management Authorities (CMAs) are a referral authority under the Planning and Environment Act 1987, and also hold an approval role under the Water Act 1989 with respect to works on waterways.

<u>Landholders</u>
Landholder's responsibilities include:

- Obtaining a permit to install a septic tank system before a building permit is issued and installing the system;
- Obtaining a certificate to use the system once installed;
- Obtaining a permit to make any alterations to the existing system and complying with the condition requirements.
- Ensuring that septic systems are appropriately maintained to ensure adequate operational performance.

8. General Strategies for Managing Water Risk

Application Approval Process:
The following steps outline the steps involved in the consideration and processing of a new approval for a septic tank permit:

a) Application form is completed by owner and or plumber and submitted with system plans/details and the prescribed fee;
b) Details from the application are entered into Councils current data base system and given an approval number;
c) EHO officer completes a preliminary constraints assessment by reviewing GIS mapping layers (flooding, contours, planning and hydrology);
d) Site inspection is conducted by EHO to assess constraints and determine the need for an LCA to be prepared;
e) Applicant advised as to whether a Land Capability Assessment is required
f) A 'Certificate To Install' is then issued with appropriate conditions;
g) Either drainer/plumber contact the EHO for 1st inspection (open trench inspection);
h) 2nd inspection (distribution pits mortared extension to tank inlet and back filled correctly);
i) *'Certificate of Approval'* is issued EHO and all relevant paper is then filed on the property file and added to the electronic record data base

Lot Risk Assessment and Land Capability Requirements:
The following factors will be considered by Councils EHO in evaluating the risks associated with the installation of an individual septic system for a new development application outside of catchment areas:

- Lot size
- Proximity to watercourse and surface/ground waters
- Flooding constraints (identified from existing planning and flood GIS layers)
- Soil type and slope
- Slope

The assessment of the above factors will determine the need and requirements for an individual Land Capability Assessment to be provided. The LCA would need to be prepared in accordance with the minimum standards outlined within the EPA Code of Practice (2013) and AS/NZS 1547:2012. The EPA Code of Practice provides scope for Councils Environmental Health Officer to determine what constitutes a satisfactory LCA.

9. Community Education Initiatives

A range of educational tools will be developed and made readily available to increase community awareness about the management requirements for their on-site system. These initiatives will include:

- Development of succinct and plain English brochures on the maintenance requirements for the most common types of septic systems;

- Online resources to be made available via the Council's website;

- Reformatting of existing forms to allow ease of completion and submission on line (including a form to request Permits to Install and Certificates to Use);

- Owners within catchment areas will be sent reminder notices advising when their next system maintenance are due

The preparation of system maintenance information that can be sent with the Council rates notices and new residents information kits will also be considered as part of the communications strategy.

10. Septic monitoring and compliance

Septic System Inspection Program:
A risk based monitoring program for existing septic tanks within the Shire is proposed to determine the level of maintenance of septic systems against the requirement of the Septic Tank Code of Practice and the Permit to Install a Septic Tank Conditions.

Areas within the various unsewered townships considered to be of highest risk will be prioritised for receiving compliance inspections from Councils EHO over the 5 year timeframe of this plan. The number of existing systems within each town has been determined as follows:

- Landsborough – 60 systems
- Moonambel – 40 systems
- Redbank – 30 systems
- Raglan – 20 systems
- Amphitheatre – 40 systems

- Initial inspections and follow-up work within these towns will initially be focused on properties where:

- No septic records currently exist on file;
- Properties with septic systems older than 25 years of age;
- Septic systems located within 100 metres of a waterway;
- Those where there is discharge of effluent off-site potentially impacting public health.

It is considered that the completion of this work will provide Council with a strong foundation of accurate data on the type and operating condition of all systems within these areas. A risk based strategy for inspection and enforcement of septics within catchment areas of the Shire is outlined within the addendum section of this report.

Requirements for further on-going inspections will be determined as part of the 5 year review of the plan.

Septic System Records Management:

Council will continue to utilize the *Health Manager* Software system as its primary database for storing all records relating of both new septic tank installations and recording compliance inspection data. Health Manager includes all relevant information concerning the date of installation, installer information, system type/capacity and on-going inspection and service report records.

For audit and compliance inspections the following will be set-up to ensure that accurate septic records are collected:-

- Addition of GIS (MapInfo) data for each property which will include fields for all relevant data and basic information concerning systems collected as part of the system inspections;
- Complete the development of an electronic field data collection tool for the recording of system information and inspection field notes;
- Generation and sending of standardised letters for properties requiring inspections and compliance reports.

There are some records of older septic systems installed prior to 2005 that are currently stored within older databases. The transfer of these records into the *Health Manager* database has been identified as an action for completion following the plan adoption.

Council has previously field tested a hand held tablet device which can record details of system information and GPS co-ordinates collected from the field inspections. Once captured, this data can be automatically updated into Council septics records data base and GIS layer.

Old Septic Systems:

Many septic systems within the Shire are more than twenty or even thirty years old. Some of these systems are likely to be approaching or beyond their economic life and could be in need of upgrade works. It is acknowledged by Council that many of these problems will take time to rectify and it is not intended that this inspection and compliance program take a ‘hard-line’ approach and require all non-compliant systems to be upgraded immediately where they present a risk to public health.

Where, following an inspection a new system or major upgrade works are needed the system must be upgraded to comply with the current Standards and *Code of Practice* requirements. Should an existing system be operating effectively, but not comply with the current Code of Practice then the system will be monitored. Unless a failure occurs the owner will not be required to upgrade or replace the system.

Monitoring Aerated Wastewater Treatment Plant Systems:

Property owners with aerated wastewater treatment plant systems will be sent reminders of their obligation to provide the required quarterly reports from an accredited service contractor.

Internal reminder tools within *Health Manager* will be used to ensure that follow-up letters are sent to land owners in cases where reports are not received. This work will be undertaken across the Shire and is identified as a priority action within the action and implementation plan.

To assist land owners the Pyrenees Shire will develop and make available a list of locally available accredited servicing agents for these systems.

Enforcement Follow-up Action:

Following each inspection a copy of the EHO inspection report will be forwarded to the land owner. Where there is non-compliance with approval conditions or the septic system is failing Council will endeavour to advise the owner at the time of the inspection.

Where operational issues with a system are identified follow-up written correspondence will be sent to property owners providing instructions on specific actions required and the timeframe for completion.

In situations where the land owner does not comply with written instructions a formal Notice to Comply may be issued under the Environment Protection Act. Failure on the part of the land owner to comply with the notice may generate the need for legal action (issuing of infringements or undertaking legal action) to enforce compliance. It is anticipated that legal action will only be required in rare occasions.

Follow-up inspections will be undertaken by Councils EHO following receipt of confirmation that the required works have been completed.

Resource Allocation:

The implementation of the DWMP will require part time administrative resources to be allocated as required to Councils environmental health unit to resource the priority septic inspection program. The commitment of the resource requirements will be reviewed both annually and at the end of the 5 year implementation period.

As part of the scheduled 5 yearly review Council will investigate options for fees that could be charged for the issue of a Permit to use a system or a charge to cover Councils costs associated with further on-going compliance inspections.

Procedures:

Council procedures for septic systems are important to ensure consistency in the management of domestic wastewater system issues across the Shire. It is important that appropriate procedures be developed to ensure the consistent and effective implementation of the plan. Procedures should be developed in the following areas:-

- Issuing Permit/Approvals to Install/alter a Septic Tank system;

- Inspection procedures for septics systems within the different risk categories;
- Maintaining the Council records and Health Manager database;
- Investigation of complaints about systems and undertaking required follow-up a action;
- Inspections for compliance with Permit to Install.

11. DWMP Review

A review panel will be established (which will consist of Senior Council Officers) to annually review the effectiveness of the implementation of the plan and review the plan at the end of five years.

As part of the on-going annual reporting Council will provide stakeholders an annual report which will address the following:

- details on the number of permits issued for septic tank systems;
- A compliance and enforcement inspection report summary;
- An update to all stakeholders on the progress against all actions contained in the Action and Implementation Plan.

At the end of 5 years the DWMP shall reviewed with relation to any changes to legislation, standards and funding arrangements, which will include a review of the septic compliance inspection program.

DWMP ADDENDUM - OPEN POTABLE WATER SUPPLY CATCHMENTS

1. Background

This addendum forms part of the Pyrenees Shire 2014 Domestic Wastewater Plan (DWMP) and has been prepared to comply with the requirements of the current *Ministerial Guidelines for Open Potable Water Supply Catchments* (2012). This document is to be utilised by Councils and Water Authorities to guide the preparation of DWMP's for areas within proclaimed water supply catchments.

The Ministerial Guidelines and local water corporations require that Councils must implement a septic system monitoring and inspection program. There is a legal impost on Council to undertake this work in order for the 1:40ha rule to be relaxed.

2. Introduction

The primary aim of this addendum is to assess the risks associated with the use of septic systems within Open Potable Water Supply Catchments, which include:

- Map the risk factors across the catchments to broadly identify areas of high, medium and low risk from domestic wastewater utilising the risk mapping methodology and weighting criteria methodologies developed through the Mansfield pilot project;
- Complete a detailed analysis of the unsewered townships within the catchment areas. This work is being completed by Paul Williams and Associates and will include the preparation of land unit mapping which will identify the development risks and LCA requirements for individual lots;
- Specify the land capability assessment requirements for sites within the identified risk categories;
- Specify the priority actions for the septic system compliance and inspection program. This will include ensuring the requirements of Permits to Install and Certificates to Use septic systems and Section 173 Agreements (under the *Planning and Environment Act 1987*) are met by land owners;
- Outline priority planning amendments to existing planning policies and township structure/strategy plans

3. Legislative Requirements

Planning Permit Applications in Open Potable Water Catchments (Nov 2012)

The Ministerial Guideline puts further emphasis on the need for DWMPs, specifically requiring them to provide for the following:

a) The effective monitoring of the condition and management of Septic Tank Systems, including compliance with permit conditions and the Code;

b) The results of monitoring being provided to stakeholders as agreed by the relevant stakeholders;

c) Enforcement action where non-compliance is identified;

d) A process for the on-going review of the DWMP;

e) Independent audit by an accredited auditor (water corporation approved) of implementation of the DWMP, including monitoring and enforcement, every 3 years;

f) Councils are required to demonstrate that suitable resourcing for implementation; including monitoring, enforcement and review are in place.

Catchment Summary

The Shire contains a number of Declared Potable water supply catchments that provide water to towns in the region. Land use planning for these areas is also the responsibility of the Shire in conjunction with water supply and catchment management authorities. Given this Septic System management in these areas is of particular importance to public health.

Around 15% of the Shire is located within proclaimed potable drinking water catchments, which are managed by the following Water Corporations, being:

- Central Highlands water
- Goulburn Murray Water
- Grampians Wimmera Mallee Water

Council records indicate that at the time of preparing this DWMP there are approximately 412 septic tanks servicing properties within potable water supply areas, the largest portion of which are located within the townships of Lexton, Waubra and Evansford.

4. Risk Mapping of Catchments: Risk mapping process

4.1. Catchment Wide Risk Mapping

The purpose of this section of the plan is to outline the risk assessment methodology that has been followed in preparing this section of the DWMP. Council opted to utilise a detailed risk based mapping approach using the assessment methodologies developed and field tested through the Mansfield Shire DWMP pilot project.

The first stage involved undertaking a broad scale catchment wide analysis utilising a three tiered assessment methodology. The following three key factors were mapped and overlayed to identify the areas of high, medium and low risk of causing adverse impacts on potable water quality utilising existing GIS data on the following:

- Distance to reservoir or potable water off-take point;
- Soil type; and
- Land slope.

The catchment wide factors were assessed utilising the following data layers from Councils MapInfo GIS system:-

- Accurate 10 metre contours;
- Mapping the boundaries of the potable water supply catchments.
- DEPI tri-level waterway hierarchy data for rivers, creeks and unnamed waterways;
- Utilisation of the currently available soil type data from the Australian Soil Science database layer

The overall catchment wide risk ratings were then determined using the following weighting and calculations:

- Low risk rating = 1
- Medium risk rating = 2
- High risk rating = 3

Overall catchment risk ratings were determined utilising the following formula:-

- *Overall minor catchment risk = (Distance to reservoir or potable off-take point risk rating x 2) + slope risk rating and soil risk rating*

Risk Factor	**Low (1)**	**Medium (2)**	**High (3)**
Distance to reservoir or Potable water offtake Point (km)*	> 15 km	2 – 15 km	< 2 km
Slope	Grid points with median slopes <_ 10%	Grid points with median slopes between 10 – 20 %	Grid points with median slopes > 20 %
Soil type	Chromosois Ferrosols Dermosols	Vertosols Kurosols Kandosols Rudosols	Anthoposols Organosois Podosois Hyrdrosois Sodosois Calcarosols Tenosols

Source: Mansfield Shire Domestic Wastewater Plan Pilot Project

Using the above parameters the following scoring schedule was utilised to determine the overall risk category for different areas of the catchment:

- Low risk catchment = overall score of 5 - 6 or less;
- Medium risk catchment = overall score between 7 - 9
- High risk catchment = overall score of 10 or more

An overall risk map for the catchment areas is included within attachment 2. A total of 412 septics numbers within catchment areas with the breakdown across the various risk categories being:

- High risk – 16
- Medium risk – 101
- Low Risk - 295

4.2. <u>Detailed unsewered township risk mapping</u>

Council engaged the services of Mr Paul Williams to undertake the second stage which involved undertaking detailed risk assessments for the three unsewered towns within the proclaimed catchments.

This involved preparing a detailed sub-catchment analysis for Lexton, Evansford and West Waubra; which included the preparation of a land unit map identifying areas where future in-fill unsewered development will be potentially a high, medium or low risk. The assessments will also address the following factors and key soil characteristics relevant to effluent disposal:

a) Analysis of contour mapping and land systems soil types and profiles and percolation rate testing;

b) Minimum requirements and recommendations concerning the types of septic tank systems and cut-off drainage works.

c) Thickness of the profile (including presence of a topsoil horizon);

d) Profile hydraulic properties (including colloid stability); and

e) Nutrient uptake and pathogen attenuation ability.

The detailed inventory of the geographical land types previously prepared by Dr Robert Van De Graaff and Associates 2011 (*Land Systems of the Pyrenees Shire - Physical Description and Land Capability Aspects, November 2011)* was also utilised as a tool for assessing soil profiles and types.

5. Land Capability Assessment Requirements

Onsite septic systems which provide for a secondary level of effluent treatment may be a requirement for sites within potable catchment areas.

All aerated waste water treatment plant secondary treatment systems require regular quarterly servicing, whereas a sand filter and septic tank system requires far lower levels of regular maintenance and produces the same quality of effluent.

Requirements for Individual Land capability Assessments
A land capability assessment (LCA) is used to determine the potential risk of additional on-site systems on water quality, public health and amenity (the cumulative risk). An LCA is required when submitting a planning permit application within a proclaimed potable water supply catchment.

The EPA's *Code of Practice* outlines the minimum requirements for the preparation of a Land Capability Assessment which provides for a twelve stage 'best practice' process (EPA *Code of Practice – Onsite Wastewater Management February 2013)*. It is recommended that this twelve step EPA *Code of Practice* process be adopted as a default standard for the LCA's in 'medium' and 'high' risk parts of the catchments. A better than best practice approach will be required for lots with a 'high' risk rating.

This is considered essential in order to comply with the requirements of the *Environment Protection Act* and *SEPP* in relation to assessing cumulative impacts of additional on-site wastewater management systems and being able to relax the 1:40 hectare provision.

As part of this assessment key soil characteristics relevant to effluent disposal capability must be assessed, including:
a) Thickness of the profile (including presence of a topsoil horizon);
b) Profile hydraulic properties (including colloid stability); and
c) Nutrient uptake and pathogen attenuation ability.

All land capability assessments within Catchment areas should contain a site and soil inventory and assessment generally conforming to the VLCAF tables 3 and 4. Completing these tables will enable the Edis Risk Algorithm (refer to Appendice 8) be utilised for determining the final site risk rating.

Land Capability Assessments in High Risk Areas:-
A 'better than best practice' approach will be required for individual site LCA's within mapped areas of 'High Risk'. This is necessary as a complete scientific analysis is required to comply with the requirements of the Environment Protection Act and SEPP Waters of Victoria in relation to assessing the potential cumulative impacts from an additional on-site wastewater system.

For properties in this category the LCA needs to be a design document and must include all 12 stages of the LCA process outlined in Section 3.6.1. of the *Code, including completion of the VCLAF tables3 and 4 and Edis Risk Assessment Algorithm.* The LCA is to also include *in situ* permeability assessment (subject to the conditions given in the *Code, Section 3.6.1*) and include a feature survey of sufficient detail to enable the delineation of surface flow vectors and buffers.

Particular emphasis is to be placed on assessment of colloid stability, soil sodicity, soil reaction trend and electrical conductivity of all relevant soil horizons and assessment of any required soil amelioration. Where sodic or dispersive soils are encountered in testing, soil amelioration needs to be quantified (e.g. laboratory determination of gypsum requirement).

Land Capability Assessments for Medium Risk Areas:-
For medium risk areas, the LCA must include all 12 stages of the LCA process given in the Code*, Section 3.6.1 including completion of the VCLAF tables 3 and 4 and Edis Risk Assessment Algorithm.*

The LCA is to also include *in situ* permeability assessment (subject to the conditions given in the *Code, Section 3.6.1).* Note: Where sodic or dispersive soils (or any type 6 soil) are encountered the LCA requirements for high risk areas is to be followed.

Land Capability Assessment within Low Risk Areas:
An LCA prepared by an independent consultant will be required to for all applications within areas of low risk. The LCA assessment will be required to include all 12 stages of the LCA process outlined within the Section 3.6.1*Code of Practice for on-site Wastewater Management.*

Note: In accordance with the requirements of the Code all Land capability assessments should only be conducted and signed-off by suitably qualified, experienced and independent soil scientists or san hydro-geologist.

Township Allotments:
For all allotments within catchment townships the LCA requirements for High Land-Soil Risk Areas should be applied, regardless of the mapped Land-Soil Risk category.

6. Cumulative Impacts

Onsite system selection needs to be appropriate to the risk and to potential cumulative impacts. While multiple septic trench systems can simultaneously fail (i.e. produce contaminated surface flows due to exceeding trench storage capacity) which typically occur during periods of prolonged higher than average rainfall this does not apply to subsurface irrigation systems. It is considered that there can be no cumulative effect if the provisions of SEPP (Waters of Victoria) are met, set back distances are observed and regular system maintenance is undertaken.

7. Septic Tank Auditing and Compliance

A risk based monitoring program for existing septic tanks within the Shire's catchment areas is programmed to be implemented. Individual compliance inspections of all systems are programed to be undertaken by Councils EHO over a 5 year period:-

- High Risk – annually;
- medium risk – 3 yearly
- Low risk – every 5 years

This will require 109 inspections to be undertaken annually by Councils EHO over the course of the next 5 year period. The completion of inspections within all 'High Risk' areas will be prioritised for completion within the next 6 months. The inspection of septics and the updating of Council records for properties within Catchments is identified as a high priority within the action and implementation plan.

The processes for septic compliance inspections & management and record keeping as detailed within section 10 of the DWMP (Septic Monitoring and Compliance) will be applied to the inspection of catchment area systems.

These processes have been developed to ensure that owners are maintaining their septic systems in accordance with the requirement of the Septic Tank Code of Practice and obligations under the septic tank permit requirements. The inspection program as outlined in this addendum will be reviewed both annually and at the end of 5 years.

Re-classification of Systems
Councils Environmental Health Officer will continually re-classify systems as compliance inspections are completed.

Councils EHO can increase or decrease the operational risk category of any current system following an inspection; if the inspection reveals that more or less frequent monitoring of that system would not pose a risk to the catchment. System re-classification would be based upon the level of system compliance and consideration of site specific risk factors and overall risk mapping category. The re-classification would also have regard to the system age, maintenance requirements and the likely need for future upgrade works.

In some circumstances upgrades to systems can decrease the operational risk rating and will reduce the frequency of inspections. Any system reclassification will require the written consent from the relevant water authority.

8. Borefield Catchment Areas

There are a number of groundwater aquifer borefields within the Shire which are used to supply drinking water to a number of townships (refer to Catchments Table within Section 14) within the region. There is a need to realistically review the likely risk to the recharge areas and develop recommendations with regards to the following:-

a) Requirements for LCA assessments
b) Septic system types suitable for new developments

Paul Williams and associates will be engaged to undertake an investigation of soil type and geological features that will assess the potential for wastewater to impact on groundwater aquifers. The Action and Implementation plan has identified this as a priority action.

9. Strategic Planning work

The Municipal Strategic Statement (MSS) is currently under review and is expected to be completed by June 2015. The MSS has close links with the Council Plan 2013-2017 and sets the strategic framework for land use and development in the Pyrenees Shire. Major planning work identified to be undertaken over the following 3 years is detailed as follows:-

a) Updating local policies covering the protection and management of potable drinking water supplies and borefield catchments;

b) Development of an updated strategy plan for the Evansford township and specific Local Planning policies which will be informed by the detailed risk assessment completed by Paul Williams and Associates;

c) Prepare a new Environmental Significance Overlay schedule to specifically address the requirements for applications within borefield catchments. This would include consideration of permit exemptions for some dwelling extensions and requirements for LCA's and septic system upgrades which would be informed by the soil risk assessment report completed by Paul Williams and Associates;

d) Development of a structure / strategy plan for the Lexton township which will address the following:

   - The report will include an assessment of environmental constraints across the existing vacant sites within the Crown Township informed by the detailed risk assessment undertaken by Paul Williams and Associates (Domestic Wastewater management Plan – Land-Soil Risk Assessment, September 2014). This will inform recommendations with relation to infill development and minimum subdivision lot sizes;

   - Review of current zoning controls within the town (areas currently within the Township and Low Density residential zone);

   - Assessment and identification of land potentially subject to inundation;

   - Review of the application and need for the current Restructure Overlay controls (Clause 45.05) as they apply to the areas around the township;

   - Assessment and identification of areas potentially suitable for rezoning to accommodate longer term growth and Rural Living expansion.

In addition to the above strategic planning work, it will be necessary to undertake additional assessment of waste disposal options in township areas where inspection and enforcement of existing septic systems is insufficient to appropriately mitigate environmental risks, or where there is sufficient demand for growth in residential development.

10. Reporting

Guideline 1 of the *Ministerial Guidelines for Open Potable Water Supply Catchments* (2012) outlines a number of actions which are to be undertaken by Council in preparation for an exemption from the requirement for a minimum density of one dwelling per 40 hectares in potable water supply catchments. The reporting and monitoring requirements include:

- Effective monitoring of the condition of septic systems, including compliance with permit conditions:-
- Independent audit by an accredited auditor of the implementation, monitoring and enforcement of the DWMP every three years; and
- The results of the audit which are to be provided to all Stakeholders as soon as possible upon its completion.

It is proposed that Council will begin implementing these reporting requirements from the adoption date of the DWMP in accordance with the timeframes provided within the Action Plan.

11. Memorandum of Understanding

In order to reduce referral requirements there is potential for Council to investigate the option of entering into separate Memorandums of Understanding with the various water authorities for planning applications within 'low risk' areas of the catchments. Standard permit condition requirements would be included in this document.

12. Reference documents

- Department of Sustainability and Environment (2012). *Planning Permit Applications in Open, Potable Water Supply Catchment Areas.* Victoria.
- Environment Protection Authority (1970) - *Environment Protection Act.*
- *Mansfield Domestic Wastewater Management Plan Pilot Project (May 2014)*
- Environmental Protection Authority (1997). *State Environment Protection Policy (Groundwater's of Victoria).*
- Environment Protection Authority (1996) - Publication 451 *Onsite Domestic Wastewater Management.*
- Environment Protection Authority (2002) - *Guidelines for Aerated Onsite Wastewater Treatment Systems.*
- Environment Protection Authority (2003). State *Environment Protection Policy (Waters of Victoria).*
- Environment Protection Authority (2003a). Publication 746.1 *Land Capability Assessment for Onsite Domestic Wastewater Management.*
- Environment Protection Authority (2008). Publication 891 *Septic Tanks Code of Practice.*
- Environment Protection Authority (2012). Publication 1364. *Code of Practice – Onsite Wastewater Management.*
- Standards Australia/ Standards New Zealand (2012). AS/NZS 1547:2012 *Onsite Domestic-wastewater Management.*

13. Appendices

1) Potable water supply catchment areas map
2) Risk map for potable water supply catchment areas
3) Land soil risk assessment – Lexton Township
4) Land soil risk assessment – Part Waubra Township
5) Septic inspection record form
6) Example information flyer – Managing your Septic Tank
7) Edis Algorithm and table for the assessment of individual site risk

14. Catchments Table

SURFACE CATCHMENTS	AREA	TOWNS SUPPLIED
AMPHITHEATRE	330	Amphitheatre
BEAUFORT (Mt Cole)	684	Beaufort, Raglan
EVANSFORD	7730	Maryborough, Talbot, Carisbrook,
LANDSBOROUGH	160	Landsborough, Navarre
LEAD DAM	130	Avoca
LEXTON reservoir – supplied via the Gordon Hill bore	2160	Lexton
MUSICAL GULLY	100	Beaufort
MALAKOFF CREEK	3000	Back-up supply for Landsborough and Navarre
REDBANK	340	Redbank
SUGARLOAF	1000	Avoca
TALBOT / MC CALLUMS CREEK	1420	Maryborough, Talbot, Carisbook
TULLAROOP RESERVIOR		Maryborough
LAANACOORIE CATCHMENT		Laanecoorie, Bridgewater and Dunolly
BOREFIELD AREAS (not open potable water supply catchments)		
BUNG BONG BOREFIELD	N/A	Avoca
LANDSBOROUGH BOREFIELD	N/A	Landsborough, Navarre
WAUBRA BOREFIELD	N/A	Waubra
RAGLAN BOREFIELD	N/A	back-up water supply for Beaufort
ST. ENOCHS SPRING	N/A	Former supply to Skipton township
AMPHITHEATRE BOREFIELD	N/A	Amphitheatre township
LEXTON BOREFIELD	N/A	Lexton township

15. Action and Implementation Plan

The action plan details actions that will be undertaken to ensure the DWMP is implemented, appropriately reported to Council and other relevant authorities to the satisfaction of all of stakeholders. The DWMP must be implemented to meet with the requirements of the State Environment Protection Policy (Waters of Victoria) which requires the following actions:

- Generate reports for the EPA as required under the EPA Act;
- Generate required reports for Council and relevant water authorities;
- Implement a compliance, regulation and enforcement program as detailed in the DWMP and Action Plan and;
- Implement the DWMP in accordance with the requirements of the Ministerial Guidelines for Assessing Planning Applications in Potable Water Supply Catchment Areas 2012.

Council will provide the following information to Council and to the relevant water authorities as outlined below.

a) Council will lodge with the EPA and key stakeholders an annual return in the month of July each year containing the following:
    - Details on the number of permits issued for septic tank systems;
    - Details of the number of systems inspected annually within each catchment;
    - Information on the number of maintenance reports received as per the maintenance reporting program as outlined in the DWMP.

Pyrenees Shire DWMP - Action and Implementation Plan

Action	Description	Priority	Officer/Team	Due Date
Adoption of the final DWMP	Council must adopt and implement the DWMP	High	Council	April 2015
Septic Compliance:				
Septic inspection resourcing	Provide adequate administrative support to enable Councils EHO to complete field audit compliance inspections of septic systems.	High	Council	On-going
Septic System - Compliance and Enforcement	Inspection program to be implemented in line with DWMP recommendations for catchment areas and small unsewered townships. This will include identification of non-compliant wastewater systems. Owners will be required to recify non - compliant systems. Follow-up inspections and liaison with land owner will be undertaken until system is compliant.	High	EHO	On-going
Septic compliance reporting	Provide water authorities with statistical data and mapping on the number of completed septic inspections. This will include numbers of compliant and non-compliant systems	High	EHO	On-going
Update current DWTS database	Council will update Health Manager to capture all septic records from other databases and old hard copy septic records currently on property files. This will be progressively updated as inspections are completed by Councils EHO	High /Medium	Administration Officer/EHO	July 2016
Development of portable data capture field tools technology	Development of portable technology devices to capture data from compliance inspections including capture of system GPS co-ordinates and system information for adding to GIS mapping layer	Medium	Council – EHO and GIS officer	On-going
AWTS service agent database	Council to develop a list of authorized servicing agents operating in the region qualified to undertake compliance inspections and services of AWTS	High	EHO	July 2015
Mandatory Maintenance	Council will require all landowners	High	Administration Officer	On-going

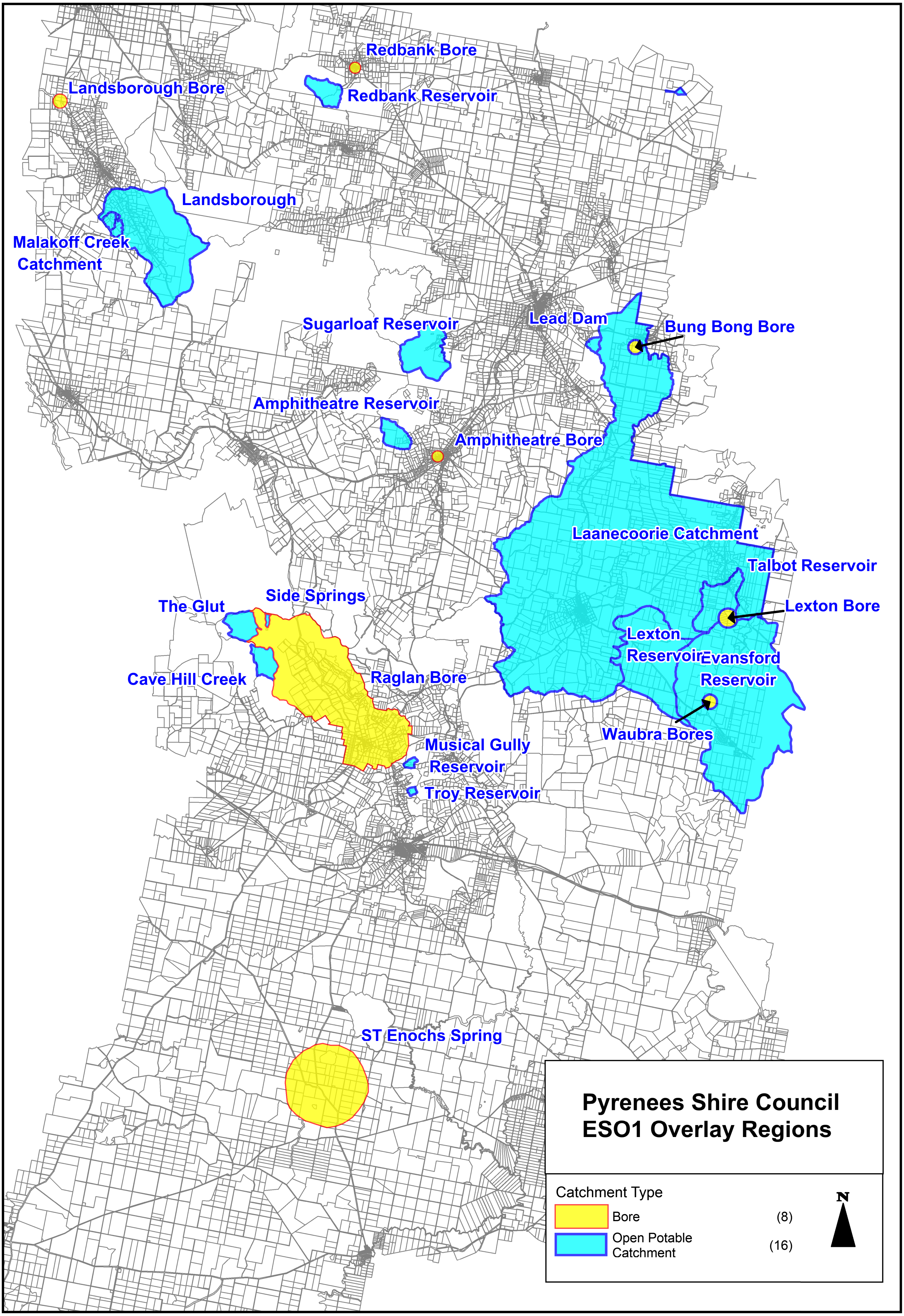
Reporting - AWTS	with AWTS to provide mandatory quarterly maintenance reports when required in accordance to the relevant EPA Certificate of Approval. Standard letter templates will be developed for this purpose.			
Septic System reclassifications	Councils EHO to consult with water authorities as required following the completion of compliance inspections in relation to proposed system reclassifications	6 monthly	Council and water authorities	On-going
Development of policies and procedures	Prepare procedures for septic permit assessment and compliance inspections in line with DWMP recommendations.	High/ Medium	EHO	End of 2015
Risk Mapping:				
Assessment of high risk minor catchments	Paul Williams and Associates to complete a desktop review and provide recommendations on the parameters for any additional risk mapping considered necessary for areas of 'high risk' minor catchments	Medium	Paul Williams and Associates and Council GIS officer	October 2015
Completion of risk assessment for Evansford township	Paul Williams and Associates to complete land and soil risk assessment of the Evansford township which will include inspection and assessment of infill development sites	High	Council	July 2015
Strategic Planning				
Undertake additional waste disposal options assessments of key sites	Assessment of areas within townships to identify effective alternative waste disposal options.	High	Activity to be outsourced, and subject to funding availability	2015/16
Lexton sewer scheme investigation	Council to seek required funding to undertake an options assessment and concept design for the Lexton township sewer scheme. This project is identified as a priority within the Central Highlands Councils Regional Investment Plan (Transformational Projects 2014)		Subject to funding availability and completion of feasibility study	On-going
Borefield Catchments	Complete assessment of ground water borefield recharge areas in accordance with Section 8) of the DWMP addendum. Consultant Paul Williams will be engaged to complete investigation of soils type and profiles to assess likely impacts on ground water	High	Council	August 2015

ESO schedule review	Preparation of additional ESO schedule to specifically address application and assessment requirements for development applications within borefield catchment areas. This work will include a review and updating of current ESO 1 requirements	High	Council in consultation with water authorities and DTPLI	August 2015
Updating local planning policies	Update local planning policies for potable catchments and borefield areas, which will include suitable reference to the DWMP as an incorporated or reference document. This will be undertaken as part of the scheduled planning scheme MSS/LPPF rewrite. A review of current ESO1 requirements will be completed as part of this work.	High/ Medium	Council	May 2016
Lexton structure / strategy plan	Completion of a strategy/structure plan for Lexton township in accordance with section 9) of the DWMP addendum	High/ Meium	Council in consultation with water authorities and DTPLI	April 2016
Evansford strategy plan	Completion of an updated strategy plan for the Evansford township.	High / Medium	Council in consultation with water authorities and DTPLI	April 2016
Community Education:				
Education of property owners	Information tools to be developed and made available via the web and front counter to home owners.	High	Council	End of 2015
Press Releases	Pyrenees Shire Council to provide information through local media outlets to residents about the DWMP septic inspection program	High	Council	These will be released upon adoption of the DWMP
Reporting and Audits:				
Internal meetings	Monthly internal meetings will be held to review performance of plan implementation and progress of compliance inspections and follow ups.	High	EHO, Manager of Planning and Director ADS	monthly
Stakeholder meetings	Initial stakeholder meeting to be held 6 months following from the adoption of the DWMP. Timeframes for further meetings to be established following this meeting.	High	Internal and External stakeholders	6 months from adoption and on-going as required
Reporting to	Council will provide an annual	High	EHO	31 July of each year

Council/Key stakeholders including water authorities	report to all stakeholders on the progress against all actions in the DWMP and Action Plan.			
Audit of the DWMP	Completion of an independent audit by an accredited auditor (water corporation approved) on the implementation of the DWMP, including the effectiveness of the monitoring and enforcement	3 yearly	Council	Every 3 years from the adoption of the DWMP
Review of DWMP	Council & stakeholders to review the DWMP recommendations annually.	Annually	Council & Water Authorities	On-going
	Complete a full review and update (as required) of the DWMP	5 yearly	Council & Water Authorities	5 yearly

APPENDIX 1

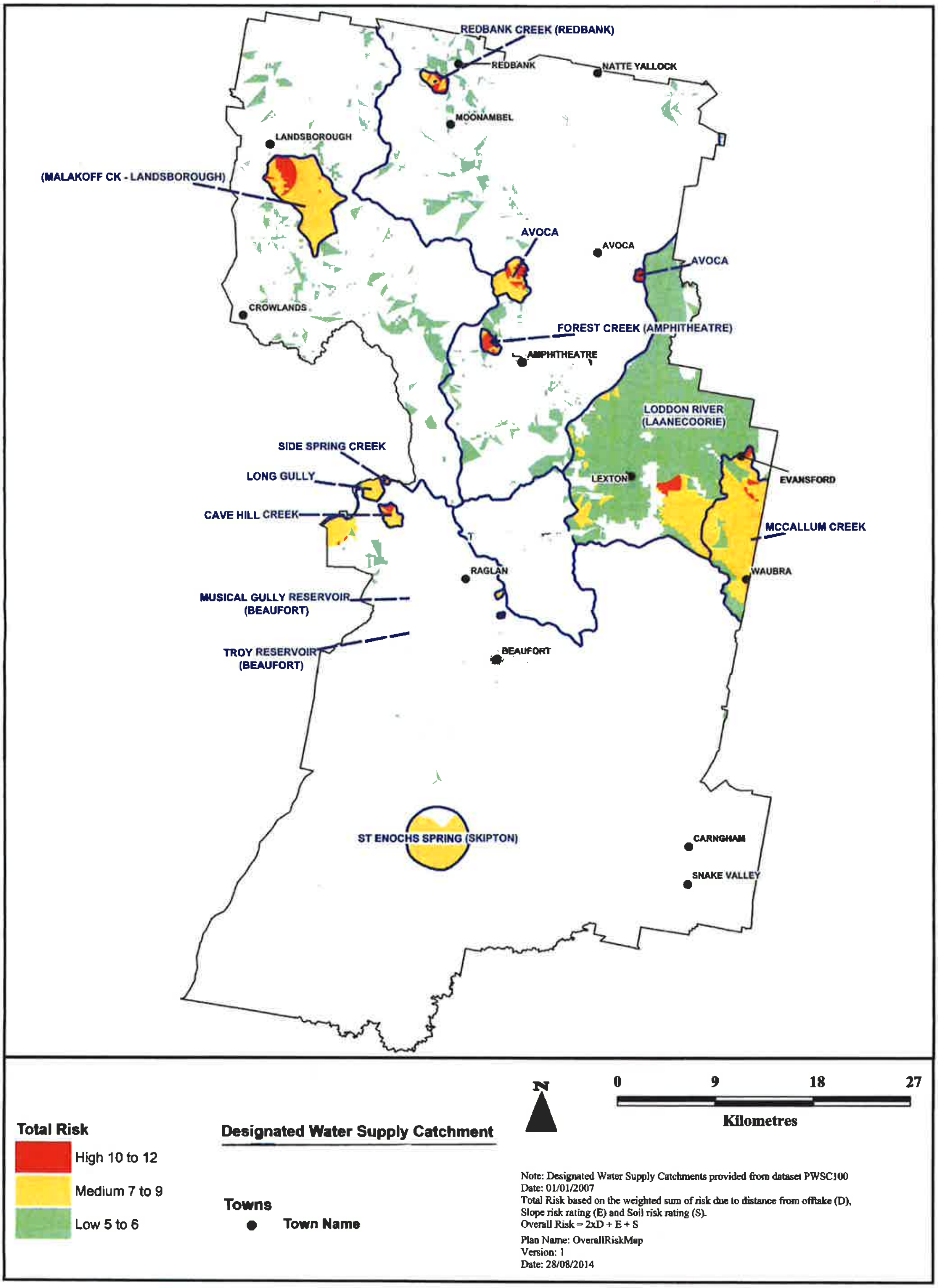
Potable water supply catchment area map


Pyrenees Shire Council
ESO1 Overlay Regions
Catchment Type
Bore (8)
Open Potable Catchment (16)
N
Redbank Bore
Landsborough Bore
Redbank Reservoir
Landsborough
Malakoff Creek Catchment
Sugarloaf Reservoir
Lead Dam
Bung Bong Bore
Amphitheatre Reservoir
Amphitheatre Bore
Laanecoorie Catchment
Talbot Reservoir
Lexton Bore
Side Springs
The Glut
Lexton Reservoir
Evansford Reservoir
Cave Hill Creek
Raglan Bore
Waubra Bores
Musical Gully Reservoir
Troy Reservoir
ST Enochs Spring

APPENDIX 2

Risk map for potable water supply catchment areas

Map 2.4: Overall Catchment Risk Rating



APPENDIX 3

Land soil risk assessment – Part Lexton Township

Paul Williams & Associates Pty. Ltd.
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LAND CAPABILITY ASSESSMENT LAND USE MAPPING TERRAIN MODELLING HYDROGEOLOGY ENGINEERING GEOLOGY SOIL SCIENCE

A140701 02 – SEPTEMBER 2014

PYRENEES SHIRE COUNCIL

DOMESTIC WASTEWATER MANAGEMENT PLAN

LAND-SOIL RISK ASSESSMENT

AT

PART LEXTON TOWNSHIP

1.1 INTRODUCTION

On instruction from the Pyrenees Shire Council, an investigation was undertaken to assess the land/soil risk for part of Lexton Township.

Note: Unless otherwise stated, this report refers to risk associated with primary (septic) effluent disposal via trench and bed systems, only.

1.2 ASSESSMENT METHOD

The assessment was carried out in accordance with *SEPPs (Waters of Victoria) and related documents. This assessment is in accordance with* current *SEPPs (Waters of Victoria)* the *Code of Practice - Onsite Wastewater Management, E.P.A.* Publication 891.3, February, 2013, (the *Code*), *Land Capability Assessment for Onsite Domestic Wastewater Management*, E.P.A. Publication 746.1, March, 2003, *AS/NZS 1547:2012*, (the *Standard*) *AS 2223, AS 1726, AS 1289, AS 2870* and *Australian Laboratory Handbook of Soil and Water Chemical Methods.*

Our assessment involved the reconnaissance mapping of unique land-soil units which were defined in terms of salient attributes including; geology (parent material), slope, soil profile characteristics (including colloid stability) and hydraulic conductivity.

Exploratory auger drilling and existing exposure inspections was undertaken in conjunction with a review of Council data base which included soil profile descriptions from both foundation investigations and land capability assessments, some colloid stability assessments (including dispersion and swell potential) and B horizon hydraulic conductivity (some measured *insitu* using the Talsma-Hallam method, but most estimated or inferred from textural analyses by others).

1.3 SOIL RISK CATEGORY

1.3.1 Soil Classifications. Soil classifications in common use within the land capability assessment industry include:

- Unified Soil Classification System (USCS) published by the American Society for Testing and Materials (1985) and variants used by geotechnical practitioners and used by AS2870 and related standards;
- USDA (Casagrande) Soil Survey Manual (1951) from which the soil textural classification and other terminology is used in the Code and in AS/NZS 1547:2012;
- The Northcote classification (1979) based on the soil *profile form*, the overall visual impact of the physical soil properties in their intimate association with one another within the framework of the solum. This system is based on observable physical, chemical and biological features and properties, and not on the mode of soil formation (soil genesis);

- Handbook of Australian Soils (1968) which distinguishes Great Soil Groups based on soil properties and features related to the processes of soil formation;
- The Australian Soil Classification (1996), which is a general purpose scheme based on defined diagnostic attributes, horizons, or materials, which are largely observable in the field and is not too reliant on laboratory data; and,
- Hybrid classifications (which range from quite practical to downright irrational).

All systems, however, describe the soil profile in terms of horizons, i.e. variations (usually textural) with depth.

End users (and many assessors) and administrators can, not surprisingly, be greatly confused. This can and has led to irrational decisions causing an unnecessary financial burden on an applicant and/or increased risk to public health and water resources.

The solution to this quandary is to consider the salient soil and associated land characteristics relevant to trench and bed disposal of septic effluent, rather than describing soil taxonomy aspects to great detail. Regardless of which classification is used, the salient soil characteristics relevant to effluent disposal capability are:

- Thickness of the profile (including presence of a topsoil horizon),
- Profile hydraulic properties (including colloid stability), and,
- Nutrient uptake and pathogen attenuation ability.

1.3.1.1 Profile Thickness. Put simply, adequate (design) renovation of the effluent requires a minimum thickness of suitable soil. The *Code* requires a minimum thickness of suitable soil between the base of the trench and a limiting layer of 0.6m. For a typical 0.6m deep trench, the minimum soil depth is 1.2m. If we consider the possibility of groundwater mounding on an impermeable layer, this minimum design soil thickness becomes about 1.4m.

In nature, there is always some correlation between soil thickness, slope and parent material (geology). In this study area, the correlation is high.

Generally the steeper (erosional) slopes are restricted to areas underlain by (predominantly) metasedimentary materials, intermediate (depositional) slopes occur on the colluvial deposits, while the most gentle (depositional) slopes reflect the alluvial deposits.

The deepest soil profiles (logically) occur on the relatively thick alluvial deposits. Here the soil profiles typically exhibit texture contrast between the topsoil (silt) and the B-horizon (mainly light to medium clays) with depths often greater than 2m.

Shallow and Intermediate depth soil profiles occur on the weathered colluvial and metasedimentary materials. Here the soil profiles typically exhibit texture contrast between the topsoil (silt and sand) and the B-horizon (mainly medium clays) with depths between 0.3m and more than 1.5m.

Shallow soils are common on slopes steeper than about 10% but are also common on the metasedimentary rocks at lesser grades.

Insufficient profile thickness is a common limiting constraint on the metasediments.

1.3.1.2 Hydraulic Conductivity. The Darcy equation states that velocity, V, of a liquid through a porous medium is the product of the hydraulic conductivity, Ksat, and the hydraulic gradient, *i*. Hence, knowing the hydraulic conductivity allows the estimation of the rate of deep seepage and flow times which allows confident disposal system design and demonstrates the adequacy of buffer distances to sensitive areas and entities.

$$V = Ksat \times i$$

Deep seepage through a saturated soil profile towards the groundwater table occurs when the hydraulic gradient equals unity (1).

Hydraulic conductivity of a soil can **<u>easily</u>** be measured *insitu*.

AS/NZS 1547 directs the practitioner to determine an indicative permeability by assessing the soil's texture (proportions of silt, sand and clay) and structure. This makes some theoretical sense but is a practical nonsense because other soil properties such as sodicity and structure stability are also factors that strongly control permeability and AS/NZS 1547 does not require these to be included in the assessment.

To demonstrate the "texture" flaw, consider the category 1 soils (gravels and sands) which the Standard assigns an indicative permeability of more than 3m/day and allows less than 5% clay content. Under certain moisture and compaction conditions, such a material could make a superb base course for a road pavement and would be considered effectively "waterproof" with a permeability of less than 0.001m/day.

Similarly, soil structure assessed by visual inspection of pit walls and exposures may not be the same structure when the soil is cyclically exposed to saline effluent.

Hydraulic conductivity is easily measured *insitu* and when coupled with some (simple) laboratory testing to determine colloid stability (dispersion and swell potential) provides a high degree of certainty in hydraulic design.

Considering hydraulic conductivity singularly, we can conclude that on balance, the soils formed on the dominant geological formations at Lexton have hydraulic conductivities capable of sustainable effluent disposal via trenches and beds, albeit, requiring an evapotranspiration assist to a greater or lesser degree.

Colloid stability varied between non-dispersive (dispersion index 0) to slightly dispersive (dispersion index 8), however, shrink-swell potential can vary from negligible to moderate, regardless of the geological formation or topographic location.

There is no discernible correlation between dispersion and geology or slope.. All soils in the study area should be assumed to be dispersive, unless rigorous laboratory testing proves otherwise.

All disposal methods, regardless of effluent quality should apply colloid stabilisation in the form of gypsum.

1.3.1.3 Nutrient Uptake and Pathogen Attenuation. Several processes affect nitrogen levels within soil after application of effluent. Alternate periods of wetting and drying with the presence of organic matter promotes reduction to nitrogen gas (denitrification). Plant roots absorb nitrates at varying rates depending on the plant species, however nitrate is highly mobile, readily leached, and can enter groundwater via deep seepage and surface waters via overland flow and near-surface lateral flow.

To ensure complete attenuation of nitrogen, a nitrogen balance is used with conservative estimates of the nitrogen uptake by different plants. Sufficient trench area should be used to encourage wetting/drying cycles within the effluent field to stimulate microbial attenuation of nitrogen. Trench dosing would assist this process to occur.

Clay subsoils (as typical of the sub catchment) can fix large amounts of phosphorus and a phosphorus balance should not be required.

In this region, phosphorus is quickly sorbed by phosphorus-deficient clay soils. Phosphorus is released as orthophosphate which is readily sorbed by plant roots and soil grains. Phosphate does not move through soil unless the part of the soil it has contacted and where it is sorbed, becomes "saturated" with phosphate first (Gerritse,). Plant uptake of phosphorus in the effluent field will be greater than nitrogen uptake. Phosphate-rich effluent seeping through these soils will lose most of the phosphorus within a few metres.

A small amount of nitrogen, as nitrate, will inevitably reach the groundwater. However, this nitrogen from the effluent would be insignificant in the context of the nitrogen routinely applied in common farming practices in the vicinity and naturally produced by nitrogen-fixing plants.

Furthermore, the time taken for the effluent to reach surface waters (a minimum distance of, say, 40m) and assuming a prevailing hydraulic gradient of 1:500 and ksat of 1m/day[a], would be in the order of 50 years. For rare perched water flow in the topsoil materials (subsurface storm flow) the time taken for the effluent to reach surface waters (a minimum distance of, say, 40m) and assuming a prevailing hydraulic gradient (ground slope) of 1:10 and ksat of 0.5m/day[b], would be in the order of 2 years and assumes no evapotranspiration during this time. If during the summer season the upper soil profile dries out the hydraulic conductivity of the unsaturated soil decreases enormously, slowing down the seepage velocity to almost zero and causing the escaped effluent to be evapotranspired.

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[a] A conservative value for basement materials.

[b] A conservative value for topsoil and slopewash gravels.

Pathogens entering a water supply can be harmful to humans, stock and the environment. There are a number of pathogenic organisms that can be present in effluent, of which the two most common are bacteria and viruses.

Bacterial source tracking (BST) has been used extensively in research to identify sources of riverine contamination. In regions with poorly located effluent treatment plants (mostly septic tanks), within multi-land use catchments, human effluent sources are reported as a contributor, along with livestock sources (Geary, 2003).

Bacteria are removed predominantly through filtration (87-88%) and partly by die-off (12-13%) (Pang et al., 2003). Filtration is a combination of attack from microscopic fauna and flora within the soil and adsorption onto soil particles. With a low application rate and high residence time in the soil, all bacteria are removed within a very short distance from the effluent source.

Determination of buffer distances to attenuate viruses is a function of "die-off" rates (or inactivation rates) of viruses and therefore retention time in soils, and adsorption rates of viruses in soil. Pang (2003) modelled removal rates for bacteria and viruses in a highly permeable (Ksat 172m/day) pumice sand soil. It was found that viruses are removed by filtration (55%), and by die off (45%). The main mechanism by which viruses are removed is therefore exposure to the maximum amount of soil (filtration media) and the maximum retention time in the soil to encourage die-off.

Underground flow is unlikely to pose a threat to the receiving waters, as with the maximum (overestimated) rate of flow of 0.05m/day[C] and an overestimated gradient of 10%, the time taken to travel the minimum setback distances to surface waters, (40m) is greater than 2 years. This is well beyond the maximum die-off rate for viruses, and does not take into account adsorption of viral matter onto soil particles, which is generally a greater factor in the removal of viruses (Pang et al., 2003).

1.4 LAND CAPABILITY ASPECTS OF THE WASTE WATER MANAGEMENT PLAN

1.4.1 General. The assessment has demonstrated that mappable units based on geology-slope-soil associations can be used in the Wastewater Management Plan.

Unlike the DPCD Guidelines: *Planning permit applications in potable, open water supply catchment areas* (November 2012), the DWMP needs to differentiate between trench disposal of septic effluent and pressure compensated subsurface irrigation of 20/30 (or better) standard effluent and between senescent and failed systems and new systems.

In addition the DWMP needs to consider the type of occupancy of each site. While septic, sand filter and reed bed systems can cope with intermittent occupancy, most AWTS require continuous operation for satisfactory performance.

Furthermore, the DWMP needs to differentiate between existing subdivisions and future applications.

1.4.2 Onsite System Selection and Risk. Onsite system selection needs to be appropriate to the risk and to potential cumulative impacts. While multiple septic trench systems can simultaneously fail (i.e. produce contaminated surface flows due to exceeding trench storage capacity) typically during periods of prolonged high and/or episodic rainfall, the same is not true of subsurface irrigation systems. In addition, it can be argued that there can be no cumulative effect if the provisions of *SEPP (Waters of Victoria)* are met.

Furthermore, except for gross negligence, reasonable operation and rudimentary maintenance would ensure that "failure" would be restricted to transient reductions in quality (secondary treatment) of effluent which would continue to be transferred to the subsoil. Potentially "dangerous" contaminated surface flow cannot occur while amelioration of contaminants (and this is also true for septic effluent) will continue over the extraordinarily large flow paths and travel times controlled by the regional/local hydraulic gradients

1.4.2.1 Low and Medium Risk Areas. For low and medium risk areas and for residential use, possible onsite systems could include septic effluent disposed via trench or wick trench and bed and AWTS, sand filter and reed bed with effluent disposed via pressure compensated subsurface irrigation or wick trench and bed. For intermittent use, possible onsite systems could include septic effluent disposed via trench or wick

[C] For a flow velocity of 0.5m/day, viruses showed a thousand fold reduction at a distance of 0.6m. For a flow velocity of 0.05m/day, viruses were not detected at a distance of 0.4m (Van de Graaff 1998).

trench and bed and sand filter and reed bed with effluent disposed via pressure compensated subsurface irrigation or wick trench and bed.

1.4.2.2 High Risk Areas. For high risk areas disposal of septic effluent via trench or wick trench and bed are unlikely to be appropriate.

For high risk areas and for residential use, possible onsite systems could include AWTS, sand filter and reed bed with effluent disposed via pressure compensated subsurface irrigation. For intermittent use, possible onsite systems could be sand filter and reed bed with effluent disposed via pressure compensated subsurface irrigation.

1.5 LAND CAPABILITY ASSESSMENT IN AREAS OF LOW, MEDIUM & HIGH RISK

The *Code* always requires a land capability assessment in a potable water supply catchment.

The assessment has demonstrated the rationale for land capability assessments of variable intensity for low, medium and high risk areas.

1.5.1 Land Capability Assessment for High Risk Areas. For high risk areas, the LCA needs to be a design document. It must include all 12 stages of the LCA process given in the *Code, Section 3.6.1.*

The LCA is to also include *insitu* permeability assessment (subject to the conditions given in the *Code, Section 3.6.1),* a feature survey of sufficient detail to enable the delineation of surface flow vectors and buffers, colloid stability, soil sodicity, soil reaction trend, electrical conductivity of all relevant soil horizons and assessment of any required soil amelioration.

1.5.2 Land Capability Assessment for Medium Risk Areas. For medium risk areas, the LCA must include all 12 stages of the LCA process given in the *Code, Section 3.6.1.*

The LCA is to also include *insitu* permeability assessment (subject to the conditions given in the *Code, Section 3.6.1).*

1.5.3 Land Capability Assessment for Low Risk Areas. For low risk areas, the LCA may be conducted by the Council's Environmental Health Officer. The LCA may be largely based on experience and knowledge of the satisfactory performance of onsite systems in the vicinity.

However, the EHO recommendations are to be considered an LCA (for the purposes of the *Code*) and the subsequent deviation from the *Code, Section 3.6.1* requirements will be the responsibility of the Council.

In addition, Council should be mindful that experienced EHOs retire and transfer and it cannot be guaranteed that the replacement has the necessary experience and local knowledge.

Note: For all township allotments the LCA requirements for High Land-Soil Risk Areas should be applied, regardless of the mapped Land-Soil Risk category.

1.6 LEXTON INFILL ALLOTMENTS

For the existing infill allotments, the majority of the allotments have been mapped as Low Risk (in terms of land-soil risk). However, following a land capability assessment and application of the Edis Risk algorithm, all allotments would be medium or high risk with limiting constraints such as proximity to surface waters and insufficient available area[d] precluding the disposal of septic effluent via trench or wick trench and bed systems.

Inspection of the infill sites at the reconnaissance level revealed that all sites (with the probable exception of one allotment at the southern end of Skene Street) should be capable of accommodating a residence and onsite effluent system.

[d] Trench and bed systems typically require more area than for irrigation systems. In addition, all trench and bed systems require an equivalently sized reserve area.

The onsite effluent system would need to consist of a sand filter, reed bed system or AWTS, producing secondary treated effluent with disposal/reuse via pressure compensated subsurface irrigation.

Site amenity and site development would necessarily be controlled by the needs of the onsite effluent disposal system.

For all township allotments the LCA requirements for High Land-Soil Risk Areas should be applied, regardless of the mapped Land-Soil Risk category.

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PRINCIPAL HYDROGEOLOGIST
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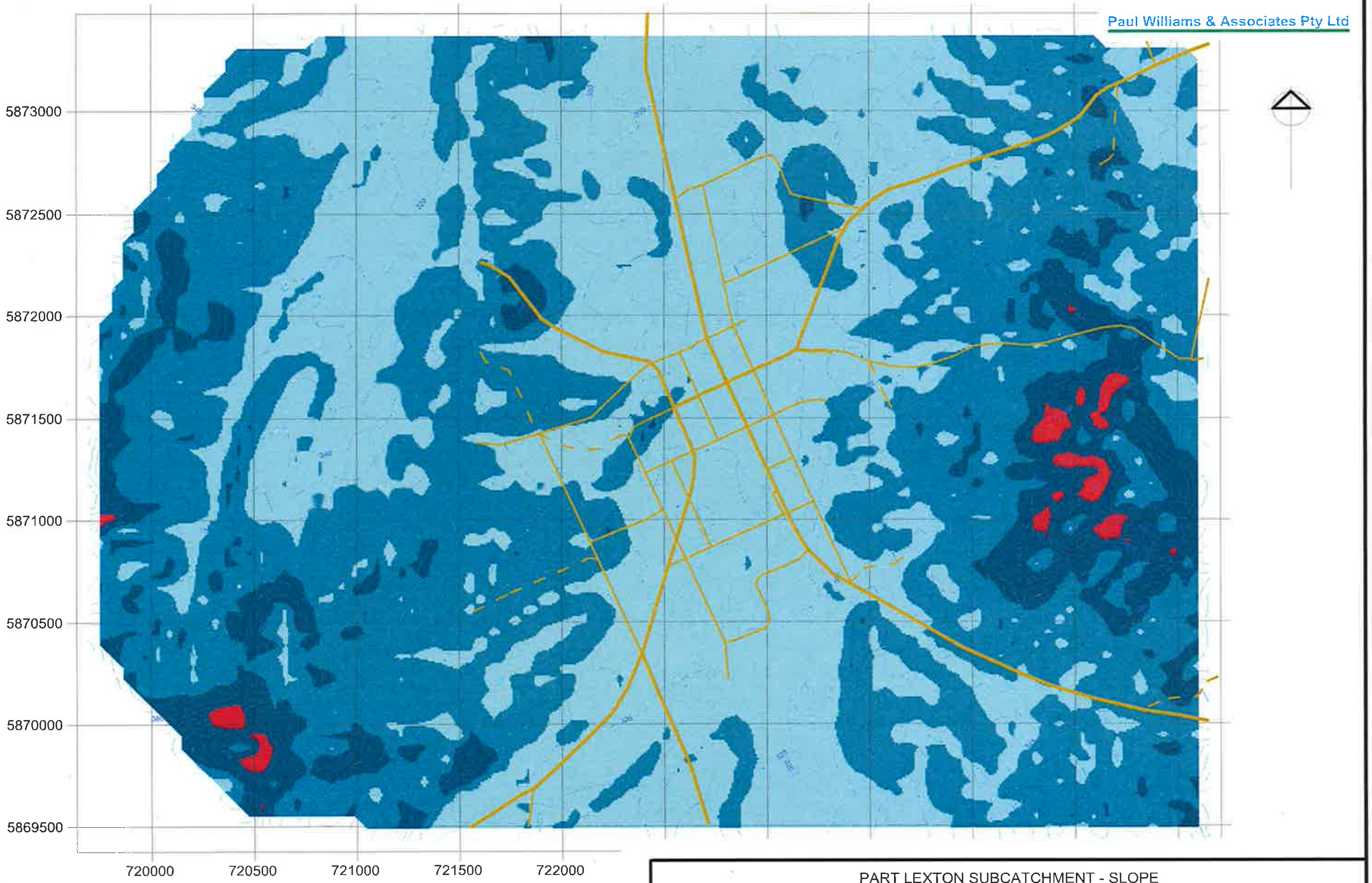


20+% SPECIAL DESIGN FOR SECONDARY TREATMENT & SUBSURFACE IRRIGATION

10%-20% LAA INCREASED BY 20% FOR SECONDARY TREATMENT & SUBSURFACE IRRIGATION

5%-10% PRACTICAL UPPER RANGE FOR PRIMARY TREATMENT & TRENCH SYSTEMS

0%-5% GENERALLY NO IMPEDIMENT FOR PRIMARY TREATMENT & TRENCH SYSTEMS

PART LEXTON SUBCATCHMENT - SLOPE		
PYRENEES SHIRE WASTEWATER MANAGEMENT PLAN		
PYRENEES SHIRE COUNCIL		
Scale: 1:25000	Drawn: P.R.W.	Report Number: A140701
Contour Interval: 5m	Date: 22 September 2014	Drawing Number: ONE

QUATERNARY ALLUVIUM: Silt/clay soil profiles to 2m+, ksat range: 0.02 to 0.05, ground slopes to 10%.

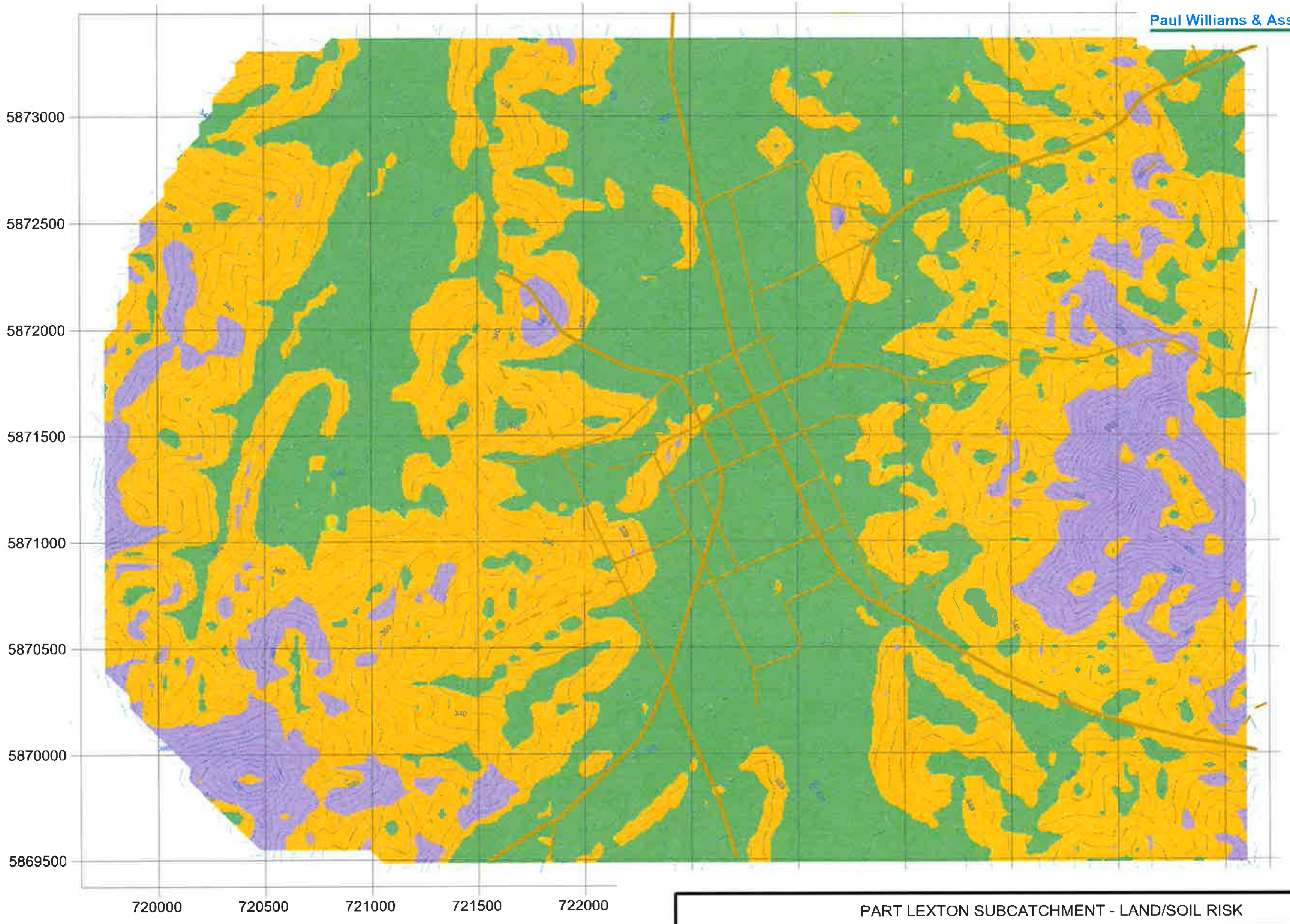
QUATERNARY ALLUVIUM/COLLUVIUM: Silt/clay (gravelly) soil profiles (often interlayered), 0.6 to 2m+, ksat range: 0.03 to 0.2, ground slopes to 10%

TERTIARY & PERMIAN SEDIMENTS: Silt or sand/clay (often gravelly) soil profiles, 0.3 to 1.5m, ksat range: highly variable, ground slopes mainly <10%

DEVONIAN GRANITE: Duplex (sand/clay) soil profiles (often gravelly), <0.1 to 1.5m, ksat range: <0.03 to 0.06, ground slopes to 20%.

CAMBRIAN METASEDIMENTS: Duplex (silt or sand/clay) soil profiles, 0.3 to 1.5m, ksat range: 0.02 to 0.1, ground slopes 5% to >30%.

PART LEXTON SUBCATCHMENT - GEOLOGY/SOILS		
PYRENEES SHIRE WASTEWATER MANAGEMENT PLAN		
PYRENEES SHIRE COUNCIL		
Scale: 1:25000	Drawn: P.R.W.	Report Number: A140701
Contour Interval: 5m	Date: 22 September 2014	Drawing Number: TWO



LOW RISK: R=1 (Alluvial, colluvial and residual soils, ground slopes to 5%).

MEDIUM RISK: R=2 (Residual and colluvial soils, ground slopes to 10%).

HIGH RISK: R=3 (Residual, some colluvial soils, ground slopes >10%).

Paul Williams & Associates Pty Ltd

PART LEXTON SUBCATCHMENT - LAND/SOIL RISK		
PYRENEES SHIRE WASTE WATER MANAGEMENT PLAN		
PYRENEES SHIRE COUNCIL		
Scale: 1:25000	Drawn: P.R.W.	Report Number: A140701
Contour Interval: 0.5m	Date: 22 September 2014	Drawing Number: THREE

APPENDIX 4

Land soil risk assessment – Part Waubra Township

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LAND CAPABILITY ASSESSMENT LAND USE MAPPING TERRAIN MODELLING HYDROGEOLOGY ENGINEERING GEOLOGY SOIL SCIENCE

A140701 01 – AUGUST 2014

PYRENEES SHIRE COUNCIL

DOMESTIC WASTEWATER MANAGEMENT PLAN

LAND-SOIL RISK ASSESSMENT

AT

PART WAUBRA TOWNSHIP

1.1 INTRODUCTION

On instruction from the Pyrenees Shire Council, an investigation was undertaken to assess the land/soil risk for part of Waubra Township.

Note: Unless otherwise stated, this report refers to risk associated with primary (septic) effluent disposal via trench and bed systems, only.

1.2 ASSESSMENT METHOD

The assessment was carried out in accordance with *SEPPs (Waters of Victoria) and related documents. This assessment is in accordance with* current *SEPPs (Waters of Victoria)* the *Code of Practice - Onsite Wastewater Management, E.P.A.* Publication 891.3, February, 2013, (the *Code*), *Land Capability Assessment for Onsite Domestic Wastewater Management*, E.P.A. Publication 746.1, March, 2003, *AS/NZS 1547:2012*, (the *Standard*) *AS 2223, AS 1726, AS 1289, AS 2870* and *Australian Laboratory Handbook of Soil and Water Chemical Methods.*

Our assessment involved the reconnaissance mapping of unique land-soil units which were defined in terms of salient attributes including; geology (parent material), slope, soil profile characteristics (including colloid stability) and hydraulic conductivity.

Exploratory auger drilling and existing exposure inspections was undertaken in conjunction with a review of Council data base which included soil profile descriptions from both foundation investigations and land capability assessments, some colloid stability assessments (including dispersion and swell potential) and B horizon hydraulic conductivity (some measured *insitu* using the Talsma-Hallam method, but most estimated or inferred from textural analyses by others).

1.3 SOIL RISK CATEGORY

1.3.1 Soil Classifications. Soil classifications in common use within the land capability assessment industry include:

- Unified Soil Classification System (USCS) published by the American Society for Testing and Materials (1985) and variants used by geotechnical practitioners and used by AS2870 and related standards;
- USDA (Casagrande) Soil Survey Manual (1951) from which the soil textural classification and other terminology is used in the Code and in AS/NZS 1547:2012;
- The Northcote classification (1979) based on the soil *profile form*, the overall visual impact of the physical soil properties in their intimate association with one another within the framework of the solum. This system is based on observable physical, chemical and biological features and properties, and not on the mode of soil formation (soil genesis);

- Handbook of Australian Soils (1968) which distinguishes Great Soil Groups based on soil properties and features related to the processes of soil formation;
- The Australian Soil Classification (1996), which is a general purpose scheme based on defined diagnostic attributes, horizons, or materials, which are largely observable in the field and is not too reliant on laboratory data; and,
- Hybrid classifications (which range from quite practical to downright irrational).

All systems, however, describe the soil profile in terms of horizons, i.e. variations (usually textural) with depth.

End users (and many assessors) and administrators can, not surprisingly, be greatly confused. This can and has led to irrational decisions causing an unnecessary financial burden on an applicant and/or increased risk to public health and water resources.

The solution to this quandary is to consider the salient soil and associated land characteristics relevant to trench and bed disposal of septic effluent, rather than describing soil taxonomy aspects to great detail. Regardless of which classification is used, the salient soil characteristics relevant to effluent disposal capability are:

- Thickness of the profile (including presence of a topsoil horizon),
- Profile hydraulic properties (including colloid stability), and,
- Nutrient uptake and pathogen attenuation ability.

1.3.1.1 Profile Thickness. Put simply, adequate (design) renovation of the effluent requires a minimum thickness of suitable soil. The *Code* requires a minimum thickness of suitable soil between the base of the trench and a limiting layer of 0.6m. For a typical 0.6m deep trench, the minimum soil depth is 1.2m. If we consider the possibility of groundwater mounding on an impermeable layer, this minimum design soil thickness becomes about 1.4m.

In nature, there is always some correlation between soil thickness, slope and parent material (geology). In this study area, the correlation is profound.

Generally the steeper (erosional) slopes are restricted to areas underlain by (predominantly) intrusive and pyroclastic (eruption point) materials, intermediate (depositional) slopes occur on the colluvial deposits, while the most gentle (depositional) slopes reflect the alluvial deposits.

The deepest soil profiles (logically) occur on the relatively thick alluvial deposits and highly weathered quaternary basalts. Here the soil profiles typically exhibit texture contrast between the topsoil (silt) and the B-horizon (mainly light clays) with depths often greater than 2m.

Intermediate depth soil profiles occur on the colluvial fan deposits and quaternary basalts. Here the soil profiles typically exhibit texture contrast between the topsoil (gravelly silt and silt) and the B-horizon (mainly gravelly light clays) with depths between 1m and more than 2m.

Shallow and Intermediate depth soil profiles occur on the weathered granite and pyroclastic materials. Here the soil profiles typically exhibit texture contrast between the topsoil (silt) and the B-horizon (mainly medium clays) with depths between 0.1m and more than 1.5m.

1.3.1.2 Hydraulic Conductivity. The Darcy equation states that velocity, V, of a liquid through a porous medium is the product of the hydraulic conductivity, Ksat, and the hydraulic gradient, *i*. Hence, knowing the hydraulic conductivity allows the estimation of the rate of deep seepage and flow times which allows confident disposal system design and demonstrates the adequacy of buffer distances to sensitive areas and entities.

$$V = Ksat \times i$$

Deep seepage through a saturated soil profile towards the groundwater table occurs when the hydraulic gradient equals unity (1).

Hydraulic conductivity of a soil can **easily** be measured *insitu*.

AS/NZS 1547 directs the practitioner to determine an indicative permeability by assessing the soil's texture (proportions of silt, sand and clay) and structure. This makes some theoretical sense but is a practical nonsense because other soil properties such as sodicity and structure stability are also factors that strongly control permeability and AS/NZS 1547 does not require these to be included in the assessment.

To demonstrate the "texture" flaw, consider the category 1 soils (gravels and sands) which the Standard assigns an indicative permeability of more than 3m/day and allows less than 5% clay content. Under certain moisture and compaction conditions, such a material could make a superb base course for a road pavement and would be considered effectively "waterproof" with a permeability of less than 0.001m/day.

Similarly, soil structure assessed by visual inspection of pit walls and exposures may not be the same structure when the soil is cyclically exposed to saline effluent.

Hydraulic conductivity is easily measured *insitu* and when coupled with some (simple) laboratory testing to determine colloid stability (dispersion and swell potential) provides a high degree of certainty in hydraulic design.

Considering hydraulic conductivity singularly, we can conclude that on balance, the soils formed on all three geological formations at Waubra have hydraulic conductivities capable of sustainable effluent disposal via trenches and beds, albeit, requiring an evapotranspiration assist to a greater or lesser degree.

Colloid stability varied between non-dispersive (dispersion index 0) to slightly dispersive (dispersion index 8), however, shrink-swell potential can vary from negligible to high, regardless of the geological formation or topographic location.

There is no discernible correlation between dispersion and geology or slope. Highly swelling clays tend to correlate with basalt and gentle (sometimes depressed) terrain. All soils in the study area should be assumed to be dispersive, unless rigorous laboratory testing proves otherwise.

All disposal methods, regardless of effluent quality should apply colloid stabilisation in the form of gypsum.

1.3.1.3 Nutrient Uptake and Pathogen Attenuation. Several processes affect nitrogen levels within soil after application of effluent. Alternate periods of wetting and drying with the presence of organic matter promotes reduction to nitrogen gas (denitrification). Plant roots absorb nitrates at varying rates depending on the plant species, however nitrate is highly mobile, readily leached, and can enter groundwater via deep seepage and surface waters via overland flow and near-surface lateral flow.

To ensure complete attenuation of nitrogen, a nitrogen balance is used with conservative estimates of the nitrogen uptake by different plants. Sufficient trench area should be used to encourage wetting/drying cycles within the effluent field to stimulate microbial attenuation of nitrogen. Trench dosing would assist this process to occur.

Clay subsoils (as typical of the sub catchment) can fix large amounts of phosphorus and a phosphorus balance should not be required.

In this region, phosphorus is quickly sorbed by phosphorus-deficient clay soils. Phosphorus is released as orthophosphate which is readily sorbed by plant roots and soil grains. Phosphate does not move through soil unless the part of the soil it has contacted and where it is sorbed, becomes "saturated" with phosphate first (Gerritse,). Plant uptake of phosphorus in the effluent field will be greater than nitrogen uptake. Phosphate-rich effluent seeping through these soils will lose most of the phosphorus within a few metres.

A small amount of nitrogen, as nitrate, will inevitably reach the groundwater. However, this nitrogen from the effluent would be insignificant in the context of the nitrogen routinely applied in common farming practices in the vicinity and naturally produced by nitrogen-fixing plants.

Furthermore, the time taken for the effluent to reach surface waters (a minimum distance of, say, 40m) and assuming a prevailing hydraulic gradient of 1:500 and ksat of 1m/day[a], would be in the order of 50 years. For rare perched water flow in the topsoil materials (subsurface storm flow) the time taken for the effluent to reach surface waters (a minimum distance of, say, 40m) and assuming a prevailing hydraulic gradient (ground slope) of 1:10 and ksat of 0.5m/day[b], would be in the order of 2 years and assumes no evapotranspiration during this time. If during the summer season the upper soil profile dries out the hydraulic conductivity of the unsaturated soil decreases enormously, slowing down the seepage velocity to almost zero and causing the escaped effluent to be evapotranspired.

[a] A conservative value for basement materials.

[b] A conservative value for topsoil and slopewash gravels.

Pathogens entering a water supply can be harmful to humans, stock and the environment. There are a number of pathogenic organisms that can be present in effluent, of which the two most common are bacteria and viruses.

Bacterial source tracking (BST) has been used extensively in research to identify sources of riverine contamination. In regions with poorly located effluent treatment plants (mostly septic tanks), within multi-land use catchments, human effluent sources are reported as a contributor, along with livestock sources (Geary, 2003).

Bacteria are removed predominantly through filtration (87-88%) and partly by die-off (12-13%) (Pang et al., 2003). Filtration is a combination of attack from microscopic fauna and flora within the soil and adsorption onto soil particles. With a low application rate and high residence time in the soil, all bacteria are removed within a very short distance from the effluent source.

Determination of buffer distances to attenuate viruses is a function of "die-off" rates (or inactivation rates) of viruses and therefore retention time in soils, and adsorption rates of viruses in soil. Pang (2003) modelled removal rates for bacteria and viruses in a highly permeable (Ksat 172m/day) pumice sand soil. It was found that viruses are removed by filtration (55%), and by die off (45%). The main mechanism by which viruses are removed is therefore exposure to the maximum amount of soil (filtration media) and the maximum retention time in the soil to encourage die-off.

Underground flow is unlikely to pose a threat to the receiving waters, as with the maximum (overestimated) rate of flow of 0.05m/day[C] and an overestimated gradient of 10%, the time taken to travel the minimum setback distances to surface waters, (40m) is greater than 2 years. This is well beyond the maximum die-off rate for viruses, and does not take into account adsorption of viral matter onto soil particles, which is generally a greater factor in the removal of viruses (Pang et al., 2003).

1.4 LAND CAPABILITY ASPECTS OF THE WASTE WATER MANAGEMENT PLAN

1.4.1 General. The assessment has demonstrated that mappable units based on geology-slope-soil associations can be used in the Wastewater Management Plan.

Unlike the DPCD Guidelines: *Planning permit applications in potable, open water supply catchment areas* (November 2012), the WWMP needs to differentiate between trench disposal of septic effluent and pressure compensated subsurface irrigation of 20/30 (or better) standard effluent and between senescent and failed systems and new systems.

In addition the WWMP needs to consider the type of occupancy of each site. While septic, sand filter and reed bed systems can cope with intermittent occupancy, most AWTS require continuous operation for satisfactory performance.

Furthermore, the WWMP needs to differentiate between existing subdivisions and future applications.

1.4.2 Onsite System Selection and Risk. Onsite system selection needs to be appropriate to the risk and to potential cumulative impacts. While multiple septic trench systems can simultaneously fail (i.e. produce contaminated surface flows due to exceeding trench storage capacity) typically during periods of prolonged high and/or episodic rainfall, the same is not true of subsurface irrigation systems. In addition, it can be argued that there can be no cumulative effect if the provisions of *SEPP (Waters of Victoria)* are met.

Furthermore, except for gross negligence, reasonable operation and rudimentary maintenance would ensure that "failure" would be restricted to transient reductions in quality (secondary treatment) of effluent which would continue to be transferred to the subsoil. Potentially "dangerous" contaminated surface flow cannot occur while amelioration of contaminants (and this is also true for septic effluent) will continue over the extraordinarily large flow paths and travel times controlled by the regional/local hydraulic gradients

1.4.2.1 Low and Medium Risk Areas. For low and medium risk areas and for residential use, possible onsite systems could include septic effluent disposed via trench or wick trench and bed and AWTS, sand filter and reed bed with effluent disposed via pressure compensated subsurface irrigation or wick trench and bed. For intermittent use, possible onsite systems could include septic effluent disposed via trench or wick

[C] For a flow velocity of 0.5m/day, viruses showed a thousand fold reduction at a distance of 0.6m. For a flow velocity of 0.05m/day, viruses were not detected at a distance of 0.4m (Van de Graaff 1998).

trench and bed and sand filter and reed bed with effluent disposed via pressure compensated subsurface irrigation or wick trench and bed.

1.4.2.2 High Risk Areas. For high risk areas disposal of septic effluent via trench or wick trench and bed are unlikely to be appropriate.

For high risk areas and for residential use, possible onsite systems could include AWTS, sand filter and reed bed with effluent disposed via pressure compensated subsurface irrigation. For intermittent use, possible onsite systems could be sand filter and reed bed with effluent disposed via pressure compensated subsurface irrigation.

1.5 LAND CAPABILITY ASSESSMENT IN AREAS OF LOW, MEDIUM & HIGH RISK

The *Code* always requires a land capability assessment in a potable water supply catchment.

The assessment has demonstrated the rationale for land capability assessments of variable intensity for low, medium and high risk areas.

1.5.1 Land Capability Assessment for High Risk Areas. For high risk areas, the LCA needs to be a design document. It must include all 12 stages of the LCA process given in the *Code, Section 3.6.1.*

The LCA is to also include *insitu* permeability assessment (subject to the conditions given in the *Code, Section 3.6.1),* a feature survey of sufficient detail to enable the delineation of surface flow vectors and buffers, colloid stability, soil sodicity, soil reaction trend, electrical conductivity of all relevant soil horizons and assessment of any required soil amelioration.

1.5.2 Land Capability Assessment for Medium Risk Areas. For medium risk areas, the LCA must include all 12 stages of the LCA process given in the *Code, Section 3.6.1.*

The LCA is to also include *insitu* permeability assessment (subject to the conditions given in the *Code, Section 3.6.1).*

1.5.3 Land Capability Assessment for Low Risk Areas. For low risk areas, the LCA may be conducted by the Council's Environmental Health Officer. The LCA may be largely based on experience and knowledge of the satisfactory performance of onsite systems in the vicinity.

However, the EHO recommendations are to be considered an LCA (for the purposes of the *Code*) and the subsequent deviation from the *Code, Section 3.6.1* requirements will be the responsibility of the Council.

In addition, Council should be mindful that experienced EHOs retire and transfer and it cannot be guaranteed that the replacement has the necessary experience and local knowledge.

1.6 WAUBRA INFILL ALLOTMENTS

Nine undeveloped allotments in Kimberly Drive have been reviewed.

1.6.1 Land/Soil Risk Rating. Our preliminary risk assessment, based on land-soil risk (see Drawing Three) has revealed the following:

Lots 1, 5, 26, 31, 40 and 41 are low risk.

Lots 47 and 49 are medium risk.

Lot 14 is high risk.

1.6.2 Drainage Design Considerations. Prevention of run-on to any land application area (LAA) is a mandatory requirement of the Code.

Much of the Kimberly Drive area is characterised by long slopes of low and intermediate grade, with intermediate to deep (to 1.2m) silts and sands overlying clay subsoil.

Cut-off drains (socketed into the underlying, restrictive clays) are rational and effective up to about 600mm deep. These drains must discharge the intercepted seepage to the stormwater system.

For restrictive clay layers up to about 600mm deep, cut-off drains are required for all LAAs including irrigation, trenches and beds.

For restrictive clay layers deeper than about 600mm, cut-off drains are not rational and site LAA run-on protection could include a surface drain and bund. In this instance, we would recommend disposal be restricted to subsurface irrigation, regardless of Risk Rating.

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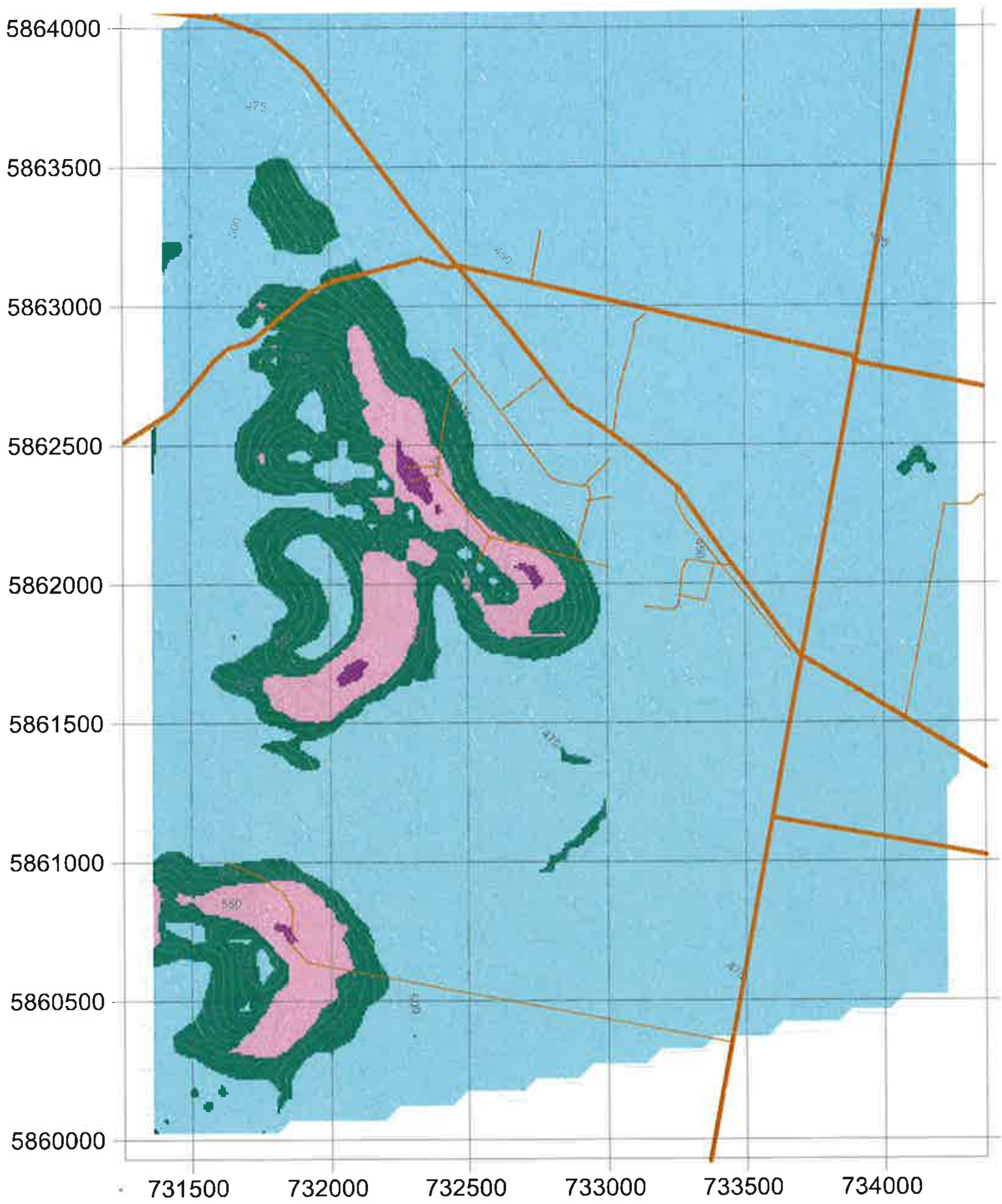

30+% SPECIAL DESIGN FOR SECONDARY TREATMENT & SUBSURFACE IRRIGATION

20%-30% LAA INCREASED BY 50% FOR SECONDARY TREATMENT & SUBSURFACE IRRIGATION

10%-20% LAA INCREASED BY 20% FOR SECONDARY TREATMENT & SUBSURFACE IRRIGATION

0%-10% PRACTICAL RANGE FOR PRIMARY TREATMENT & TRENCH SYSTEMS

PART WAUBRA SUBCATCHMENT - SLOPE		
PYRENEES SHIRE WASTE WATER MANAGEMENT PLAN		
PYRENEES SHIRE COUNCIL		
Scale: 1:25,000	Drawn: P.R.W.	Report Number: A140701
Contour Interval: 5m	Date: July 2014	Drawing Number: ONE

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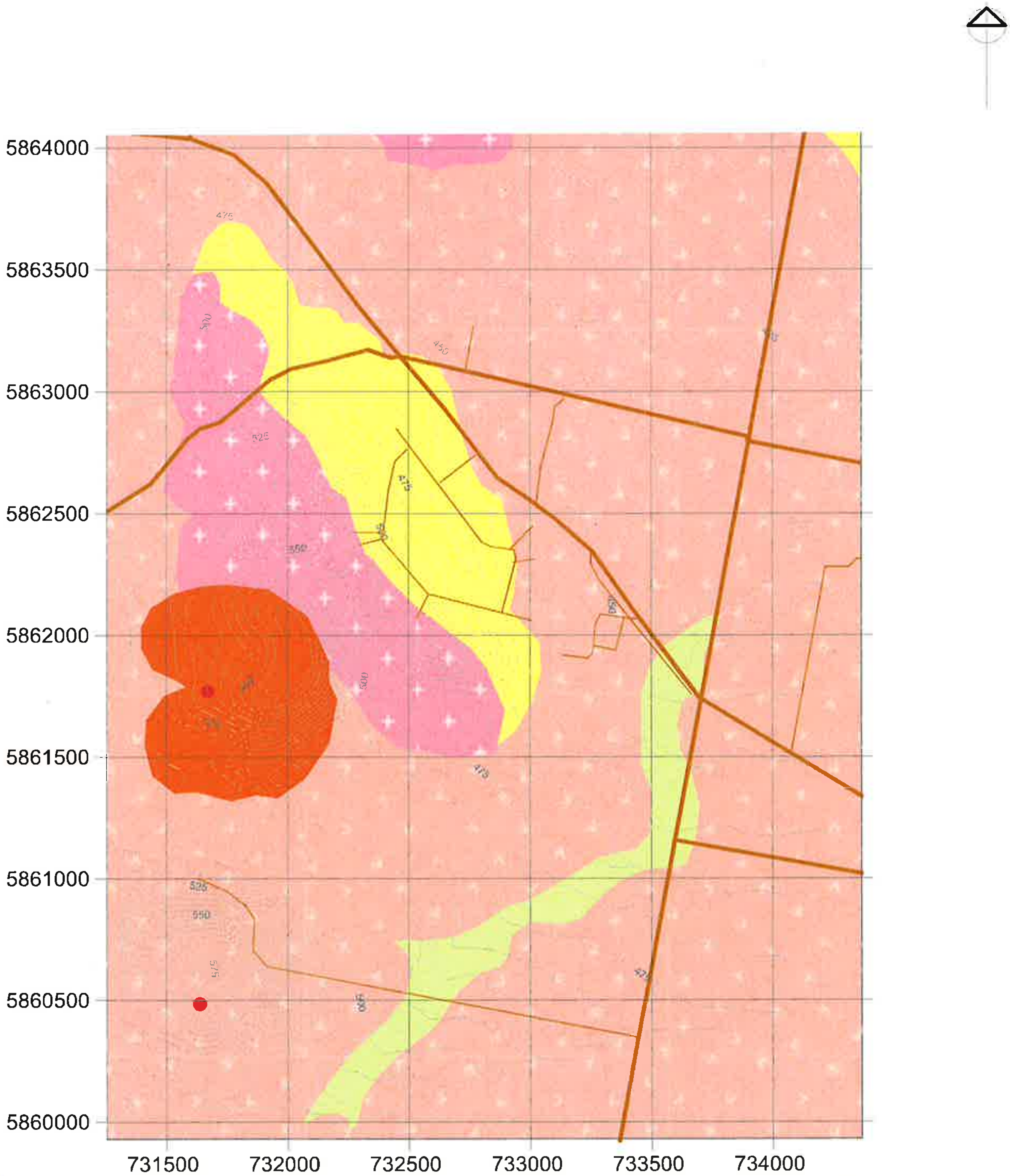


QUATERNARY ALLUVIUM: Duplex (silt/clay) soil profiles to 2m+, ksat range: 0.02 to 0.05, ground slopes to 10%.

QUATERNARY COLLUVIUM: Duplex (silt/clay) soil profiles (often gravelly), 1 to 2m+, ksat range: 0.03 to 0.2, ground slopes <10% to 30%

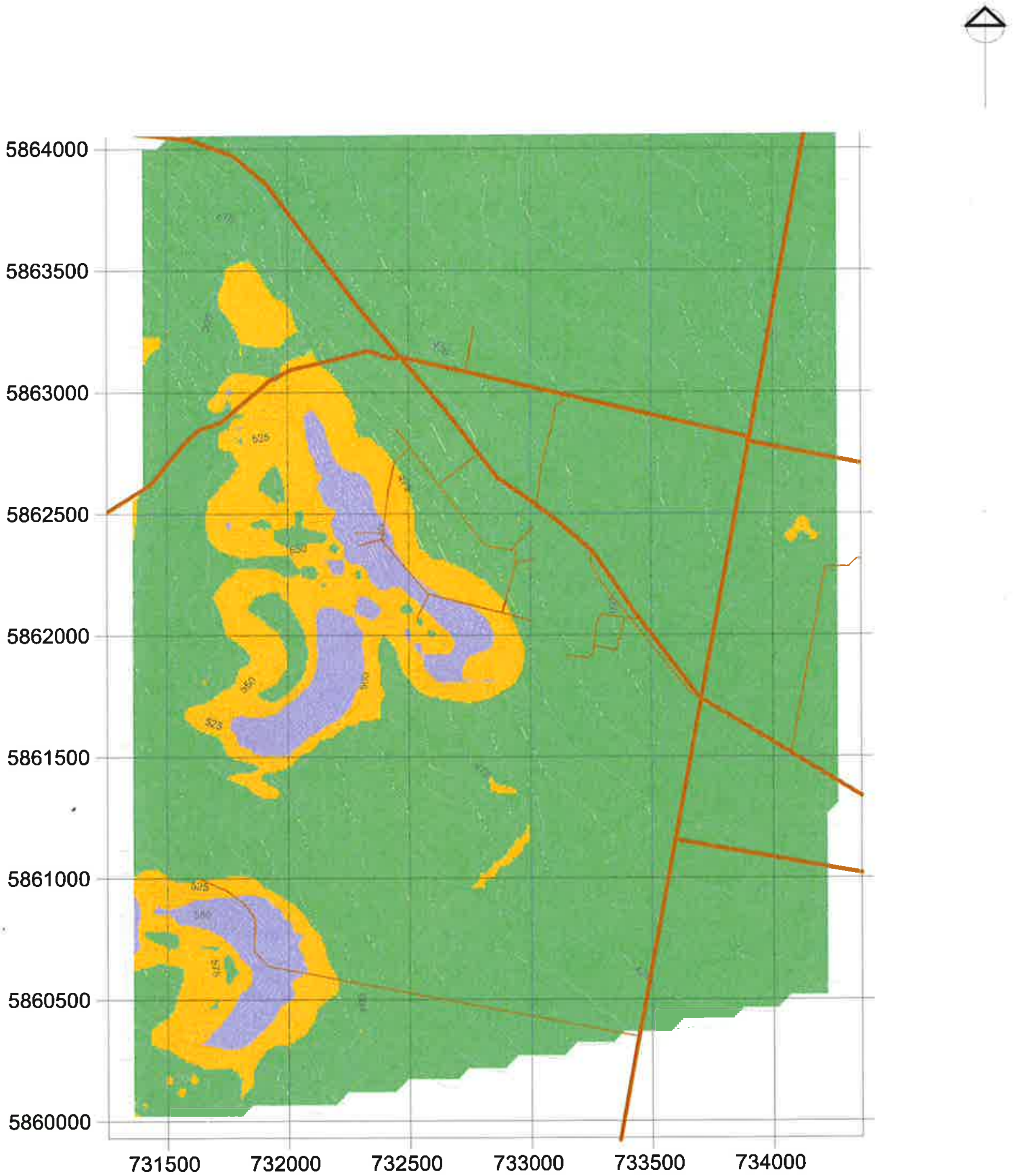
QUATERNARY BASALT: Duplex (silt/clay) soil profiles, 0.3 to 1.5m, ksat range: highly variable, ground slopes mainly <10%, locally to 30%.

QUATERNARY PYROCLASTICS: Duplex (silt/clay) soil profiles (often gravelly), <0.5 to 1.5m, ksat range: <0.03 to 0.2, ground slopes to 30%.

DEVONIAN GRANITE: Duplex (silt/clay) soil profiles (often gravelly), 0.1 to 1.5m, ksat range: 0.03 to 0.06, ground slopes 10% to >30%.

PART WAUBRA SUBCATCHMENT - GEOLOGY/SOILS		
PYRENEES SHIRE WASTE WATER MANAGEMENT PLAN		
PYRENEES SHIRE COUNCIL		
Scale: 1:25,000	Drawn: P.R.W.	Report Number: A140701
Contour Interval: 5m	Date: July 2014	Drawing Number: TWO

Paul Williams & Associates Pty Ltd



LOW RISK: R=1 (Alluvial and residual soils, ground slopes to 5%).

MEDIUM RISK: R=2 (Residual and colluvial soils, ground slopes to 10%).

HIGH RISK: R=3 (Residual, some colluvial soils, ground slopes >10%).

PART WAUBRA SUBCATCHMENT - LAND/SOIL RISK		
PYRENEES SHIRE WASTE WATER MANAGEMENT PLAN		
PYRENEES SHIRE COUNCIL		
Scale: 1:25,000	Drawn: P.R.W.	Report Number: A140701
Contour Interval: 5m	Date: July 2014	Drawing Number: THREE

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APPENDIX 5

Septic inspection record form

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Fax: 03 5349 2068
E-mail: pyrenees@pyrenees.vic.gov.au

ENVIRONMENTAL HEALTH UNIT 0500

DOMESTIC WASTE WATER SYSTEM - MANAGEMENT/INSPECTION REPORT

Site:

Location/address:		
Property details: C.A.	**Section**	**Parish**
Lot No. PS/LP		
Septic tank permit number:	**When installed:**	
Property number:		

Owner:

System type and brand name:

Septic tank: All waste/Split system	
Aerated wastewater Treatment Plant	
Worm farm(all waste composting)	
Composting system separate greywater	
Other	

EPA CA number:

Method of effluent treatment/disposal:

Absorption drains/transpiration bed	
Sand filter	
Mound system	
Sub-surface irrigation	
Surface irrigation	
Reed bed	
Disinfection: YES/NO	
Other:	

NOTES:

Subject to S.173 Agreement ?	**YES /NO**
Off-site disposal?	**YES / NO**
Last desludged (approx.) ?	

RECOMMENDATIONS:

Environmental Health Officer
Date / /

APPENDIX 6

Example information flyer – Managing your septic tank

2. Maintenance Checklist Cont'

- Ensure that only suitably trained persons work on the system.
- Check sludge level, pumps and alarms regularly.
- Arrange for an inspection of the system, at least annually.
- Pump-out the tank in accordance with the permit conditions.

3. Indications of Failing Systems

Indications of failing systems may include:

- Seepage break-out at the end of trench lines;
- A lush green growth at the end of trench lines or down slope of trench lines;
- Inspection pits or trench lines consistently exhibiting high water levels;
- Trench lines that fill following storms;
- General waterlogging about the land application area;
- Presence of dead and dying vegetation (often native vegetation) about (particularly below) land application areas;
- A pungent odour about the tank and land application area;
- Fixtures blocked and wastewater overflowing from the relief point;
- Failure to comply with the certificate of approval, or septic tank permit effluent quality requirements;
- High sludge levels within the primary tank (within about 150mm of inlet pipe, or obstructing the flow through the mid baffle); and
- A scum surface layer that is blocking outflow.

For more information on on-site waste water management go to the Environment Protection Authority website—www.epa.vic.gov.au

Or contact Council's Environmental Health Officer

Phone : 5349 1100

Fax:: 5349 2068

Email: Pyrenees@pyrenees.vic.gov.au

PYRENEES SHIRE

MANAGING YOUR SEPTIC TANK

Pyrenees Shire
5 Lawrence Street
Beaufort Victoria 3373
Phone: 5349 2000

MANAGING YOUR SEPTIC TANK

If you occupy a house that is not connected to the main sewer, then it is likely that your property contains an on-site sewage management system. If this is so, then you have a special and legal responsibility to ensure that it is working properly.

The most common form of on-site sewage management system is a septic tank system consisting of a holding tank with a below ground system of absorption trenches for effluent disposal.

The following information has been prepared to assist householders in the proper care, operation and maintenance of septic tank systems and to provide some indications of system failure.

It is important that you read and take note of this information as poorly maintained systems can significantly affect you and your family's health as well as the local environment, and can shorten the effective life of your system.

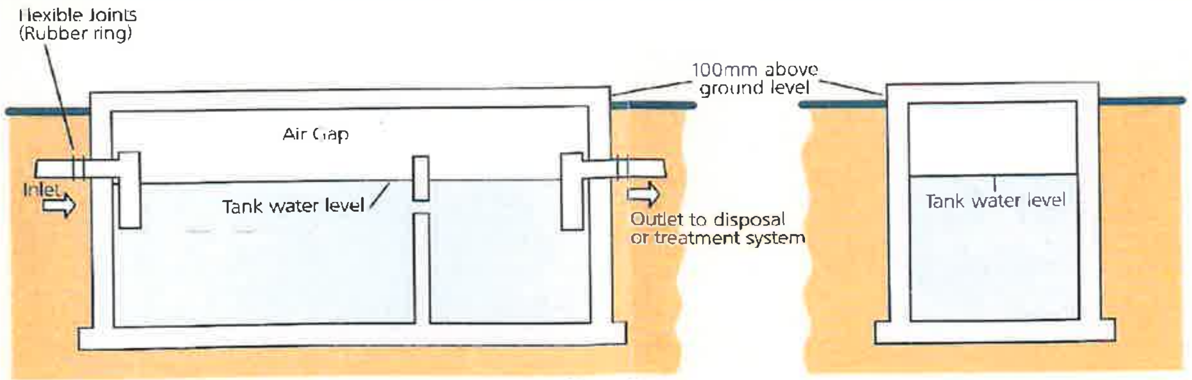
1. Care and operation of Septic Tanks

- Restrict the use of germicides (such as strong detergents, disinfectants, toilet cleaners and bleaches), as they will kill the bacteria which makes the septic work.
- Use soapy water to clean toilets and other fixtures.
- Use only detergents that have low alkaline salts and chlorine levels.
- Use of proprietary or chemical additives is not recommended at any time for septic systems—except for lime used as outlined above.
- Do not flush sanitary napkins or disposable nappies down the system. Minimise the amounts of oil and fat flushed into the system.
- Use a sink strainer to restrict food scraps entering the septic system. Do not use garbage disposal units.
- Odours may occur on installation or after addition of large quantity of germicide. If this happens, flush a cup of lime down the toilet each day until odours abate.

Septic Tanks (pictured below)

Septic tanks have two compartments and treat both greywater and blackwater, but they provide only limited treatment through the settling of solids and the flotation of fats and greases.

Bacteria in the tank physically break down solids over a period of time. Wastewater that has been treated in a septic tank can only be applied to land through a below soil absorbtion system, as the effluent is too contaminated for above ground or near surface irrigation.

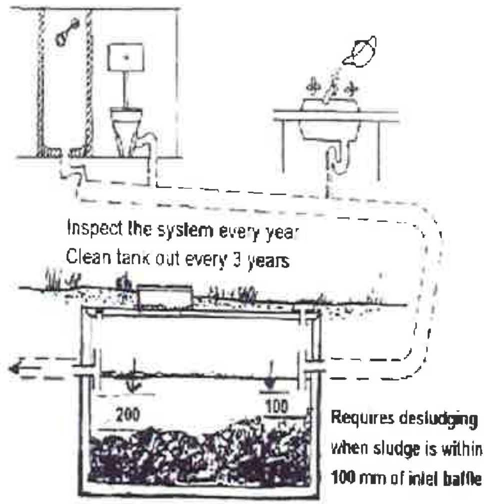


1. Care and operation of Septic Tanks Cont'

- Fill tank with water to reduce odours on start up or after de-sludging tanks. They should not be washed or disinfected after de-sludging.
- Ensure the tank and disposal field are not built over or disturbed.
- Inspect the system at least annually and desludge the tank at least once every three years, or as otherwise directed by Council.

2. Maintenance Checklist

- Keep a record of all maintenance (including tank pump-outs and the location of the system, tank inspection and access openings) and send copies of the maintenance reports to the local council in accordance with the septic tank permit and Certificate of Approval.
- Do not add to or alter any part of your system without council approval.



All dimensions are in millimetres.

APPENDIX 7

Edis Algorithm and table used in the assessment of individual site risk

Major Factors Influencing the Likelihood of Consequential Impacts of a Proposed On-Site Wastewater Management System (Risk rating for values of individual site factors (R)

Risk Factor	**Low**	**Medium**	**High**
Distance to Reservoir	15 km	2-15 km	< 2 km
Soil type rating *	1	2	3
Distance to river	> 80 m	40- 80 m	< 40 m
Distance to stream	> 80 m	40- 80 m	< 40 m
Distance to drain	> 40 m	10 – 40 m	< 10 m
Lot size	> 10 ha	2 – 10 ha	0.2 – 2 ha
Density (houses/km2)	< 20 /km2	20 – 40 / km2	> 40 / km2
LCA rating	1 – 2	2 – 3	3 - 4
System fail rate **	< 5 %	5 – 10 %	> 10 %

Source: *Approaches for Risk Analysis of Development with On-site Wastewater Disposal in Open, Potable Water Catchments (Dr Robert Edis, April 2014)*

	Low (1)	**Medium (2)**	**High (3)**
Soil type	Chromosois Ferrosols Dermosols	Vertosols Kurosols Kandosols Rudosols	Anthoposols Organosois Podosois Hyrdrosois Sodosois Calcarosols Tenosols

Edis Algorithm weights the following risk factors based on their potential impact on a potable water catchment:

$$(R_n) = (R_{\text{Distance to reservoir/offtake point}} + R_{\text{Soil type rating}}) \times (R_{\text{Distance to river}} + R_{\text{Distance to stream}} + R_{\text{Distance to drain}} + R_{\text{Lot size}}) + (2 \times R_{\text{LCA}}) + (3 \times R_{\text{System fail rate}} \times R_{\text{Density}})) / 10$$

The overall risk rating for an individual site is based on the following algorithm value:

- **Low Risk individual site rating**: An Rn value less than 2.5
- **Moderate Risk individual site rating**: An Rn value of 2.5 – 5
- **High Risk individual site rating**: An Rn value greater than 5.

Source: *Mansfield Shire Domestic wastewater management plan pilot project (Mansfield Shire Council 2014)*