Landform Research
Land Systems - Quarries - Environment
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**ADDITIONAL NOTES**
**PROPOSED SAND EXCAVATION**
**LOTS 4 – 7 JARRAHDALE AND TRANSIT ROADS, MARDELLA**

This additional information is provided in response to a letter sent from the Shire of Serpentine – Jarrahdale to Redire Pty Ltd, dated 10 December 2012.

The items raised are considered in turn.

The additional documentation should be considered in conjunction with the Excavation and Rehabilitation Management Plan dated March 2012.

The management plan was prepared with what was felt at the time to be sufficient information for such a relatively small short, term proposal.

A number of additional figures have been produced and these are referred to.

## 1.0 Background

The proposed sand excavation will be a small short term operation.

There is approximately 190 000 cubic metres of sand in excess of future requirements. The resource covers 7 hectares to a depth of between 2 – 4 metres.

The site was planted to pines, but these have been cleared and only trash remains. This will be removed as part of the excavation process.

Removal of the sand ridge will improve the soil moisture availability and increase the land capability of the excavated soil. The final end use will be a return to pasture.

It is anticipated that the sand will be taken as one large contract or several small contracts. In all it is anticipated that with one large contract and 6 laden truck movements per hour the sand will be removed within six months.

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### 1.1 Need for sand

An analysis of the development needs for the next 20 years has been conducted by the Department of Planning in *Directions 2031 and Beyond*. Similar analyses were produced in the planning document, Outer Metropolitan Perth and Peel Sub-regional Strategy.

In summary, the Department of Planning estimated that the 2009 population of the Shire of Serpentine Jarrahdale will grow significantly from 16 500 residents with the addition of another 30 800 dwellings by the year 2031. For 30 800 dwellings it is assumed that if 80% are constructed on lower lying land, using 1 000 $m^2$ sand fill per dwelling which includes roads and other filled areas and a thickness of sand fill of 1.5 metres, then 46 million cubic metres of sand fill will be required.

It is understood that currently the Department of Planning are working on the amount of fill required for the next 20 and then 50 years. To achieve this they are working with the Department of Mines and Petroleum and Department of Environment and Conservation to try and construct dwellings in the most efficient manner with the most minimal impact on the environment from the sourcing and supplying of the sand fill.

There is a real shortage of fill sand within the south eastern corridor. Sand for fill is very price sensitive and therefore in the interests of sustainability and minimising costs for housing it is essential that where there is excess sand on a particular site, that the sand is used prior to it being sterilised.

Typically sand for a dwelling lot can cost $6 - $8 000 per lot. However with transport costs being about 50 cents per tonne per km travelled, depending on the type of truck used, the cost of transporting that sand can be $10 000 and can blow out by up to $10 000 depending on the source of sand.

It is therefore critical to use all available sand prior to sterilisation.

This is explained in Section 1.1 of the Management Plan.

### 1.2 End Use

The end use described in the Management Plan is pasture. The land is zoned rural and that end use is consistent with the zoning.

## 2.0 Visual Impact Assessment

The WAPC *Visual Landscape Planning in Western Australia* has been viewed and the project considered against that document.

The location of the extractive industry is determined by the presence of the sand and cannot be relocated to another site. The sand is identified in line with high level planning policies as outlined in Section 1.1 of the Management Plan.

The excavation areas are set back from Jarrahdale Road. Figure 1A. The excavation is setback 40 metres from the lot boundaries from South Western Highway and Transit Roads. Figure 1A.

The site lies on a gently sloping ridge/spur. It is described in the Management Plan in which site photographs are included. Additional photographs are attached.

The proposed excavation occupies a small portion of the subject land as shown in Figure 1A. There will be no alteration to local features, roads, access, zonings, ridge lines or natural features.

The Tonkin Highway extension will enter the site as shown on Figure 2A. The proposed sand excavation will not impact on the alignment.

An analysis of the potential impacts is provided in the attached figures which include aerial photography, ground photography and sections.

The proposal is for a short term sand pit of perhaps 6 months. It covers 7 hectares to a depth of between 2 – 4 metres. With an averaged depth of 3 metres there will be minimal impact on the excavated landform.

No native vegetation will be cleared. The site consists of an old pine plantation from which some trash remains on site. The trash will be removed from the excavation area and that area returned to pasture, which is compatible with the surrounding rural landscape which has areas of trees interspersed with cleared pasture. Adjoining land to the north, east and west is pasture.

The tree buffer along South Western Highway should prevent the most of the operations from being visible from that road. Figures 1A and 1C. With a proposed perimeter bund of 2 – 3 metres of overburden it is unlikely that the operations will be seen from South Western Highway when driving past the tree lined area. Figure 1C.

However it is possible that the excavation may be seen from the turn-in bay on South Western Highway to the north west of the site. Figure 1B.

The excavation may also be visible from parts of Jarrahdale Road, (Figures 1A and 1B), and will be visible from higher elevations north of Jarrahdale Road, but at a distance.

The operations may be visible from Transit Road, but, with a perimeter bund of overburden pushed to the perimeter of the excavation, from road elevation a break of slope is likely to minimise views of the excavation. Figures 1A and 1D.

The reduced time frame for operations should only cause temporary impact, with only the southern part of the excavation near Transit Road.

Because of the nature of the operation there is no advantage in planting any trees along Transit Road because they will not have time to grow. The same applies to the turn-in bay on South Western Highway and Jarrahdale Road.

This pit will not be a deep pit, but even so, with the cut of 2 - 4 metres and perimeter bunding, some visual and noise protection will be afforded. See sketch sections 1B, 1C and 1D.

The final land surface will be consistent with the existing land surface of the adjoining land as the ridge will be lowered by some 2 – 4 metres.

The *Shire of Serpentine – Jarrahdale LPP8 Landscape Protection Policy* may apply to the operations. With the excavations unlikely to be visible from most of South Western Highway, the setback from Jarrahdale Road and the short nature of the operations, it is considered that whilst there may be some short term conflict with the intent of the policy the use of the sand for fill for local developments provides substantial environmental offsets in costs, transport impacts and reduced greenhouse gas emissions when compared to sourcing sand from further away.

Some comments relating to *Shire of Serpentine – Jarrahdale LPP8 Landscape Protection Policy* were raised by a submitter to the Shire during the advertising period.

Comments on the items raised are made below. The text in Italics is taken from the submitter's comments who sourced their comments from LPP8.

*The objectives of the policy as stated are:*

*"To preserve the amenity deriving from the scenic value of the Darling Scarp;"*

Response

The extraction of sand is a short term landuse with minimal impact by being so shallow and relatively small. It will not compromise the LLP8 Landscape Protection Policy. The proposal is compatible with points 1 – 3 under the policy LLP8 after the short term excavation.

The need for sand is explained on page 1 of the Management Plan and the relevant policies on pages 1 – 4 of that plan.

The land has previously been used for plantation, and it is proposed that future planning and use of the site will provide good outcomes as rural land. By rehabilitating the site to pasture the site will remain compatible with the surrounding land and LPP8.

"*To maintain the integrity of landscapes within the Landscape Protection Area;"*

Response

A short term extractive industry, will temporarily reduce the landscape value of a small portion of the site from some land, mostly to the north.

However the needs of the community must be considered in any decision making. By sourcing the sand from here for anticipated use within the Shire the truck movements to supply that sand will be significantly reduced in length assisting the amenity of residents within the Shire and helping to keep development costs of new urban land to more affordable levels. Every decision contains compromises and Redire believes that the benefits to the community out way the short term local impact.

The sand excavation, if all goes to plan, will be excavated as a one off contract in a short 6 months time frame. If this cannot be obtained then excavation will extend for a longer time frame but at reduced rates of extraction. Compared to other sand pits and quarries this is a very small low impact operation.

The visual consideration suggest that the excavation will not have a large impact on the local area.

"*To maintain the integrity of landscapes in the line of sight view corridor along identified scenic routes in the Shire, including but not limited to South West Highway,... Jarrahdale Road,... both the North-South and East-West Railway lines and natural water courses;"*

Resonse

As noted above this is a small short term operation. The visual analysis suggests that the potential impacts from local roads and land will be small. See Figures 1A to 1D.

*"Development Considerations*
*... the following will also be considered when assessing a development application within the Landscape Protection Area:*
*The 'seen area' of the development from the coastal plain, major roads and tourist routes, and major recreation areas;"*

Response

As noted above and explained in Figures 1A to 1D the impacts from view corridors will be small and short term. This is offset by reductions in the length of transport routes required to supply the same amount of sand to developments within the Shire.

*"The visual intrusiveness of the development within the 'seen area';"*

Responset

The colour of the sand is yellow to brown, a natural colour. With perimeter bunding formed by pushing the overburden to the perimeter of the pit visual impact will be minimized. The overburden is the natural soil currently on site.

*"The landscape values of the area;"*

Response

This is addressed above under other issues raised. The landscape values will be impacted on from some locations for a short period of time.

*"All development (including access roads) in the policy area shall not be permitted:*
*"1. On ridge lines or spur, bluff or knoll, escarpments, hill tops or visually exposed areas..."*

Response

The land is on a gently sloping rise but is relatively well screened from the adjoining roads, although some parts of the pit are likely to be seen for a relatively short time. The site is not part of the skyline.

The site is not a ridgeline, bluff, knoll or escarpment. There will be no change to the viewscape at the end of excavation with the removal of 2 – 4 metres of sand from the western flank of the ridge. The proposal is compatible with the development guidelines mentioned.

*"In areas having a generalised slope greater than 25 percent."*

Response

The land, the subject of the Application, fails to meet the slope requirements.

The slope of the excavation area varies from a 10 metre rise in 160 metres to a 10 metre rise in 140 metres. That is 4.17% to 6.25% (see Figure 2 of the management plan and the attached sections which are subject to vertical exaggeration).

*"Developments*

*Screening around proposed extractive and industrial developments or operations will be required to minimise visual impacts*."

Response

Screening is proposed given the constraints provided by the short term nature of the proposal.

*"These types of developments are not to be seen from the coastal plain, major roads and tourists routes, and major recreation areas"*

Response

As noted earlier the visual impact will be relatively small for a short time. See Figures 1A to 1D.

*"Approval for these types of development will not be given unless the visual impact of the proposal on the Darling Scarp has been addressed to Council's satisfaction".*

Response

Council will determine a development application such as this on its merits. The need for sand and the State Government Policies that require that basic raw materials are identified and extracted prior to sterilisation are discussed in Section 1.1 of the Management Plan. The benefits of sourcing sand locally is also a mitigating circumstance in terms of transport impacts, costs to the community and greenhouse gas emissions as a result of transport. This is in addition to the relatively small scale of the operation.

## 3.0 Water Management and Hydrogeology

The water management was assessed by Lindsay Stephens of Landform Research, who is experienced in regolith assessment which includes the geology, soil and natural surface interactions including the hydrology.

Sand excavation is a clean industry permitted in Priority 1 Groundwater Source Protection Areas such as Gnangara at separations of 3 metres to the water table. This site far exceeds that requirement. Attached is a copy of the DOW Guidelines for Priority Groundwater areas and shows that Extractive Industries are permitted activities in all Priority 1 – 3 areas with the only restriction being the management of fuel and maintenance. That is the proposed sand excavation complies with DOW Guidelines.

There will be no fuel or other potential contaminants stored on site.

The management actions listed in the Excavation - Rehabilitaiton Management Plan are in summary, no fuel stored on site with a fuel management plan in place. The sand is porous and will not lead to runoff. If there was runoff it would occur under natural soil conditions. Surface water may currently run for a small distance in storms before soaking into the sand as occurs on all soils of this type.

The management plan is repeated here and expanded in response to the Shire request. There are no changes to the procedures proposed just more words used to describe it.

## 3.1 Summary of the Site Characteristics

The site lies on the degraded Darling Scarp just back from the Darling Fault, at the exit of Medulla Brook through the Scarp.

The land rises up the southern side of Medulla Brook, from 57 metres AHD at the northern edge at Jarrahdale Road rising to 130 metres at the south eastern corner. See Figures 1A and 2A.

Granite gneiss basement rocks of the Balingup Terrane of the Yilgarn Craton outcrop to the south east.

Overlying the majority of the land is Yogannup Formation, formed as shoreline alluvial and marine sands that are feldspathic and now carry significant clay content at depth, These are deep yellow earthy sands that are variably leached of clay and iron oxides at the surface to form the lighter yellow sands and white sands of the sand resource.

Tertiary to recent laterite development has formed gravel in these sands as part of the leaching processes.

The protection of water, whether groundwater or surface water, is an important part of the management of quarries. Different types of quarries have different potential impacts which are listed below in general terms. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed.

*Guidance on the quality of water can be found in;*

- *Western Australian Water Quality Guidelines for Fresh and Marine Waters, EPA Bulletin 711, 1993.*
- *ANZECC, 1992, Australian Water Quality Guidelines for Fresh and Marine Waters.*

*A number of documents provide guidance on the management and disposal of surface water that can lead to waterways, wetlands and underground water systems. These mainly apply to urban development but the methods are also applicable to the quarrying industry.*

- *Engineers Australia 2003, Australian Runoff Quality, National Committee on Water Engineering.*
- *Stormwater Management Manual for Western Australia, Department of Environment WA, 2004.*
- *Guidelines for Groundwater Protection in Australia, ARMCANZ, ANZECC, September 1995.*

*Documents specific to the mining and quarrying operations are the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing.*

- *Overview*
- *Minesite water quality monitoring*
- *Minesite stormwater*
- *WQPN 28 Mechanical servicing and workshop (2006)*
- *Mine dewatering*
- *WQPN Landuse Compatibility in Public Drinking Water Source Areas (2004)*
- *WQPN 15 Extractive Industries near sensitive water resources.*

The sand excavation complies with all the documents above. The most relevant document is WQPN 15 *Extractive Industries near sensitive water resources.* The location of the sand and its proposed excavation complies with all Advice and recommendations, of the policy (Numbers 1 – 62).

The main hydrological feature is the valley of Medulla Brook to the north of Jarrahdale Road.

The soils are free draining, elevated and not susceptible to winter wet conditions. They were assessed by hand auger to 3.5 metres at the base of the sand resource where the sand becomes more earthy.

The site is elevated and well drained and consists of a sloping area of deep permeable sandy soils. The site was assessed on several occasions by Lindsay Stephens of Landform Research who is a geologist.

### 3.2 Surface Water

There is no waterlogging, surface water runoff and no watercourses, wetlands or dams on site.

The site is a gently sloping sandy site from which there is no surface water runoff except in heavy storm events when surface water will congregate and flow for a short distance before spreading out and soaking into the ground.

The surface water from storms is fresh with no evidence of salinity.

In winter there is potential on the extreme west for a very small area of white sand to have a temporary perched water table for small intermittent periods in some winters.

With excavation the walls of the pit will enable all water to be retained within the excavation area.

At the end of excavation the land surface will be reformed to be similar to that existing prior to excavation with similar soils. That is, in storm events some minor surface flows might occur in heavy storms before soaking into the ground.

### 3.3 Groundwater

The subject area is located within the Serpentine Groundwater Area as proclaimed under the Rights in Water and Irrigation Act 1914. Any groundwater abstraction in this proclaimed area, for purposes other than domestic and/or stock watering, taken from the superficial aquifer is subject to licensing by the Department of Water. The issuing of a groundwater licence is not guaranteed but if issued will contain a number of conditions that are binding upon the licensee.

There is no evidence of groundwater availability on site and, as the site is underlain by granitic basement which has a steep slope as a result of the Darling Fault and erosion through past geological times, there is unlikely to be any groundwater available on site. This statement is based on a review of the mapping of the site, drill auger holes to 3.5 metres on the excavation area, mapping from backhoe excavation, site geological mapping and examination of Western Australian Geological Survey and Department of Water maps.

Figure 2A is taken from the Perth Groundwater Atlas produced by the Department of Water. It shows the groundwater to the east is at an elevation of 30 metres AHD. Medulla Brook to the north is at an elevation of 55 metres AHD.

Groundwater data from bores on the Swan Coastal Plan is not really relevant to the site, and neither is any groundwater from bores on the Scarp because they would either be in fractured zones or ponded groundwater.

The site itself is underlain by granite basement. Groundwater forming on that would simply flow off the basement by subsurface flow to the porous sediments that underlay the Swan Coastal Plan.

The sections in Figure 3 show that the groundwater could not possibly be close to the surface under the site. Under the sand resource the groundwater is geologically deep and interpreted to be at least 10 metres below the base of the sand resource.

There is potential for a bore to source groundwater in the north of the site adjacent to Jarrahdale Road where subsurface flows of Medulla Brook might be able to be intersected.

### 3.4 Dewatering

Dewatering of the pit is not proposed because the soils are sand into which any surface water collected will infiltrate.

### 3.5 Recharge

When the farm was first cleared the vegetation cleared, the recharge will have increased. However the planting of the pines will have lead to a small reduction in recharge until harvested, because of increased evapotranspiration. With a return to pasture the recharge will return to the cleared situation.

That is there will be no net change to recharge when the pasture is restored compared to the cleared condition of the land at the time of planting the pines.

The recharge will be similar to pasture areas such as the sandy land west of South Western Highway.

It is estimated that considering the soils and rainfall of 975 mm per year (Whitby Falls) depth to the water table and well known recharge rates, such as outlined in EPA Bulletin 788, currently and after excavation approximately 20% of rainfall will contribute to recharge of the groundwater. The proposed excavation will have no impact on that figure.

The proposed operation complies with all Government Policies and Guidelines.

There will be no alteration to drainage lines, and neither surface water nor ground water will be affected.

### 3.6 Salinity

The site lies in a high rainfall area in an elevated position. There is no evidence of salinity or salt stored in the soil profiles and none would be expected in this type of regolith situation.

### 3.7 Acid Sulfate Risk

There has been an increased interest in acid sulfate soils since the release of WAPC Planning Bulletin 64.

However the interest has been over reactive and conditions and risk applied in many areas where there is no geological risk or evidence of acid sulfate.

The most definitive survey procedure was produced by the Acid Sulfate Soil Management Advisory Committee NSW, 1998, in their *Acid Sulfate Manual.* This Manual forms the basis for all assessment procedures in Australia, including those adopted by the Western Australian Planning Commission and the Department of Environment and Conservation. The *Acid Sulfate Manual* adopts the procedure of reviewing the published data followed up by field assessment, which has been completed for this site. If a geological risk is determined, then a Preliminary Acid Sulfate Assessment is conducted. The recognition and treatment is also considered in the NSW guidelines.

Acid sulphate potential was considered in the Western Australian Planning Commission Planning Bulletin 64. This document contained maps that are broad based from aerial photography and not site specific. The mapping does not extend to this location.

It is not known on what basis the Department of Planning mapping shows part of the site as having Low to Moderate Risk of Acid sulphate, but as a large area of that mapping was completed from aerial photography with limited field work site assessment, then interpretation of the photography, is likely to be in error. Even so it is puzzling why such an elevated obviously no risk area was not identified by the mapping officers.

Acid Sulfate Soils can potentially form under reducing conditions when there is a source of carbon and a source of sulfur (normally from sea or saline water). Micro-organisms are thought to play an important role in reducing the sulfates within the sediments to form the iron sulfide. It is a natural phenomena, that can be exacerbated by disturbance.

Potential acid sulfate conditions most commonly form under reducing conditions under current or past estuarine conditions, peaty conditions, some organoferricretes, and may also result from weathering of some geological formations and situations which contain sulfides. Carbon is normally required and a lack of oxygen is always required to create the reducing conditions.

Materials at risk under reducing conditions are normally grey in colour or have been grey with no brown or red brown iron oxides. Where exposed to the atmosphere there is a change to brown iron oxides, with yellow jarosite and other alteration minerals that are distinctive.

None of these conditions occur on site.

On this site the geology of the soils is highly oxygenated well drained sands.

Therefore there is no potential for acid conditions to develop in this ecological or geomorphological situation which is why they were not included in the Management Plan.

## 3.8 Waste Management

### 3.8.1 Waste Rock and Tailings Management

There will be no washing of products. Subgrade materials will be used for subsoil restoration or used for perimeter bunding and landform restoration.

There will be no waste rock or tailings.

### 3.8.2 Unauthorised Access and Illegal Dumping

The potential for rubbish to be dumped relates to unauthorised access to the site. Access is restricted by current farm fencing and locked gates. Fences will be maintained and upgraded as required.

Wastes generated will be recycled wherever possible and periodically disposed of at an approved landfill site. Any illegally dumped materials are to be removed promptly to an approved landfill or other suitable site, depending on the nature of the material.

### 3.8.3 Solid Domestic and Light Industrial Wastes

All solid domestic and light industrial wastes will be stored in commercial waste storage containers and/or removed to an approved landfill facility. There will be no waste disposal on site. Waste storage containers will be sealed so that rainfall cannot enter, therefore preventing the formation of leachates.

### 3.8.4 Wastewater Disposal

As the operations are small scale and intermittent it is proposed to use on site approved serviced portable toilet facilities when the site is manned.

This complies with *WQPN 15 Extractive Industries near sensitive water resources.*

### 3.8.5 Refuelling

The protection of water from fuels and other chemicals is an important part of the management of quarries. Different types of quarries have different potential impacts which are listed below in general terms. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed

Sand extraction is a clean operation. No chemicals are used apart from normal lubricants, and sand excavation is one of the few industries that are permitted to operate in a Priority 1 Public Drinking Water Source Area, indicating the clean nature of the activity. See Department of Water *Land Use Compatibility in Public Drinking Water Source Areas.*

All spills are to be cleaned up in accordance with the summarised procedures following.

*Documents specific to the fuel and maintenance are the DEC – DMP Water Quality Protection Guidelines for Mining and Mineral Processing*

- *Mechanical servicing and workshop facilities*
- *Above-ground fuel and chemical storage*
- *WQPN 28 Mechanical servicing and workshop (2006)*
- *WQPN 15 Extractive Industries near sensitive water resources.*

A list of the management actions for maintenance is provided. The actions will be used where applicable and as the opportunity presents to maintain water quality on this site.

The operator will have in place safety and pollution management procedures. They will also use self contained service and recovery vehicles to undertake minor servicing in the field.

**Refuelling - Fuel Spill Management Plan**

The protection of water from fuels and other chemicals is an important part of the management of quarries. Different types of quarries have different potential impacts, which are listed below in general terms. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed.

The operational procedures proposed comply with *WQPN 15 Extractive Industries near sensitive water resources.*

Refuelling will use mobile tankers. There will be no onsite fuel storage. This method is undertaken on most mine and construction sites as well as many farming properties and almost all quarries including those located on the Gnangara Mound. Refuelling will occur in a dedicated area.

The main risk of contamination is the minor drips that occur during the removal of hoses etc. Minor spills are quickly degraded by soil microbial matter. Any drips or minor fluid spills will be scooped up with the sand and sent offsite for on the ground for bacterial remediation; the most commonly used method of dealing with small spills.

The only other risk is from a tank rupture, but tanks are designed to manage this eventuality. Soil contaminated by large spills will be removed from the site to an approved disposal area.

- Refuelling will be carried out in accordance with the DEC – DMP Water Quality Protection Guidelines for Mining and Mineral Processing, *Mechanical servicing and workshop facilities, Above-ground fuel and chemical storage* and *WQPN 15 Extractive Industries near sensitive water resources.*

- Soils such as those on this site are adsorptive. The main risk of contamination is the minor drips that occur during the removal of hoses etc. Minor spills are quickly degraded by soil microbial matter.

- The operators of the mobile refuelling facilities (SWP) are trained in re-fuelling duties including the management of any spills.

- Refuelling and lubricating activities are to occur in the base of the pit, and equipment for the containment and cleanup of spills is to be provided. The mobile facilities are equipped with adsorbent mats and products (eg attapulgite) to be used in the event of spills.

- Spillage will be contained in plant and working areas by shutting down plant or equipment if the plant or equipment is the source of the spill (provided it is safe to do so).

- Transport chemicals in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code).

- All significant adverse incidents (such as a fuel spill of >5 litres) in one dump, are to be recorded, investigated and remediated. A record is to be kept of incidents, and DEC, DOW and Shire of Serpentine Jarrahdale notified within 24 hours of an incident.

- In the event of a spill or adverse incident, activities will be stopped in that area until the incident is resolved.

- Any spills will be contained by the excavation. Soil and resource will quickly be placed around the spill to contain it in as small an area as possible. When contained, the contaminated sand will be scooped up and removed to an approved landfill or other approved site.

### 3.8.6 Dangerous Goods and Hazardous Substances

There is no transport, storage or handling of hazardous materials involved in sand extraction.

### 3.8.7 Servicing and Maintenance

- All major servicing of vehicles will be conducted off site, and maintenance using dedicated trucks with oil and waste recovery systems will be used. This is consistent with *WQPN 15 Extractive Industries near sensitive water resources.*

- Waste oil and other fluids derived from the routine maintenance of mobile machinery, will be transported off site and disposed of at an approved landfill site. Grease canisters, fuel filters, oil filters and top-up oils will be stored in appropriate containers in a shed or brought to the site as required.

- Vehicle washdown is not proposed.

- Regular inspections and maintenance of fuel, oil and hydraulic fluids in storages and lines will be carried out for wear or faults.

- Servicing plant and equipment will be in accordance with a maintenance schedule.

- Accidental spill containment and cleanup protocol will be implemented as necessary.

- Rubbish generated is to be recycled wherever possible and periodically disposed of at an approved landfill site.

- The site will be maintained in a tidy manner by removing all rubbish regularly offsite.

### 3.8.8 Monitoring

Monitoring will concentrate in two areas;

- Supervision and management of the operations.

- Monitoring of soils for spills and leakages.

With such porous soils detention basins and sumps and dams will not be required.

Soils found to be contaminated with be dealt with as outlined above.

Being such a small short term operation, that complies with DOW Guidelines, no water monitoring is proposed. It is most unlikely that any bore would be able to intersect ground water on the western boundary. The best means of water management is due operational diligence because the time taken for any contaminant to reach any such water would be substantial and at that stage no action could be taken. At that time it would be likely that the excavation would have long since ceased.

| LOTS 4 – 7 JARRAHDALE AND TRANSIT ROADS, MARDELLA | |
|---|---|
| **PROPOSED EXTRACTION AREA** | |
| Landform Research | April 2009 |
| Basemap LANDGATE 2009 Photography | Scale 1 : 4 000 |

Proposed extraction area

16 Soil Test Hole Location

0 80 m

| KEY | SOIL TYPE | DESCRIPTION |
|---|---|---|
| S/GS | **Sand over Gravelly Sand** | Leached white or yellow sand to 100 – 400 mm depth over yellow sandy gravel with minor intermittent and weak gravel duricrust to depths of 200 – 1500 mm. Subsoils are deep yellow earthy sands that contain a small amount of clay.<br>Developed on Yogannup Formation.<br>Gently sloping and well drained. |
| YGS | **Yellow Gravelly Sand** | Similar to Sand over Gravelly Sand but with the gravel layer being weakly developed as gravelly sand and lacking duricrust.<br>Developed on Yogannup Formation.<br>Gently sloping and well drained. |
| YS | **Yellow Sand** | Pale deep yellow sand with minor gravel over deep yellow earthy sand.<br>Developed on Yogannup Formation.<br>Gently sloping and well drained. |
| GL | **Gravelly Loam** | Dark brown sandy gravel and gravelly sand to 250 mm, over brown and grey mottled clay that is free draining, and containing beds of boulders and cobbles imbedded in the clays.<br>Probable valley fill or of Permian glacial remnant as the boulders are mixed rock types rounded and may be glacial erratics related to other similar boulder beds along the edge of the Darling Scarp. |
| LWS | **Leached White Sand** | Leached white sand in the upper horizons over yellow gravelly sand at depth with yellow earthy sand subsoils.<br>Developed on Yogannup Formation.<br>Gently sloping and well drained. |
| BL | **Brown Loam** | Dark brown loam over brown loam at 100 mm with yellow brown loam and loam clay to 1500 mm over yellow brown saprolite from weathering granite gneiss. May contain a shallow overlying sand layer and stone in the profile.<br>**D** indicates the soil profile is more red brown and is developed on dolerite dyke.<br>Developed on weathered granite gneiss basement. Well drained.<br>Moderate slopes with minor steep areas. |
| RBL | **Rocky Brown Loam** | Same basic soils as Brown Loam but with scattered to abundant rock outcrop.<br>**Q** indicates quartz vein as the dominant rock, **+** indicates granite gneiss as the rock basement.<br>Very rocky with moderate slopes and minor steep areas.<br>Development normally not recommended. |
| SRBL | **Steep Rocky Brown Loam** | Same as Brown Loam, but with steep slopes that will normally preclude development. |

Perimeter bunding 2 - 3 metres high formed from overburden

Pull in bay

40 metre buffer to lot boundary

SECTION D

SECTION E

SECTION F

200 m

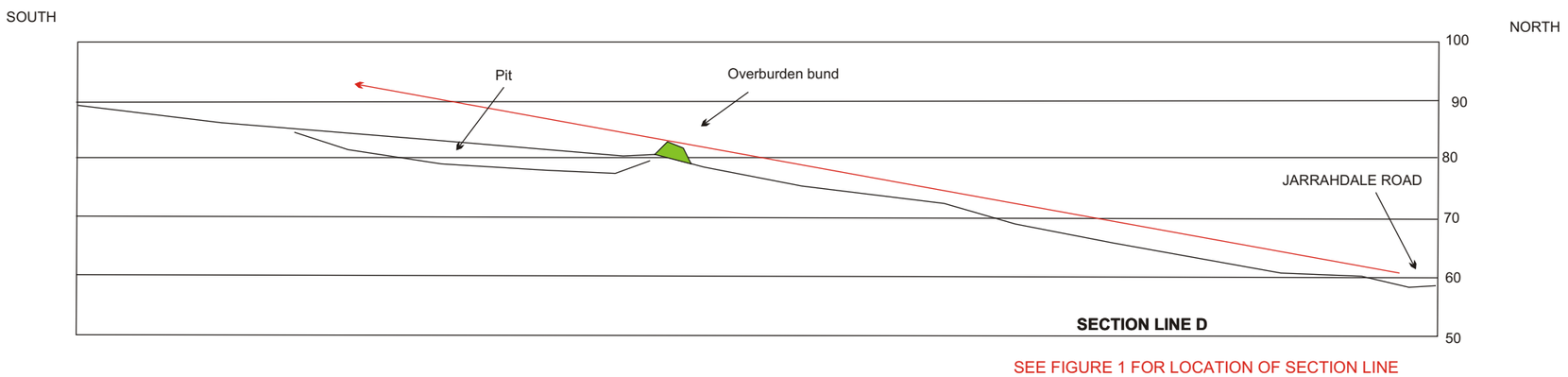
300 m

Agricultural industry

Closest sensitive premises

Figure 1A


The only obvious viewscape of the excavation is from the pull in area off South Western Highway.




SEE FIGURE 1 FOR LOCATION OF SECTION LINE

Figure 1B

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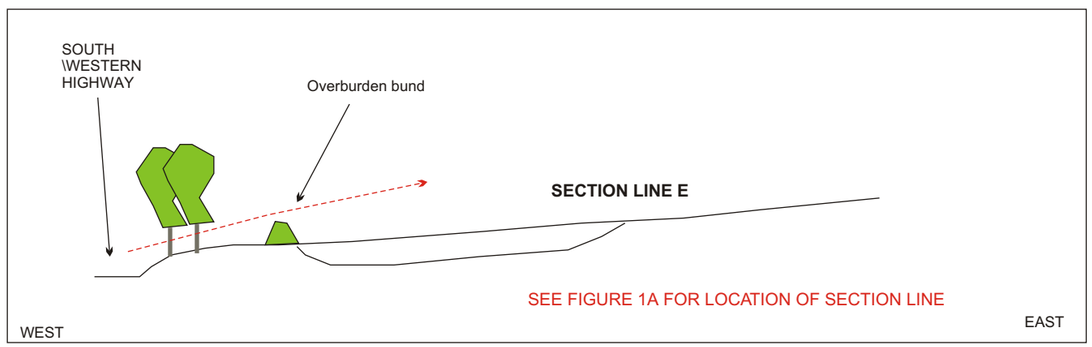
VIEWS FROM SOUTH WESTERN HIGHWAY

Typical views from South Western Highway, when stopped and looking towards the excavation area.

Note that there is nowhere to safely stop in this location and that when travelling the trees and view will be rapidly skimming by.

As the land slopes upwards a 2 metre bund of overburden and operating below ground level will hide the excavation.
The fence is 1 - 1.2 metres high showing that the excavations would be hidden when a low bund is used.

SKETCH SECTION FROM SOUTH WESTERN HIGHWAY



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WEST

Break of slope and edge of the pit

CENTRAL WEST

Break of slope and edge of the pit

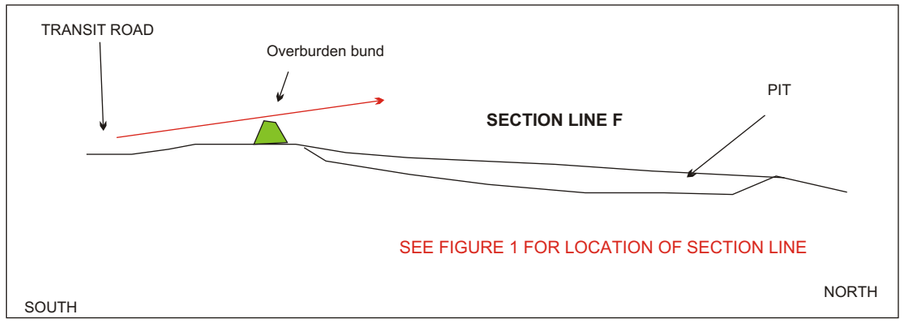
CENTRAL EAST

EAST

Views from Trsansit Road. Note that the break of slope means that the pit is unlikely to be visible from Transit Road when a perimeter bund of overburden to 2 - 3 metres high is formed along the southern boundary

VIEWS FROM TRANSIT ROAD

SKETCH SECTION FROM TRANSIT ROAD



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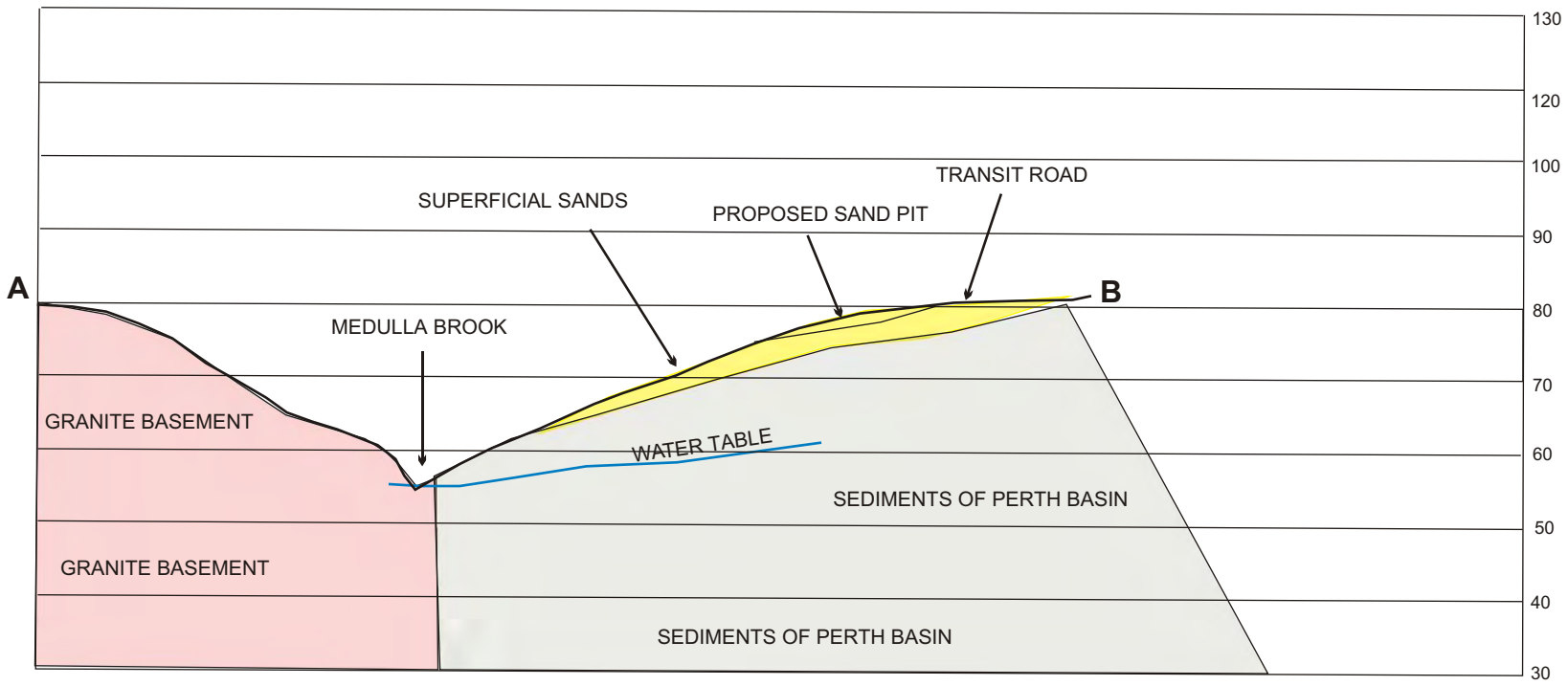
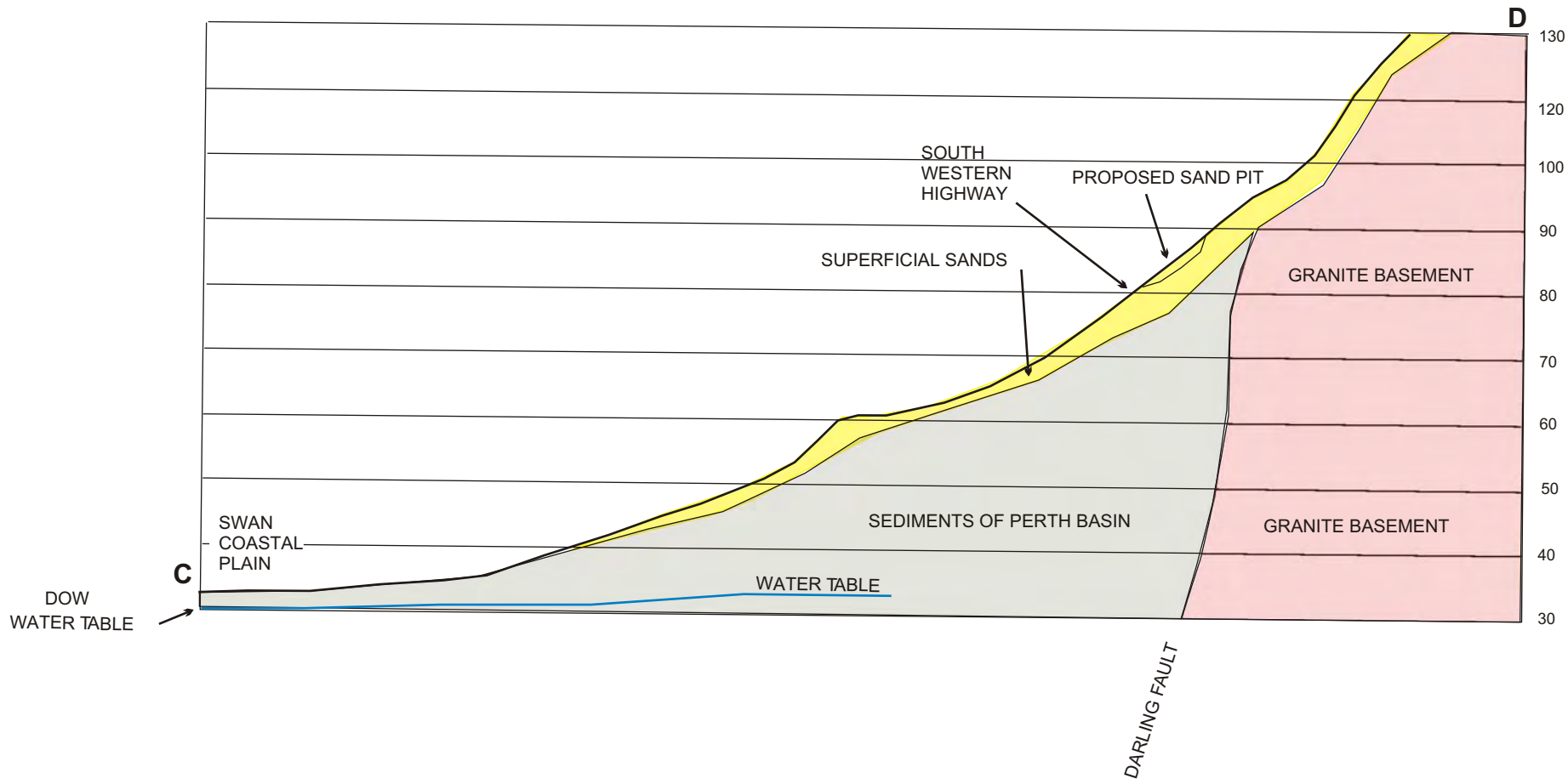
**CROSS SECTIONS**

**LOTS 4 - 7 JARRAHDALE AND TRANSIT ROADS**

Figure 2A

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SEE FIGURE 2A FOR LOCATION OF SECTIONS

**CROSS SECTIONS**

**LOTS 4 - 7 JARRAHDALE AND TRANSIT ROADS**

Figure 2B

# Appendix 1- Acceptability of Land Uses Within Public Drinking Water Source Areas

WATER AND RIVERS
COMMISSION

# ACCEPTABILITY OF LAND USES WITHIN PUBLIC DRINKING WATER SOURCE AREAS

## OVERVIEW OF PROTECTION FRAMEWORK

The Water and Rivers Commission is responsible for managing and protecting Western Australia's water resources. The Commission has developed policies for the protection of public drinking water source areas which are based on three levels of priority classification.

**Priority 1** (P1) source protection areas are defined to ensure that there is no degradation of the water source. P1 areas are declared over land where the provision of the highest quality public drinking water is the prime beneficial land use. P1 areas would typically include land under Crown ownership. P1 areas are managed in accordance with the principle of risk avoidance and so development is generally not permitted.

**Priority 2** (P2) source protection areas are defined to ensure that there is no increased risk of pollution to the water source. P2 areas are declared over land where low intensity development (such as rural) already exists. Provision of public water supply is a high priority in these areas. P2 areas are managed in accordance with the principle of risk minimisation and so some development is allowed under specific guidelines.

**Priority 3** (P3) source protection areas are defined to minimise the risk of pollution to the water source. P3 areas are declared over land where water supply needs co-exist with other land uses such as residential, commercial and light industrial developments. Protection of P3 areas is achieved through management guidelines rather than restrictions on land use. If the water source does become contaminated, then water may need to be treated or an alternative water source be found.

In addition to priority classification, **wellhead protection zones** and **reservoir protection zones** are defined to protect the water source from contamination in the immediate vicinity of production wells and reservoirs. Wellhead protection zones are usually circular, with a radius of 500 metres in P1 areas and 300 metres in P2 and P3 areas. Reservoir protection zones usually consist of a 2 kilometre area around the top water level of a reservoir and includes the reservoir itself. These zones do not extend outside water reserves. Additional restrictions apply within these zones.

## LAND USE COMPATABILITY TABLE

This table is to be used as a guideline only. Further information relating to land use and developments within Public Drinking Water Source Areas including those not listed in the table can be obtained from the Commission.

This table does not replace the need for assessment by the Commission. Please consult the Commission regarding any land use proposals in Public Drinking Water Source Areas which may impact on water resources.

## DEFINITIONS USED IN THE TABLE

| | |
|---|---|
| *Compatible* | The development/land use is compatible with the management objectives of the priority classification. |
| *Incompatible* | The development/land use is incompatible with the management objectives of the priority classification. |
| *Restricted* | The development/land use may be compatible with the management objectives of the priority classification with appropriate site management practices.<br>Restricted activities should be referred to the Commission for assessment on a case specific basis. |
| *Extensive* | Where limited additional inputs are required to the land to support the desired land use. eg supplementary feed in drought etc. |
| *Intensive* | Where regular additional inputs are required to support the desired land use. eg irrigation, additional feed, fertilisers. |

## *AGRICULTURE - ANIMALS*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Apiary | Restricted | Restricted | Restricted |
| Aquaculture eg. marron farm, trout farm etc | Incompatible | Restricted | Restricted |
| Dairy Farming | Incompatible | Restricted | Restricted |
| Feedlots | Incompatible | Incompatible | Restricted |
| Livestock grazing (extensive) | Restricted | Compatible | Compatible |
| Livestock grazing (intensive) | Incompatible | Incompatible | Compatible |
| Piggery | Incompatible | Incompatible | Incompatible |
| Poultry farming (housed) | Incompatible | Restricted | Restricted |
| Stables | Incompatible | Restricted | Compatible |
| Stockholding and saleyards | Incompatible | Incompatible[7] | Restricted[7] |

## *AGRICULTURE - PLANTS*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Broad acre cropping i.e. non-irrigated | Restricted | Compatible | Compatible |
| Floriculture (extensive) | Incompatible | Restricted | Compatible |
| Floriculture (intensive) | Incompatible | Incompatible | Restricted |
| Horticulture | Incompatible | Incompatible | Restricted |
| Hydroponic Horticulture | Incompatible | Restricted | Restricted |
| Orcharding | Incompatible | Restricted | Compatible |
| Potted Nurseries | Incompatible | Restricted | Compatible |
| Silviculture | Restricted | Restricted | Compatible |
| Turf Farms | Incompatible | Incompatible | Restricted |
| Viticulture | Incompatible | Restricted | Compatible |

## *DEVELOPMENT - COMMERCIAL*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Aircraft Servicing | Incompatible | Incompatible | Restricted[6] |
| Amusement Centre | Incompatible | Incompatible | Compatible[6] |
| Automotive business | Incompatible | Incompatible | Restricted[6] |
| Boat Servicing | Incompatible | Incompatible | Restricted[6] |
| Caravan and trailer hire | Incompatible | Incompatible | Restricted[6] |
| Carpark | Incompatible | Incompatible | Compatible |
| Consulting rooms | Incompatible | Incompatible[7] | Compatible[6] |
| Cottage Industries | Restricted | Incompatible[7] | Compatible |
| Drive in take-away food shop | Incompatible | Incompatible | Compatible[6] |
| Drive in theatre | Incompatible | Incompatible | Compatible[6] |
| Dry Cleaning Premises | Incompatible | Incompatible | Restricted[6] |
| Farm supply centre | Incompatible | Incompatible[7] | Restricted |
| Fuel depot | Incompatible | Incompatible | Restricted |
| Garden Centre | Incompatible | Incompatible | Compatible |
| Local shop | Incompatible | Incompatible[7] | Compatible |
| Market | Incompatible | Incompatible | Compatible[6] |
| Milk depot | Incompatible | Incompatible | Restricted |
| Restaurant | Incompatible | Incompatible | Compatible |
| Service Station | Incompatible | Incompatible | Restricted |
| Transport Depot | Incompatible | Incompatible | Restricted |
| Veterinary Clinic/hospital | Incompatible | Incompatible[7] | Restricted |
| Wrecking vehicles and machinery | Incompatible | Incompatible | Restricted |

## *DEVELOPMENT - INDUSTRIAL*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| General Industry | Incompatible | Incompatible | Restricted[6] |
| Heavy Industry | Incompatible | Incompatible | Incompatible |
| Light Industry | Incompatible | Incompatible | Restricted[6] |
| Power Stations | Incompatible | Incompatible | Incompatible |

## *DEVELOPMENT - URBAN*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Aged and dependent persons accommodation | Incompatible | Incompatible | Compatible[6] |
| Amenity building | Incompatible | Restricted | Compatible |
| Airports or landing grounds | Incompatible | Incompatible | Restricted[6] |
| Cemetery | Incompatible | Incompatible | Restricted |
| Civic building | Incompatible | Restricted | Compatible[6] |
| Club | Restricted | Restricted | Compatible[6] |
| Community hall | Restricted | Restricted | Compatible |
| Family Day Care Centre | Incompatible | Restricted | Compatible[6] |
| Funeral parlour | Incompatible | Incompatible | Compatible[6] |
| Health Centre | Incompatible | Incompatible | Compatible[6] |
| Hospital | Incompatible | Incompatible | Restricted[6] |
| Medical centre | Incompatible | Incompatible | Compatible[6] |

## *EDUCATION/RESEARCH*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Education Centres | Restricted | Restricted | Compatible[6] |
| Primary/Secondary Schools | Incompatible | Incompatible | Compatible[6] |
| Scientific Research | Restricted | Restricted | Compatible |
| Universities | Incompatible | Incompatible | Restricted[6] |

## *MINING AND MINERAL PROCESSING*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Extractive Industries | Restricted[2] | Restricted[2] | Restricted[2] |
| Mining/Mineral Exploration | Restricted[4] | Restricted[4] | Restricted[4] |
| Tailings Dams | Incompatible | Incompatible | Restricted |

## *PROCESSING OF ANIMALS/ANIMAL PRODUCTS*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Abattoirs | Incompatible | Incompatible | Incompatible |
| Cheese/butter factory | Incompatible | Incompatible | Restricted |
| Composting (using sewage sludge and animal products) | Incompatible | Incompatible | Restricted |
| Fish Processing | Incompatible | Incompatible | Incompatible |
| Tannery | Incompatible | Incompatible | Incompatible |
| Woolscourer | Incompatible | Incompatible | Incompatible |

## *PROCESSING OF PLANTS/PLANT PRODUCTS*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Breweries | Incompatible | Incompatible | Restricted |
| Composting (not using sewage sludge or animal products) | Incompatible | Restricted | Restricted |
| Vegetable/food processing | Incompatible | Incompatible | Restricted |
| Wineries | Incompatible | Incompatible | Restricted |

## *SUBDIVISION*

*Subdivision of land to lots of any size is incompatible within Priority 1 areas.*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Kennel Subdivisions | Incompatible | Restricted | Restricted |
| Rural with a minimum lot size of 4 ha (unsewered) | Incompatible | Compatible | Compatible |
| Rural with a minimum lot size of 1 ha (unsewered) | Incompatible | Incompatible | Compatible |
| Special rural with a minimum lot size of 2 ha (unsewered)[5] | Incompatible | Restricted[8] | Restricted[8] |
| Special rural with a minimum lot size of 1 ha (unsewered)[5] | Incompatible | Incompatible | Restricted[8] |
| Urban Residential | Incompatible | Incompatible | Compatible[6] |

## *SPORT AND RECREATION*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Equestrian Centre | Incompatible | Incompatible | Compatible |
| Golf Courses | Incompatible | Incompatible | Restricted |
| Irrigated Recreational Parks | Incompatible | Restricted | Restricted |
| Motor sports i.e permanent racing facilities | Incompatible | Incompatible | Restricted |
| Public Swimming Pools | Incompatible | Restricted | Restricted |
| Rifle Ranges | Restricted | Restricted | Compatible |
| Temporary recreational activities (active) eg four wheel driving, rallies | Incompatible | Restricted[3] | Restricted[3] |
| Temporary recreational activities (passive) eg. horse riding, bush walking | Restricted | Restricted | Restricted |

## *STORAGE OF DESIGNATED SUBSTANCES*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Above ground storage of designated substances | Restricted[7] | Restricted[7] | Restricted[7] |
| Bulk Chemical Storage Facility | Incompatible | Incompatible | Incompatible |
| Underground Storage Tanks | Incompatible | Incompatible | Restricted |

## *TOURISM ACCOMMODATION*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Bed and Breakfast | Incompatible | Restricted | Compatible |
| Caravan Parks | Incompatible | Incompatible | Restricted[6] |
| Holiday accommodation eg farm chalets | Incompatible | Restricted[9] | Compatible[6] |
| Motel lodging house, hostels | Incompatible | Incompatible | Compatible[6] |

## *WASTE TREATMENT AND MANAGEMENT*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Deep well injection of effluent | Incompatible | Incompatible | Incompatible |
| Municipal Landfills | Incompatible | Incompatible | Restricted |
| Recycling depot | Incompatible | Incompatible | Restricted |
| Refuse transfer stations | Incompatible | Incompatible | Restricted |
| Sewers | Incompatible | Restricted | Acceptable |
| Used Tyre Storage Facility | Incompatible | Incompatible | Incompatible |
| Wastewater Treatment Plants | Incompatible | Incompatible | Restricted |
| Water Treatment Plants | Restricted | Restricted | Restricted |

## *OTHER DEVELOPMENTS*

| Development | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Caretakers house | Restricted | Restricted | Compatible |
| Construction Projects | Restricted | Restricted | Restricted |
| Forestry | Restricted[1] | Compatible | Compatible |
| National Parks | Compatible | Compatible | Compatible |
| Nature Reserves | Compatible | Compatible | Compatible |
| Radio and TV installation | Restricted | Restricted | Restricted |
| Major Transport Routes | Incompatible | Restricted[10] | Compatible |

1. Restrictions apply to fertiliser application rates with strict controls on the application of pesticides and field operations.
2. Restrictions apply to the storage of fuels and chemicals with strict guidelines for rehabilitation.
3. Restrictions on the use of fuel and chemicals apply.
4. Subject to conditions placed on lease.
5. Special rural development requires appropriate planning justification including provisions in the town planning scheme text.
6. Must be connected to deep sewerage.
7. May be permitted if this use is incidental to the overall land use in the area and is consistent with planning strategies.
8. Restrictions apply to siting effluent disposal systems in areas with poor land capability and a shallow depth to groundwater.
9. Restrictions apply on density of accommodation.
10. Restrictions apply on road design and construction and the types of goods that may be carried.

June, 1997
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