Government of Western Australia
Department of Health

Assessment of Site-and-Soil Evaluation Reports

74th WA State Environmental Health Conference
Masterclass

Natalia Ramswell

Environmental Health Directorate

24 February 2021

better health ▪ better care ▪ better value

Timeline

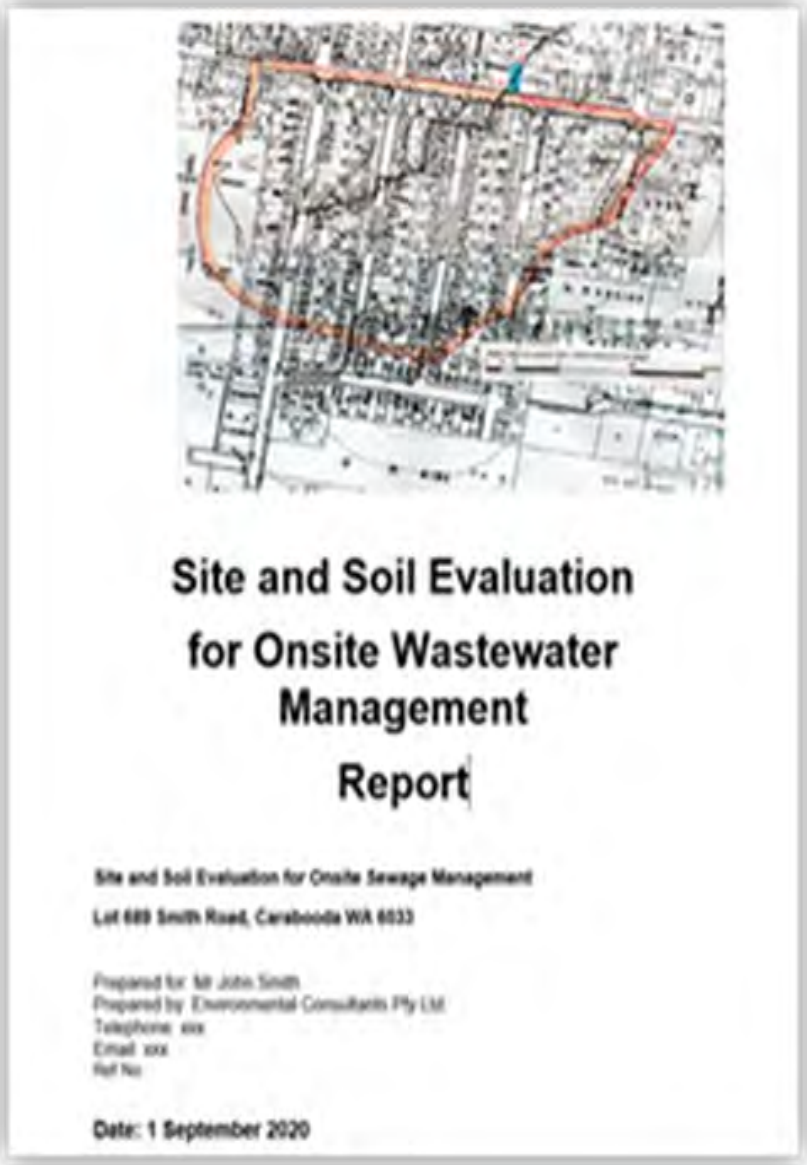
Time	Topic	Presenters
1:00-2:00	Site and Soil Evaluation requirements: legislation, policy, Australian Standard and guidance material	**Natalia Ramswell**
2:00-2:45	Wastewater system design	**Jared Chong**
2:45-3:00	Afternoon tea	
3:00-3:30	Assessment of SSE repots (practical exercise)	**In groups**
3:30-4:00	Findings and recommendations by each group	**Group representative**
4:00-4:20	Case studies from Shire of Mundaring	**Martin Shurlock**
4:20-4:40	Case studies from Shire of Serpentine Jarrahdale	**Matt Sargeson**
4:40-4:45	Discussion	**Participants & Presenters**

Overview

- What is Site-and-soil evaluation(SSE) report?
- SSE regulatory requirements
- SSE requirements of Government Sewerage Policy 2019
- SSE procedure of AS/NZS 1547:2012
- SSE guidance material:
  - Guidance note
  - Template
  - Water Balance spreadsheet
  - Checklist

What is Site-and-soil evaluation?

- A written report that details the results of an assessment of a development, subdivision or individual lot for public health, environmental, legal and economic factors which are likely to affect the siting and design of an on-site wastewater system.
- **It is NOT a Geotechnical report** prepared in accordance with:
  - *AS 1726:2017 Geotechnical site investigation* or
  - *AS 2870-2011 Residential Slabs and Footings*



Site-and-soil evaluation

AS/NZS 1547:2012

- SSE is based on the risk management framework of AS1547
- SSE required in early stage of the planning phase.
- SSE Report submitted to LG and DOH with all unsewered WAPC applications.
- Innovative onsite systems and private service providers are encouraged.
- Shift from waste disposal to land irrigation/garden watering

Who should undertake a SSE?

AS/NZS 1547:2012

Individual landowners or developers are responsible for engaging a suitably qualified and experienced professional to undertake an SSE for unsewered developments and subdivisions.

SSE regulatory requirements

Planning and Development proposals

Government Sewerage Policy

(Planning and Development Act 2005)

SSE required for most unsewered proposals as per **AS/NZS 1547**

Application to install a wastewater system

Regulations 1974

(Health (MP) Act 1911)

SSE required for large commercial applications as per **AS/NZS 1547**

Proposed Wastewater Regulations

(Public Health Act 2016)

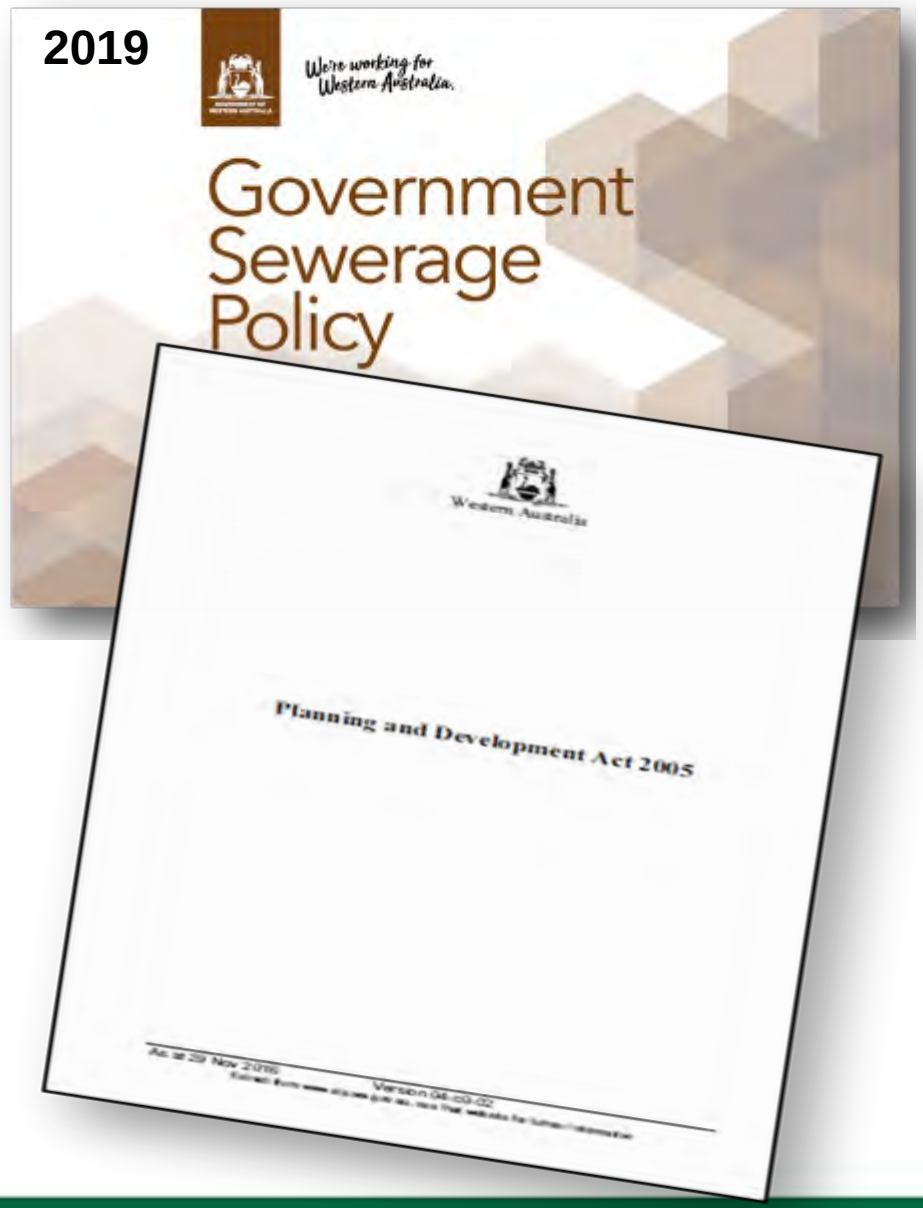
Almost for all applications

When is a SSE required?

Stages in Planning Process	Possible Scales	Level of Assessment	Purpose
Sub-regional/district plans and local planning strategies	• catchment-wide (prepared by multiple adjoining LGAs) • one LGA • part of an LGA	• broad SSE to determine areas which are most favourable for new developments • desktop analysis based on soil landscape maps, GIS (geographic information systems), reports, studies and local knowledge • representative testing of different soil landscape types (if necessary)	• determine broad suitability for onsite sewage management • review practicability of sewered versus unsewered option for wastewater management • eliminate areas not suitable for onsite sewage management or where technological solutions are cost prohibitive or ecologically unsustainable • review LGA's capability to monitor onsite sewage management • evaluating environmental and public health risks
Rezoning and local structure plan	• one LGA • part of an LGA • specific site	• detailed SSE for site-specific rezoning	• determine minimum lot sizes • identify appropriate treatment technologies and onsite sewage management system (e.g. disposal, reuse) • establish performance standards/criteria • define onsite sewage management locations • determine management and monitoring options
Subdivision	• specific site	• detailed SSE if not done at the earlier planning stage	• determine appropriate density • select and size treatment/onsite sewage management system • Identify management and monitoring options
Development	• individual lot	• detailed SSE if not done at the earlier planning stage	• design precise treatment/onsite sewage management system • Implement management and monitoring options

Government Sewerage Policy 2019

- The Policy was developed by the DPLH with input from DOH and DWER;
- Administered by DPLH in accordance with the planning legislative framework (Planning and Development Act 2005)
- Multi-agency involvement- WAPC referrals to LG, DOH, DWER and other agencies;
- The DPLH is the final decision making agency for any WAPC submission.



Policy Application

- Only applies to planning proposals
- **Does not apply to:**
  - building applications
  - subdivision applications for lots >4 hectares
  - development applications for:
    - a single house on a single lot
    - rural use
  - applications to install an on-site wastewater system but if any conditions are imposed at early stage of development (e.g. subdivision, DA) it will be considered at this stage

Challenges

- Multi-agency and cross-disciplinary decision making process
- Financial implications of innovation
- Nutrient Retentive System requirements
- Inconsistency between the Policy and the Regulations 1974
- Innovation comes with greater responsibility on Government to:
  - determine the wastewater system that is appropriate for development
  - monitor/audit performance and maintenance of innovative systems which require ongoing maintenance

Points to consider when assessing SSE:

- **Section 5.1.1 (7)** – where land is being rezoned for the creation of lots less than one (1) hectare and the highest groundwater level is less than 0.5m below the natural ground level – connect to sewer is required
- Consider LG's ability to manage the ongoing supervision of the maintenance of nutrient retentive STS before supporting any subdivision.
- Highest known (seasonal) water table based on historic data from nearby bores or site assessment in wettest time of the year to at least 2m
- Separation from groundwater:

Discharge point of the on-site wastewater system to the highest known groundwater level:	
• PDWSA	2.0
• Sewage sensitive areas	1.5
• All other areas -	
o Sands	1.5
o Gravels	1.0
o Loams and heavy soils	0.6

- Separation from water resources, inundation/flooding in 10%AEP, stormwater controls, drainage management, amount of fill required
- Setback distance to Hardpan or bedrock is min 0.6m
- Consider total wastewater volume including trade waste
- Size of LAA determined based on Schedule 2 of GSP
- Location, profile depth and adequate number of soil tests

GSP requirements for on-site wastewater systems

- Installation of Secondary Treatment System (STS)
- Installation of STS with nutrient retentive capability in some instances.
- This is required by DWER and enforced by DPLH
- Contact these agencies for further information and advice on whether Aerated Wastewater Treatment Systems (AWTS) can be used instead of STS.

Difference between STS and AWTS (knows as ATUs)

- **Secondary treatment systems** (STS) produce treated effluent of secondary standard, must be certified to the latest Australian Standard **AS 1546.3:2017**, and approved by the CHO.
- **Aerated Wastewater Treatment Systems** (AWTS) uses the processes of aeration followed by clarification to achieve biological treatment of wastewater, are certified to the previous Australian Standard **AS 1546.3:2008**, and must be approved by the CHO.
- All new STS and AWTS systems without a current certification are required to be certified to AS 1546.3:2017.
- List of approved STS and AWTS is available on DOH website

Determination of LAA

AS/NZS 1547:2012

SCHEDULE 2:
Site requirements for on-site sewage systems

1 Minimum lot sizes for residential development in heavy soils

Table 1: Minimum lot sizes for residential development serviced by on-site sewage disposal in heavy soils located outside public drinking water source areas and sewage sensitive areas outside of Perth Metropolitan and Peel Region Scheme Areas.

Soil category[5]	Soil texture	Minimum lot sizes m² (R-code)[6]	
		Primary treatment	Secondary treatment
4	Clay loams	2,000 (R5)	1,000 (R10)
5	Light clays	4,000 (R2.5)	1,000 (R10)
6	Medium to heavy clay	Special design requirements and distribution techniques or soil modification procedures will be necessary. Refer to Table L1 of AZ/NZS 1547 for more details.	2,000 (R5)
-	Rock	Special design requirements and distribution techniques or soil modification procedures will be necessary.	

Refer to section 5.2 for minimum lot sizes in public drinking water source areas and sewage sensitive areas.

[5] Soil categories, extrapolated from Table 5.1 AS/NZS 1547, are to be determined by undertaking a site and soil evaluation (SSE) as per *AS/NZS 1547 On-site domestic wastewater management*.

[6] Minimum lot sizes are based upon area required to accommodate dwelling, primary on-site sewage system, land application areas and associated setback distances.

2 Determination of land application area (m²)

The size of the land application area should be determined in accordance with the conversion factors prescribed in Table 2 and *AS/NZS 1547 On-site domestic wastewater management* as follows:

1. Estimate hydraulic load (L/day):
   - occupancy rate (persons) x design loading rate (L/person/day)
2. Calculate land application area (m²):
   - hydraulic load (L/day) x conversion factor from Table 2

Table 2: Conversion factors to calculate the minimum required land application area for subdivision/ development (conversion factors are determined using a hydraulic load of 1 L/day.

Soil category	Soil texture	Conversion factors	
		Primary treatment	Secondary treatment
1	Gravels and sands	0.377	0.2
2	Sandy loams	0.377	0.2
3	Loams	0.477	0.25
4	Clay loams	0.689	0.286
5	Light clays	1.284	0.333
6	Medium to heavy clays	Special design requirements and distribution techniques or soil modification procedures will be necessary	0.5

State Government of Western Australia – September 2019

LAA for a single house

AS/NZS 1547:2012

3 Land application areas for single houses

Table 3: Land application areas for a single house (occupancy of 6 persons in a 5 bedroom house)

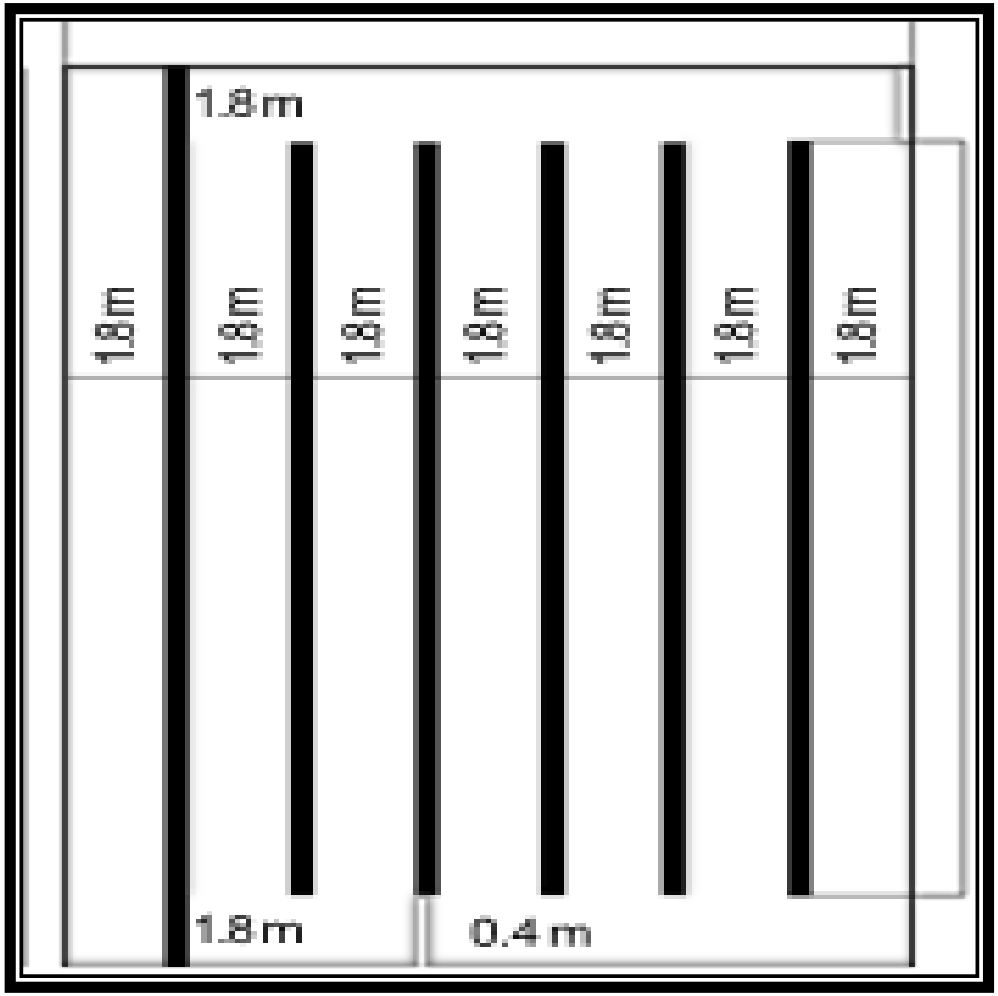
Soil category	Soil texture	Land application area (m^2)[7]	
		Primary treatment (includes area required for setbacks)	Secondary treatment (excludes setbacks)
1	Gravels and sands	339	180
2	Sandy loams	339	180
3	Loams	429	225
4	Clay loams	620	257
5	Light clays	1,156	300
6	Medium to heavy clays	Special design	450

This table may be used to inform residential subdivision applications. It is based upon Table 2. Different sized areas may be required at development or building stage in response to anticipated hydraulic load.

A sample calculation for determining the land application area for a primary treatment system in Soil Categories 1 and 2 is provided in the Explanatory Notes.

[7] The land application area has been determined using design loading rates for trenches and beds, extrapolated from Table L1 *AZ/NZS 1547 On-site domestic wastewater management*. Calculations used a hydraulic loading of 900litres/day, which is based on the occupancy of 6 persons in a 5 bedroom house and a sewage design flow of 150L/person/day. Values for primary treatment include setback distances. Note that values for secondary treatment exclude setback distances, which will vary depending on the system used.

LAA for primary treatment with setback distances



Calculation: 900L/d / 20mm/d / 0.4m (width of the standard concrete leach drain 400mm) = 112.5= 6 drains x 18.75m long
Length of the LLA: 18.75m + 2 x 1.8m (setback under Regs 1974) = 22.35m
Width of LAA= 0.4m (width of each drain) x 6 + 1.8m x 5 =3.6m + 9m =15m
22.35m x 15m = 335.25m
Total LAA=335sqm

Site-and-soil evaluation procedure

AS/NZS 1547:2012

1. Desktop study
2. Comprehensive an onsite and surrounding area field check
   - Topography, slope, services, identify potential health/environmental constraints, define land-application area, delineate exclusion area, soil permeability, etc
3. Detailed site and soil assessment
   - Determine site and soil characteristic
   - Identify and describe the level of constraint presented by each site and soil characteristic and provide the mitigation measures when required.

SSE guidance material

- Guidance note
- SSE Report Template
- Checklist
- Water Balance spreadsheet

Assessment of SSE Reports

- Site and Soil Evaluation for Onsite Wastewater Management Report Template - provides consistency and guidance
- Checklist is based on SSE template structure

Section 1- Introduction

SSE report template

- Competency of SSE evaluator:
  - an appropriate tertiary-level qualification; or
  - specific knowledge and practical experience of soil science, in particular soil hydrological and soil chemical processes.
    - technical expertise and experience including skills in the interpretation of site, soil and climate conditions, undertaking water and nutrient balances, selection and design of appropriate wastewater treatment systems, disposal and reuse options, and other relevant skills.
- Purpose of SSE
  - Support subdivision application or
  - Support Application to Install a wastewater system

Section 2–Site and development description

SSE report template

- Estimation of anticipated wastewater volume including sewage and trade waste
- Description of the development

Development Characteristic	Description		
Site Address			
Owner/Developer			
Postal Address			
Contact for SSE	Ph:	Mob:	Email:
Date of field work			
Local Government			
Zoning			
Lot size/s			
Proposal			
Water Supply			
Availability of Sewer			
Development located within:	Public drinking water source area ☐		Sewage Sensitive Areas ☐
Anticipated Wastewater Volume	Sewage (L)		Trade waste (L)

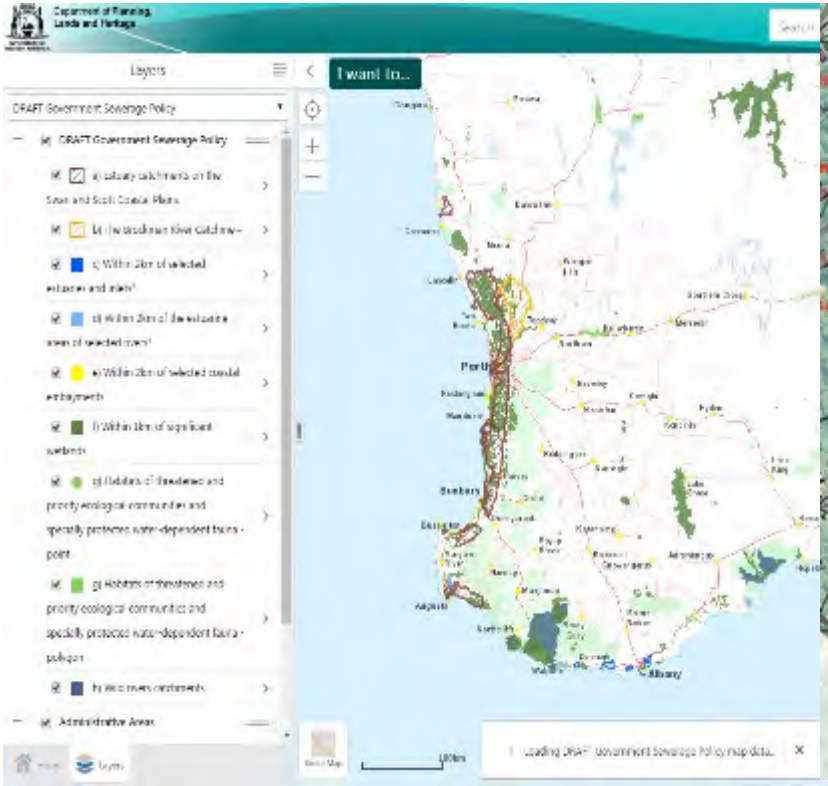
PDWSA and SSA

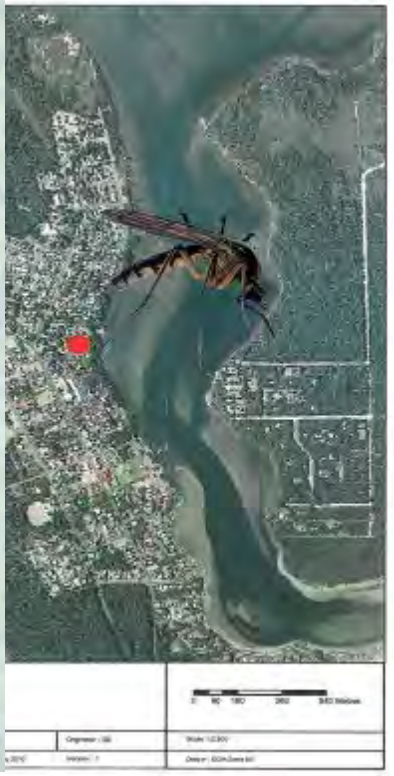
- The location of SSA's can be found on the Department of Planning, Lands and Heritage website. Mapping is indicative:

https://espatial.dplh.wa.gov.au/planwa/Index.html?viewer=planwa&layertheme=Government%20Sewerage%20Policy&run=ActivateLayerList

- The location of Public Drinking Water Sources areas can be found at:

https://data.gov.au/ or contact DWER for more details.





Section 3 - Site and Soil Assessment

SSE report template

- Defining the key characteristics of the site and soils
- Use risk based approach to identify level of constraint and assign adequate mitigation measure:
  - ***Nil or Low:*** *If all constraints are Low, standard designs are generally satisfactory and no mitigation measures are required.*
  - ***Moderate:*** *For each Moderate constraint an appropriate mitigation measure or design modification over and above that of a standard design, should be outlined.*
  - ***High:*** *Any High constraint might prove an impediment to successful on-site wastewater management, or alternatively will require in-depth investigation and incorporation of sophisticated mitigation measures in the design to permit compliant onsite wastewater management.*
- Example of key site characteristics outlined in Table 2

Soil Assessment

AS/NZS 1547:2012

- Review published soil and geological information
- On site at least 3 test pits for single lot development and at least 1 test pit per lot for subdivision.
- Profile depth is at least 1.5m (2m in PDWSAs) below LAA
- Assessment of soil physical characteristics- soil drainage, structure, texture & permeability
- Assessment of soil chemical characteristics
- Soil permeability test as per AS/NZS 1547:2012 -Constant Head Test
- Determine soil category and DIR/DLR

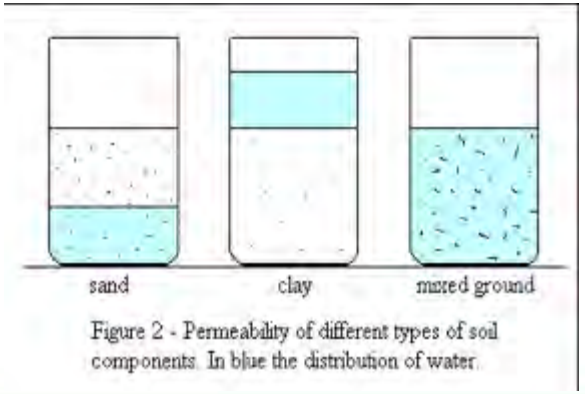


Figure 2 - Permeability of different types of soil components. In blue the distribution of water.

Determination of soil category

AS/NZS 1547:2012

TABLE 5.1
DETERMINATION OF SOIL CATEGORY

Soil category (see Notes 1 and 2)	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d) (see Note 2)
1	Gravels and sands	Structureless (Massive)	> 3.0
2	Sandy loams	Weakly structured	> 3.0
		Massive	1.4 – 3.0
3	Loams	High/moderate structured	1.5 – 3.0
		Weakly structured or massive	0.5 – 1.5
4	Clay loams	High/moderate structured	0.5 – 1.5
		Weakly structured	0.12 – 0.5
		Massive	0.06 – 0.12
5 (Note 3)	Light clays	Strongly structured	0.12 – 0.5
		Moderately structured	0.06 – 0.12
		Weakly structured or massive	< 0.06
6 (Note 3)	Medium to heavy clays	Strongly structured	0.06 – 0.5
		Moderately structured	< 0.06
		Weakly structured or massive	< 0.06

Soil categories and DIR/DLR

TABLE 5.2
SOIL CATEGORIES AND RECOMMENDED DESIGN IRRIGATION/LOADING RATES (DIR/DLR) FOR LAND-APPLICATION SYSTEMS

Soil Category	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds (see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds (basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	> 3.0	(see Note 1 of Table L1 for DLR values)			(see Note 4 of Table L1)	5 (see Note 2 of Table M1)	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	> 3.0						4	24
			1.4 – 3.0	15	25	50				
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5 – 1.5	10	15	30				16
4	Clay loams	High/ moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
		Weakly structured	0.12 – 0.5	6	10	20	8			8
		Massive	0.06 – 0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see Note 4 of Table M1)	8
		Moderately structured	0.06 – 0.12	(see Notes 2 and 3 of Table L1)	5	10	5 (see Notes 2, 3, and 5 of Table L1)			(see Note to Table N1)
		Weakly structured or massive	< 0.06			8				
6	Medium to heavy clays	Strongly structured	0.06 – 0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	< 0.06							
		Weakly structured or massive	< 0.06							

Risk Assessment of Site Characteristics- Table 6

SSE report template

Table 6: Risk Assessment of Site Characteristics

Characteristic	Level of Constraint			Assessed Level of Constraint for Site
	Nil or Low	Moderate	High	
General Characteristics				
Climate (difference between average annual rainfall and average pan evaporation, mm/year)	Excess of evaporation over rainfall in the wettest months	Rainfall approximates to evaporation	Excess of rainfall over evaporation in the wettest months	
Exposure to sun and wind	Full sun and/or high wind or minimal shading and North / North-East / North-West aspect	Dappled light East / West / South-East / South-West aspect	Limited patches of light and little wind to heavily shaded all day and South aspect	
Vegetation coverage over the site	Plentiful vegetation with healthy growth and good potential for nutrient uptake Turf or pasture	Limited variety of vegetation	Sparse vegetation or no vegetation, dense forest with little understorey	
Landslip (or landslip potential)	Nil	Low to moderate	High or Severe	
Slope Form (affects water shedding ability)	Hill crests, convex or divergent side-slopes and plains	Straight side-slopes and footslopes	Floodplains, concave or convergent side-slopes and incised channels	
Site Drainage (qualitative)	No visible signs or likelihood of dampness, even in wet season	Some signs or likelihood of dampness Moist soil but no standing water in soil pit.	Wet soil, moisture-loving plants, standing water in pit; water ponding on surface	

Section 4- Wastewater system type and design

SSE report template

- Depending on the purpose of the SSE:
  - **General assessment**: type of wastewater system and size of LAA based on Schedule 2 of the GSP are required;
  - **Specific assessment**: detailed design specifications, sizing and management recommendations required
- Setback distances – APPENDIX 1
- Stormwater Management
- Water Balance Excel spreadsheet is available for detailed assessment and Appendix 5 for the southwest of WA

APPENDIX 5 - Number of months each year when rainfall exceeds pan-evaporation in the southern part of WA

Section 5 - Monitoring, operation and maintenance

SSE report template

- This section is for a Specific assessment SSE when system design is provided
- However when recommendation is made to install STS or any other systems with ongoing monitoring and servicing, these requirements should be outlined in this section

Section 6 – Conclusion and Recommendations

SSE report template

- Written in plain English so that the landowner is able to understand and act on the recommendations.
- The relationship between the assessment and the recommended must be outlined and clearly explained.
- Location and size of LAA is identified and shown on the site plan.
- Justification of the design procedure should be provided.

ATTACHMENTS

SSE report template

- Locality plan with indicative distances to water resources.
- Fully dimensioned and accurately scaled plan of the proposal, including lots sizes, contours at a sufficient interval to justify system design, the location of the proposed building envelope and other development works, wastewater management system components, location and size of LAA, physical site features, cut off drains and setback distances etc.
- Photographs of the site and soil test location including a log, GPS coordinates and site plan showing the location of soil sample sites.
- Soil Bore Logs, colour photo of each test site and a diagram of the soil profile from onsite test sites.
- Proposed onsite wastewater system design.
- Water Balance calculation.

Thank you ☺

Questions?

Natalia.Ramswell@health.wa.gov.au

Government of Western Australia
Department of Health

Wastewater Management System Type and Design

EHA Conference 2021

Jared Chong
Environmental Health Directorate
24 February 2021

Overview

- Section 4.1 General Assessment SSE – Selection and design of the system
  - Application of AS1547 to Site and Soil Evaluation (SSE) Report under Government Sewerage Policy (GSP) 2019

- Section 4.2 Specific Assessment SSE – Sizing for treatment system and land application area
  - AS1547 to supplement *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regs 1974* for application to install an Onsite Wastewater System (OWS) – in particular for commercial

General Assessment – Selection and design of the system

- Where GSP is applied, onsite wastewater management needs to be designed to address the GSP, particularly Section 5 and Schedule 2.
- SSE in accordance to AS1547 (Section 5.3.1)
- Address the sizing of land application areas, groundwater clearances and setback requirements

For Example:

- Sewage Sensitive Area
  - Secondary Treatment Systems with nutrient removal generally required, and
  - 1.5m of separation between discharge point and highest groundwater level
- Residential design loading rate: 150L/person/day
- Land Application Area: hydraulic load (L/day) x conversion factor from Table 2

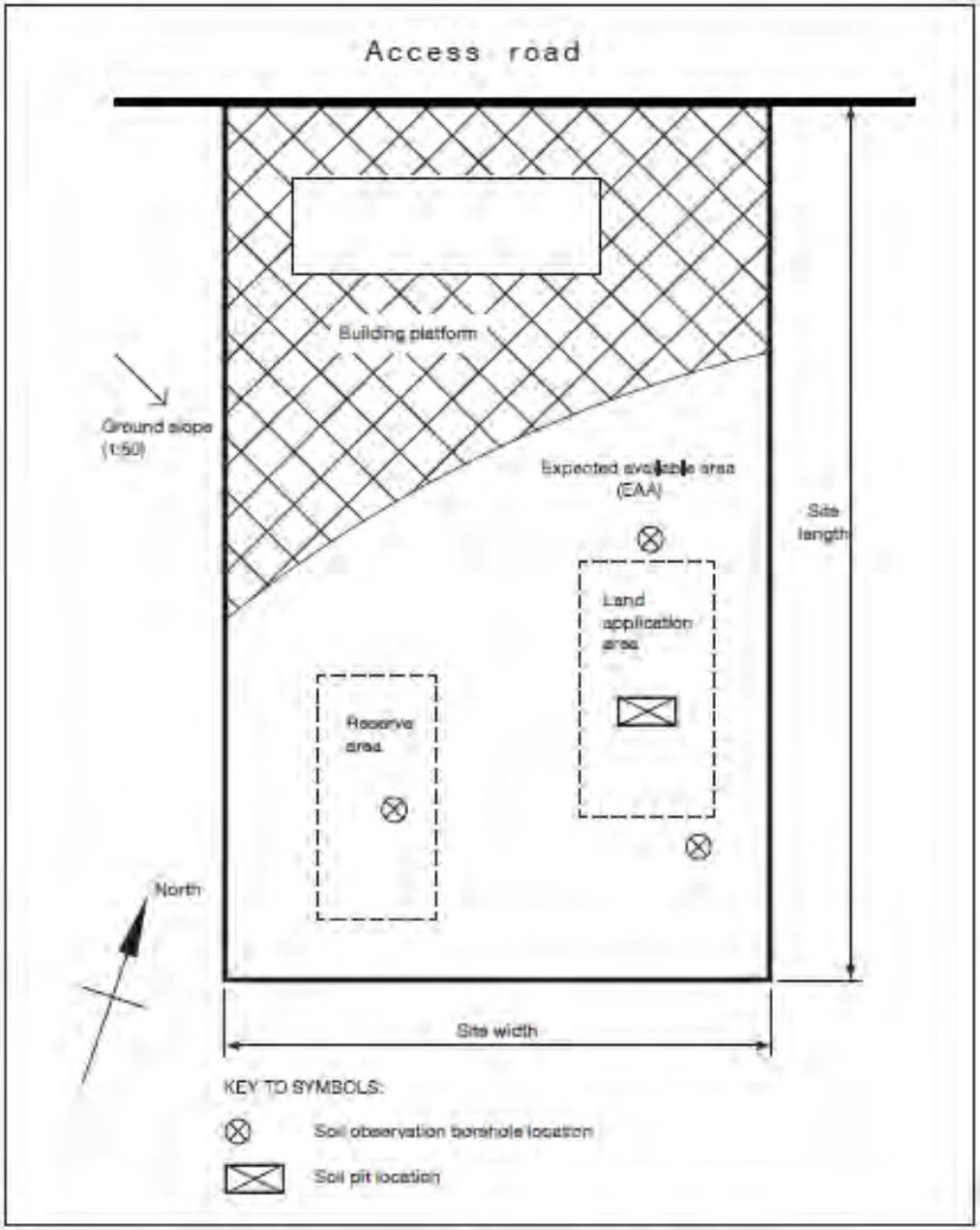
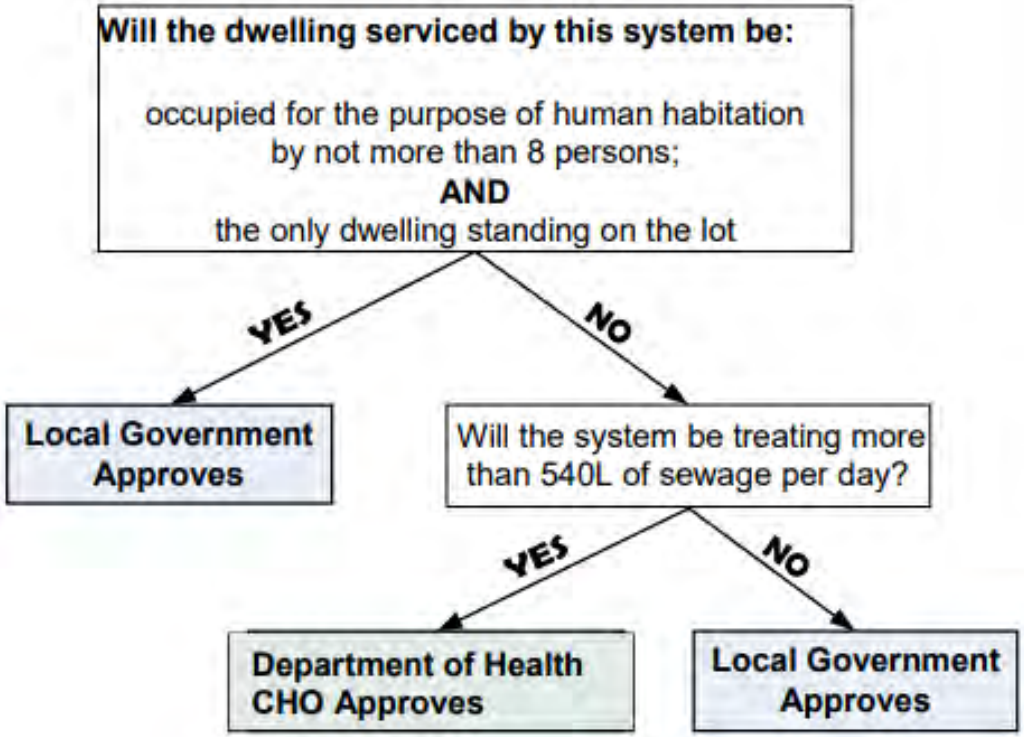
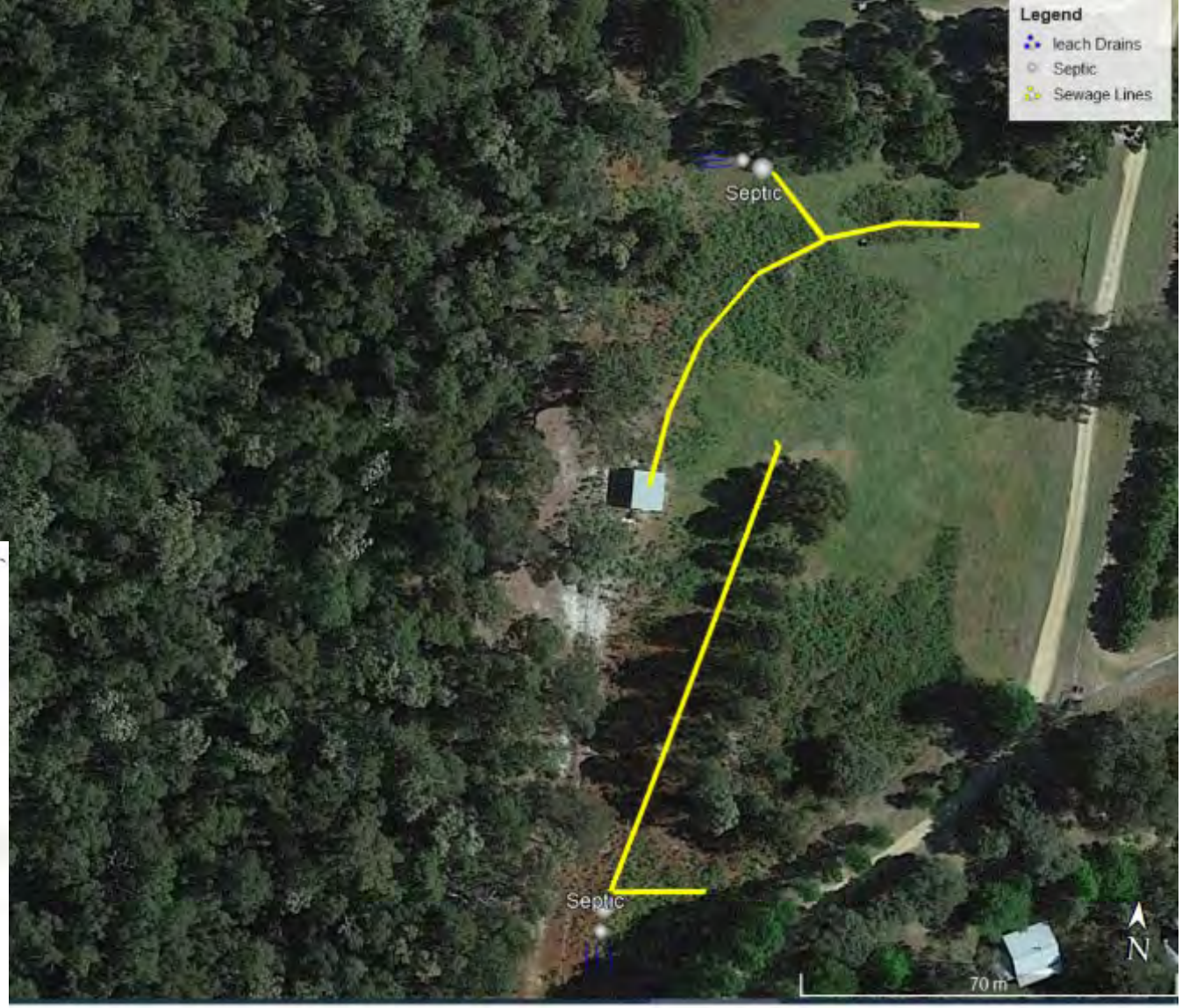


FIGURE D1 SITE PLAN – INDIVIDUAL LOT – EXAMPLE

Specific Assessment – Application to install an Onsite Wastewater System (OWS)



Scaled Drawing



APPLICATION TO CONSTRUCT OR INSTALL AN APPARATUS FOR THE TREATMENT OF SEWAGE

1. Application Details

Read the application instructions in Appendix 1 before filling in this form.
Referring to Figure 1 in the Appendix 1, this is an application to the:

☑ Local Government → Proceed to Section 2

☑ Executive Director of Public Health → Receipt number required for the payment of $38.50 BEFORE this application is forwarded to the Department of Health WA. Refer to Appendix 2 for payment instructions.

Receipt Number for the payment of $38.50: 58835125608
Note: Applications without a receipt number will be returned to applicant.

Complete Section 2 AND Section 3

2. Location of System

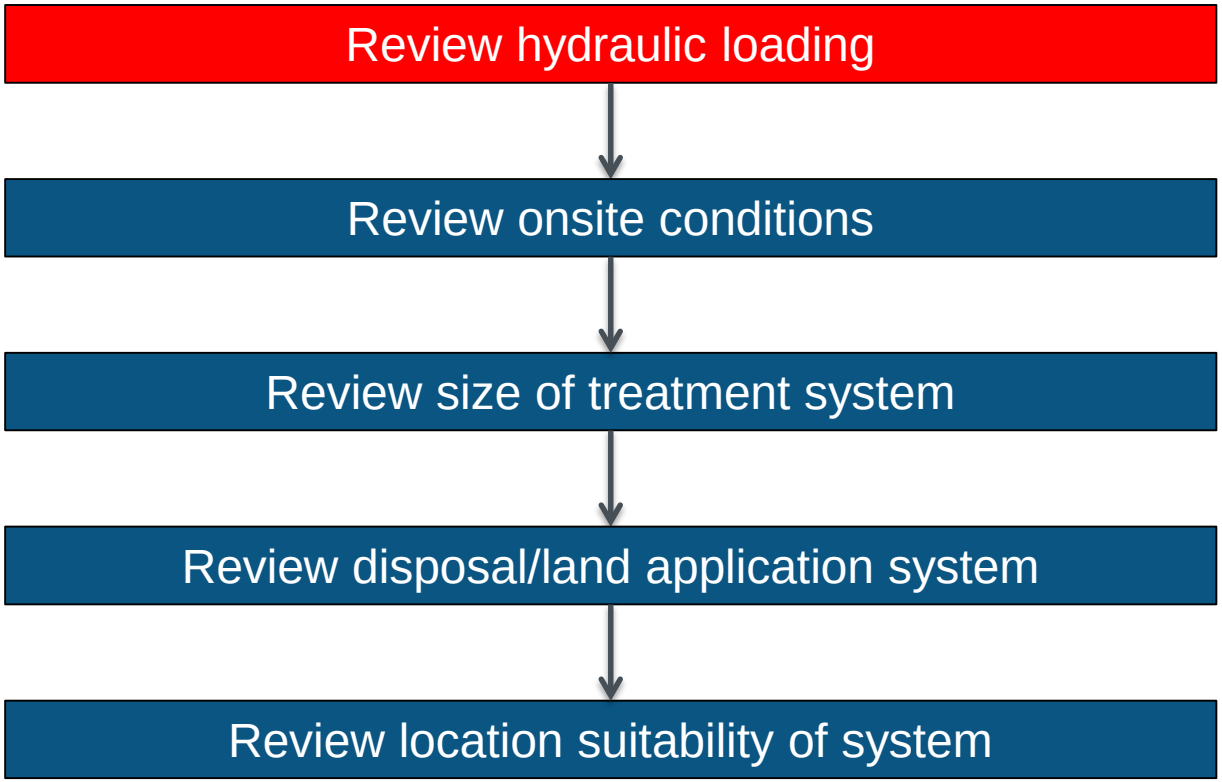
Lot Number	[redacted]	House Number	[redacted]
Street Name	Vasse Hwy		
Town or Suburb	Pemberton		
Nearest cross road	Spencer rd (not a cross road)		
Local Government (City/Town/Shire)	Nannup		
Minesite (include Minesite name, GPS coordinates and Adit location)			

3. Owner / Applicant Details

Owner's Name	[redacted]		
Applicant's Name	[redacted]		
Applicant's Postal Address	[redacted]		
Suburb	Pemberton	Postcode	6260
Applicant's Phone Number	[redacted]		
Applicant's Email Address	[redacted]		

Proceed to Section 4

Assessment Process



Determine Hydraulic Loading

- Domestic house up to 5 bedrooms – Schedule 9

Number of bedrooms	Volume of wastewater (litres)	
	Blackwater system	Combined system (blackwater and greywater)
2 or less	188	564
3	254	761
4 or more	276	829

- Domestic house with ≥6 bedrooms:
  - LG to determine maximum occupancy.
  - AS1547: 150L/person/day.
- Commercial premises
  - Regulation 29
  - Supplement to Regulation 29

Type of premises	Blackwater system litres	Combined system litres
Hotel	90	180
Motel	70	140
School (boarding)	70	140
School (day)	30	45
Public building (frequent use)	15	30
Public building (infrequent use)	5	10
Caravan park	90	140
Swimming pool	10	15
Drive-in theatres (2 persons per car)	10	10
Factories and shops (based on the number of persons therein on any 8 hour shift)	45	70
Construction camps (temporary)	25	45
Clubs	10	15
Clubs (licensed)	25	35

Supplement to Regs 29

Type of premises (Regulation 29)	Equivalent Use	Combined Flow (L/person/day)
Caravan Parks	3 persons / caravan park bay	140
	2 persons / tent site	140
	Park homes / chalets / Standard short-stay holiday houses 2 or less bedrooms/dwelling 3 bedrooms/dwelling 4 or more bedrooms/dwelling	 564/dwelling 761/dwelling 829/dwelling
	Large short-stay holiday houses (>6 persons) / Eco-tourism accommodation facilities	140
Swimming Pool		15
Drive-in theatres	2 persons per car	10
Factories & shops (an 8 hour day)	Bakery Staff Café staff Caravan park staff member (not living onsite Gym (with showers) Health centre patients (using shower facilities) Office staff (using shower facilities) Restaurant staff Warehouse staff Workshop staff	70
Construction camps (temporary)		45
Clubs	Men's shed	15
Clubs (licensed)		35

Commercial premises waste

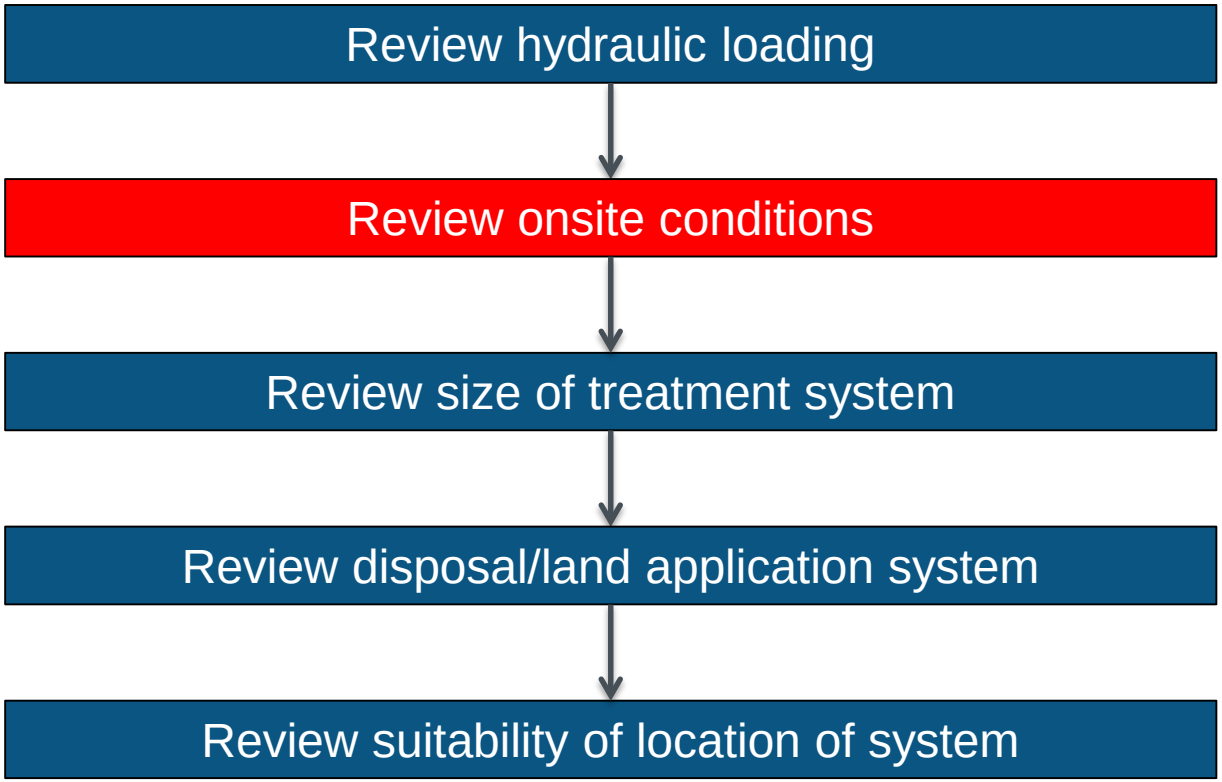
Table 3: Commercial / industrial waste hydraulic loading rates

Wastewater Source	Examples	Activity	Total Flow (L/day)
Food premises / food production	Cafés, Restaurants, Bakeries and the like.	Wastewater generated from cooking and food production operations (eg. takeaway food preparation, offsite catering food preparation, equipment and floor wash down) - excludes personal hygiene and loading for sit in customers.	Refer to Note 1
Commercial waste streams	Winery Brewery Abattoir	Bottle rinsing Wash down Processing	System must be separate and not combined with any human waste stream. Refer to Note 1
Non-human waste systems	Washdown bays Carwash Dog kennels Horse stables	Washdown	

Note:
1) System owner to propose wastewater / liquid waste hydraulic loading. Hydraulic loading must be based on peak flow events. The following controls will be implemented:

- Metering of wastewater / liquid waste volumes produced
- System owner to ensure the maximum capacity of the system is not exceeded

Assessment Process



Assessment Tools

Assessment Tools Links	Information
Water Corporation ESInet	Provides information of Water Corporation's sewerage infrastructure, contours, drainage,
Department of planning, Lands and Heritage's (DPLH) Map Viewer	Sewage Sensitive Areas Planning, land and heritage information
Western Australia Floodplain Mapping	Flooding Map – 1 in 100 (1%) annual exceedance probability flood event
Department of Primary Industries and Regional Development (DPIRD) Natural Resource Information	Public Drinking Water Source Areas, hydrography, hydrology, hydrographic catchments Soil-Landscape Mapping Soil-Land Qualities – Site Drainage Potential, Waterlogging and Inundation Risk, Flood Hazard
Google Maps Google Earth	Site location, aerial and street, view, historical aerial view
Department of Water and Environmental Regulations	Public Drinking Water Source Areas Perth Groundwater Map Public Drinking Water Source Area Mapping Tool Floodplain Mapping Tool

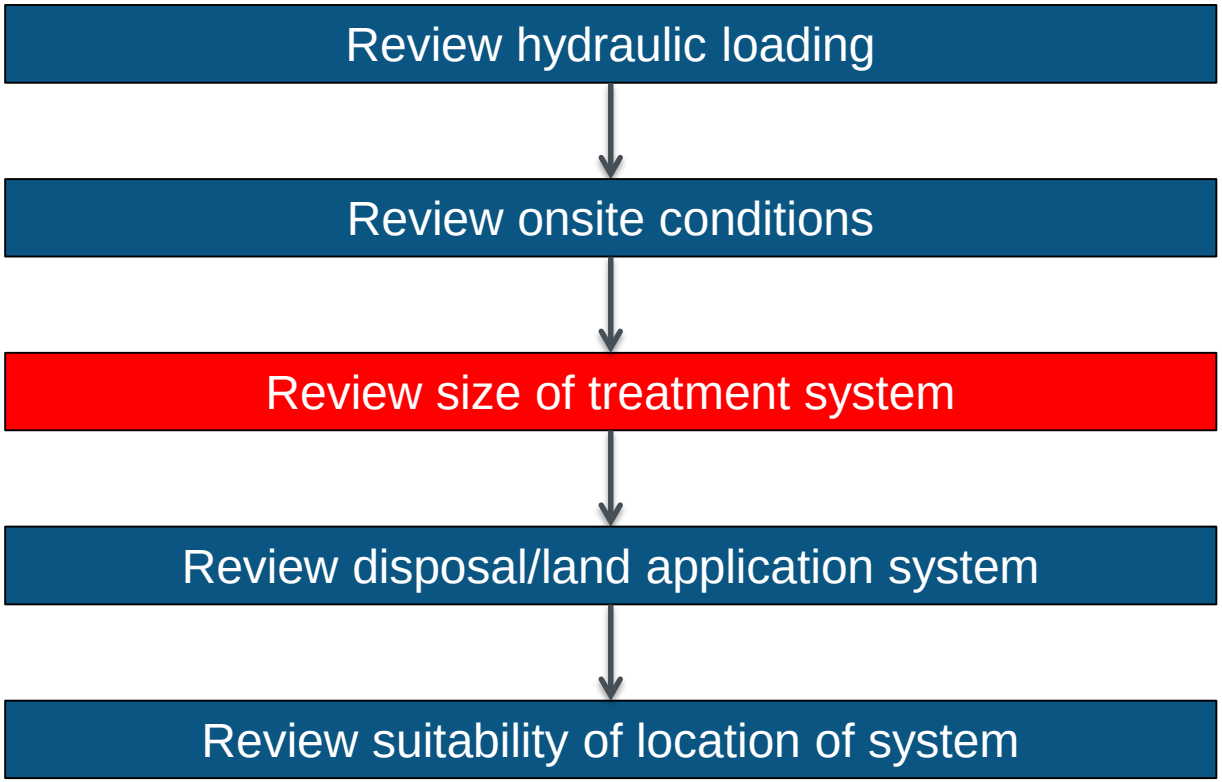
Onsite Conditions

- Site and Soil Evaluation
- Soil type, texture and permeability
- Groundwater
- Contours and slopes
  - Stormwater
- AS1547: Table D1

TABLE D1
SITE ASSESSMENT FACTORS – INDIVIDUAL LOT

Site factor	Minimum investigation	Method
Slope	Measure over 20 m slope length	Inclinometer or Abney level
Shape	Concave, convex or planar	Visual assessment
Shape	Divergence/convergence	Visual assessment
Aspect	Note direction slope faces	Compass
Exposure (sun, wind)	Exposure assessment – identify on site plan	See E2
Erosion, mass movements, land slip	Note location and details on site plan	Visual assessment and aerial photo inspection
Boulders, rock outcrops	Note location on site plan	Visual assessment
Vegetation	Record type on site-and-soil evaluation form Record cover area on site plan	Visual assessment and sampling if necessary for subsequent identification of species
Watercourse	Note locations of standing water and watercourses including flow direction on site plan Locate ephemeral flow paths and flow direction	Visual assessment
Soil water regime	Frequency and duration of seasonal shallow waterlogging (perched water tables) Depth to permanent dry weather groundwater table	Anecdotal information from landholders; monitoring boreholes if available in locality; soil profile inspection determination of mottling; any available records of groundwater tables
Fill	Note location, depth and type on the site plan	From inspection of soil pits
Run-on/flooding	Note location of run-off producing or flood prone areas on site plan	Examine site for flood debris and silt deposits; visual assessment of topography of adjacent upslope areas
Channelled (concentrated) run-off	Note location of areas on site plan and those which produce concentrated run-off towards neighbouring properties	Visual assessment of site topography
Soil surface condition	Note cracks, hardness, previous compaction, dampness, and the location of seepage areas	Inspection of topsoil with hand tools and by visual appearance
Salinity	Record salt tolerant vegetation, bare ground, or presence of salt crystals on surface	Visual assessment
Other site-specific factors	As per site-and-soil evaluation form	See Figure D3

Assessment Process



Treatment System - Performance

- Sufficient capacity to receive and treat all wastewater from premises
- Produce effluent suitable for land application system
- Avoid the likelihood of creating unpleasant odours, or the accumulation of offensive matter

Treatment Systems

1. Primary Treatment system – Septic Tanks
2. Secondary Treatment systems
   - AS1546.3: 2017 certified
   - Aerated Wastewater Treatment Systems – AS1546.3: 2008 certified – superseded, phased out soon.
   - Wastewater Treatment Plants
   - Waste Stabilisation Ponds
3. Other Systems
   - Alternative Systems (DoH Website)
   - Greywater Diversion/Treatment System
   - Waterless Toilets

Sizing Primary Treatment system – Septic Tanks

- Residential Premises – Regs 28

Table

Type of tank	Number of bedrooms	Liquid capacity (litres)
Septic tank serving water closets and urinals only	5 or less	1 820
	more than 5	1 360 plus 90 litres per bedroom
Septic tank treating all wastes	5 or less	3 180
	more than 5	1 820 plus 270 litres per bedroom

Typical 1500mm & 1200mm Septic tanks

- Commercial Premises – Regs 29
- Total Volume of Septic Tank
  - Total Volume = Hydraulic Loading (L) + 1820L
  - Primary tank/chamber: 2/3 x Total Volume
  - Secondary tank/chamber: 1/3 x Total Volume

Sizing of Secondary Treatment Systems

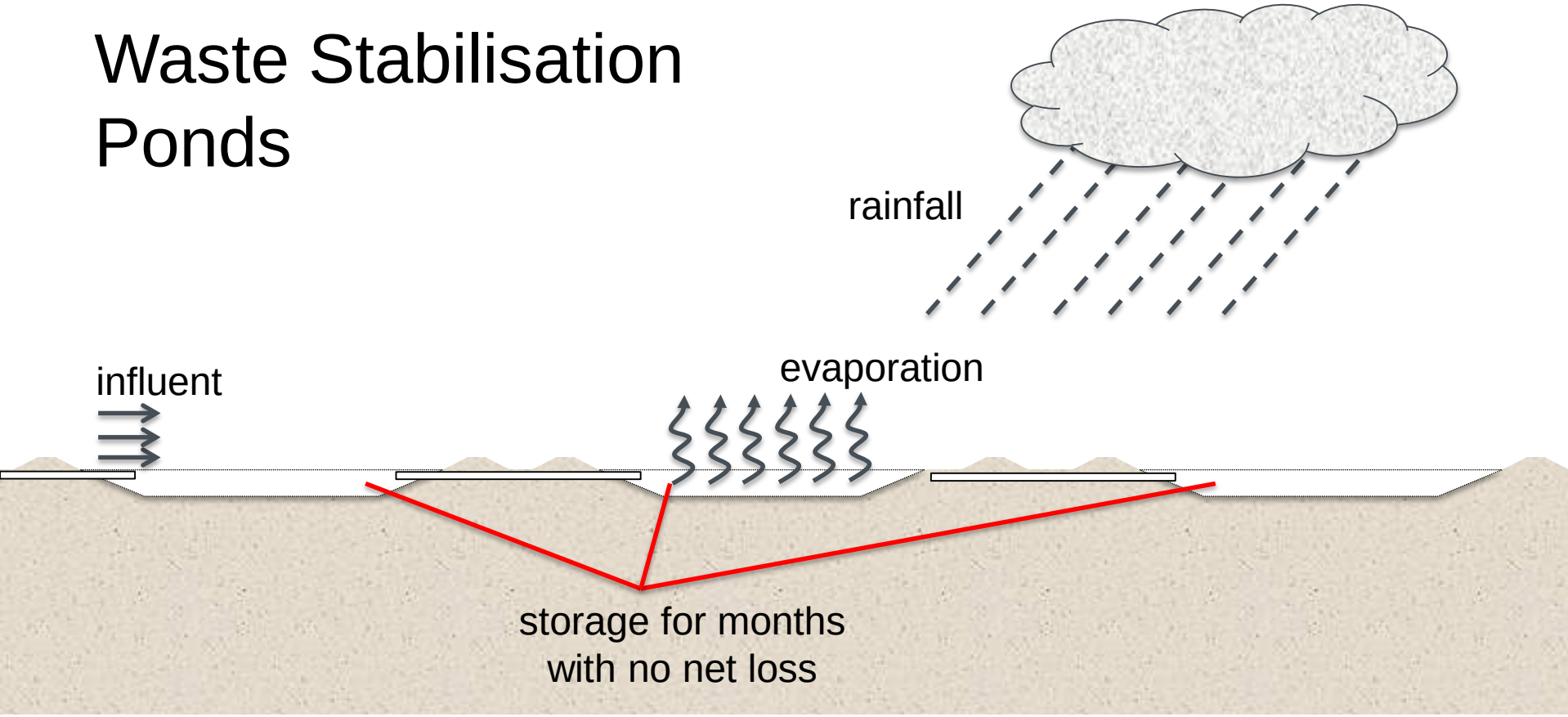
- Check hydraulic loading is within capacity.

Manufacturer / Distributor	Model	Capacity	Comment / Restrictions	Approval Expiry Date
Allied Pumps (external site) Phone: 9350 1000 / 1800 447 777 Email: sales@alliedpumps.com.au	Everhard Aqua-Nova 2000 Model 80100	1800L/day	Aerated Wastewater Treatment System certified to AS1546.3:2008	Global Certification (external site) No. 077 16/02/2022
	Aquarius O–3	1800L/day	Aerated Wastewater Treatment System with Ozone disinfection and Alum dosing. Nutrient reduction capability: N reduced to <10mg/L. & P reduced to < 1mg/L as per certification SMKH21519 to AS1546.3:2008	
Aquarius Wastewater Systems Pty Ltd (external site) Phone: 9240 8545 Email:admin@aquariuswastewater.com.au	Aquarius O–2	1800L/day	Aerated Wastewater Treatment System without disinfection and Alum dosing certified to AS1546.3:2008.	SMKH21519 25/03/2026

Sizing of Wastewater Treatment Plants

- Engineering certification required (Refer DoH Website for details)
  - Hydraulic capacity: Peak and Off-peak
  - Influent / Effluent quality
  - Structural design
  - Serviceable life years (minimum of 15 years)
  - Other documents:
    - Indemnity insurance
    - Proof of Australian accreditation
- Check hydraulic loading is within WWTPs capacity.

Waste Stabilisation Ponds

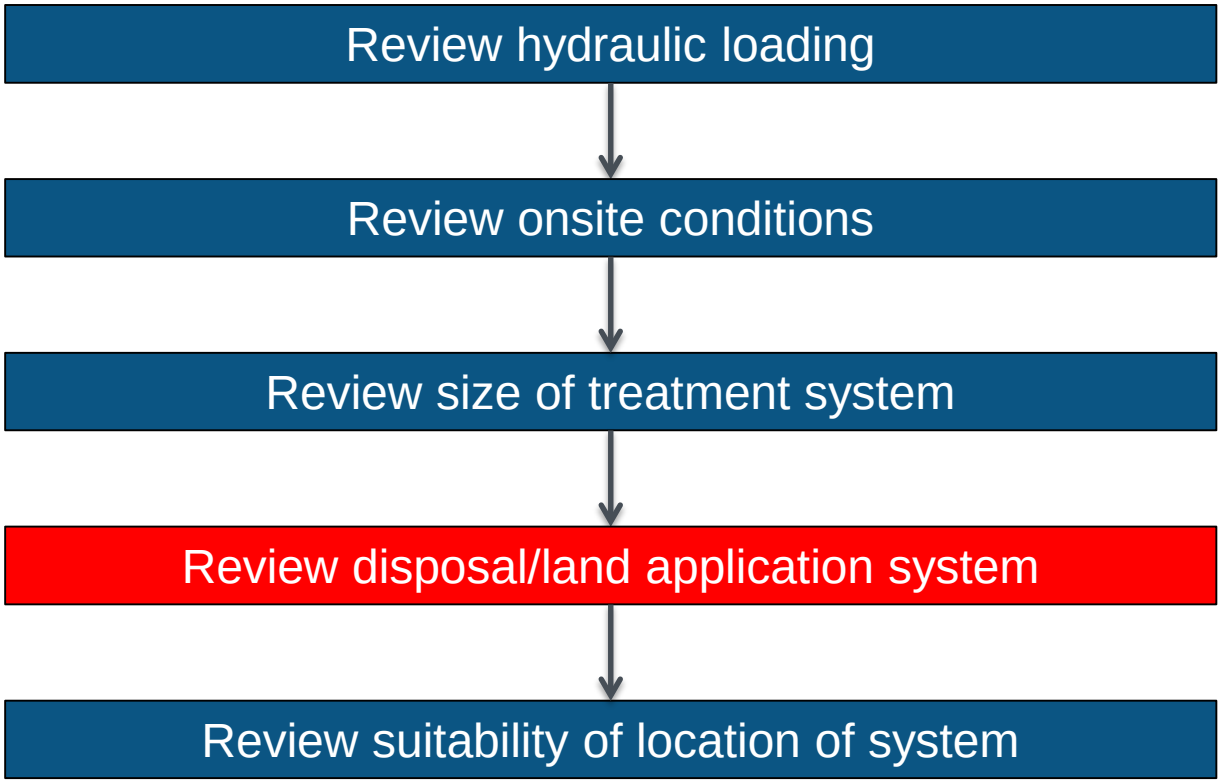


- Engineer's certification required for design
- Influent volume and quality, pond capacity
- Local climatic conditions, storm events

Alternative Systems

- Refer to website for details.
  - Wormsmart (Vermiculture system): 1800L/day
  - Filtrex (Amended Soil)

Assessment Process

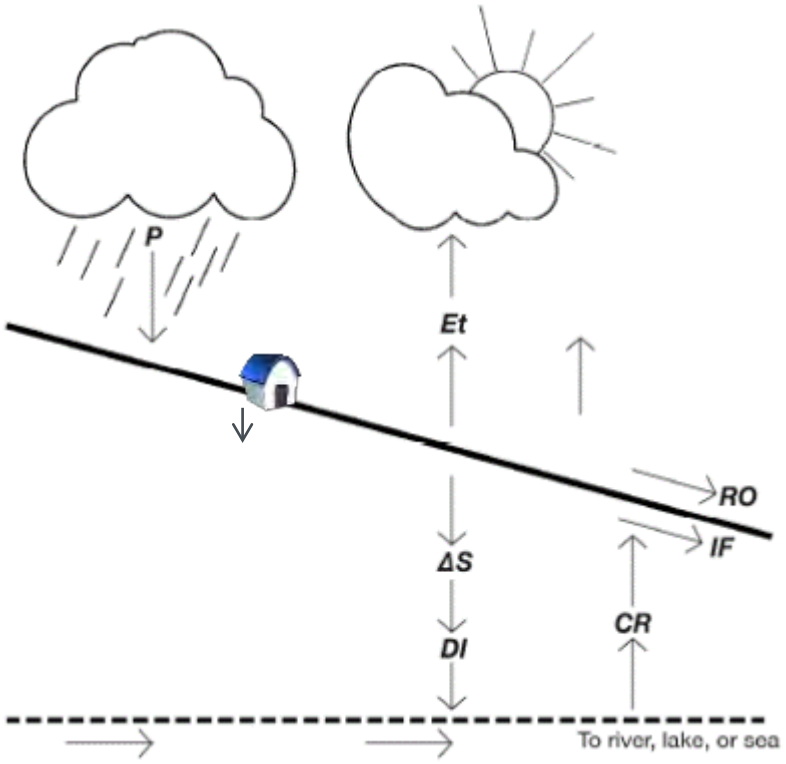


Land Application System Design - Performance

- Sufficient capacity to receive, treat and absorb all treated wastewater flows
- Complete the uptake and absorption of the final effluent within the boundaries of the property
- Avoid the likelihood of creating unpleasant odours, or the accumulation of offensive matter

Water Balance

- To estimate land application area requirements based on climate and wastewater production



Legend

P = precipitation
CR = capillary rising flow from a shallow water table
Et = evapotranspiration from a vegetated soil surface
RO = run-off
IF = interflow (lateral subsurface seepage)
DI = deep infiltration (groundwater recharge)
ΔS = changes in the amount of water stored in the soil.

INPUTS	=	OUTPUTS
precipitation + applied wastewater	=	evapotranspiration + percolation + runoff

- Wet weather Storage

INPUT – OUTPUT = STORAGE REQUIREMENT

Land Application System Selection Considerations

- Volume of wastewater produced
- Quality of effluent
- Nature of the soil profile and resulting soil category
- DLR/DIR associated with the soil category
- Size of the application area
- Surface water and groundwater levels and movements – Setback distances
- Local climate
- Local experience

Groundwater and adsorptive zones

- Setback distances to groundwater from the discharge point of the on-site sewage system (GSP):
  - Public Drinking Water Source Areas: 2m
  - Sewage Sensitive Areas: 1.5m
  - All other areas:
    - Loams and heavy soils: 0.6m
    - Gravels: 1m
    - Sands:
      - Primary treatment system: 1.5m
      - Nutrient retentive secondary treatment system: 0.6m
- 600mm adsorptive zone (DOH)
- 500mm – Aerobic Treatment Unit COP

Disposal/ Land Application System Design

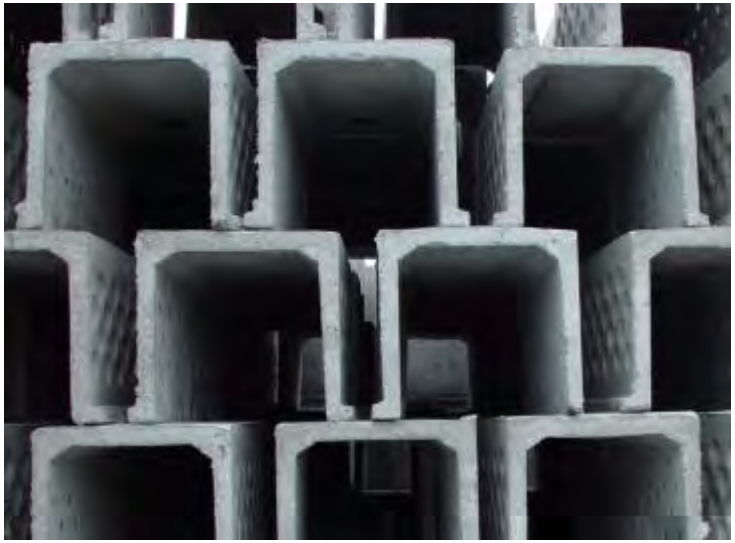
Health Regs 1974 – Regs 49 and 50

- Leach, French, Evaporation Drains
- Holding Tanks
- Soakwells – Sand only
- Waste Stabilization Pond
- Irrigation (COP ATU) – Surface, subsurface and substrata

AS1547

- Trenches, beds and evapotranspiration-absorption systems (Appendix L)
- Irrigation systems (Appendix M)
- Mounds (Appendix N)

Concrete Leach Drains



- Check website for infiltrative area.
- *Infiltrative area: Internal surface of the bottom area and sidewall areas between inverted level of the inlet and the base of the drain*

Sizing of leach drains / trenches / beds

Daily loading (L/day)	÷	Soil infiltration rate (L/m^2/day)	÷	Infiltrative area per metre length of drain (m^2/m)
829L/day		Sand: 30 (alternating) or 15 (non-alternating) L/m^2/day		1.6m^2/m

=

Total length (m)
2 x 9m (alternating) or 2 x 17m (non-alternating)

Differences in LD sizing between Regs 1974 and AS1547

- The Reg 49 (2) (a) have provision for an alternating system (only one out of two leach drains is in operation then switched annually), AS1547 requires all LDs to be in operation at the same time;
- The Regs using base and 2 x effective depth of aggregate/drain for calculation of leach drain length, AS1547 using only base as sidewall infiltration is already included in the DLR of soils and allows width of the drain to be increased by adding aggregate to increase infiltrative capacity of the soil

EXAMPLES OF SIZING

of Non-alternating LDs for residential premises in sandy/loam soils

4-bedroom House

Regs Calculation:

Sand

- 829÷15÷1.6 = 34.5m (2x17m)

Loam

- 829÷10÷1.6 = 52m (2x26m)

AS1547 Calculation:

Sand

- 750÷35÷0.6 = 36m (2x18m)

Loam

- 750÷25÷0.6 = 50m (2x25m)

Leach drain lengths

- AS1547 recommends a maximum length of 20m
- Longer lengths can be permitted if the installer can guarantee a level base across entire length
- Even number of lengths required to ensure even distribution

Leach drains in clay soils

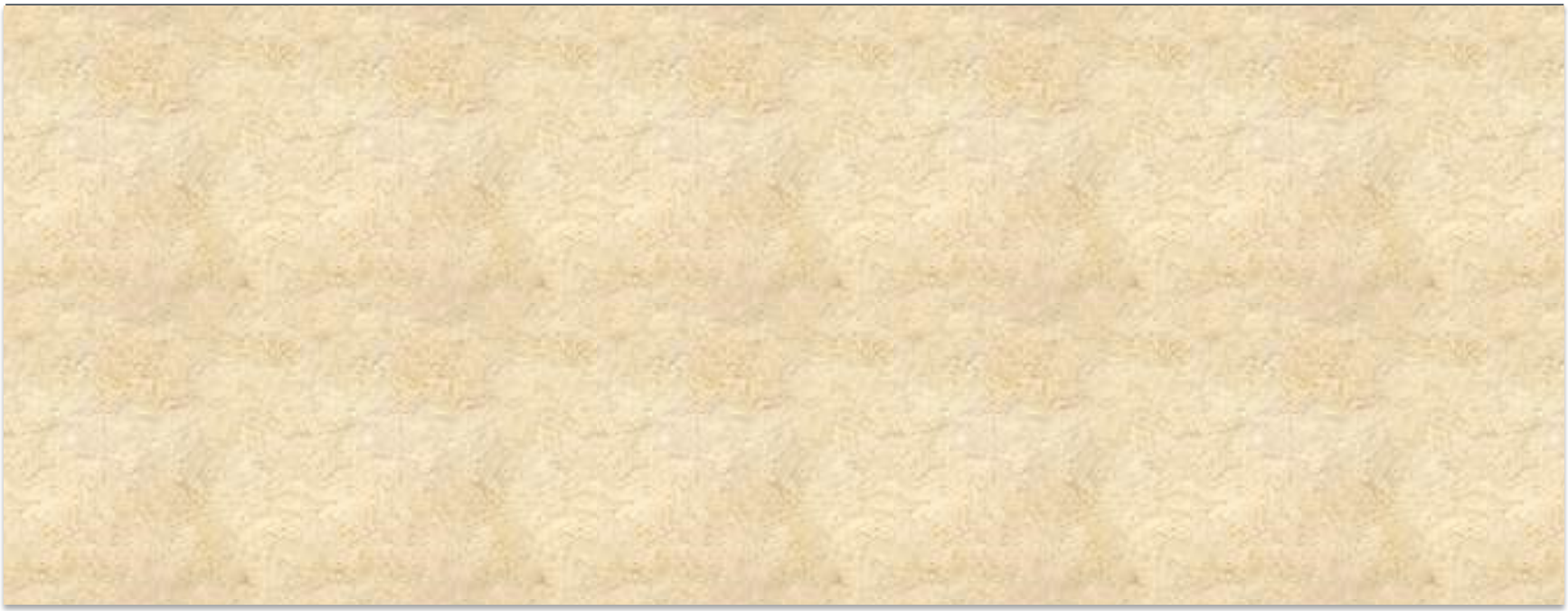
TABLE 5.2

SOIL CATEGORIES AND RECOMMENDED DESIGN IRRIGATION/LOADING RATES (DIR/DLR) FOR LAND-APPLICATION SYSTEMS

Soil Category	Soil texture	Structure	Indicative permeability (K_{sat}) (m/d)	Design irrigation/loading rate (DIR/DLR) (mm/day)						
				Trenches and beds (see Table L1)			ETA/ETS beds and trenches (Table L1)	Drip and spray irrigation (Table M1)	LPED irrigation (Table M1)	Mounds (basal area) (Table N1)
				Primary treated effluent		Secondary treated effluent				
				Conservative rate	Maximum rate					
1	Gravels and sands	Structureless (massive)	> 3.0	(see Note 1 of Table L1 for DLR values)			(see Note 4 of Table L1)	5 (see Note 2 of Table M1)	(see Note 3 of Table M1)	32
2	Sandy loams	Weakly structured massive	> 3.0						4	24
			1.4 – 3.0	15	25	50				
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50		4 (see Note 1 of Table M1)	3.5	24
		Weakly structured or massive	0.5 – 1.5	10	15	30				16
4	Clay loams	High/ moderate structured	0.5 – 1.5	10	15	30	12	3.5 (see Note 1 of Table M1)	3	16
		Weakly structured	0.12 – 0.5	6	10	20	8			8
		Massive	0.06 – 0.12	4	5	10	5			(see Note to Table N1)
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8	3 (see Note 1 of Table M1)	2.5 (see Note 4 of Table M1)	8
		Moderately structured	0.06 – 0.12	(see Notes 2 and 3 of Table L1)	5	10	5 (see Notes 2, 3, and 5 of Table L1)			(see Note to Table N1)
		Weakly structured or massive	< 0.06			8				
6	Medium to heavy clays	Strongly structured	0.06 – 0.5					2 (see Note 2 of Table M1)	(see Note 3 of Table M1)	
		Moderately structured	< 0.06							
		Weakly structured or massive	< 0.06							

5. This soil type in its natural state is unsuitable for on site disposal, however the Chief Health Officer may approve of a loading infiltration rate in a particular case if satisfied that system design and site modification to justify the loading rate will be carried out.

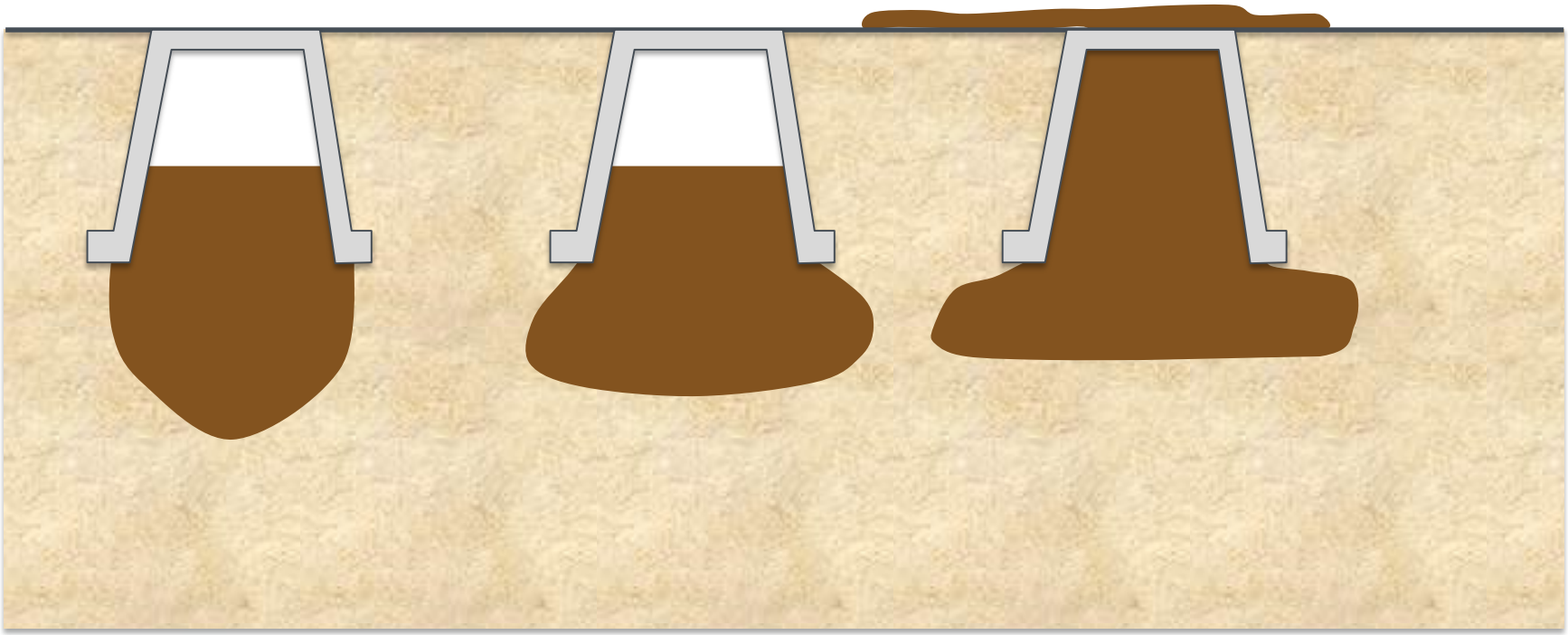
Why get it right?



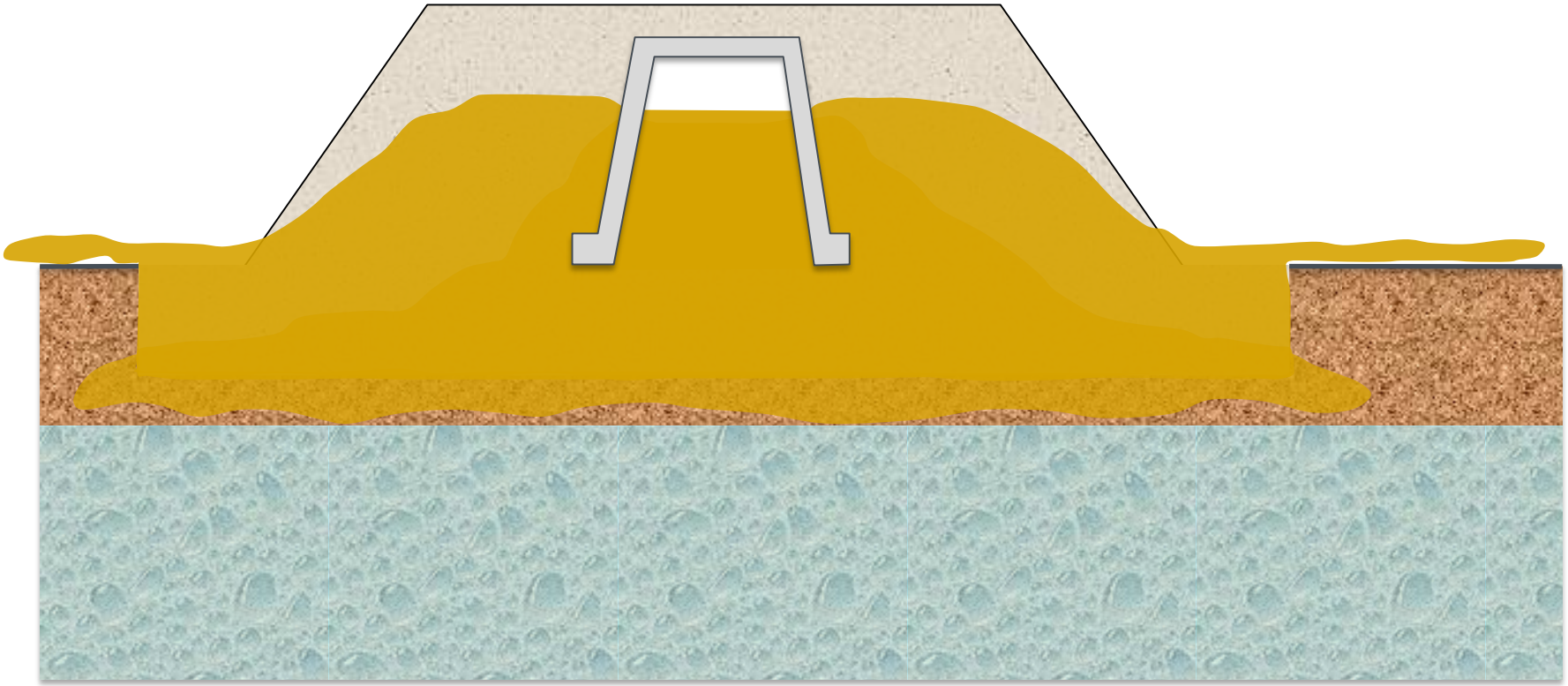
Sand

Gravel / loam

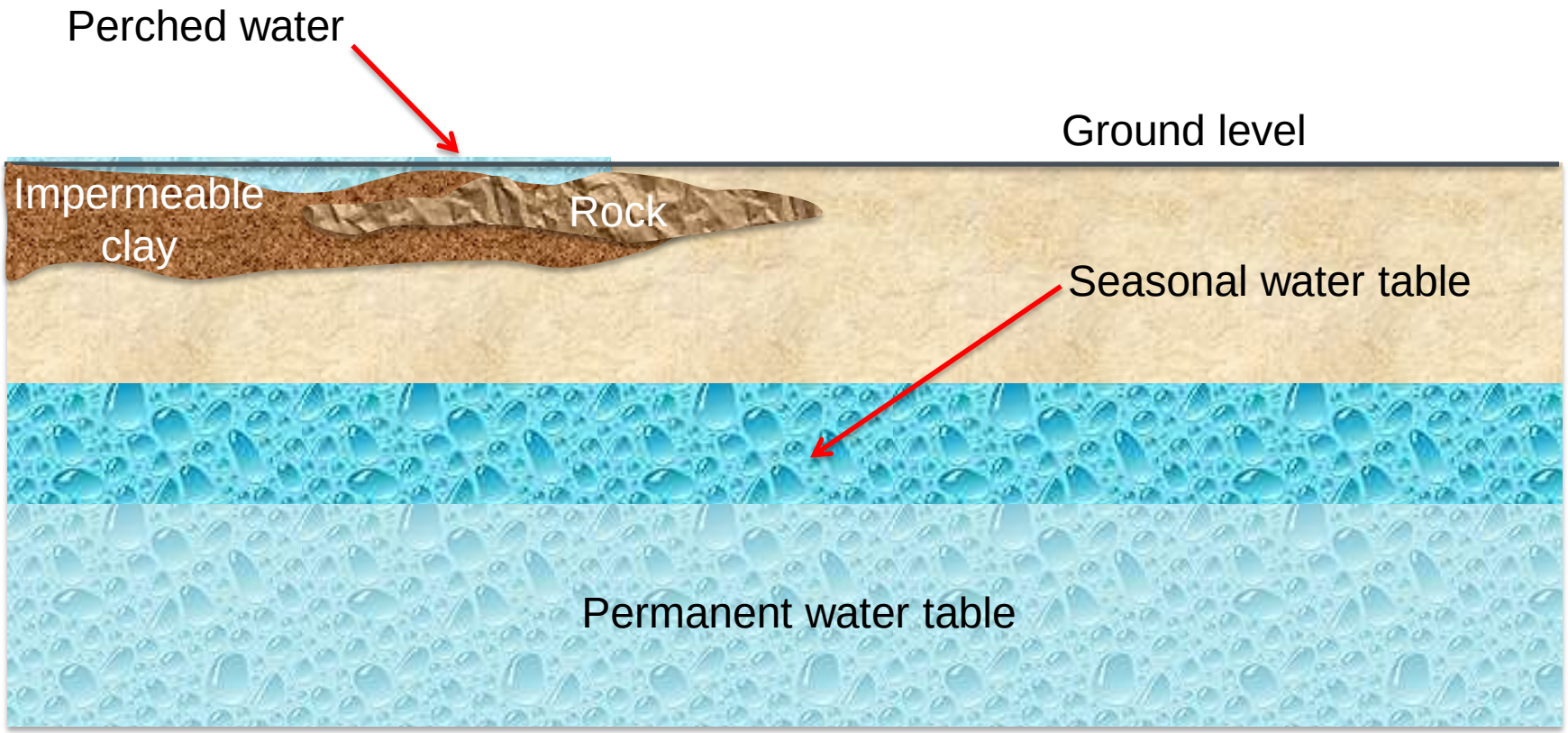
Clay



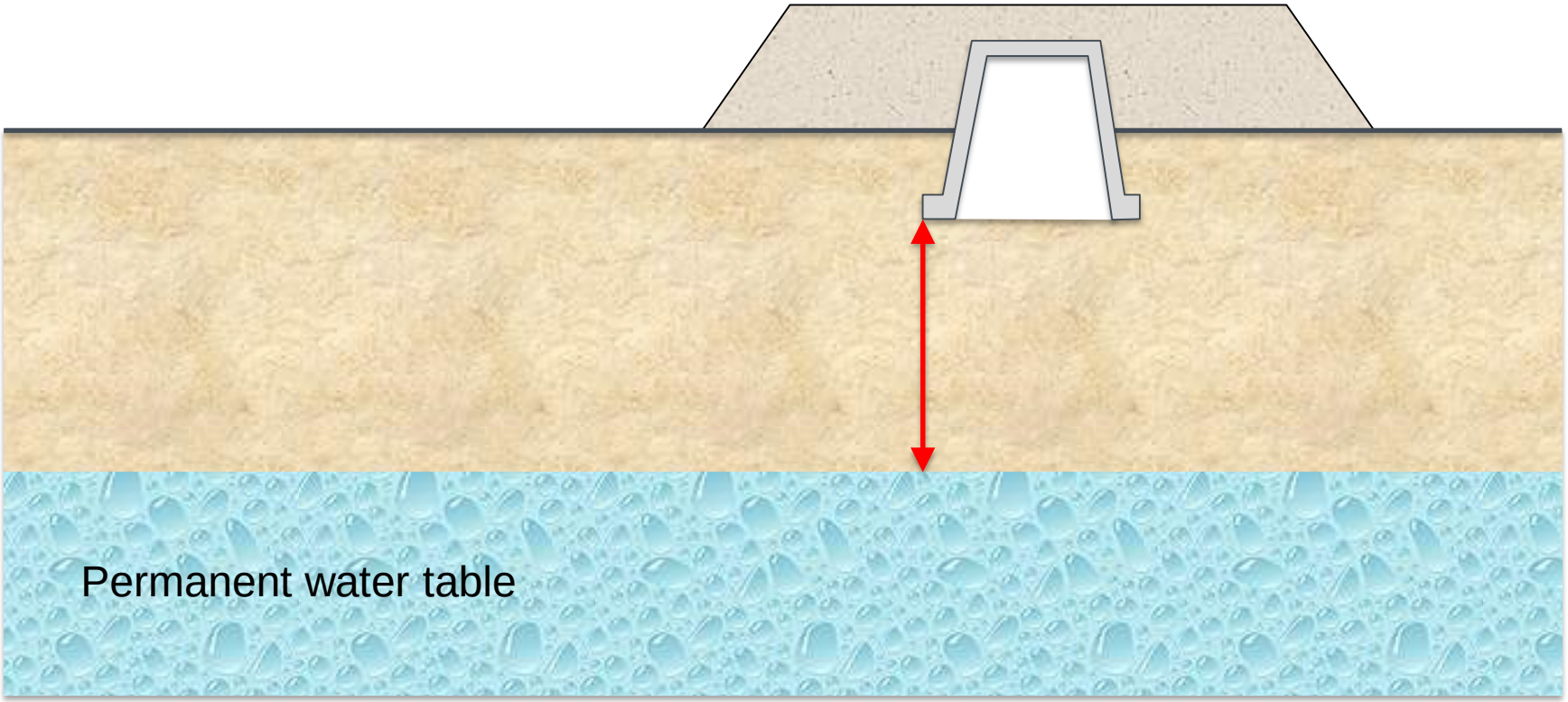
Sizing to native soil type



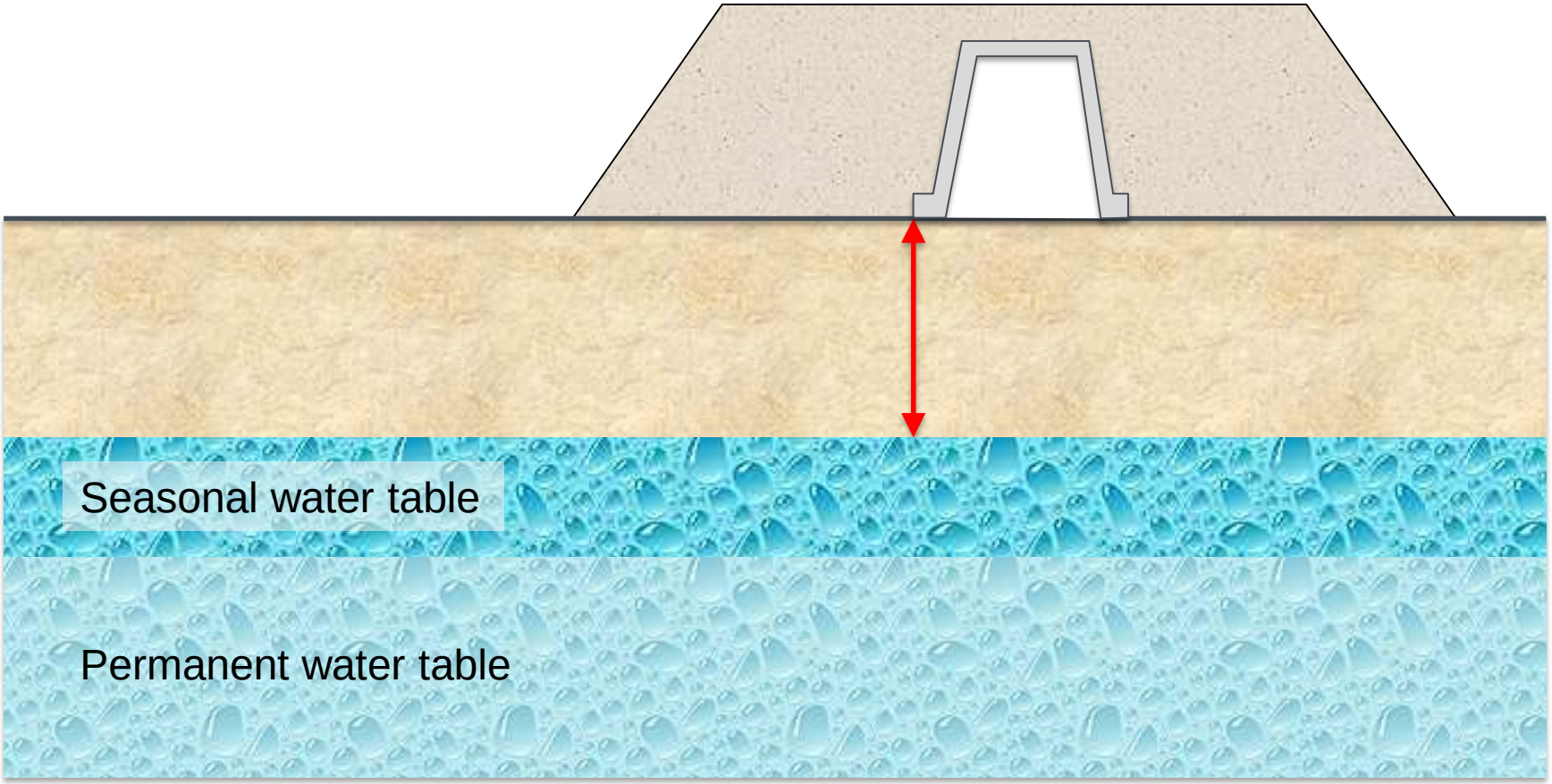
Groundwater



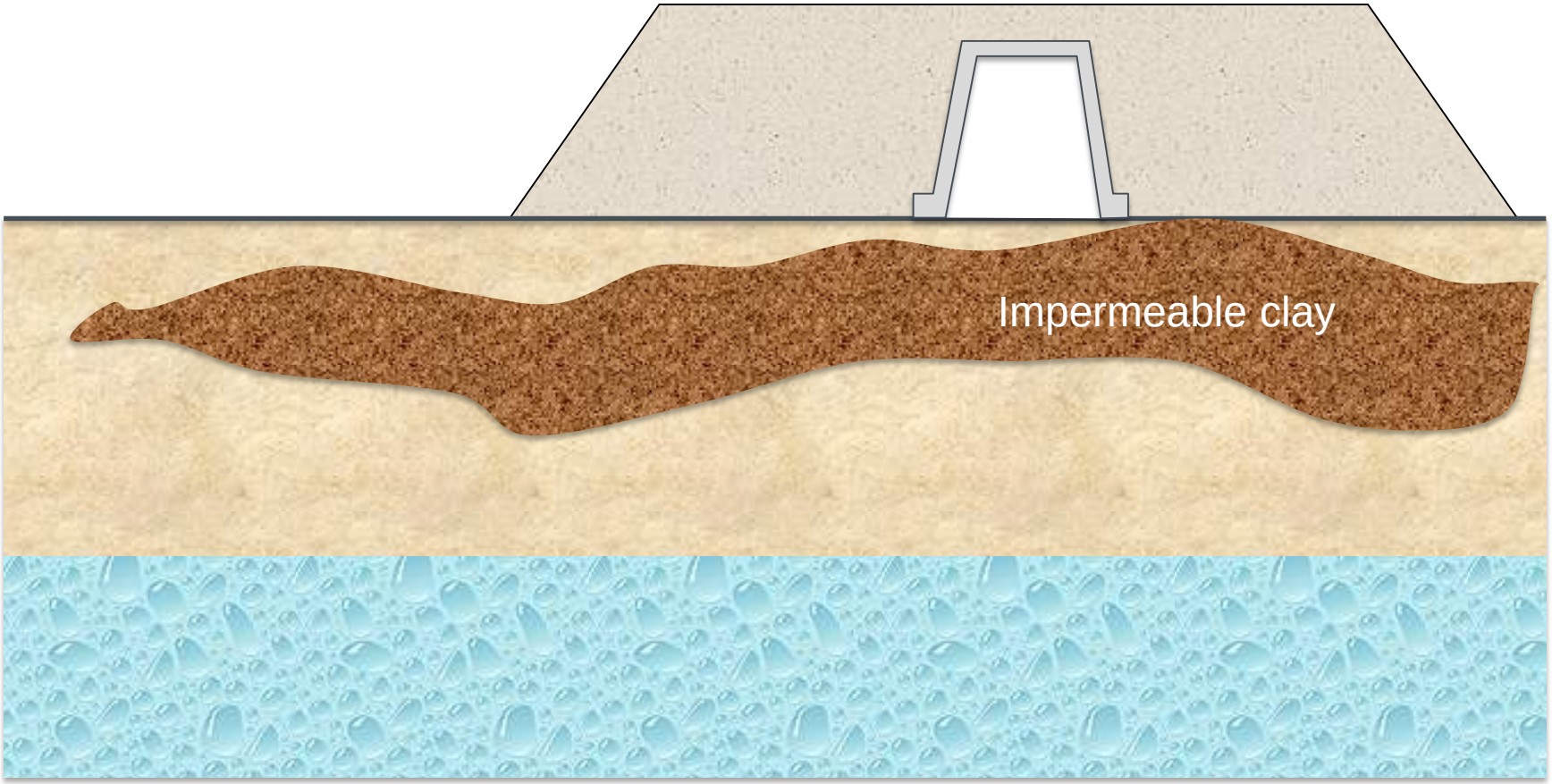
Fill / Semi-Inverted



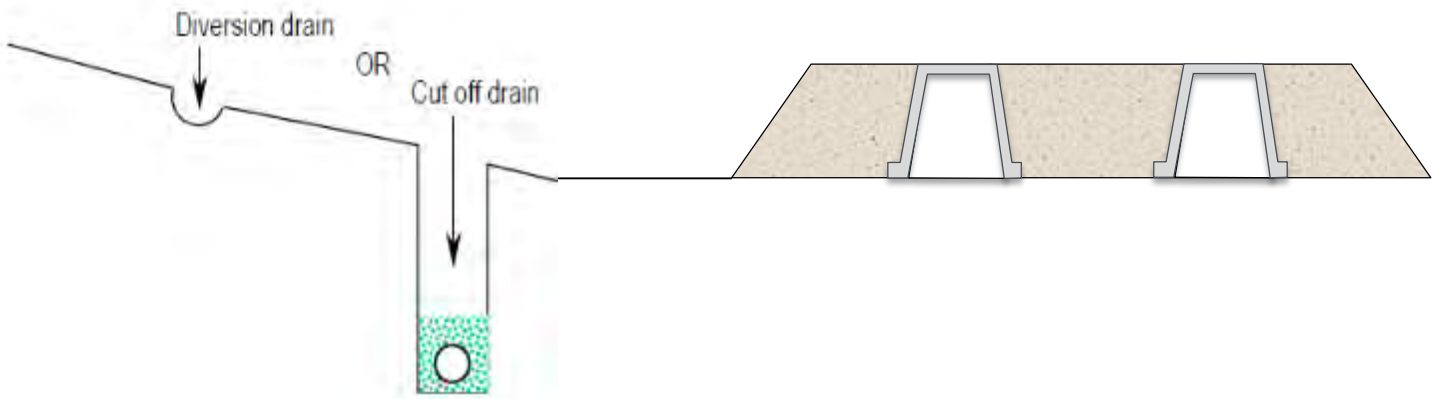
Fill / Fully-Inverted



600mm adsorptive zone

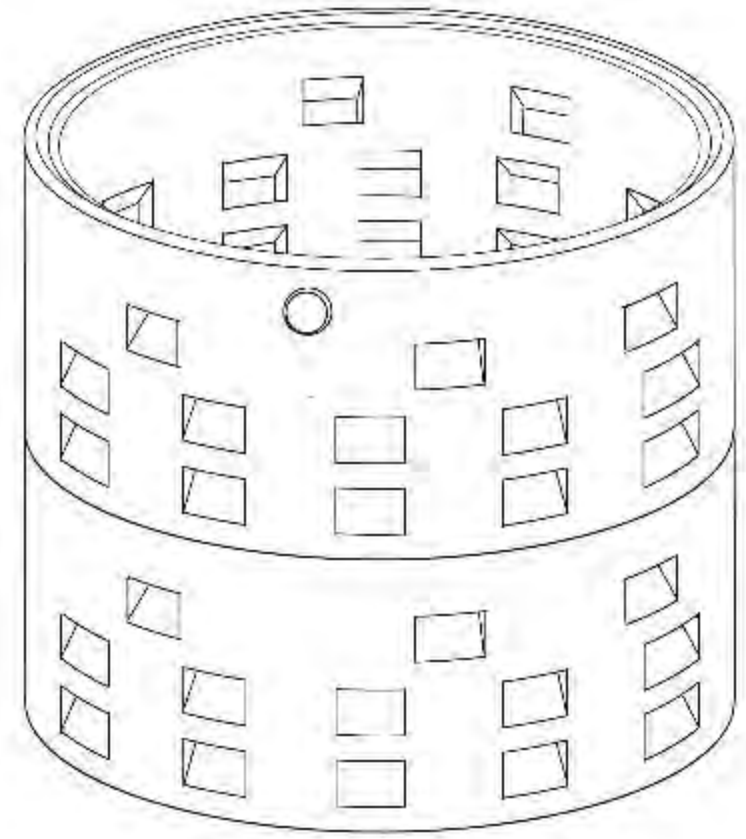


Terracing and diversion drains

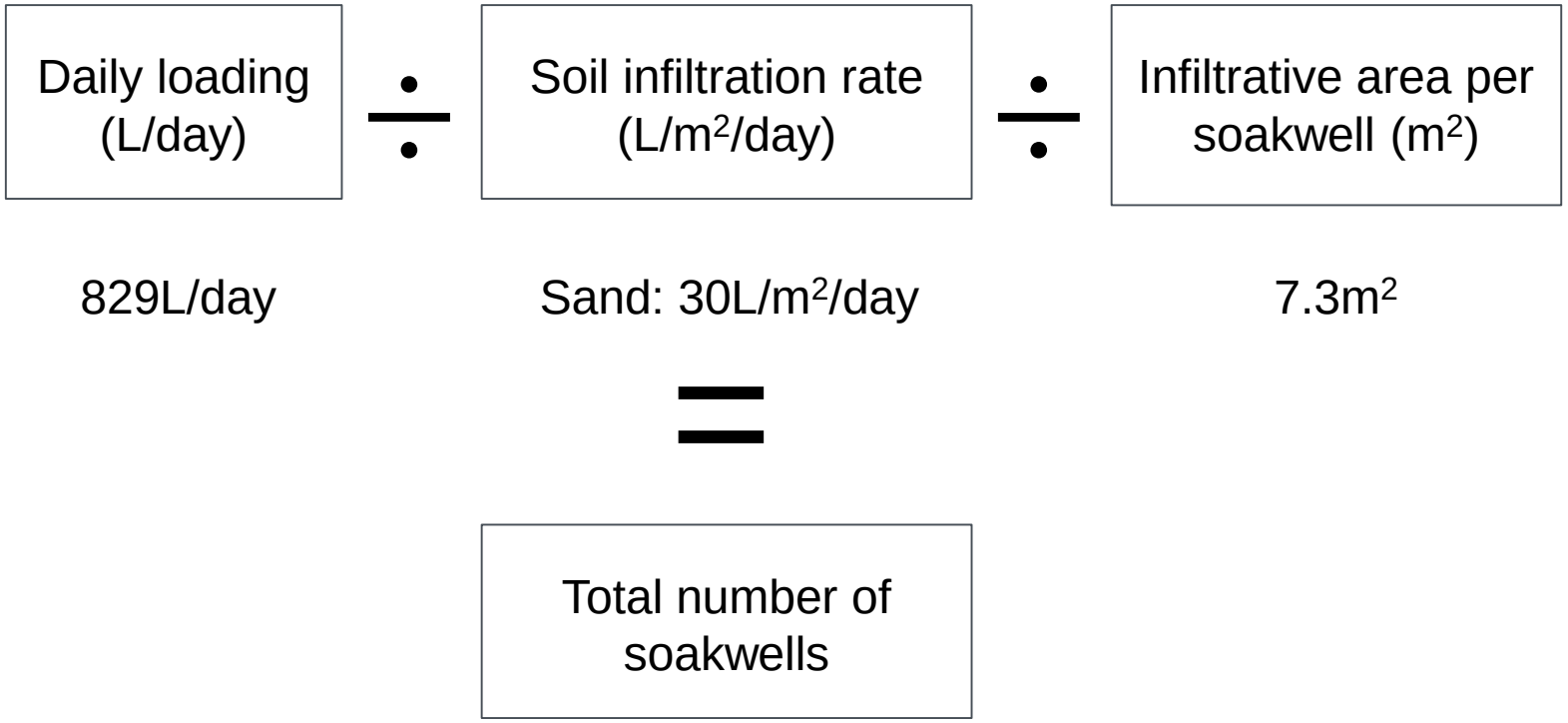


Soakwells

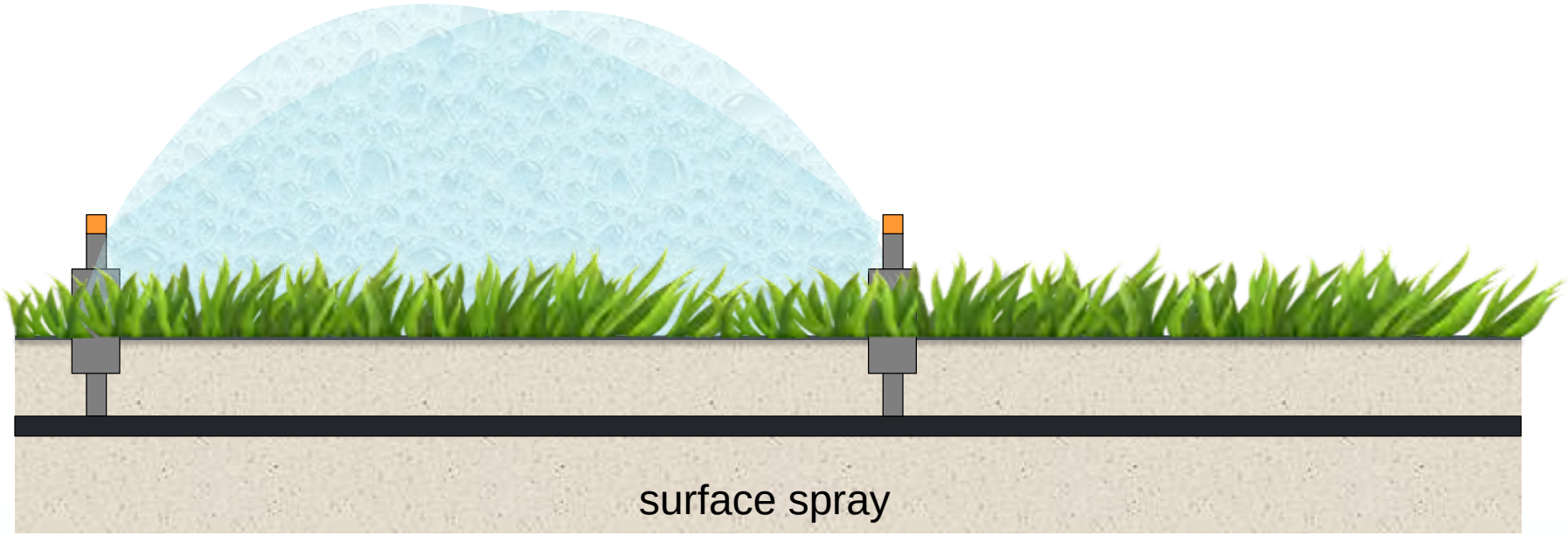
- Only permitted in sandy soils
- Needs to be fully below ground
- Check website for details and infiltrative areas



Sizing of soakwells



Irrigation systems



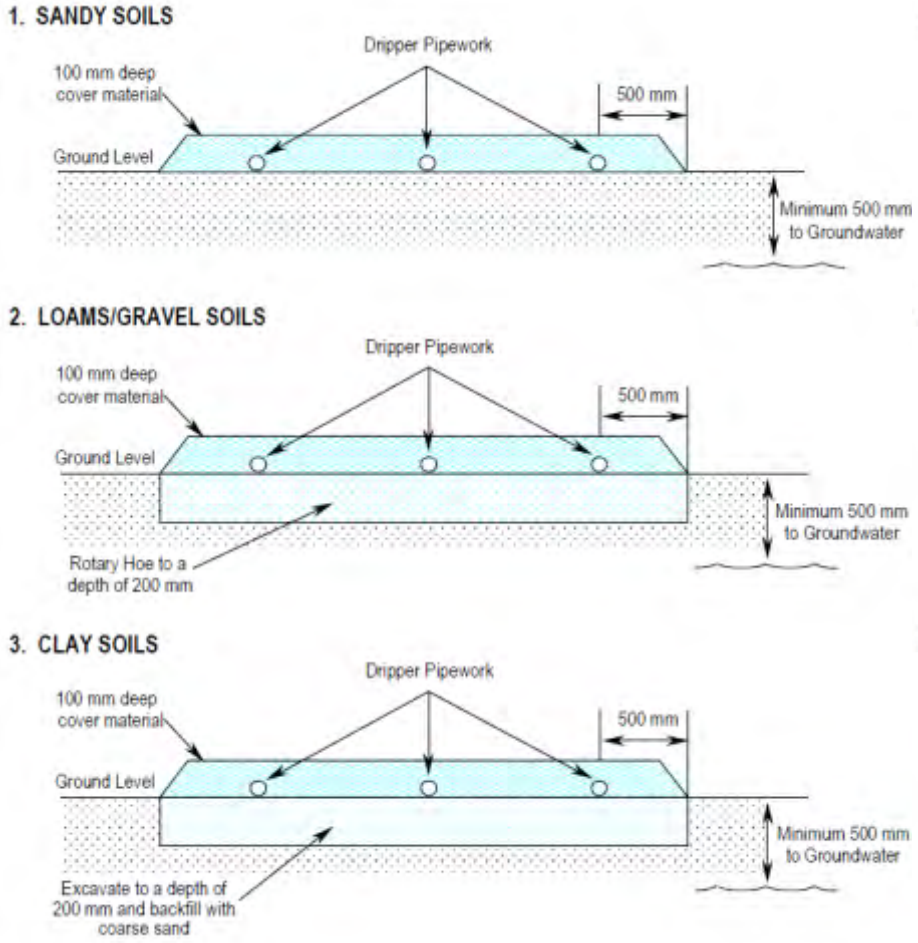
Sizing of irrigation systems

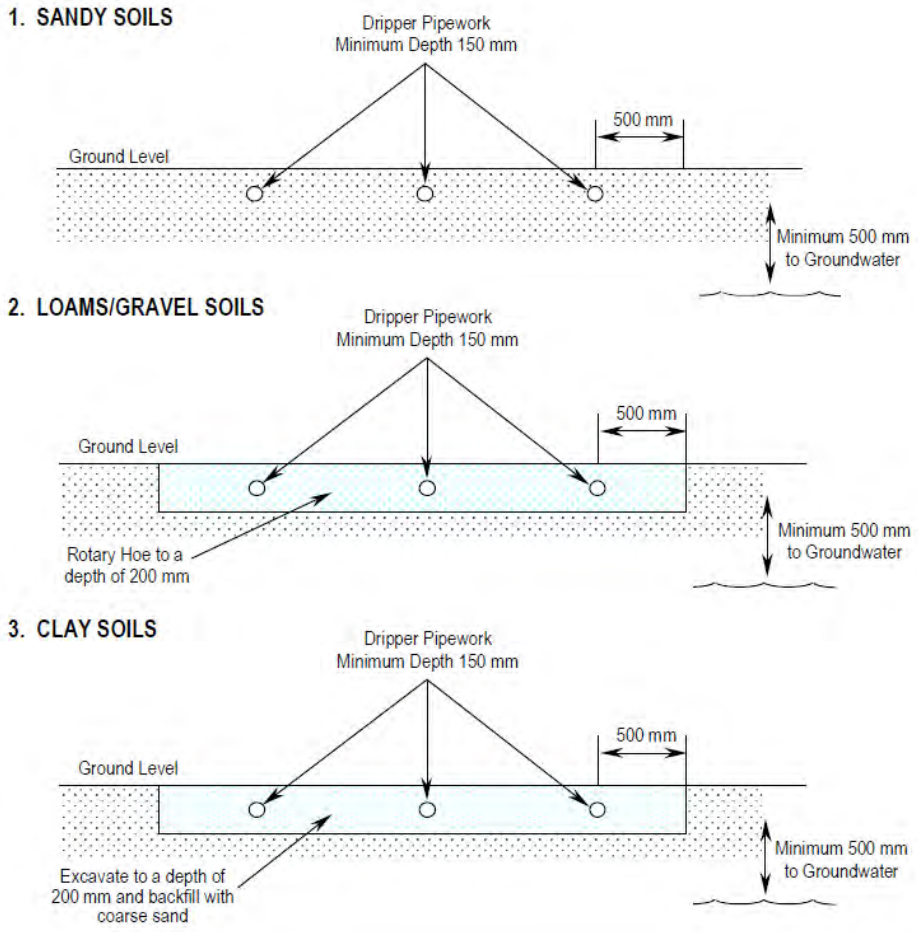
9000L/day

Clay loam: 3.5mm/day

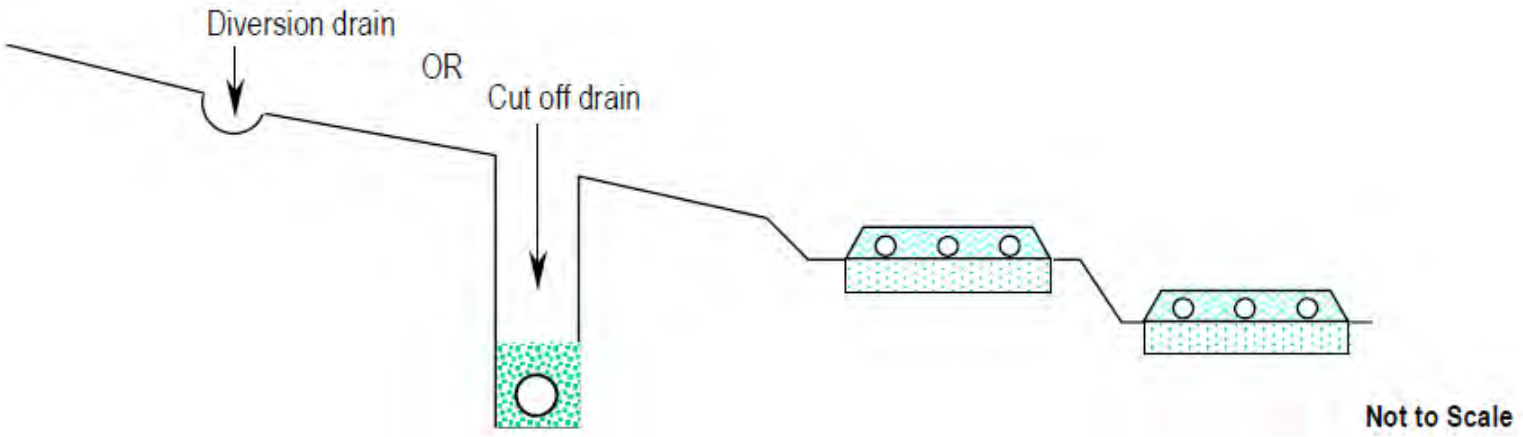
2571m^2

ATU COP and clearance to groundwater





Terracing and diversion drains



Reduction in Design Irrigation Rate

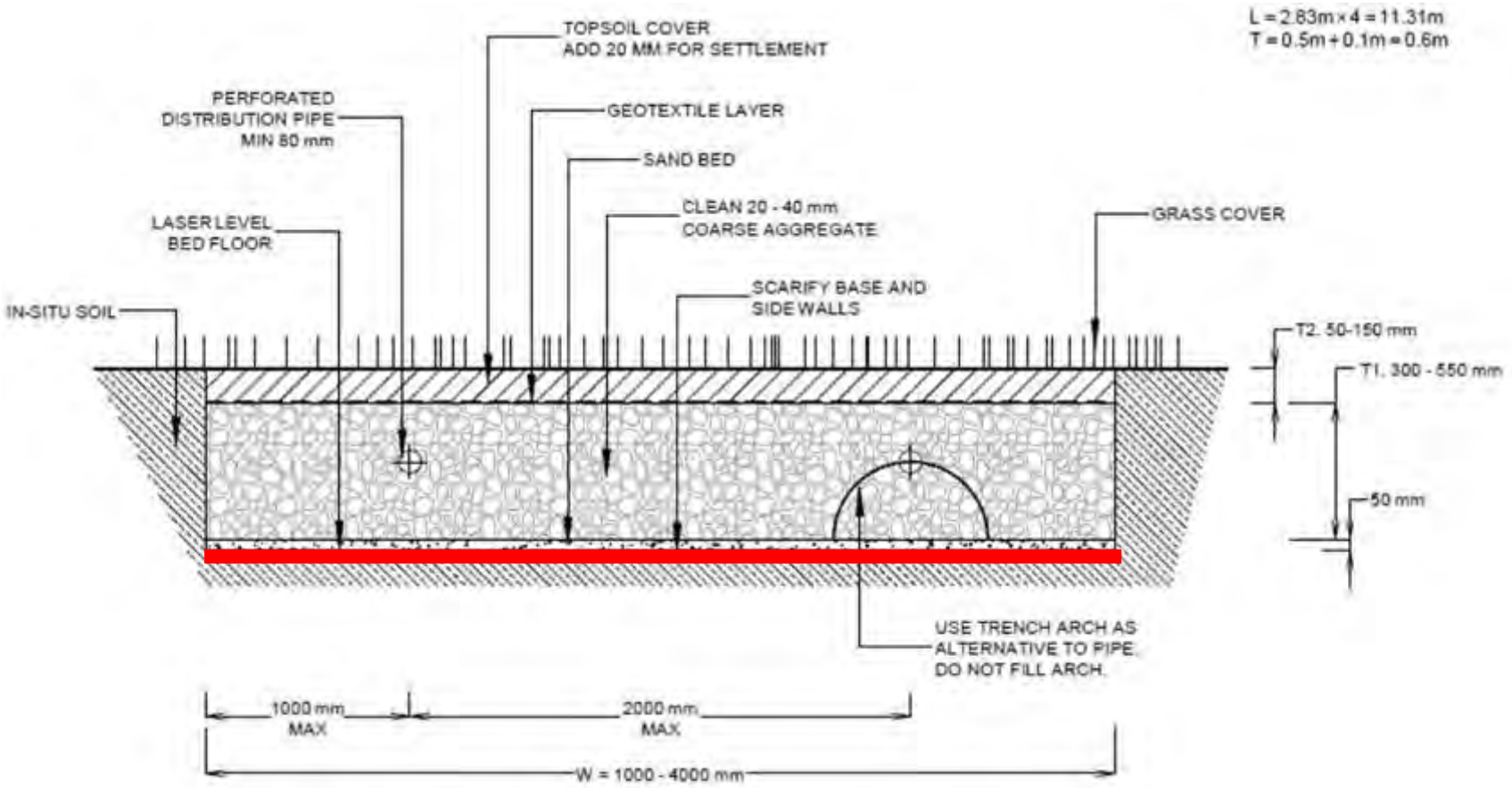
TABLE M2
RECOMMENDED REDUCTIONS IN DIR ACCORDING TO SLOPE

Slope	Reduction in DIR
Flat up to 10%	No reduction
10% to 20%	20%
20% to 30%	50%
> 30%	Advice required from a suitably qualified and experience person
NOTE: See Table 1.1 for conversion of slope per cent grade into slope angle and slope ratio.	

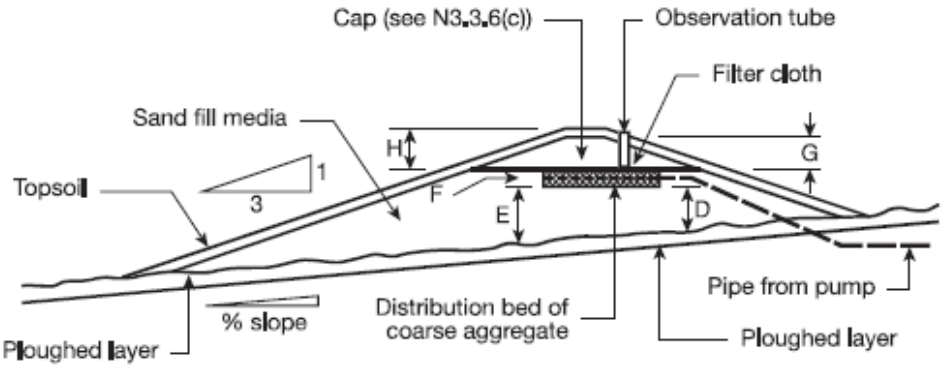
Land Application Area

- LAA should be unencumbered. Activities within the LAA should be controlled or prohibited
- LAA should be protected in a way that will avoid the likelihood of penetration of roots or entry of groundwater

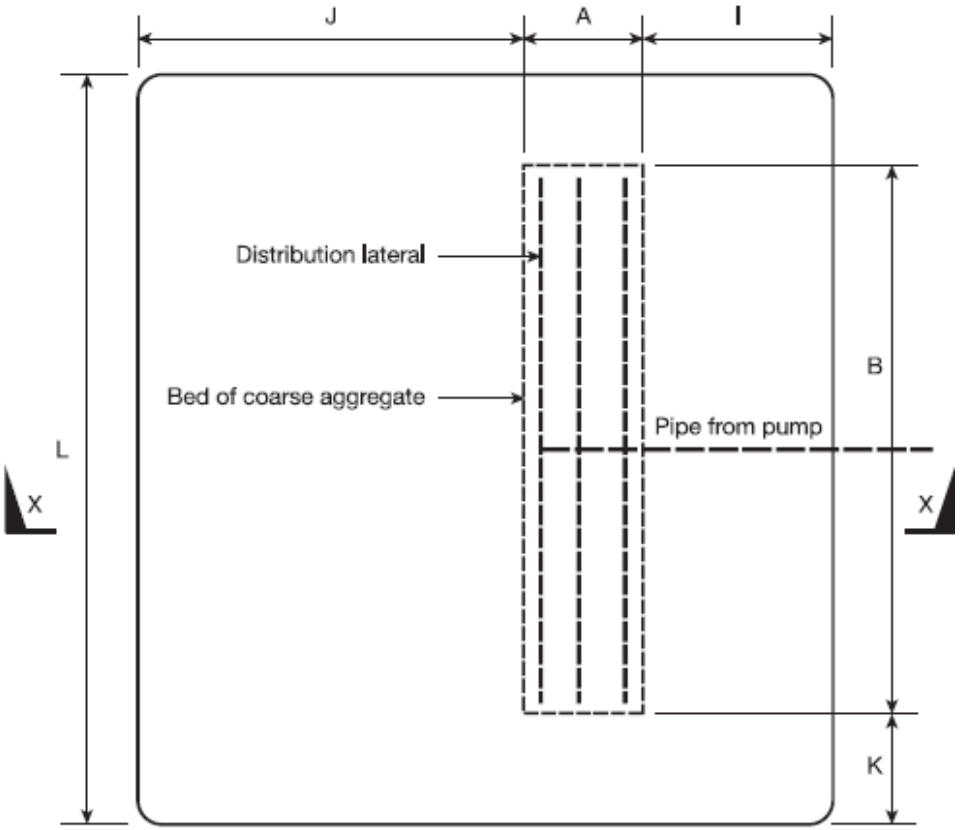
AS1547 Absorption beds



Mounds



CROSS SECTION VIEW OF MOUND ON SLOPING LAND

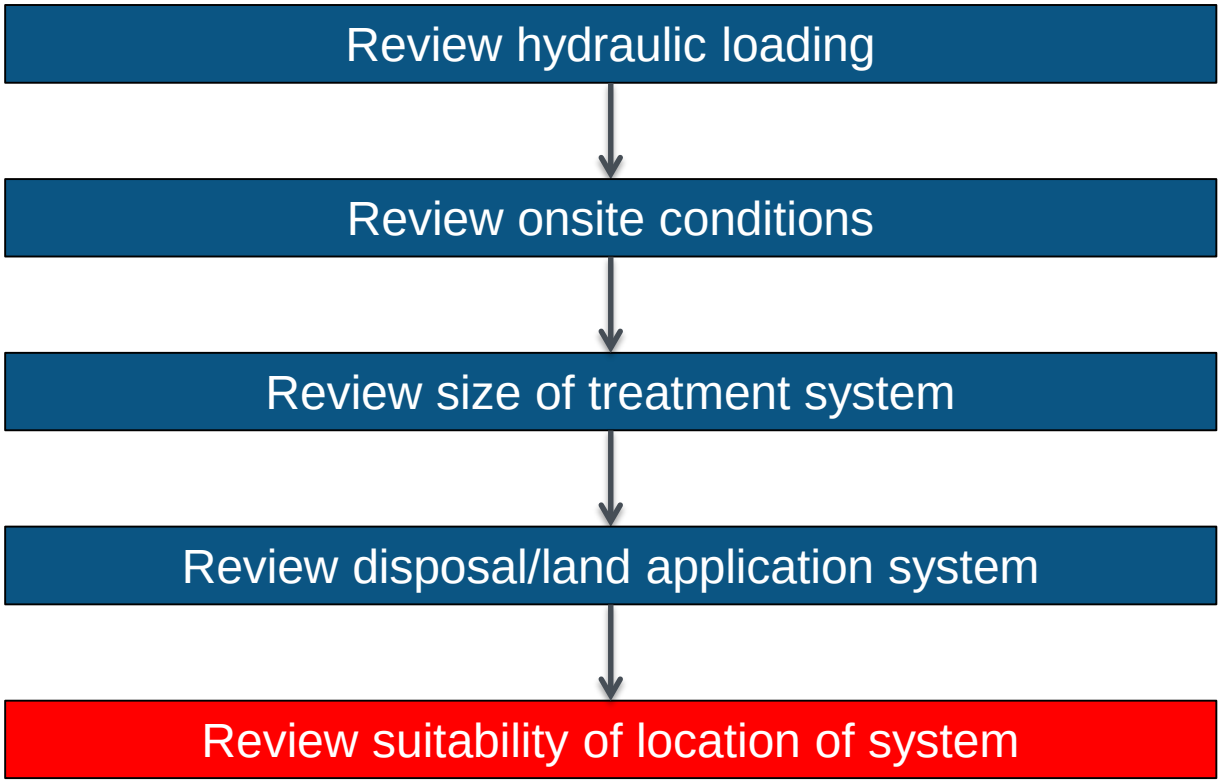


PLAN VIEW OF DISTRIBUTION BED

Holding Tanks

- Maximum use of 12 months.
- Check for high water level alarms.
- Minimum pump out frequency:
  - Hydraulic loading (L/day) / Volume of tank (L) = days
- Confirmation from licensed controlled waste contractor that pump out can be undertaken at the required frequencies.

Assessment Process



Setback distances - Regs

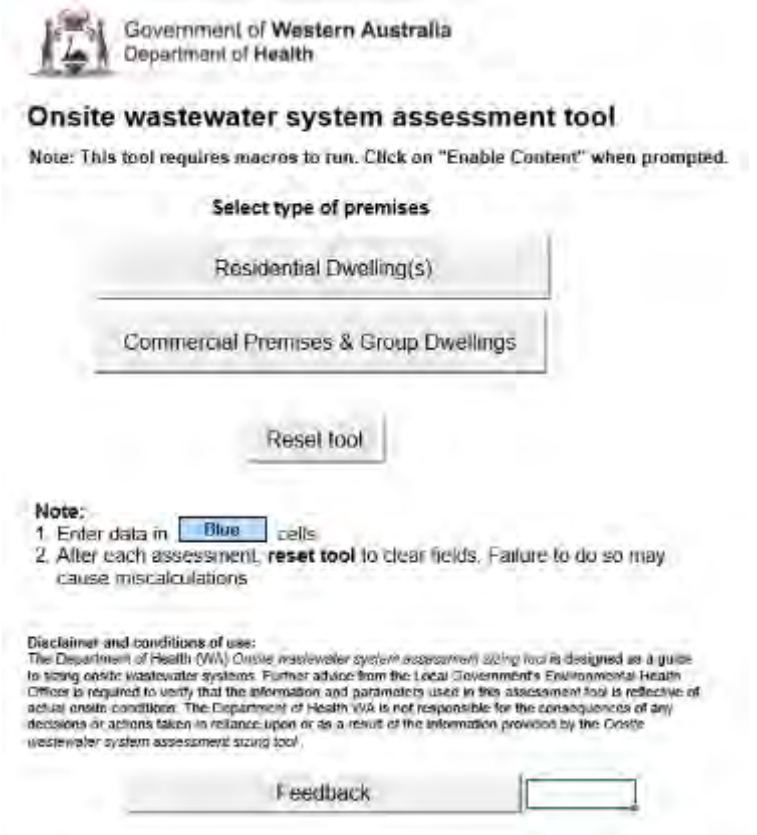
Setback	Distance (m)
Septic tank to buildings and boundaries	1.2
Receptacle for drainage to trafficable areas	1.2
Dry type septic tank to buildings	6
Dry type septic tank to boundaries	1.8
Dry type septic tank to well, creek, underground water source	30
Receptacle for drainage to well, stream or underground source of water **intended for consumption**	30
Receptacle for drainage to subsoil drainage	6
Soakwell to boundary, building, septic tank & other soakwells	1.8
French drain setbacks: •To dwelling •To window, door of any dwelling •To boundaries	 3.5 6 1.8
Leach drains to boundaries	1.8

Setback distances – ATU COP

Feature	ATU	Spray irrigation		Substrata* / Subsurface drippers
		Up Slope	No Slope	
Boundaries	1.2	1.8		0.5
Buildings	1.2	3.0	1.8	0.5
Sub-soil / Open drains	-	6.0		3.0
Swimming pools	1.2	6.0	3.0	2.0* / 0.5
Potable water bores	6.0	30.0		30.0
Garden bores	6.0	NA	NA	10.0
ATU	1.2	1.2		0.5
Paths, driveways, carports..	1.2	1.8		0.5

Assessment Tool

- Wastewater Calculator



Thank you.

Questions?

Jared.chong@health.wa.gov.au

Agenda

Time	Topics
15:00-15:30	Assessment of SSE report
15:30-15:55	Presentation of findings and recommendations by each group
15:55-16:00	Discussion

Government of Western Australia
Department of Health

Assessment
Site and Soil Evaluation Reports: Case studies

Lot 16, Davern Street, Muchea

Finding	Issue	GSP requirement
Reference to Regulation 1974 in section 2 of the report		Government sewerage policy 2019
June site assessment	Perch water table/drainage	Setback distances
	Ground water conditions	Fill requirement and suitability of the LAA
Sewerage sensitive area	Ground water clearance	1.5m separation distance to the ground water
	System requirement	Secondary treatment with nutrient removal
	Lot size 8094m2	Minimum lot size 1Ha (for sewerage sensitive area)
Sizing Land application area	Calculation based on 4 residents	Table 3 – 180m2 (for secondary treatment and sandy soil)
Maps	not adequate	Proposed subdivision LAA Set back distances Building envelop
Permeability test	0.2m/day calculated as sand	0.12-0.5 Light clay/clay loam

Lot 801 Bournbrook Avenue, CARDUP

Finding	Issue	GSP requirement
Sewerage sensitive area	Ground water clearance	1.5m separation distance to the ground water
	System requirement	Secondary treatment with nutrient removal
Set back reduction		Reference to DWER
Land application area	Calculation based on 4 residents	Table 3 of the GSP
	Not shown in the map- setback distances from the drain/waterbody to the LAA	100m setback distance from drainage

SSE – Shire of Mundaring perspective

Shire of MUNDARING

Case study 1 – Swan View Rd – Swan View

- Vacant lot, proposed two lot subdivision. 4052m²
- Lot located on the western face of the Darling Range Escarpment
- Geotechnical report prepared 2014 by an engineering firm
- Introduction speaks of effluent disposal being designed to AS1547:2012

Report observations

- Upper 1m of soil profile described as class 4 soils
- Soils are not suitable for stormwater management via soak wells. Discharge offsite instead.
- No groundwater observed, however may be perching at 1.8m

Report conclusions

- Site is suitable for leach drains
- Contact engineering firm if ATU is proposed
- Simple eh?

The real deal

The real deal continued

- So, no mention of any granite outcrops
- Soak wells won't work on site, but leach drains are ok are they?
- By the way, there is no LG storm water network to connect to in that part of the world
- Shortcomings of the report brought to the attention of the consulting planner and engineering firm
- S70A Notifications placed on the titles requiring ATU's

Case study 2 – Approach Rd - Boya

- Proposed two lot subdivision with existing house to be retained. 5180m²
- Lot located in a valley system of the western end of the Darling Range Escarpment
- SSE provided December 2020 to support the impending subdivision
- SSE reported as undertaken to AS1547:2012

Report observations

- Soil identified as class 6
- Stormwater to discharge to LG system

Report conclusions

- Blink and you would miss it – an ATU
- 800mm sand pad for any house

The real deal

- What is going on with the bore hole locations?

The real deal - continued

- There is no storm water network to connect to
- Err, where is the recommendation for what kind of effluent disposal system? There is only a hint of the use of an ATU
- Where is the detail about sizing of any such system?
- How might such a system look on a lot such as this, taking into account other development and storm water?

Summary

- Get to know the geology of your patch!
- Do the observations and the recommendations of the SSE match what else is in the local area? Does it sound reasonable? Have they fundamentally missed something?
- SSE operators appear to be reluctant to subsequently provide the calculations/design the necessary effluent disposal system.

Shire of Serpentine Jarrahdale

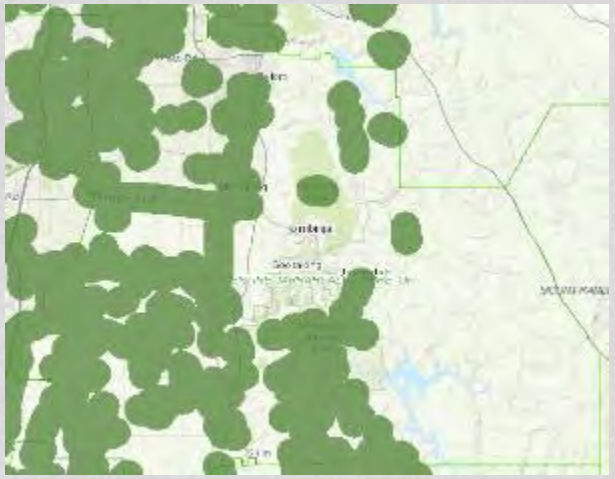
SSE in SJ

SSA's, sewage separations and solutions

Sewage Sensitive Areas in SJ

- Development within the Peel-Harvey estuary catchment
- Proximity to significant wetlands.
- Priority P1 & P2 PDWA's; Jandakot Mound
- Varied soil profiles and landscapes
- Bassendean system, sand dunes and plains with flats and swamps.
- Pinjarra system, poorly drain coastal plain.
- Guildford formations, typically sand over clay.
- Seasonally waterlogged, flat land.

Shire of Serpentine Jarrahdale



Plan WA Online Mapping

Case Studies

- Separation to waterways and major drainage systems
- Separation to high water table
- Flood prone areas

Emerge, Bioscience, 2020

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Separation from waterways / drainage systems

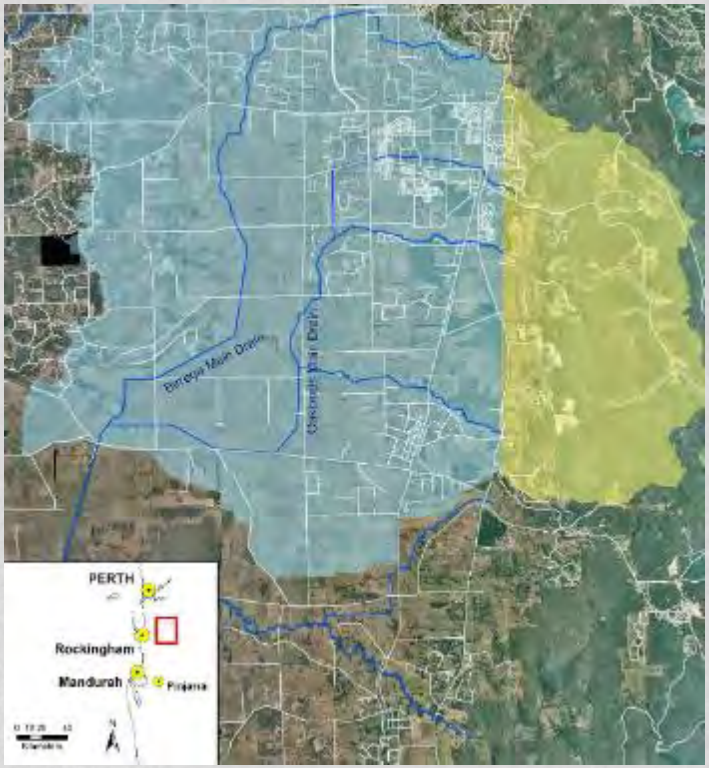
5.2.2 Separation from water resources

An on-site sewage system is not to be located within:

- 100 metres of a waterway or significant wetland and not within a waterway foreshore area or wetland buffer. The separation distance should be measured outwards from the outer edge of riparian or wetland vegetation;
- 100 metres of a drainage system that discharges directly into a waterway or significant wetland without treatment; or

Government Sewerage Policy, 2019

Shire of Serpentine Jarrahdale



DWER drainage study , 2014

Separation from waterways / drainage systems

Case Study: Cardup

SSE Report proposal:
Reduce setback from LAA – 100 metres down to 35 metres

SSE Report Justification
Drainage system does not discharge directly into waterway
Drainage system is not discharging without treatment
Localised groundwater flow moves away from drainage system

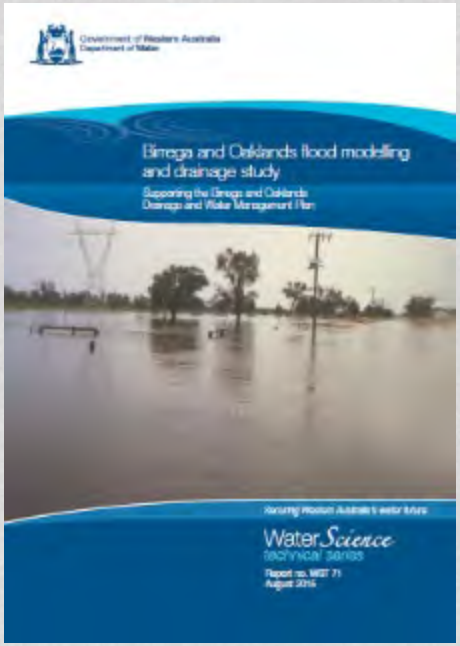
Shire of Serpentine Jarrahdale

Separation from waterways / drainage systems

Case Study: Cardup

Learnings:

- Access local information before using regional information.
- Demonstrate broader significance of drainage system.
- Provide evidence of the sensitivity of the waterway.
- Reinstate the importance of upholding the GSP provisions.
- AS1547 Table R1 and R2 - surface water risk assessment tool
- Refer to DWER to define drainage system, treatment adequacies and setbacks.



Shire of Serpentine Jarrahdale

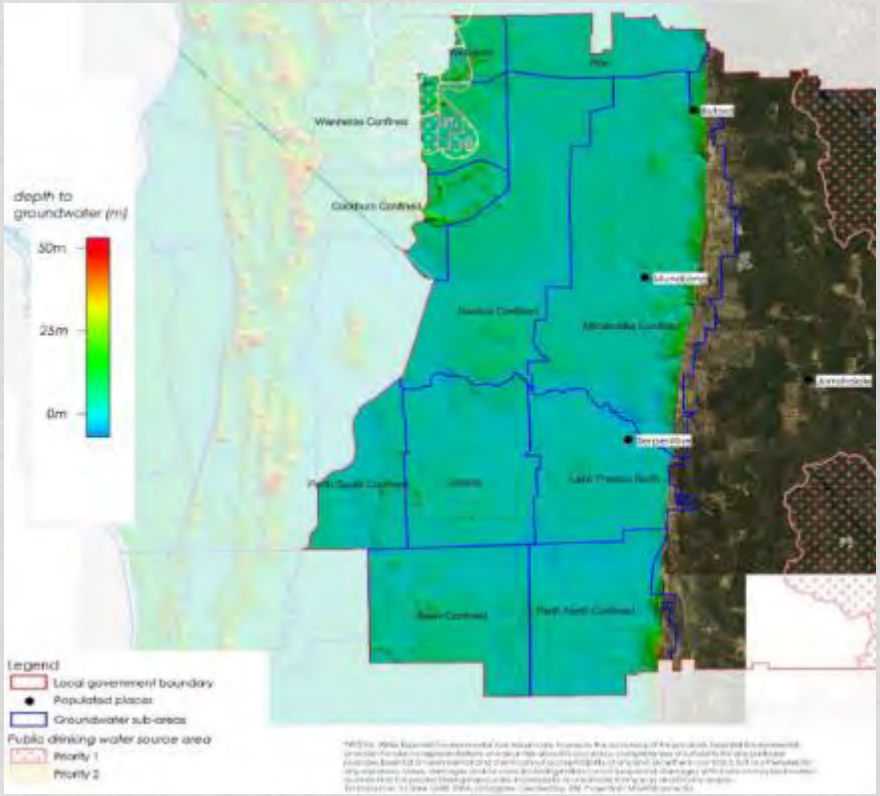
Separation to Water Table

5.2.3 Separation from groundwater

The discharge point of the on-site sewage system should be at least the following distances above the highest groundwater level, taking into account the range of seasonal groundwater conditions in the context of long term variability and possible groundwater rise following development:

- two metres in public drinking water source areas;
- 1.5 metres in sewage sensitive areas; and
- 0.6 to 1.5 metres in all other areas, depending on soil type and the type of treatment system used (refer to schedule 2).

Government Sewerage Policy 2019



Essential Environmental 2016

Shire of Serpentine Jarrahdale

Separation to Water Table

Case Study: Oakford

SSE Report Proposal:
Land application area raised 600mm above ground level.

SSE Report Justification
Groundwater 1m below natural ground level (was at NGL)
Perched water at natural ground level (was GW)
Groundwater separation of 0.6 metres proposed for ATU's. (1.5m required in SSA)

DWER, 2020.

Shire of Serpentine Jarrahdale

Separation to Water Table

Case Study: Oakford

Learnings:

- Ensure correct and consistent surface and groundwater elevations
- Groundwater information for August/September
- Extrapolated seasonal groundwater data unreliable
- Ensure clearance from perched water table.
- SSE report may include PRI testing and the addition of amended soil to manage risk of nutrient migration.
- Fill requirements placed on title to allow owner to choose the location disposal size (depending LAA method)

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Oakford subdivision

Flood Prone Areas

5.2.2 Separation from water resources

An on-site sewage system is not to be located within:

- any area subject to inundation and/or flooding in a 10 per cent Annual Exceedance Probability (AEP) rainfall event.

Government Sewerage Policy 2019

1987 Flood event, Water Corporation.

Flood Prone Areas

5.2.2 Separation from water resources

An on-site sewage system is not to be located within:

- any area subject to inundation and/or flooding in a 10 per cent Annual Exceedance Probability (AEP) rainfall event.

Government Sewerage Policy 2019

Learnings:

- Use all available flood information resources
- Local studies with hydrology datasets/floodplain mapping
- Local Water Management Plan prepared for Local Structure Plans / subdivisions
- Regional data – DWER Floodplain mapping tool
- Australian Rain & Run Off Data Hub - https://data.arr-software.org/

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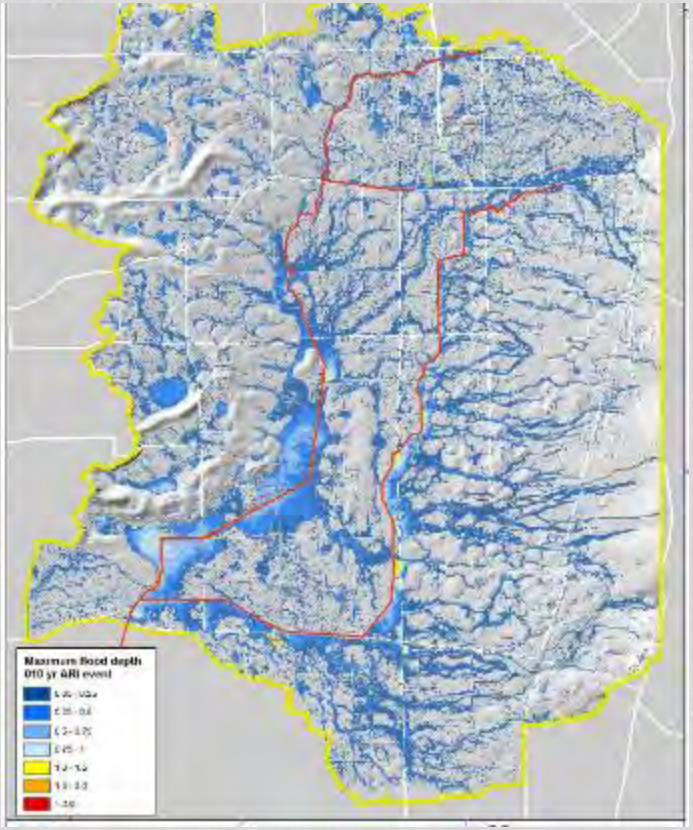

Floodplain mapping in SJ. DWER, 2020.

Shire of Serpentine Jarrahdale

Thank you

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