



REVIEW OF
CHALET RIGI DEVELOPMENT -
LOT 3, MUNDARING WEIR ROAD, PIESSE BROOK

30 April 2020

Background

Fallright Property Unit Trust seeks approval from the City of Kalamunda and the various Government Agencies to continue to operate Chalet Rigi as a local restaurant and associated facilities.

In support of the proposal, the proponent has completed a substantial amount of site studies and provided a number of reports.

All documentation available has been supplied to Landform Research by both the City of Kalamunda and Fallright Unit Trust through the City and Fallright's consultant, Evergreen Consultancy Pty Ltd.

There have been discussions between Lindsay Stephens of Landform Research and the City of Kalamunda.

There has been some discussion between Lindsay Stephens of Landform Research and the proponent's consultant Evergreen Consultancy mainly in late 2019.

Where decisions or assessments have to be made, they are made on the basis of the various policies, documented decisions and a logical approach to find a solution.

Aims of this Review

In its simplest form the issues are therefore;

- Review the documentation relating to waste water management and disposal.
- Review the site conditions.
- Review the submitted assessment, design and management to determine compliance with the various approvals, guidelines and best practice.

Even though this is a review of the issues relating to the development application, and the City of Kalamunda is the decision maker, conclusions are made and a way forward is proposed, with suggested actions.

The format is a listing of the main correspondence.

From the correspondence the various approvals and recommendations are summarised in Table 2 and then a check of the compliance of the prepared documentation is provided against the various approvals and recommendations in the attached Table 3.

Review of Waste Water Disposal Proposed for the Chalet Rigi Upgrade – Landform Research

Conclusions and recommendations are made from the attached Table 3 and at the end of this review.

History

Chalet Rigi first operated as a facility in 1976.

The background history relating to Chalet Rigi is summarised from Section 1.2 of Evergreen Consultancy Water and Stormwater Management Plan December 2019 and documents supplied by the City of Kalamunda.

Since 2010 the owners of Chalet Rigi have been updating the facilities and have been seeking approval to expand the permitted patron numbers.

Since 2010 technical studies have been undertaken at Chalet Rigi to support the installation of an ATU, waste water system to support re-opening of the venue. These have included water sampling, geotechnical investigations, soil characterisation and permeability testing, among other studies related to planning, transport, fire management and other factors.

One of those studies was *Stass Environmental, June 2012, Waste Water Treatment, Chalet Rigi Restaurant, Kalamunda, WA*. That study provided for a waste water system in the central and southern portion of Lot 3.

In May 2019 an Addendum Water Management Report was produced by Evergreen Consultancy (WA Pty Ltd to supplement the 2012 Stass Wastewater Treatment Report previously approved by the City and DOH.

In late September 2019 the City of Kalamunda sought advice from, and commissioned Lindsay Stephens of Landform Research to review the submitted documentation and the positions adopted by the various Government Agencies.

On 22 July 2019 the Department of Health issued Licence Approval 200.18, issued under the *Health Act 1911 and Health (Treatment of sewage and Disposal of Effluent and Liquid waste) Regulations 1974*.

The Department of Health Licence was for a Biomax C80 wastewater system with a maximum capacity of 14,400L/day, servicing 480 people per day provided a suitable waste water disposal area of 4,120 sqm is available.

In October 2019, Evergreen Consultancy conducted additional soil permeability and geotechnical testing and made some changes to the proposed management of waste water.

The updated documentation was submitted to the City of Kalamunda as a bundle dated December 2019 as *Water and Stormwater Management Plan, Chalet Rigi Restaurant, Piesse Brook, Kalamunda WA 6076, dated December 2019, prepared by Evergreen Consultancy Pty Ltd*.

It is the December 2019, Water and Stormwater Management Plan that is reviewed here.

Review of the December 2019, Water and Stormwater Management Plan

The review of the December 2019 Management Plan has been generated by considering the various correspondence and documentation supplied by the City of Kalamunda and Evergreen Consultancy Pty Ltd.

A review of the various legislation, Regulations, Standards and Guidance that may apply to the proposal was also undertaken.

Review of Waste Water Disposal Proposed for the Chalet Rigi Upgrade – Landform Research

A site inspection was conducted on 3 October 2019 attended by the officers of the City, Lindsay Stephens of Landform Research, representatives of Fallright Property Unit Trust, and Evergreen Consultancy.

The key points were that the disposal of waste water in the northern corner of Lot 3 was not the best solution because of;

- The quantity of granite basement outcrop,
- The flow of surface water to Hackett Gully to the north that did not meet the recommended 100 metre buffer distances to the creekline,
- There was a larger area of more suitable land in the south of Lot 3.

A review of the site assessment design and management of the waste water disposal against the Department of Health Licence Approval 200.18 was completed.

From the various information, the requirements for the waste water treatment were categorised into what are Mandatory requirements, Advice, Recommendations or Guidance.

The information was summarised in the attached Table 1.

Table 1 considers the main environmental and design criteria, the various Approvals, Guidance and Recommendations and makes an assessment of compliance with the identified criteria.

Conclusions and Recommendations

1. Waste water systems servicing more than a dwelling must be approved by the Department of Health.
2. The waste water system is approved under the *Health Act 1911*. On 22 July 2019 the Department of Health issued Licence Approval 200.18.

An analysis of the Water and Stormwater Management Plan produced by Evergreen Consultancy WA Pty Ltd dated 9 December 2019, provides sufficient information to satisfy the of waste water disposal for the proposed facility at the loading of 480 persons per day.

Several recommendations are made in the last Column of Table 1, which may be incorporated into Conditions of Approval if the City of Kalamunda determined that the facility could be approved.

The documentation provided by Evergreen Consultancy WA Pty Ltd adequately addresses all issues suggested by the Department of Water Environment Regulation in an additional Water Management Plan, with the exception of some further consideration of stormwater from hardstands.

Further brief documentation of the stormwater management to support Evergreen Consultancy WA Pty Ltd Figure 1 of 8, which is the site plan, would be beneficial, and assist construction.

A contour plan and concept terrace for waste water disposal would likely assist the design and construction of the waste water disposal area. Those documents will need to be flexible to enable changes to be made to the construction to reflect localised soil conditions.

Lindsay Stephens

Lindsay Stephens BSc (Geology), MSc (Plant Ecology)
Mem Aus Geomechanics Soc – MEIANZ – FIQA - MAIG

1/ 49 Birdwood Avenue Como WA 6152
Tel 08 9474 3978, landform@iinet.net.au

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
Loading, System and Exemption						
1	<p>Loading</p> <p>Approval of an alternative waste water system for 480 patrons, 14,000 litres per \ of 4120 square metres for irrigation disposal of wastewater.</p>	<p>Approved for 480 person per day loading, provided sufficient suitable area is proven for 4 120 m².</p> <p>Health Department Advice.</p> <p>AS/NZ 1547 Appendix M.</p>	Compliant	<p>Water Management Plan Dec 2019. Sections 6.2.</p> <p>Water Management Plan Dec 2019. Section 5.0 Wastewater Treatment Appendix A</p>	<p>The loading of 480 persons is approved by the Health Department issued Licence. As noted later that loading is permitted if sufficient area of suitable ground is available and proven.</p> <p>The 480 person per day loading determined by the Department of Health was provisional on there being provided sufficient proven suitable area of 4,120 m² for waste water disposal.</p> <p>The 480 person loading is not likely to be achieved every day, therefore the average daily flows may be less and will provide a conservative approach. The greater patronage is anticipated to be more common in the warmer months when evapotranspiration and evaporation is greater.</p>	A contingency mechanism to regulate the number of patrons if required may be useful in the management procedures.
2	<p>Exemption to the Government Sewerage Policy</p> <p>Exemption to the Government Sewerage Policy from connection to an offsite sewerage system, permitted to a maximum capacity of 480 persons including staff.</p>	<p>Approved for 480 person per day loading, provided sufficient suitable area is proven for 4 120 m².</p> <p>Health Department Advice,</p> <p>Department of Health issued a Licence Approval 200.18. (22 July 2019).</p> <p>Deputy Premier and WA Minister for Health, Hon Roger Cook MLA letter (20 June 2019).</p> <p>Government Sewerage Policy 2019</p>	Compliant	<p>Water Management Plan Dec 2019. Sections 6.2.</p>	<p>Approved for 480 person per day loading, provided sufficient suitable area is proven for 4,120 m².</p> <p>As noted later that loading is permitted if sufficient area of suitable ground is available and proven.</p>	

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
3	<p>Daily waste water loading</p> <p>DOH supports an on-site waste water treatment and disposal system to cater up to 14.4 kL/day (Biomax C80) or 480 persons including staff, provided they can meet the 4,120m² disposal area.</p>	<p>The advice is issued under the <i>Health Act 1911 and Regulations</i>.</p> <p>Department of Health issued a Licence Approval 200.18. (22 July 2019).</p> <p>AS/NZ 1547</p>	Compliant	<p>Water Management Plan Dec 2019. Sections 6.2.</p>	<p>With the likely daily rate of patronage being greatest on the weekend and less on some weekdays the average volume of waste water may be less during the week days.</p> <p>At those times the Primary waste water disposal area is proposed to be used with the Secondary waste water disposal area used as reserve.</p> <p>Evergreen Consultancy proposes to only use the secondary disposal area when capacity has been reached in the southern Primary waste water disposal area.</p> <p>The use of the Secondary waste water disposal area is therefore most likely to occur at the weekends or during maintenance to the Primary waste water disposal area.</p> <p>The daily loading is dependent on the area of waste water disposal available, which has been demonstrated to be the required 4,120 m². Therefore the daily loading is acceptable.</p> <p>The waste water loading has been calculated by the Department of Health using AS/NZ 1547, based on the soil types and permeability, and is conservative. It is equivalent to only 3.4 mm of rain per day, to ensure that the waste water will soak into the soil and not saturate the soil or cause excessive runoff.</p>	<p>The northern Secondary waste water disposal area should avoid granite outcrops and be located on the southern side of the spur to enable surface water to drain south and west.</p> <p>Construct the northern waste water disposal area to ensure 600 mm free draining soil above granite basement or rock.</p> <p>The southern Primary waste water disposal area needs to be terraced. A contour plan with concept staging prepared by the installer will be useful to ensure even and sequential distribution of the waste water.</p> <p>Guidance on terracing can be found in the Code of Practice for the Design, Manufacture, Installation and Operation of ATU's Serving Single Dwellings, prepared by the Department of Health, and AS/NZ1547 Appendix M.</p>
4	<p>Biomax C80 is specified in the Licence</p>	<p>Approved</p> <p>Department of Health issued a Licence Approval 200.18 and approved the BioMAX C 80 system.</p> <p>Department of Health issued a Licence Approval 200.18. (22 July 2019).</p>	Compliant	<p>Water Management Plan Dec 2019. Sections 5.1 to 5.7</p>	<p>A BioMAX C80 is proposed and has been assessed for the site.</p> <p>The location of the unit has not changed from the site considered by the Department of Health that they used to assess the issue of a Licence for the waste water disposal.</p>	<p>Needs to be installed to specification</p>

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
5	Operational Considerations	Guidance	Compliant	Water Management Plan Dec 2019. Section 8.0 See also Section 12 Risk Management and Control Measures	These relate to the day to day management and water use. The proposed actions are all standard best practice procedures and are to be encouraged through the use of staff training, signage and other means. The Risk Management and Control Measures provide a good basis for ongoing operations.	

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required	
Waste Water Disposal Areas						
6	<p>Waste water disposal site suitability.</p> <p><i>Approved for 480 person per day loading</i>, provided sufficient suitable area is proven for 4,120 m².</p>	<p>Mandatory</p> <p>The advice is issued under the <i>Health Act 1911 and Regulations</i>.</p> <p>Department of Health issued a Licence Approval 200.18. (22 July 2019).</p> <p>Guidance</p> <p>Department of Health 2015 <i>Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATU's)</i> for Single Dwellings, provides some Guidance.</p>	Compliant	<p>Water Management Plan Dec 2019. Sections 6.2. Section 6.3.2</p> <p>Table 8</p> <p>Figures 13 and 14</p>	<p>The site has the Primary waste water disposal area in the south of 3,215 m² with an additional 1,111 m² as the secondary disposal area in the north, used after the primary area at peak times only or for maintenance.</p> <p>A contingency of 5% or 207 m² is built into the waste water disposal areas selected.</p> <p>The permeability and distance to impermeable ground have been determined for the waste water disposal area and are covered in the sections below.</p> <p>Recommendations are made for the construction of the terracing on the Primary southern disposal area and the Secondary northern disposal area.</p>	
7	<p>Treatment and Vegetation</p>	<p>Mandatory</p> <p>AS/NZ 1547 and Department of Health 2015 <i>Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATU's)</i> for Single Dwellings, provides some Guidance.</p>	Compliant	<p>Water Management Plan Dec 2019 Section 6.5</p>	<p>The suggested species are acceptable. It is noted that non local plants are likely to use more soil moisture, and assist in drying the soils, but this needs to be balanced against the use of native species which are likely to survive if soil moisture in summer reduces for any reason such as alternative disposal areas or reduced loadings.</p>	

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required	
Setbacks and Separations						
8	<p>Waste water disposal area set back 30 metres from creeklines</p> <p>Health Act 1911 <i>Health (Treatment of sewage and Disposal of Effluent and Liquid waste) Regulations 1974</i> Section 49 (1) (b).</p> <p>(Department of Health 4 October 2019).</p>	Mandatory	Compliant	<p>Water Management Plan Dec 2019 Figures, 3, 6 and 9</p> <p>Section 6.2, 6.3 and Figures 12 and 13 Section 6.6.1 Table 9</p> <p>Site Plan 1 of 8.</p>	<p>Purpose of Setbacks</p> <p>The 30 metre setback relates to the hydrogeologic connectivity by either overland flow and groundwater flow, by providing sufficient distance for any nutrients and organic matter to be attenuated.</p> <p>The research by Gerritse et al and others on the Darling Scarp and elsewhere demonstrate that when the water stays in the soil treatment occurs within very short vertical horizontal distances in loam and gravel soils. For example;</p> <p>Gerritse RG, JA Adeney, LE Bates, 1992 <i>Nutrient inputs from various land uses on the Darling Plateau in Western Australia, Results of a survey</i>, CSIRO Divisional Report 92/3.</p> <p>Gerritse RG, JA Adeney, GM Dimmock and YM Oliver, 1995, <i>Retention of Nitrate and Phosphate in Soils of the Darling Plateau in Western Australia: Implications for Domestic Septic Tank Systems</i>, Aust. J. Soil Res 1995, 33.</p> <p>Gerritse RG and JA Adeney, 1992, <i>Nutrient exports from various land uses on the Darling Plateau of Western Australia: Effects on stream water quality</i>, CSIRO Report No 92/41.</p> <p>Gerritse RG and JA Adeney, 1992 and J Hosking, 1995, <i>Nitrogen Losses from a Domestic Septic Tank System on the Darling Plateau in Western Australia</i>, Wat. Res. Vol 29, No 9.</p> <p>Bolland MDA, DG Allen and NJ Barrow, 2003, <i>Sorption of Phosphorus by Soils, how it is measured in Western Australia</i>, Department of Agriculture Bulletin 4591.</p> <p>The key aim is to provide reduced risk of wastewater flowing to a watercourse. That is achieved by the use of set backs,</p>	<p>The northern secondary waste water disposal area should avoid granite outcrops and be located on the southern side of the spur to enable surface water to drain south and west.</p> <p>Consider relocating the northern portion of the Secondary waste water disposal area because it drains north towards Hackett's Gully.</p>

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
				<p>the location of waste water disposal areas, the potential flow paths of the waste water, and the waste water disposal system.</p> <p>That is, when the waste water is closer to a watercourse it is pest practice to ensure that hydrogeological flow of the water is away from the watercourse.</p> <p>Even though Hackett’s Gully may be close to waste water disposal areas, there is only a risk if the waste water can readily traverse that gap.</p> <p>The design proposed by Evergreen Consultancy in December 2019, minimises the risk of flow to Hackett’s Gully.</p> <p>This can be further improved by relocating the northern portion of the Secondary waste water disposal area to a location further south so that it can drain west and south. See the attached annotated plan.</p> <p>Waste Water System Chosen</p> <p>Alternative systems have efficient nutrient and microbial attenuation within the systems prior to release to the soils and reduced loading rates per area so offer much reduced risk of waste water impacts.</p> <p>Further there are strict controls on the methods of waste water disposal to ground which offer significantly reduced risk than other systems. The selection of a BioMAX C 30 system reduces the initial soil loading by nutrients and in turn reduces the environmental risks from nutrients.</p> <p>Behaviour of the Waste Water</p> <p>Surface water has the potential to flow across the land surface downslope, and if there is a close watercourse or impermeable ground, the diluted waste water may contact the water course.</p> <p>This risk can be reduced by;</p> <ul style="list-style-type: none"> • increasing the travel distance to allow greater 	

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
				<ul style="list-style-type: none"> • soakage time, reducing the slope of the soils, • reducing the water loading, • directing the waste water away from impermeable or wet soils. <p>Groundwater flows are down to the granite basement and then along the top of the rock basement, through crevices and depressions. In reality the basement granite has a similar surface to the rock outcrops with protruding rock and intervening deeper soil and subsoil where soil moisture will move.</p> <p>In addition the soil moisture is taken up by plants that transpire the water into the atmosphere and use the nutrients for growth.</p> <p>All of these aspects have been considered by Evergreen Consultancy in the design and location of the waste water disposal area. Hence the changed locations of the waste water disposal areas, the terracing of the soils, the use of fill if necessary and the planting of the disposal areas to shrubs.</p> <p>Assessment of the Setback</p> <p>It is noted that the 30 metre setback under the <i>Health Act 1911</i>, applies to both septic systems and alternative systems.</p> <p>In the original proposal of mid 2019 all waste water was directed to the north eastern corner of Lot 3 in an area that drained north towards Hackett’s Gully and was partially located on granite basement, Surface flows, if they occurred, in that early 2019 proposal had a greater chance of accessing a watercourse (Hackett’s Gully).</p> <p>The updated design (December 2019) moves 74% of the waste water disposal area (Primary Area) back from the immediate catchment of Hackett’s Gully to a land surface that drains west for over 200 metres before encountering a creek line of Piesse Brook. That means that all surface water flows are to the west and has to flow over 200 metres before it can intersect a watercourse.</p>	

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
					<p>The design also uses the southern Primary waste water disposal area first with the northern or Secondary area being used as a reserve and therefore having less loading.</p> <p>The northern secondary waste water disposal area is generally located on the southern side of the spur also draining west and south to Piesse Brook and not Hackett's Gully. The aim at that location will be to ensure that surface water flows are also to the west and south west.</p> <p>That is, at the location of the Northern, Secondary disposal area the underlying granite basement is at its highest point near the centre of the ridge which enables the waste water to flow east and south away from Hackett's Gully with over 200 metres of flow before it intersects a watercourse, Piesse Brook.</p> <p>As noted above the northern (Secondary) waste water disposal area can be further improved by relocating the northern portion of the Secondary waste water disposal area to a location further south so that it can drain west and south. See the attached annotated plan.</p> <p>During construction of this disposal area modification for the land surface to drain south west is desirable and will ensure that hydrogeologically the disposal area complies with both the 30 and 100 metre setbacks. With that construction the waste water will not be able to contact Hackett's Gully.</p> <p>Further, as this is the secondary waste water disposal area the design proposed will mean that the disposal area is not used all the time, further reducing the risks.</p>	

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
9	Waste water disposal area set back 100 metres from creeklines	Recommendation DWER Recommendation	Compliant for Primary Area. Constructed to be made compliant for secondary Area	Water Management Plan Dec 2019 Figure 3, Figure 6. Figure 14 Section 6.6 Table 9 Section 12 Risk Management and Control Measures. Site Plan 1 of 8.	See the discussion on setbacks above at Item 6. The updated design moves 74% of the waste water disposal area back from the immediate catchment of Hackett's Gully to a land surface that drains west for over 200 metres before encountering a creek line of Piesse Brook. See the attached annotated plan. The northern secondary waste water disposal area is generally located on the southern side of the spur also draining west and south to Piesse Brook and not Hackett's Gully. During construction of the secondary disposal area modification for the land surface to drain south west is desirable which will hydraulically comply with the 100 metre buffer.	Modify the northern waste water disposal area so that the surface gently drains west and south. See Figure 14 Provide bunding, impermeable barrier or other containment to prevent waste water flowing to Hackett's Gully in the event of pipe rupture, blockage or breakdown.
10	Location of the Biomax Unit	Approved Department of Health issued a Licence Approval 200.18 and approved the BioMAX C 80 system.			The BioMAX C80 location was approved by the Minister and Department of Health Licence based on the earlier design and the <i>Health (Treatment of sewage and Disposal of Effluent and Liquid waste) Regulations 1974</i> . The set back is less than 100 metres. The BioMAX C80 position is located at the northern boundary and was approved by the Minister and Department of Health Licence issued based on the earlier mid 2019 design. This is close to the northern boundary and it is recommended that there be some means of impermeable retaining features to prevent a leak, or tank rupture from flowing to Hackett's Gully. This could be earth or other bunding or some form of impermeable lined bunded area. An impermeable lined area is not recommended because it will capture stormwater that will have to be dealt with. What is required is a method of containment of a spill onto natural local soils that will enable precipitation to soak into the ground. If a spill of waste water occurred the waste water will be retained and could be removed prior to it causing any	Provide bunding, impermeable barrier or other containment to prevent waste water flowing to Hackett's Gully in the event of pipe rupture, blockage or breakdown.

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
				significant environmental impact.	
11 Setbacks to structures and facilities	Mandatory Health Act 1911 <i>Health (Treatment of sewage and Disposal of Effluent and Liquid waste) Regulations 1974.</i> AS/NZ 1547 Appendix R.	Compliant	Water Management Plan Dec 2019 Figure 3, Figure 6. Figure 14 Section 6.6 Table 9	Setbacks are defined in AS/NZ 1547 and Health Act Regulations: - see Side boundaries 1.5 metres 1.8 m (AS/NZ 1547), Health Act Regulations 1.8 metres Terracing and toe of wall 3.0 metres Site Buildings 1.8 m (AS/NZ 1547), Health Act Regulations 6.0 metres (Regulations 49 and 50) Paths 1.8 metres Groundwater 0.5 to 1.2 metres (see Item 10 below).	
12 Free draining soil 500 mm free draining soil below waste water disposal area. And 500 mm separation to the highest known water table.	Mandatory Health Act 1911 <i>Health (Treatment of sewage and Disposal of Effluent and Liquid waste) Regulations 1974, (500 mm)</i> AS/NZ 1547 Appendix M. Guideline Government Sewerage Policy 2019 Table 4, (600 mm). Guideline City of Kalamunda	Compliant for Primary Area. Any part of the Secondary disposal area that does not meet specification can be made compliant through construction.	Water Management Plan Dec 2019 Section 6.3.2 Sections 9.0, 9.1 – 9.4 Figure 4 Appendix E.	The geomorphology and hydrogeology of the site were confirmed by Lindsay Stephens during a site inspection in October 2019. The southern primary waste water disposal area is compliant as shown by the geotechnical testing completed. The northern secondary waste water disposal area should avoid areas of rocky basement soils. If fill is used it should be 500 mm separation. The requirement in the <i>Health Act 1911</i> is for 500 mm and prevails over the Government Sewerage Policy. The Government Sewerage policy recommends a separation of 600 mm. In this location to allow greater soil retention and treatment time, and better potential for hydrogeological connection to the west, the 600 mm of soil fill where required is preferred.	The northern secondary waste water disposal area should avoid granite outcrops and be located on the southern side of the spur to enable surface water to drain south and west. Construct the northern waste water disposal area to ensure 600 mm free draining soil above granite basement or rock. To achieve that consider relocating the northern portion of the Secondary waste water disposal area because it drains north towards Hackett's Gully.

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
		(2018) Guidelines for Installing Septic Tanks and Leach Drains In the City of Kalamunda. (1200 mm)			The City of Kalamunda Guidelines require 1.2 metre separation, but the Health Act prevails through the Department of Health issued a Licence Approval 200.18.	
13	<p>Separation to groundwater</p> <p>The irrigation area shall not be located within land prone to waterlogging or subject to floodwater inundation.</p>	<p>Mandatory</p> <p>Health Act 1911 <i>Health (Treatment of sewage and Disposal of Effluent and Liquid waste) Regulations 1974</i>, (500 mm)</p> <p>AS/NZ 1547 Appendix M.</p> <p>Guideline</p> <p>Government Sewerage Policy 2019 Table 4, (600 mm).</p> <p>Guideline</p> <p>City of Kalamunda (2018) Guidelines for Installing Septic Tanks and Leach Drains In the City of Kalamunda. (1200 mm)</p>	Compliant	<p>Water Management Plan Dec 2019 Section 6.3.2 Sections 9.0, 9.1 – 9.4</p> <p>Figure 4</p> <p>Appendix E.</p>	<p>The location of the disposal area is on the peak of a ridge where the water table is deep and draining from the underlying rock basement at depth. That type of geological and geomorphological environment is well known for there being no shallow groundwater. In addition the southern area has been levelled and filled and will require further fill and terracing.</p> <p>There is no evidence of perched winter water tables and none would be expected. Separations to the groundwater are required to be 500 mm – (Mandatory <i>Health Act 1911 and Regulations</i>) or 600 mm (Guideline <i>Government Sewerage Policy 2019</i>).</p> <p>The soil test holes were drilled to depths of between 1000 mm to 1500 mm and did not detect any water in any hole.</p> <p>See the Structerre test results and soil logs in the Water Management Plan Dec 2019, Appendix E.</p>	<p>The northern secondary waste water disposal area should avoid granite outcrops and be located on the southern side of the spur to enable surface water to drain south and west.</p> <p>Construct the northern waste water disposal area to ensure 600 mm free draining soil above granite basement or rock.</p> <p>To achieve that consider relocating the northern portion of the Secondary waste water disposal area because it drains north towards Hackett's Gully.</p>

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
Soil Properties						
14	<p>Timing of Soil testing</p> <p>The comment on the timing of the soil testing made by the is not binding and is satisfied.</p>	<p>Recommendation</p> <p>DWER on 26 February 2020</p> <p>Guidance from Government Sewerage Policy.</p> <p>AS/NZ 1547 requires that soil testing be conducted at an appropriate time.</p>		<p>Compliant with Australian Standard and geotechnical best practice.</p>	<p>The geomorphology and hydrogeology of the site were confirmed by Lindsay Stephens during a site inspection in October 2019.</p> <p>Soil testing was completed in October 2019 just past winter groundwater peaks. Winter groundwater peaks are normally September to early October and not in winter, as the winter rainfall eases and a balance is established prior to soil evaporation and evapotranspiration rates from vegetation moves to exceed the rate of precipitation as the weather warms into spring. (Note evapotranspiration is the loss of water from the soil as plants suck up and lose water to the atmosphere).</p> <p>Average winter rainfall at Bickley is May 129.8 mm, June 197.6 mm, July 218.8 mm, August, 178.8 mm and September 123.2 mm, dropping in October to 66.1 mm. (Bureau of Meteorology). Bureau of Meteorology. The highest groundwater elevations are normally in late September.</p> <p>Evapotranspiration data is available for Bickley and in 2019 showed that the evapotranspiration was 105 mm for September 2019 with 67 mm rainfall and the last significant rainfall being on 19 September 2019 when 21.4 mm rain fell. Bureau of Meteorology.</p> <p>In October 2019 there was also 23.6 mm of rainfall on 5 October 2019. The soil test holes were completed on 10 October 2019. Considering the site hydrogeology, the average and 2019 rainfall patterns, the 23.6 mm rainfall event, the timing of the site assessments for groundwater separation is acceptable.</p> <p>Separations to the groundwater are required to be 500 or 600 mm. The soil test holes were drilled to depths of between 1000 mm to 1500 mm and did not detect any water in any hole. The separation distances are greater than any differences that might occur due to the variation in the dates of soil testing.</p>	

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
15	Soil Permeability Testing	<p>Mandatory</p> <p>Health Act 1911 <i>Health (Treatment of sewage and Disposal of Effluent and Liquid waste) Regulations 1974.</i></p> <p>AS/NZ 1547 Appendices B and G.</p> <p>Government Sewerage Policy 2019 Schedule 2.</p>	Compliant	<p>Water Management Plan Dec 2019 Section 6.2 Section 6.3.2 Table 1</p> <p>Appendix E.</p>	<p>Soil permeability was determined by Structerre and found to be Clay Loam soils with typical soil permeabilities for those soils.</p> <p>The waste water disposal area calculated by the Health Department is based on the measured soil permeabilities.</p> <p>The methods of testing were compliant with AS/NZ 1547 Appendices B and G.</p>	
16	<p>Terracing</p> <p>Any irrigation disposal area with a slope of greater than 10% shall be terraced</p>	<p>Mandatory on steeper slopes</p> <p>Health Act 1911 <i>Health (Treatment of sewage and Disposal of Effluent and Liquid waste) Regulations 1974.</i></p> <p>AS/NZ 1547 Appendix M, Table M2.</p> <p>Guidance</p> <p>Department of Health 2015 <i>Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATU's) for Single Dwellings</i>, provides some Guidance.</p>	Compliant in design but needs to be constructed.	<p>Water Management Plan Dec 2019 Section 9.5</p> <p>Section 6.7</p>	<p>The design of the trench disposal envelopes will depend on the nature of the land application area, which in the south is steep in places and changeable. A survey plan is likely to be useful to provide a sketch design of how the waste water will be distributed to the various terraces and what retaining mechanisms and soil fill if required are to be used for the waste water disposal areas.</p> <p>Terracing is proposed. A recommendation is made above to provide concept design plans to inform the installer of the design data to ensure even waste water distribution and flows.</p> <p>Concept rather detailed plans are considered more useful as the plans will need to be flexible to be modified as installation will be required to respond to individual soil conditions.</p>	<p>The southern waste water disposal area needs to be terraced. A contour plan with concept terracing prepared by the installer will be useful to ensure even and sequential distribution of the waste water.</p> <p>Guidance on terracing can be found in the Code of Practice for the Design, Manufacture, Installation and Operation of ATU's Serving Single Dwellings, prepared by the Department of Health, and AS/NZ1547 Appendix M.</p>

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
DWER Comments and Recommendations, 20 February 2020						
17	<p>DWER Advice</p> <p>The location of the secondary effluent disposal field and the effluent treatment system is approximately 35 metres from Hackett’s Gully.</p> <p>This setback is insufficient, in accordance with the Draft Government Sewerage Policy (State Government, Nov 2016) and the DWER’s Water Quality Protection Note No. 70: Wastewater treatment and disposal – domestic systems (DWER, March 2016), which both require a minimum 100 metre setback to waterways for the effluent treatment system and any effluent disposal area.</p>	<p>Advice</p> <p>DWER Advice of 26 February 2020</p>	Compliant	<p>Water Management Plan Dec 2019. Section 4.4 – 4.6 Wastewater Treatment</p>	<p>The Minister for Health approved the project and the Department of Health, on 22 July 2019, issued Licence Approval 200.18, (22 July 2019) under the <i>Health Act 1911</i>, which prevails over advice provided by the DWER and the Middle Helena Catchment Management Plans.</p> <p>As noted above the waste water disposal area has been moved to increase the setbacks to Piesse Brook with 200 metres. There will be no hydraulic connectivity to Hackett’s Gully.</p> <p>The <i>Health Act 1911</i> requires the local authority to carry out the provisions of the <i>Health Act 1911</i>. The Conditions of the Licence will also prevail.</p> <p>The setbacks are discussed at Items 6 and 7 above</p>	<p>See above for the comments on the recommendation for the northern waste water disposal area and the installation of the BioMAX system.</p>

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
Stormwater from car parking						
18	Waste water separated from stormwater	Advice DWER Advice of 26 February 2020		Water Management Plan Dec 2019. Water Management Plan Dec 2019. Section 9.3, 9.4 Site Plan 1 of 8.	Waste water is to be separated from stormwater from the car park and other areas. That is proposed in the December 2019 Management Plan, but some more detail is recommended with respect to stormwater management, the size of the basins and overflows. The stormwater is proposed to be collected in a central area and then piped under the waste water disposal area through an impermeable pipe system to a dam on the adjoining land to the west (owned by the proponent).	Ensure that all stormwater is separated from waste water and that neither is able to impact on each system. There does not appear to be a detailed description of the stormwater management apart from Site Plan 1 - 8
19	DWER concerns with stormwater from the car park The latest proposal again proposes a significant area for <i>car parking</i> . Further information on the stormwater management for the carpark was requested in previous correspondence to the City. The DWER has concerns regarding: Stormwater modelling and storage calculations, Treatment and conveyance mechanisms for large carpark,	Advice DWER Advice of 26 February 2020	Compliant but further information is recommended	Water Management Plan Dec 2019. Water Management Plan Dec 2019. Section 9.3, 9.4, 9.6 Site Plan 1 of 8.	The site already has significant hardstand, and therefore stormwater generation, and has done so for many years. The current situation is that there is already a parking area in the south and all stormwater is direct to a central sump, from which it is piped to the edge of the subject land and then flows by overland flow to a dam 80 metres away from the car parking sump. The dam on the adjoining lot to the west is owned by the same landholder. It is understood that stormwater is used to provide the water for the dam which is used on that lot (Lot 100) for normal irrigation and other rural activities. Overflows from the dam flow to Piesse Brook 170 metres further to the west. The proposed car park feeds to the same central collection area and down the same pipe network and overland flow. Water will be detained in the dam as it is now. The difference in recharge and stormwater will slightly increase in volume with the conversion of more car parking and gravel hardstand to asphalt. There does not appear to be a detailed description of the stormwater management apart from Site Plan 1 – 8, including volumes, storm events, capacities. Some	Ensure that all stormwater is separated from waste water and that neither is able to impact on each system. It is recommended that additional information be provided and address the implications of the stormwater travelling offsite, such as calculated volumes, storage and designated flow paths to separate stormwater from the waste water disposal areas.

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
	Extent of stormwater events being discharged off site (over property boundary), Interaction of carpark stormwater and the proposed primary effluent disposal field.				calculation of volumes, capacities and flow paths could be useful.	
20	Legal status of potential surface water flows		Suggested easement or notification		It is noted that the stormwater from the car park is to be directed to a dam on the adjoining land to the west, currently held by the proponent and any overflow is to eventually end up in Piesse Brook if any overflow occurs.	It is recommended that an easement or some other form of notification be placed on the lot to the west, Lot 100, to the effect that the land may receive stormwater from Chalet Rigi with the easement or notification providing access to make repairs and modifications to the stormwater management.

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
Middle Helena Catchment						
21	Middle Helena Public Drinking Water Source Area (PDWSA) and is managed for Priority 2 (P2) source protection.	Advice DWER Advice of 26 February 2020	Not Compliant with the DWER Advice. Compliant with DOH Licence Approval 200.18, (22 July 2019). The Department of Health is the determining Agency for projects larger than a waste water system serving a single dwelling and they have issued a Licence Approval 200.18.	Water Management Plan Dec 2019. Section 4.4 Public Drinking Water Source Area (PDWSA) Section 12 Risk Management and Control Measures	The proposal appears to comply with the various Water Quality Protection Guidelines apart from the Middle Helena Public Drinking Water Source Area (PDWSA) and is managed for Priority 2 (P2) source protection. However the Department of Water Environment Regulation provides advice to the City who makes their own determination. The Department (DWER) does note that should the City approve the proposal a number of conditions might be considered. The Minister for Health approved the project and the Department of Health on 22 July 2019 issued Licence Approval 200.18, (22 July 2019) under the <i>Health Act 1911</i> , which prevails over advice provided by the DWER and the Middle Helena Catchment Management Plans. As noted above the waste water disposal area has been moved to increase the hydraulic setbacks to watercourses to over 200 metres with no impact from the waste disposal area on Hackett's Gully.	

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
Water Management Plan						
22	<p>Water Management</p> <p>Prior to the commencement of site works, a Water Management Plan is to be prepared and approved, to the satisfaction of the Department of Water and Environmental Regulation and the City of Kalamunda. <i>(It is noted that the Department of Health has issued a Licence and stated that was based on a comprehensive Water Management Plan).</i></p> <p>The approved Water Management Plan shall be implemented to the satisfaction of the City of Kalamunda.</p> <p>The Water Management Plan should identify and address all potential risks to water quality from the existing land uses and proposed</p>	<p>Advice</p> <p>Department of Water Environment Recommendation and comments in correspondence to the City of Kalamunda.</p> <p>The Water Management Plan should be prepared in accordance with relevant Water Quality Protection Notes (WQPN) and guidelines including, WQPN 25: Land use compatibility tables for public drinking water source areas, WQPN 70: Wastewater treatment and disposal – domestic systems, WQPN 79, Rural restaurants, cafés and taverns near sensitive water resources, WQPN 88: Rural tourist accommodation;</p>	<p>Compliant</p> <p>Apart from the addition of some extra detail on the terracing and stormwater separation from the car park and hard stand the December 2019 Evergreen Water and Stormwater Management Report addresses the issues associated with the proposal.</p>	<p>Water Management Plan Dec 2019.</p> <p>Section 12 Risk Management and Control Measures</p>	<p>DWER provides advice.</p> <p>As part of the Health Department Approval and issue of the Licence it was noted by the Department of Health that there was a comprehensive water management plan presented. The December 2019 plan has been updated and includes additional information.</p> <p>The proposal appears to comply with the various Water Quality Protection Guidelines apart from the Middle Helena Public Drinking Water Source Area (PDWSA) and is managed for Priority 2 (P2) source protection.</p> <p>The current plan by Evergreen Water and Stormwater Management Plan Dated December 2019, contains more information on waste water management and adequately deals with nutrient management and the changed setbacks which complies with DWER Guidelines.</p> <p>The most general and applicable document is WPQN 79, but that repeats what is in other documents and requirements.</p> <p>A review of the Water Quality Protection Notes shows that the current proposal and documentation is compliant and covers all the information.</p> <p>The preparation of a new Water Management Plan to DWER requirements seems not necessary and would repeat all the current information.</p> <p>Even though DWER provides advice only the current includes all issued raised in the DWER documents with the exception of stormwater.</p> <p>The stormwater measures are acceptable, and are documented on Figure 1 of 8.</p>	<p>If further documentation of stormwater management is required a brief stormwater management plan could be required as part of a condition.</p> <p>Any requirement for an additional water management plan would be repetition and is regarded as not being necessary.</p>

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
	development, including but not limited to: <ul style="list-style-type: none"> • wastewater loadings and management; • nutrient budget and effluent disposal field details; • management of stormwater from carparks and roads; • management of irrigation and nutrients from landscaped areas; • potential impacts and mitigation measures for onsite and offsite water 					

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
Nutrient Management						
23	<p>Nutrients</p> <p>DWER Advice</p> <p>Any proposal for a reduced setback of the effluent disposal field from Hackett's Gully should be supported by a nutrient budget/balance. The details provided on the BioMAX Model C80 Wastewater Treatment System detail that the level of Total Nitrogen in the effluent is equal to (or less than) 10 mg/L.</p>	<p>Mandatory exiting the BioMAX C80 system</p> <p>Department of Health issued a Licence Approval 200.18 and approved the BioMAX C80 system.</p> <p>AS/NZ 1547 Appendix S.</p> <p>Recommended</p> <p>Water Quality Testing</p>	Compliant	<p>Water Management Plan Dec 2019 Appendix E Section 3.3.3</p> <p>Section 7.0 Nutrient Behaviour.</p> <p>Section 12 Risk Management and Control Measures</p>	<p>Existing Water Quality</p> <p>The existing quality of the water in Hackett's Gully and Piesse Brook was assessed by Evergreen Consultancy. This provides baselines data for the watercourses, but nutrient levels can vary considerably between years and months, and as day to day land uses change; such as the location of stock, nutrient application to land etc.</p> <p>Therefore additional sampling is recommended to provide more definitive data.</p> <p>Potential Nutrient Impacts of the System</p> <p>The behaviour or nutrients in waste systems and soils is also referred to under setback at Item 8, above where a number of references are listed that has examined such behavior.</p> <p>The requirements for Nutrient Management for Nitrogen and microbial material are mandatory for the design of the waste water disposal tank and apparatus. These are specified and tested by the Health Department during the design of the unit. When constructed the BioMAX C80 is capable of achieving the required minimal nitrogen and microbial levels in waste water disposed to ground.</p> <p>The design acceptance was noted in the letter from Premier of Western Australia Hon Mark McGowan, dated 19 September 2019 where it is noted that the Department of Health considered the on-site pathogen risks and impacts on human health.</p> <p>In addition chlorination dosing is built into the operating procedures to ensure that microbial material is brought to very low levels. See Evergreen Consultancy December 2019 Section 12, Risk and Management Control Measures.</p> <p>Phosphorus loss takes place in the soil as discussed below.</p>	<p>Incorporate the Recommendations in Evergreen Dec 2019, Section 8, Operational Considerations and Section 12 Risk Management and Control Measures.</p> <p>Continue monitoring Hackett's Gully and Piesse Brook as a minimum in Autumn and spring when the creeks are flowing.</p>

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

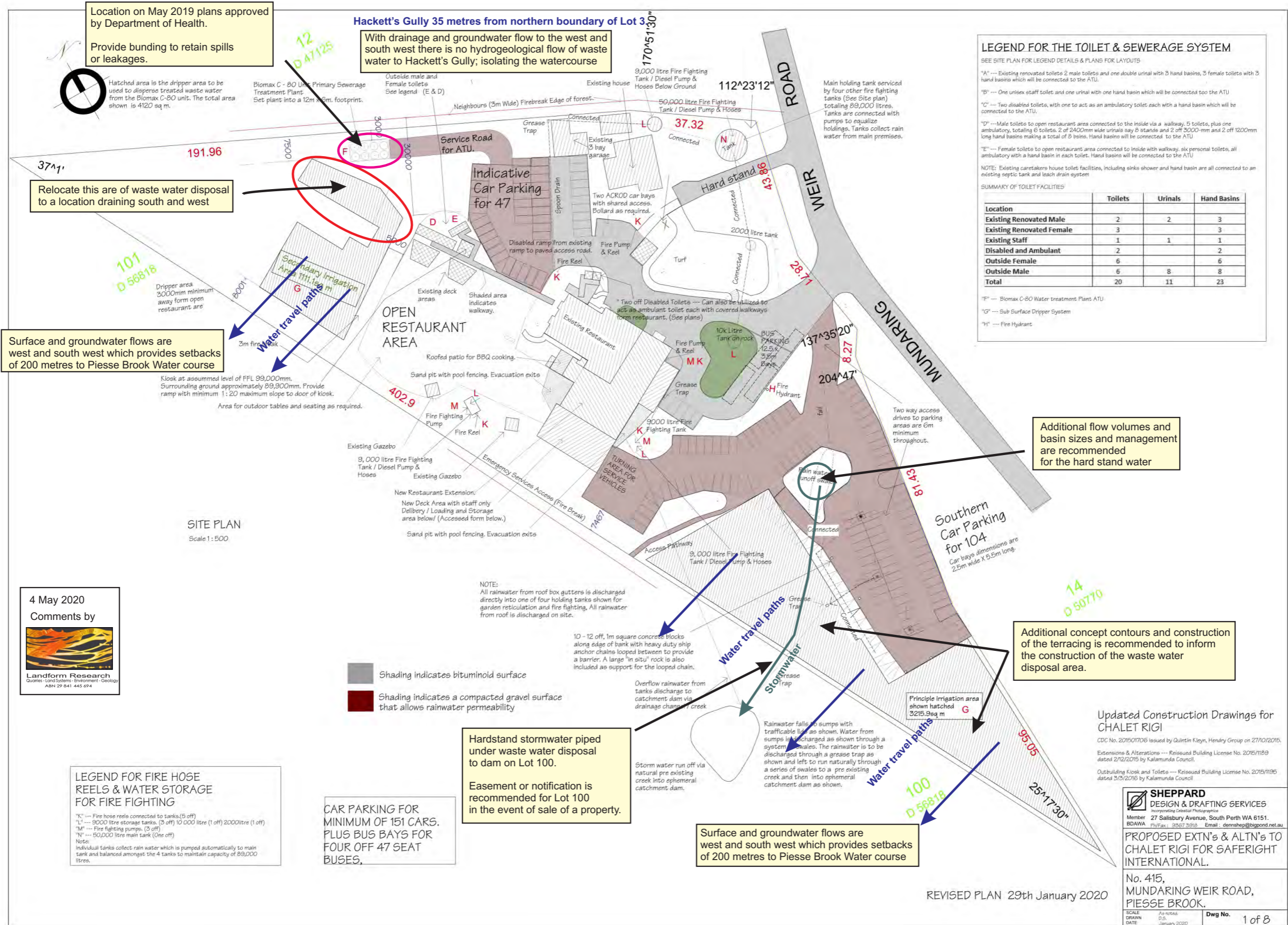
Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
				<p>Nitrogen loss and reduction is built into the design of the BioMAX C80 and then occurs by denitrification in the waste water disposal area. Denitrification occurs in moist soils and is complete within 1 – 3 metres. There are numerous studies showing this in all soil types as it is independent of the soil type and depends on the microorganism function of the soil. See the references at Item 8.</p> <p>Phosphorus is responsible for nutrification of fresh water bodies.</p> <p>BioMAX quotes the phosphorus export as 0 – 2 mg/L (Evergreen Dec 2019). This would take into account the soil characteristics of the soil of the disposal area</p> <p>After exiting the waste water system the water will be distributed to the laterite gravel soils with well known very high phosphate retention of >50 PRI which is capable of adsorbing all phosphorus within 1 metre of the disposal points.</p> <p>At an average raw waste water concentration of 10 mg/L P in waste water, P is 140 g/day That is, at full capacity 1 cubic metre of laterite gravel will retain all P for from 300 days operation within an area of 4,120 m² that is sufficient capacity for over 3 000 years. See the references at Item 8.</p> <p>Microbial Purification is completed through the design of the BioMAX X80 system and chlorination treatment. Soil microbes will treat the waste water as well and can cope with small breakdown events.</p> <p>There is no evidence from the design that the proposed waste water disposal will adversely impact on the current water quality of Hackett’s Gully. Drainage will be to the west and south to Piesse Brook 200 metres away. The proposed design is adequate and capable of minimising or negating any nutrient risk.</p> <p>The design of the BioMAX C80 system, the proposed installation, the methods of waste water disposal and the soil conditions all have been designed to take into account the potential for nutrient impacts and should satisfy the concerns</p>	

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
					of the DWER.	

TABLE 1 SUMMARY TABLES OF COMPLIANCE OF THE WATER AND STORMWATER MANAGEMENT PLAN WITH THE REQUIREMENTS

	Requirement - Management	Source of Requirement - Management	Current Proposal Compliance	Reference in Evergreen December 2019	Comments – by Landform Research	Landform Research Recommendations - if required
Risk Management and Contingencies						
24	Risk Management	Guidance		Water Management Plan Dec 2019 Section 12 Risk Management and Control Measures.	The system is based on minimising the environmental risks by the selection of the system, the design and location of the waste water disposal areas and the proposed operations of the facility. A risk Management Assessment which included Risk Reduction Measures is included by Evergreen Consultancy at Section 12 of the December 2019 Management Plan. The risk assessment addresses the main risks and provides mitigation and management for those items. Risk Management Systems are flexible documents and are added to or modified as site or other conditions change and so at any one time some of the contingencies or management may be used or others may be added.	



Location on May 2019 plans approved by Department of Health.
Provide bunding to retain spills or leakages.

Hackett's Gully 35 metres from northern boundary of Lot 3
With drainage and groundwater flow to the west and south west there is no hydrogeological flow of waste water to Hackett's Gully; isolating the watercourse

Relocate this area of waste water disposal to a location draining south and west

Surface and groundwater flows are west and south west which provides setbacks of 200 metres to Piesse Brook Water course

Additional flow volumes and basin sizes and management are recommended for the hard stand water

Additional concept contours and construction of the terracing is recommended to inform the construction of the waste water disposal area.

Hardstand stormwater piped under waste water disposal to dam on Lot 100.
Easement or notification is recommended for Lot 100 in the event of sale of a property.

Surface and groundwater flows are west and south west which provides setbacks of 200 metres to Piesse Brook Water course

LEGEND FOR THE TOILET & SEWERAGE SYSTEM
SEE SITE PLAN FOR LEGEND DETAILS & PLANS FOR LAYOUTS

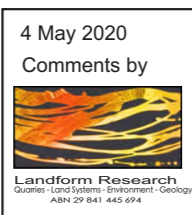
A --- Existing renovated toilets 2 male toilets and one double urinal with 3 hand basins, 3 female toilets with 3 hand basins which will be connected to the ATU.
B --- One unisex staff toilet and one urinal with one hand basin which will be connected to the ATU.
C --- Two disabled toilets, with one to act as an ambulatory toilet each with a hand basin which will be connected to the ATU.
D --- Male toilets to open restaurant area connected to the inside via a walkway, 5 toilets, plus one ambulatory, totalling 6 toilets. 2 of 2400mm wide urinals and 2 off 3000mm and 2 off 1200mm long hand basins making a total of 8 basins. Hand basins will be connected to the ATU.
E --- Female toilets to open restaurant area connected to inside with walkway, six personal toilets, all ambulatory with a hand basin in each toilet. Hand basins will be connected to the ATU.

NOTE: Existing caretakers house toilet facilities, including sinks shower and hand basin are all connected to an existing septic tank and leach drain system

SUMMARY OF TOILET FACILITIES

Location	Toilets	Urinals	Hand Basins
Existing Renovated Male	2	2	3
Existing Renovated Female	3		3
Existing Staff	1	1	1
Disabled and Ambulant	2		2
Outside Female	6		6
Outside Male	6	8	8
Total	20	11	23

F --- Biomax C-80 Water treatment Plant ATU
G --- Sub Surface Drinker System
H --- Fire Hydrant



LEGEND FOR FIRE HOSE REELS & WATER STORAGE FOR FIRE FIGHTING

K --- Fire hose reels connected to tanks, (5 off)
L --- 9000 litre storage tanks, (3 off) 10 000 litre (1 off) 2000 litre (1 off)
M --- Fire fighting pumps, (3 off)
N --- 50,000 litre main tank (1 off)

Note:
Individual tanks collect rain water which is pumped automatically to main tank and balanced amongst the 4 tanks to maintain capacity of 89,000 litres.

CAR PARKING FOR MINIMUM OF 151 CARS. PLUS BUS BAYS FOR FOUR OFF 47 SEAT BUSES.

Updated Construction Drawings for CHALET RIGI
CDC No. 20150706 issued by Quintin Klayn, Hendry Group on 27/10/2015.
Extensions & Alterations --- Released Building License No. 2015/1189 dated 2/12/2015 by Kalamunda Council.
Outbuilding Kiosk and Toilets --- Released Building License No. 2015/1195 dated 2/12/2015 by Kalamunda Council.

SHEPPARD
DESIGN & DRAFTING SERVICES
Member 27 Salisbury Avenue, South Perth WA 6151.
BOAWA Pty Ltd. 9367 2918. Email: donshep@bigpond.net.au

PROPOSED EXTN'S & ALTN'S TO CHALET RIGI FOR SAFERIGHT INTERNATIONAL.

No. 415, MUNDARING WEIR ROAD, PIESSE BROOK.

SCALE: As Shown
DATE: 29 January 2020
Dwg No. 1 of 8

REVISED PLAN 29th January 2020