HENDERSON POULTRY PRODUCTION FARM

Environmental Management Plan

Prepared for:

ProTen Pty Limited
PO Box 1746
NORTH SYDNEY NSW 2059

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PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Ground Floor, 503 Murray Street
Perth WA 6000 Australia

T: +61 8 9422 5900
E: perth@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

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DOCUMENT CONTROL

Reference	Date	Amended Section	Prepared	Checked	Authorised
61/19300/03/73503	December 2007		GHD		
675.30036-R01-v1.0	June 2021	1.1 – update of EMS referral 2.2 – update of legal requirements 3.1.2 – Update of groundwater 3.1.3 – update of water licensing 3.3.1 – referral to LVMP 4.2 – update of tense and amended DA conditions 7.2 – electronic database 7.3 – electronic database 7.4 – electronic database 7.5 – electronic database 7.6 – training register 5 – Removal of construction activity requirements	J. Curran	K. Singh	C. Davies

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APPENDICES

1 Introduction

ProTen Ltd (ProTen) obtained Development Approval (DA) from the Shire of Serpentine Jarrahdale for 16 poultry sheds and associated infrastructure on Lot 701 Henderson Rd, Hopeland (reference P02435/02). The site is approximately 39.2ha in area and the facility has 16 sheds, each housing 60,000 birds, with a total poultry capacity of 960,000 birds for meat production.

The broiler shed facilities constitute sixteen (16) sheds which have been grouped into two (2) units. Eight (8) sheds are located south of the gas pipeline easement and eight (8) to the north. The poultry sheds are 17m by 160m long with a separation distance of 12m. All sheds are located in the centre of the site to optimise the buffer distance between the site boundary and the shed facilities.

It is the intention of ProTen that the production from this operation will contribute towards meeting the future growth in poultry meat demand in Western Australia.

As a condition of the DA, ProTen is required to prepare an Environmental Management Plan (EMP) and provides a system for documenting the following:

- Natural resources and amenity issues that are vulnerable to the operation of the meat chicken farm;
- Minimisation of risks through design and management;
- Measurement of the effectiveness of these design and management strategies through ongoing review and monitoring; and
- Reporting of monitoring results.

1.1 EMP Objectives

The main objectives of this EMP are:

- To promote management review and continual improvement of environmental performance of the development;
- To co-ordinate environmental management in order to achieve business objectives,
- To identify and control environmental aspects;
- To comply with all relevant Local and State government legislation; and
- To ensure compliance with ProTen's Environmental Policy.

This EMP has been prepared to satisfy Condition 3 of the DA issued by the Shire of Serpentine Jarrahdale on the 4th September 2007. This document has also been prepared in accordance with the National Environmental Management System for the Meat Chicken Industry – Part C Generic Environmental Management Plan published by the Australian Government Rural Industries Research and Development Corporation (2014).

In addition to this document, a Landscape and Vegetation Management Plan (LVMP) and Drainage and Nutrient Management Plan (DNMP) have been developed to satisfy conditions within the DA. These have been attached in Appendices B and C respectively and should be read in conjunction with this EMP.

2 Environmental and Legal Compliance

2.1 Commitment to Sound Environmental Management

As part of our commitment to the environment, ProTen Limited have established an environmental policy that is to be adhered to by all staff and contractors. A copy of the environmental policy is presented in Appendix A.

2.2 Legal Requirements

ProTen is committed to undertaking operation of the poultry complex in an environmentally sensitive manner. ProTen has considered requirements of legislation and standards to ensure that the operation aligns with relevant environmental legislation, standards, codes and principles of good environmental management practices. These are listed in Table 1.

Table 1 Relevant Environmental Legislation and Standards

Legislation/Standard	General Description	Source	Associated Regulation
Environmental Protection Act (1986) (EP Act)	An Act to create an Environmental Protection Authority for the prevention, control and abatement of environmental pollution, for the conservation, preservation, protection, enhancement and management of the environment. The EP Act is the overarching environmental legislation that deals with the protection of the environment and environmental offences. The EP Act is administered and enforced by the Western Australian Department of Water and Environmental Regulation (DWER).	WA	*Environmental Protection Regulations 1987* *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* *Environmental Protection (Noise) Regulations 1997* *Environmental Protection (Diesel and Petrol) Amendment Regulations 2012* *Environmental Protection (Controlled Waste) Regulations 2004* *Environmental Protection (Unauthorised Discharges) Regulations 2004*

Legislation/Standard	General Description	Source	Associated Regulation
Rights in Water and Irrigation Act (1914)	An Act relating to rights in water resources, to make provision for the regulation, management, use and protection of water resources, to provide for irrigation schemes, and related purposes	WA	*Rights in Water and Irrigation Regulations 2000*
Contaminated Sites Act 2003	The Act provides for the identification, recording, management and remediation of contaminated sites. The Act requires: Any owner or occupier or a site; Any person who knows or suspects that they have caused or contributed to contamination; or Any auditor engaged to provide a report for the purposes of the Act; to report any site known or suspected to be contaminated	WA	*Contaminated Sites Regulations 2006*

Legislation/Standard	General Description	Source	Associated Regulation
Dangerous Goods Safety Act 2004	An Act to consolidate and amend the law relating to explosives; to regulate the manufacture, importation and use of explosives, and the classification, marking, storage, carriage, and sale of explosives and dangerous goods; and for other incidental purposes. An Act relating to the safe storage, handling and transport of dangerous goods and for related purposes.	WA	*Dangerous Goods Safety (Explosives) Regulations 2007* *Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007* *Dangerous Goods Safety (General) Regulations 2007*

Legislation/Standard	General Description	Source	Associated Regulation
Biosecurity and Agriculture Management Act 2007	An Act to provide for: • the control of certain organisms; and • the use of agricultural and veterinary chemicals; and • the identification and attainment of standards of quality and safety for agricultural products, animal feeds, fertilisers and other substances and things; and • the establishment of a Declared Pest Account, a Modified Penalties Revenue Account and accounts for industry funding schemes; and • related matters.	WA	*Biosecurity and Agriculture Management Regulations 2013*
Exotic Diseases of Animals Act 1993	An Act to provide for the detection, containment and eradication of certain diseases affecting livestock and other animals, and for incidental matters.	WA	*Exotic Diseases of Animals Regulations 2011*

Legislation/Standard	General Description	Source	Associated Regulation
Animal Welfare Act 2002	An Act to: • promote and protect the welfare, safety and health of animals; • ensure the proper and humane care and management of all animals in accordance with generally accepted standard; and • reflect the community's expectation that people who are in charge of animals will ensure that they are properly treated and cared for.	WA	*Animal Welfare (General) Regulations 2003* *Animal Welfare (Scientific Purposes) Regulations 2003* *Animal Welfare (Commercial Poultry) Regulations 2008* *Animal Welfare (Pig Industry) Regulations 2010*
Soil and Land Conservation Act 1945	An Act relating to the conservation of soil and land resources, and to the mitigation of the effects of erosion, salinity and flooding.	WA	*Soil and Land Conservation Regulations 1992*

Legislation/Standard	General Description	Source	Associated Regulation
Health Act (Miscellaneous Provisions) 1911	An Act to deal with certain matters concerning public health. An Act to consolidate and amend the law relating to public health, such as financial, sanitary provisions, dwellings, public buildings, nuisances and offensive trades, animal produce, drugs, medicines, disinfectants, therapeutic substances and pesticides, food, infectious diseases, hospitals, community health and the regulations pertaining to these.	WA	None

Legislation/Standard	General Description	Source	Associated Regulation
AS 1940:1993 – The storage and handling of flammable and combustible materials	This Standard sets out requirements and recommendations for the safe storage and handling of flammable liquids of dangerous goods and recommendations for the storage and handling of combustible liquids. This Standard provides minimum acceptable safety requirements for storage facilities, operating procedures, emergency planning and fire protection. It provides technical guidance that may assist in the storage and handling of flammable and combustible liquids in accordance with the risk management requirements.	Australia	None
AS 1851:2005 – Maintenance of fire protection systems and equipment	The standard sets out requirements for the inspection, test, preventative maintenance and survey of fire protection systems and equipment.	Australia	None

Legislation/Standard	General Description	Source	Associated Regulation
Environmental Code of Practice for Poultry Farms in Western Australia (2004)	This Code was prepared for the Western Australian Broiler Growers Association and the Poultry Farmers Association of Western Australia with the support of the Departments of Environment, Agriculture, Planning and Infrastructure, Health; Western Australian Local Government Association; Shire of Gingin and Shire of Serpentine Jarrahdale	WA	None

3 Natural Resources and Amenity Issues

ProTen submitted a Development Application to the Shire of Serpentine Jarrahdale for assessment in April 2007. Accompanying this Development Application was an Environmental Impact Assessment Report (61/19300/67702). The Environmental Impact Assessment Report provided information on the existing environment and the potential environmental impacts and mitigation measures to be undertaken during construction and operations. The Environmental Impact Assessment Report identified the following as issues that have required additional consideration and management which have been addressed in this EMP.

This Environmental Impact Assessment Report should be referred to for further detailed background information.

3.1 Water

3.1.1 Surface Water

There are no significant surface water features in close proximity to the site. The closest water bodies with their approximate location relative to the site are:

- Karnet Brook, 1.5km to the northeast;
- Dirk Brook, 3km to the southeast;
- Yangedi Swamp, 3.5km to the southwest; and
- Serpentine River, 7km to the north.

Wetlands mapping was conducted for the site. The area is classified as a Geomorphic Wetland for Multiple Use. Wetlands in this category are significantly degraded and possess few natural attributes.

A Conservation Category wetland was identified to occur approximately 1km west of the site, at the intersection of Henderson and Punrak Roads. No overflow from the project area is expected to reach the Conservation Category wetland and it is not considered that the development will impact on off site wetland areas.

Water currently drains off the site into an open urbanised drain that runs along the southern boundary of the site. There is also a shallow artificial drain that runs through the site in an east/west direction and a natural drainage pathway to the north of the site.

A Drainage and Nutrient Management Plan has been developed and is contained within Appendix B.

3.1.2 Groundwater

Groundwater investigations have found that there is a potential variation in groundwater quality across the site, with the 'split' being approximately 2/3 north, to 1/3 south. The southern areas contain groundwaters that are considerably more saline than those in the north.

There are 21 groundwater bores within the 2km radius of the site. The majority of the site has a water table depth varying between 1-2.5mbgl.

3.1.3 Water Supply

Approximately 115.5ML of potable water is required annually for the site, which is sourced from the Leederville Aquifer. The site is located in the Serpentine groundwater area, Serpentine 2 sub-area, which currently has 115.5ML available. ProTen currently hold a 5C Licence to take water under the Rights in Water and Irrigation Act. (GWL172830). This Licence was granted on 9 August 2011 and has been granted an extension to 13 March 2024. This 5C Licence allows for water to be used for the following purposes:

- Cooling water purposes;
- Domestic use;
- Irrigation of up to 0.4ha;
- Poultry purposes for meat production; and
- Product processing washdown purposes.

3.2 Soils

Typical soil profiles comprise of ~5cms of a thin topsoil of grey, fine to medium grained sand containing some organic matter. Below this layer there is a horizon of yellow, grey or white very fine to medium sand ranging from 30cm to 1.5m. Orange and red mottles are apparent in the southern areas of the site. Grey, clayey sand horizons underlay the sand and consist of differing portions of orange and red mottles and iron stained rocks. Some north-western areas of the site have coffee rock at 2.5m depth.

The water table varies across the site ranging from 1m to 2.5m below ground level. The results of previous ASS investigations indicate that there is no apparent geological distribution pattern of actual or potential ASS across the site. However, there is a strong indication of Potential Acid Sulphate Soils (PASS) on the site. No ASS was discovered during the construction process. As an awareness initiative, ProTen have given staff and contractors a toolbox talk on what ASS look like and what to do should they suspect ASS to occur.

3.3 Community Amenity

All 8 residents (within a 5km radius) were included as part of the community consultation process for the development. Residents directly adjoin the operation's boundary to the north, east and west. There are multiple other residents, particularly to the north and east. There are also several other poultry and pig operations generally to the northeast of the operation.

3.3.1 Visual

The topography of the area is generally flat and there are no natural hills to act as a screen or buffer to the operation. There are existing trees in the southwestern corner of the site which form a visual screen and a filter for particulate matter. In addition, visual screenings have been established on the north, south and east boundaries of the site.

A LVMP has been developed and a copy is contained within Appendix C. This LVMP has been implemented and will continue to be implemented for the duration of operations.

4 Operational Design

4.1 Road, Traffic and Machinery Movements

Traffic management is related to the bird growth cycle. The three (3) components of transport are listed below:

- Truck Deliveries - including chicks, feed, and shavings for the litter bed;
- Truck Removals - including harvest/catching, spent litter and dead birds; and
- Staff and cleaning contractor vehicles.

The total truck movements for feed delivery are approximately 10 trucks per shed over the 10 week period. The approximate average weekly truck movement is 104 trucks per week. This will occur during week 9 due to the overlap of catching movements and litter removal for all sheds.

Process operations for a batch occur as two components, even/day standard process and end of batch process the latter being more labour intensive.

The machinery used onsite for everyday standard use will comprise two RTV's, four tractors and one lawn mower. Machinery requirements will increase for the end of batch use and will include:

- forklifts for loading birds;
- loaders for loading out manure;
- tractors for manure removal;
- tractor to sanitise shed; and
- trucks for bird and manure removal.

Dead birds will be removed from the sheds and stored in onsite refrigeration units. The birds will be removed periodically from the site and disposed of at the local rendering plant. The current rate is scheduled as follows:

- Three (3) times per week from beginning of batch to final harvest.

Section 5 provides specific detail regarding the management of impacts resulting from road, traffic and machinery movements discussed.

4.2 Siting and Design

In line with industry practices, ProTen have constructed 'controlled environment' broiler growing sheds. Controlled environment sheds are operated under negative pressure to ensure optimum control over the internal environment. Every shed is equipped with:

- Insulated metal roofing and wall materials;
- Concrete flooring and a dwarf wall;
- Computer controlled shed management system;
- Automated ventilation system that includes:
    - Fixed speed wall fans at the eastern and western ends of the sheds;

  - Motorised vents in the shed walls;
  - Evaporative cooling panels; and
  - Gas heating;
- Temperature, humidity and pressure sensors inside the sheds;
- Computer controlled lighting; and
- Automatic feed and water supply systems.

The sheds are operated to maintain optimal temperature, humidity and light conditions for the growth of meat chickens. Temperature and humidity are managed primarily by the computer controlled ventilation system.

Continuous earthen bunds measuring 2.5m above the floor level of the sheds have been constructed and maintained at opposing ends of each farm near the shed fans to provide a barrier to particulate matter and provide noise attenuation measures. These earthen bunds have been constructed to requirements set out in Condition 32 of the DA document.

The earthen bunds will be vegetated to aid in visual screening and to maximise particulate capture. Screening vegetation is also to be established along the northern, southern and eastern boundaries. These are detailed in the LVMP attached to this EMP as Appendix C.

Access to the site is via Henderson Road. Existing access has been and the current access road has been constructed at the south-eastern end of the site. Creating a new access allows existing trees surrounding the old access to remain undisturbed.

Section 5 discusses the mitigation measures used to reduce potential impacts from the operation.

5 Operational Management

This section of the EMP outlines the mitigation measures to be used to manage impacts associated with aspects of the operation. Mitigation measures associated with drainage and nutrient management and vegetation management are detailed in dedicated management plans attached as appendices to this EMP.

5.1 Litter and Odour Management

Inadequate management of operations at the site has the potential to increase the risk of odour emissions.

5.1.1 Potential Sources of Odour

Odours may be generated from the following sources:

- Decomposition of manure, feathers, dust and bedding material;
- Breath and flatus from the chickens as the result of dietary upset;
- Volatilisation of odorous compounds in the litter;
- High litter moisture content and low oxygen levels;
- High temperatures and low pH which encourage anaerobic activity;
- Dietary upset caused by feed formulation, medication or poor bird health will result in wet manure, high litter moisture content and odour;
- Litter removal from sheds if undertaken during poor ambient dispersion conditions; and
- Inappropriate handling of dead birds.

5.1.2 Mitigation Measures

Management of Shed Temperature and Humidity

The odour mitigation measures outlined in this EMP have been developed with consideration to the section 3.7 of the *Environmental Code of Practice for Poultry Farms in Western Australia 2004.* These include the following:

- Sheds will have adequate roof and wall insulation to conserve energy and increase the cooling capacity of ventilation air;
- Sheds will be aligned along a general east-west axis where possible to minimise exposure to solar radiation;
- Surrounding areas will be grassed or vegetated to reduce ground radiation;
- Heat levels in the sheds will be controlled by way of evaporative cooling;
- Shed roofs will be built with overhang so as to shade shed walls;
- Refrigeration unit material will be used to construct the sheds which will increase insulation and reduce the radiant heat incident on the birds; and
- Ventilation openings will be kept free of obstructions.

Management of Shed Ventilation

Ventilation removes excess heat, water vapour and odorous compounds from the sheds. The following will continue to be implemented at the site to maintain effective and efficient ventilation in the sheds:

- Ventilation systems will be regularly maintained by removing dust build up from screens and ventilation shafts. This improved operational efficiency will reduce odours by improving bird health and maintaining drier litter; and
- Maximum possible airflow will be maintained throughout the sheds to keep litter as dry as possible and promote aerobic conditions.

Management of Litter Moisture

The effective management of poultry litter moisture is essential in controlling odours from a chicken broiler farm. ProTen will continue to implement the following actions and shed design technology to maintain optimal litter moisture content:

- The use of effective evaporative cooling systems to provide optimum growing conditions;
- Cooling systems and bird drinkers will be monitored and adjusted throughout the day to avoid spillage, leaks and uneven distribution;
- Sheds will have appropriate stocking densities and particular attention given to bird health;
- Caked litter will be regularly broken up and removed from beneath drinking lines;
- Feeders will be maintained to ensure spillage is minimised. This will ensure bird health and an optimal litter moisture content;
- Sheds will be designed to prevent entry of rainwater, water from irrigation sprinklers and surface water;
- Leaks in walls and roofs will be promptly repaired; and
- Appropriate litter moisture levels will be maintained to avoid excessive odour generation.

Management of Litter and Dead Birds

Litter and dead birds at the ProTen operation will continue to be managed by implementing the following:

- Wherever possible, litter will not be handled during poor ambient dispersion conditions, such as temperature inversions (early mornings and evenings) and light winds;
- Litter to be stored on site prior to disposal shall be contained in a weather-proof and covered storage compound (on hardstand) or under weather-proof covering prior to removal from the property for disposal;
- Litter collected for disposal shall be loaded into trucks with minimum spillage and dust creation. Any small amounts of litter remaining after shed cleaning shall be swept or vacuum cleaned prior to shed wash-down and disinfection;
- When litter is transported offsite it shall be placed in covered truck to reduce the transport of odour and dust;
- Spent litter will not be applied onsite. All litter produced onsite will be taken offsite for use or sale as fertiliser;

- Dead birds will be removed from the sheds as soon as practicable and placed in a refrigeration unit pending offsite disposal; and
- Dead birds will be collected by a contractor in a covered truck and disposed of at a local rendering plant.

Vegetative Screens and Wind Breaks

Vegetative screens and windbreaks will continue be utilised at the development as a means of managing odour transport. These measures provide the potential to reduce impacts by increasing dispersion and absorbing a proportion of the dust and odour emissions.

These screens were designed and constructed in accordance with *Environmental Code of Practice for Poultry Farms in Western Australia 2004*. The design shall ensure that:

- They will not influence airflows within the sheds by impacting on ventilation fan efficiency;
- They will redirect air movement and reduce dust mobilisation; and
- Help mask and disperse odour plumes.

Details are available in the LVMP presented in Appendix C.

5.2 Dust Management

5.2.1 Potential Sources of Dust

Airborne dust at the farm can be generated during construction activities associated with the development and ongoing operational activities. These activities can include:

- Clearing vegetation;
- Topsoil stripping & stockpiling;
- Earthworks;
- Excavation/levelling of the pads for construction;
- Construction of water holding and sediment dams;
- Wind movement across exposed/bare soil;
- Traffic entering and leaving the property;
- Delivery of feed to the silo's (feed dust);
- Dust from the sheds where the birds are kept (feathers, dust etc during grow out); and
- Dust generated during the removal and loading out of the used litter, including shed cleanout (litter & feather dust).

5.2.2 Mitigation Measures

The following mitigation measures aim to reduce the potential for activities at the ProTen operation to result in an impact on local or regional air quality. These measures include:

- Maintaining & maximising vegetation cover where possible;

- Minimising the level and extent (area) of ground disturbance;
- Minimise handling (and re-handling) of materials;
- Revegetate and rehabilitate eroded & degraded areas to measures outlined in the LVMP in Appendix C;
- Roads will be constructed of limestone material rather than fine particle material so as to reduce the dust potential;
- Maintaining adequate buffer distances & vegetation screens (after the implementation of dust controls);
- All bedding material and spent litter leaving the site will be covered prior to transporting;
- Shed fans will be regularly cleaned to reduce the build up of dust material; and
- Vegetative screens will be established as soon as practicable. More information is available in the LVMP in Appendix C.

5.3 Noise Management

5.3.1 Potential Sources of Noise

Equipment identified as being potential sources of noise at the broiler operation are shown in Table 2.

Table 2 Potential Noise Sources

Construction	Operation
Power tools	Vehicles (light and heavy)
Mobile crane	Ventilation fans
Bulldozers	Feed Delivery
Front end loaders	Refrigeration units
Vibrating rollers	Farm machinery
Excavators	Bird catching

5.3.2 Mitigation Measures

The following measures will continue to be employed at the ProTen operation to reduce the impacts from noise:

- Implement and maintain noise attenuation measures outlined in the DA document (P02435/02);
- Set a low traffic speed for on farm transport movements;
- Schedule the use of noisy equipment/plant during the day where practicable;
- Siting noisy equipment behind structures that act as noise barriers, or at the greatest distance from noise sensitive areas;
- Considering noise levels as a criteria when purchasing plant/equipment such as fans and refrigeration units; and
- Keeping equipment well maintained.

5.4 Lighting Management

5.4.1 Potential Sources of Light

External lights on the farm are used for security and other reasons, such as for night collection of birds and ongoing farm operations. The following is a list of potential sources of light that may originate from the operation:

- Heavy vehicle lighting from trucks at night;
- Farm machinery lighting, including light vehicles; and
- External shed lighting at the ends of the sheds.

5.4.2 Mitigation Measures

Inconsiderate positioning and operation of external lighting may pose a nuisance to neighbours. Impacts from the ProTen operation will be controlled through the following:

- External shed lighting will be mounted over the aprons at the ends of each shed to a maximum height of 4 metres and directed downwards;
- Low beam shall be used by all transport utilising the site at night;
- External lighting will only be used when required;
- Energy efficient lighting and timers should be used to control switching for optimum production efficiency;
- Narrow beam luminaries will be utilised to reduce the spread of the beam; and
- Farm equipment and light vehicle use will be kept to a minimum where possible during night-time periods.

5.5 Waste Management

5.5.1 Sources of Waste

The main sources of waste produced at the ProTen operation are as follows:

- Bird mortality;
- Poultry litter;
- Shed wash down water;
- Domestic effluent (residences and farms); and
- Workshop areas (waste chemicals, fuels, oils and drums, etc.)

5.5.2 Mitigation Measures

Table 3 contains a summary of waste materials that will be generated and possible disposal options.

Table 3 Summary of Controls for Waste Material Types

Waste Category	Examples	Recovery or Disposal Method
Inert Waste	Cleared and excavated vegetation and soil material.	• Employees and contractors to use onsite as mulch or ground cover where possible.
	Concrete, bricks, plasterboard, timber, tiles, scrap metal, plastics from construction of houses and sheds.	• Employees and contractors to segregate wastes to recover recyclable materials where possible. • Mixed wastes are to be disposed of to a landfill.
	Paper, plastics, glass, metals and timber from general site operations.	• ProTen operations staff and contractors to segregate recoverable materials from mixed waste for disposal to landfill.
	Tyres from existing waste onsite prior to development.	• Source separated and removed offsite to landfill (tyres are differentially priced).
Solid waste	Food waste, domestic household from farm residences.	• Food waste composting encouraged where possible. • Residual domestic waste to be removed from site to landfill as general waste.
	Regular mortality (dead birds).	• Regularly collected by ProTen farm staff and frozen onsite in a dedicated refrigeration unit).
	Poultry litter.	• Temporary stockpiles to be contained in weatherproof conditions. • Litter to be collected and transported in licensed, covered trucks for sale as fertiliser or other sustainable reuse.
	Felled vegetation	• To be used onsite in rehabilitation areas for natural habitat. • Excess source to be disposed of as green waste offsite.
Liquid waste	Washdown water	• Picked up in swale drains

Waste Category	Examples	Recovery or Disposal Method
	Domestic effluent (farm residences and staff ablution facilities).	• Treated by 'biocycle' self-contained septic treatment units as each site. • Approval for the units is required.
	Construction: Portable amenities effluent (Portaloos).	• Appropriately managed and disposed of offsite by construction contractor.
Hazardous waste	Unused/expired chemicals and empty chemical drums	• Stored in appropriate, safe and bunded areas. • Collected and disposed of appropriately offsite by a licensed Hazardous Waste transporter.
	Batteries, flammable liquids (oils), oxidising and corrosive agents, waste fuel and oil drums	• Stored in appropriate, safe and bunded area. • Collected and disposed of appropriately offsite by a licensed Hazardous Waste transporter

5.6 Chemical Storage and Use

Chemicals used on site will be stored, handled and disposed of to the following requirements:

- Environmentally hazardous chemicals including, but not limited to, fuel, oil or other hydrocarbons (where the total volume of each substance stored on the premises exceeds 250 litres) will be stored within low permeability compound(s) designed to the satisfaction of the Shire;
- The storage compound is to contain not less than 110% of the volume of the largest storage vessel or inter-connected system, and at least 25% of the total volume of vessels stored in the compound;
- Any liquid or contaminated material resulting from spills or leaks of chemicals including fuel, oil or other hydrocarbons, whether inside or outside the low permeability compound(s), shall be immediately removed and disposed of by a licenced waste disposal contractor to the appropriate waste disposal facility;
- Storage, use and disposal of all chemicals including, but not limited to, pesticides, disinfectants and veterinary products is to comply with the manufacturers recommendations;
- Storage areas will have Signage clearly showing the content and class of chemicals being stored;
- Fuels, lubricants and chemicals shall be stored in appropriate containment facilities, not in the vicinity of natural or built waterways or water storage areas;
- No chemicals or potential liquid contaminants are to be disposed of on-site;
- Persons handling dangerous chemicals shall wear appropriate PPE and receive appropriate training in it's use,

- Material Safety Data Sheets (MSDS) shall be kept within the storage facility for easy access by staff and contractors;
- Spill containment and treatment equipment and materials shall be available near storage areas of hazardous materials;
- Totally enclosed containment shall be provided for all hazardous waste;
- Hazardous waste that cannot be recycled must be disposed of to a licensed waste disposal facility;
- Should any chemical incidents occur onsite they will be recorded in Section 7.4 - Chemical Spills; and
- Spills of more than 20L are to be recorded for investigation and appropriate follow up by ProTen Management.

6 Contingency Measures

Contingency plans to deal with possible emergency situations that may occur onsite as a result of natural or man-made failures are listed in Table 4.

Table 4 Contingency Plans for Possible Emergency Situations

Emergency Situation	Contingency Plans
Disease Outbreaks	• Should a disease outbreak occur at the farm, a veterinary report should be obtained and reported to the Shire's Environmental Health Officer.
	• The WA Department of Agriculture will be consulted on the appropriate course of remedial action. Where required, the site will be locked down and quarantine measures will be implemented.
	• No unauthorised people will be allowed to enter site.
Mass Deaths	• In the event of a mass death due to natural causes, the rendering plant is able to accept large quantities of carcasses.
	• If this occurs during the weekend, then the plant will operate to handle the excess birds.
	• Should deaths be from disease, guidance on disposal would be obtained from the WA Department of Agriculture.
Power Failures	• In the event of a power failure, diesel generators are automatically engaged to run all essential equipment on the farm. These include fans, lights, winches and water supply infrastructure.
	• The operation will have a generator for each set of eight (8) sheds. These generators are to be tested on a weekly basis.

Emergency Situation	Contingency Plans
Water Supply Failure	• The farm has large water storage onsite. In the event of a water supply failure, there is adequate treated water for cooling and drinking for a period of two (2) days.
	• Should repair work take longer than two (2) days, water will be trucked in to maintain the water supply.
Equipment Malfunction	• Should there be a failure with equipment such as winches, cooling, lighting and drinkers, a local plumber and electrician with knowledge of these systems will be on call 24hrs a day to attend to issues.
	• Some replacement parts are kept on the farm to aid in reducing down-time.
Chemical Spills	• All chemicals and hazardous liquids are kept within bunded storage areas.
	• Should a spill occur there are MSDS sheets, procedures and spill response kits onsite to contain and clean up spills.
Interruption to Spent Litter Pick Up	• Should an issue occur with the litter transporters not being able to collect spent litter from the farm at the time of clean-out, another transport operator will be utilised.
	• The litter removal contractor will have adequate ability to meet pick up requirements. Should contractor be unavailable, ProTen will have preferred suppliers to meet litter pick up requirements. Therefore, the likelihood of a truck not being available is extremely low.
Interruption to Bird Pick Up	• In the event of a delay with transport of birds offsite, instruction would be provided by the processor to mitigate density issues.
	• The last resort would be the humane destruction of some birds to achieve normal flock density.
	• Culled birds would be disposed of at the local rendering plant.

7 Monitoring, Recording and Reviewing

Key findings of the internal or external monitoring, inspections and audits shall be recorded in the ProTen internal electronic database Safehold, managed by the SHEQ Officer. The entries will include a mechanism for assigning appropriate management actions and closing out corrective actions.

7.1 Spent Litter Removal

Litter dockets are kept for each batch of spent litter removed from the site by the transport contractor. The dockets record the amount of litter taken and the name of the transport contractor.

7.2 Community Liaison

Throughout the approval process for the development of the operation, ProTen engaged the community to address the concerns of local residents and surrounding rural businesses. During the operational life of the farm, ProTen will continue to engage and work with the community should any concerns be raised.

Site contact details are displayed on signage erected at the entrance to the farm. This enables the community to contact the operations management with complaints or inquiries. Information on the contact details and general information about the development is also listed on the company website www.proten.com.au.

Complaints/grievances are recorded into the Safehold electronic database. To reduce the potential to receive complaints and maintain positive relationships with the surrounding residents, ProTen undertake regular inspections on the perimeter of the operation for noise, dust and odour.

7.3 Complaints Management

Community complaints management includes receipt of complaints, investigation, implementation of appropriate remedial action and feedback to the complainant, communication to site management or personnel and notification to the external bodies where necessary. All complaints are to be investigated as soon as possible after the event, with the complainant being notified of the outcome from the investigation. All complaints are recorded in the Safehold electronic database and managed by the relevant SHEQ Officer.

7.4 Chemical Spills

Details of chemical spills onsite and corrective action required as part of the spills response process will be recorded in the Safehold electronic database and managed by the relevant SHEQ Officer

7.5 Training

Details of any environmental training undertaken by staff and contractors will be recorded in ileader an electronic training system. All environmental training onsite will be undertaken in accordance with ProTen's environmental induction program, in addition, staff will undergo regular 'Toolbox Talks' on specific environmental issues related to the operation of facility.

8 Management Review and Compliance Reporting

This EMP will be reviewed on an annual basis and updated where necessary, or:

- following any changes to the ProTen operation;
- changes in legislation;
- issue of an amended DA;
- key findings from the annual audit require changes to this EMP;
- or a change to the surrounding landscape.

8.1 Compliance Auditing

An audit report, required under Condition 5 of the DA will be drafted and submitted to the Shire on an annual basis by the 14th September.

The audit report must include:

- An identification of the sources and nature of all emissions, discharges and wastes generated on the site;
- An assessment of dust amenity (dust deposition) and health impacts (total suspended particulate, particulate matter less than 10 micron);
- An assessment of environmental impacts associated with its operations and its compliance with planning and environmental requirements;
- An evaluation of its response to any complaints; and
- A review of operational and management practices relating to environmental performance and the management of environmental risk, including emergency response, contingency plans and other measures to prevent or minimise environmental impacts.

Progressive amendments will be made to the EMP based on the annual audit and review in line with ProTen's continuous improvement process.

8.2 Odour and Noise Assessments

The DA requires an assessment of noise and odour to be undertaken within 12 months of the commencement of use of one or more of the poultry sheds and thereafter annually, during the life of the development. The noise and odour assessments are to be conducted each year, during summer, at a time which includes the final week of a growing cycle, harvest at the end of the cycle and shed clean out. The Shire shall make the reports available for public inspection. The owner shall then undertake and complete any required works or measures within three (3) months of receipt of the environmental engineers report.

8.2.1 Noise Assessment

The noise assessment must be undertaken to the following requirements:

- An assessment to be conducted within 12 months of the commencement of use of one or more of the poultry sheds;

- An assessment to be conducted annually during the lifetime of the development thereafter;
- ProTen to engage an acoustics engineer agreed to by the Shire;
- This acoustics engineer must conduct the assessment;
- The assessment of the operation of the farm should be conducted in summer;
- The assessment to be undertaken at a time which includes:
    - the final week of a growing cycle,
    - harvest at the end of the cycle and shed cleanout,
    - indicating whether the development complies with condition 33, and
    - in the case of any non-compliance, the assessment to recommend measures or works that must be undertaken to achieve compliance.
- The acoustics engineer shall provide a copy of the report to the Shire at the same time as providing the report to the developer/operator.

8.2.2 Odour Assessment

The noise assessment must be undertaken to the following requirements:

- An assessment to be conducted within 12 months of the commencement of use of one or more of the poultry sheds;
- An assessment to be conducted annually during the lifetime of the development thereafter;
- ProTen to engage an environmental engineer with experience in odour emission and mitigation agreed to by the Shire;
- This environmental engineer must conduct the assessment;
- The assessment of the operation of the farm should be conducted in summer;
- The odour assessment report drafted must involve odour monitoring of the operation of the development in:
    - the final week of a growing cycle,
    - in summer,
    - indicating whether the odour emissions from the development complies with condition 35 of the DA; and
    - in the case of any non-compliance, the assessment to recommend measures or works that must be undertaken to achieve compliance.
- The environmental engineer shall provide a copy of the report to the Shire at the same time as providing the report to the developer/operator.

8.3 Competency

The annual audit and assessments (refer to section 8.2) must be conducted by a suitably qualified and experienced person to the satisfaction of the Shire. This Shire should be notified prior to commencement of the annual audit or assessment, and approval should be received in writing from the Shire prior to undertaking the audit.

9 Document Control

To ensure that contractors and staff only use the latest version of this EMP, all amendments to this EMP should be recorded to ensure ongoing compliance with DA conditions.

Amendments should be reviewed and approved by a competent authority and entered into the Document Control Table located at the front of this document.

10 References

Department of Environment (2004) Environmental Code of Practice for Poultry Farms in Western Australia, Western Australian Local Government Association.

Development Approval (P02435/02) for a 'Proposed Poultry Broiler Farm - Lot 701 Henderson Road, Hopeland, issued by the Shire of Serpentine Jarrahdale WA, September 2007.

Notice of Determination on Application for Development Approval, Application No: PA19/644 for a Description of Proposed Development: Amendment to Existing Approval - Poultry Farm, issued by the Shire of Serpentine Jarrahdale WA, 21 September 2020.

Environmental Impact Statement (April 2007) ProTen Limited – Lot 701 Henderson Road, prepared by GHD Pty Ltd (Document number 61/19300/67702).

Rural Industries Research and Development Corporation (2014) National Environmental Management System for the Meat Chicken Industry – Version 2. Publication 14/100.

APPENDIX A

ProTen Environmental Policy

Environmental and Community Policy

PRT-P&P-SHEQ-002

ProTen is committed to managing its operations in an efficient and environmentally responsible manner that is compatible with the expectations of our shareholders, government agencies, customers, employees and the community. The responsibilities that underpin this commitment include:

- Identifying and understanding the potential environmental impacts and risks of our operations and reducing these impacts/risks through a program of continuous improvement;
- Ensuring the application of best practice environmental management;
- Implementing all practical measures to prevent or minimise harm to the environment and community that may result from our operations;
- Meeting or exceeding the relevant requirements of applicable legislation and the requirements of the regulatory framework for the respective operation (for example, development consent, environment protection licence), as well as responsible consumer expectations;
- Implementing the requirements of the respective environmental management plan as part of our day-to-day operational practices, including required environmental monitoring and reporting;
- Actively work towards minimising waste generation via exploring and implementing opportunities for re-use, recycling and/or energy recovery;
- Actively work towards reducing energy consumption via exploring and implementing opportunities for improved energy efficiency and renewable energy options;
- Ensuring any environmental incident is effectively responded to and necessary corrective actions implemented;
- Ensuring environmental aspects are considered in our investments, corporate strategies, procurement policies and products and services;
- Ensuring employees have a heightened awareness of environmental matters via inductions and training.
- Setting annual improvement objectives aimed at improving the overall environmental performance of the business;
- Engaging with members of industry, government agencies, customers, employees and shareholders on environmental issues and transparently communicating and reporting on environmental performance.

Bill Williams

Chief Executive Officer

August 2020

APPENDIX B

Drainage and Nutrient Management Plan

HENDERSON POULTRY PRODUCTION FARM

Drainage and Nutrient Management Plan

Prepared for:

ProTen Limited

SLR Ref: 675.30036.00000-R02
Version No: v1.0
June 2021

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Ground Floor, 503 Murray Street
Perth WA 6000 Australia

T: +61 8 9422 5900
E: perth@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with ProTen Limited (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
630.11395.00000-R02-v0.1	July 2016	Samantha Roberts	Sophie Nicholas	Sophie Nicholas
675.30036.00000-R02-v1.0	June 2021	Julia Curran	Angus McFarlane/Kate Singh	Colin Davies

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DOCUMENT REFERENCES

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TABLES

FIGURES

APPENDICES

1 Introduction

ProTen Ltd (ProTen) obtained Development Approval (DA) from the Shire of Serpentine Jarrahdale for 16 poultry sheds and associated infrastructure on Lot 701 Henderson Rd, Hopeland (reference P02435/02). The site is approximately 39.2ha in area and the facility has 16 sheds, each housing 60,000 birds, with a total poultry capacity of 960,000 birds for meat production.

Condition 14 of Development Approval P02435/02 states

> *The proponent shall prepare a Drainage and Nutrient Management Plan for approval by the Shire prior to the issue of a building licence for the new sheds and thereafter implement the approved Drainage and Nutrient Management Plan in its entirety..*

This *Drainage and Nutrient Management Plan* (DNMP) is based on the previous version of the DNMP developed by GHD in 2007. Sections one to three remain in accordance with the 2007 version. However, sections four and five have been updated to reflect the changes to groundwater monitoring in accordance with the approved *Operating Strategy for Groundwater Bores* PB1 and PB2 (SLR, 2021).

1.1 EMP Objectives

The main objectives of this DNMP are to:

1. Comply with the approved DNMP at all times;
2. Show how the capacity of the settling pond (detention basin) will cope with stormwater and shed wash-down water in all but 1:100 year storm events (**Section 3.1**);
3. Show how chemicals from disinfectants used, and nutrients from wash-down water are treated so that no pollution can impact ground water resources or drain to the conservation category wetland (**Section 3.2**);
4. Describe and commit to best management practice (BMP) of swales (**Section 4**); and
5. Prepare a monitoring plan for quarterly measurements to be reported to The Shire to ensure there is no increased export of nutrients, sediments or other contaminants from the Site (**Section 5**).

1.2 Site Description

The site is located on Lot 701 Henderson Road in Hopeland (Figure 1) and is approximately 39.2 hectares. Configuration of the site is rectangular and runs approximately 392 m east to west and 1020 m north to south.

The site is relatively flat, with elevations varying from 16 mAHD (Australian Height Datum) to 18 mAHD (excluding drains). There are slightly elevated sections in the south-east and north-west corners of the site. There are three soak dams currently on the site. The material removed has been stockpiled next to each dam.

Bunding has been developed along the southern boundary that prevents drainage from the site into Dirk Brook, which has been diverted along the southern edge of the property. Drains are located along the northern and eastern edges of the boundary. A Water Corporation owned drain runs in the westerly direction through the centre of the site.

The geology of the site is white to pale grey sand at the surface, and fine- to medium grained overlying sandy clay to clayey sand of the Guildford Formation. The groundwater level of the superficial aquifer beneath the site is typically around 2.5m below ground level (BGL). However, the Guildford Clay formation beneath the site forms a perched aquifer, which can result in seasonal inundation for low lying areas on the site.

Figure 1 - Site Location

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REGIONAL LOCALITY

FIGURE 1

2 Drainage Management

2.1 Flood Level Design

To prevent flooding of the broiler sheds, the finished floor level of the sheds is greater than the 1 in 100 year ARI flood level. Vegetated drainage swales at the base of the sheds have been designed to manage the 1 in 100 year ARI five minute storm event. The process water volumes resulting from the operations of the broiler shed are unlikely to produce volumes of water that would impact upon the drainage of the site.

The swales convey stormwater, promote infiltration and reduce stormwater run peak flow, velocity and volume. The swales are also effective at removing pollutants, such as suspended solids, and thereby reduce the nutrient content (predominantly the particulate nutrients) and turbidity of the water as it enters the detention basin. The selection of appropriate swale slopes and widths, in addition to the use of kikuyu grasses and sedges within the swales has increased roughness within the swales which reduces the velocity of the water passing through the swale.

The key design parameters of the vegetated swale drains located between the sheds are presented in Table 1.

Table 1 - North to South Vegetated Swales Key Parameters

Parameter	Units	Northern Shed Swales	Southern Shed Swales
Length	m	160	160
Fall	m	0.5	0.5
Longitudinal Slope		0.0036	0.0036
Base Width	m	3	3
Depth during 100 Yr ARI	m	0.16	0.16
Flow Rate during 100 Yr ARI	kL/s	0.25	0.25
Flow Velocity of 100 Yr ARI	m/s	0.39	0.39

The detention basins have been designed to manage a 1 in 100 year ARI 72 hour storm without over-topping, using the approach presented in the Stormwater Management Manual of Western Australia (DoW, 2007). The invert levels of outlet pipes have been set at 200 mm from the base of the basins. This allows for the storage of the 1 year ARI 72 hour storm for treatment purposes. The basins have controlled outlets, so in the event of a wash-down during wet conditions, the outlet can be closed to increase the detention time for treatment purposes. In normal conditions, a detention time of less than 3 days is required to prevent mosquito breeding, whilst allowing for sufficient detention for sedimentation to occur.

The invert and levels of the inlet drains and the spillway of the detention basin have been established such that there is no reverse flow effect.

The key design parameters for the detention basin are presented in Table 2.

Table 2 - Key Design Parameters for Detention Basins

Parameter	Units	Northern Basin	Southern Basin
Contributing Catchment Area	ha	4.9	4.9
Runoff Coefficient		0.95	0.95
Surface Area	m^2	12,010	17,250
Outlet Pipe Diameter	mm	225	225
Depth for Storage of 1 Year ARI	m	0.2	0.2
Invert of Outlet	m	0.2	0.2
Storage Volume (at 0.2 m depth)	kL	2,402	3,450
Maximum Storage Volume	kL	3,603	5,175

2.2 Inlet Points

A Water Corporation Open Unlined Drain (OUD) passes through the site. It is understood that this drain collects stormwater from other agricultural properties in the region. The OUD currently receives water from the drain that passes along the eastern boundary of the site.

2.3 Outlet Points

To reduce the risk of infection from migratory birds, it is undesirable to have standing water in the detention basins during the dry months. The northern detention basin has an outlet at the northern end of the basin, which allows the water to drain over land through a grassed channel to the open drain located on the northern boundary of the site. The water then drains into the wetlands to the west of the site, and eventually into Dirk Brook. That water then leaves the northern detention basin for at least 6 months of the year during average rainfall conditions. During the remainder of the year, water is removed through evapotranspiration and infiltration.

The southern detention basin has an outlet at the eastern end of the basin, which reports to the open drain located on the eastern boundary of the site, which feeds into a Water Corporation drain. A spillway has been installed to avoid the risk of flooding impacting upon the broiler shed. The water then leaves the southern detention basin for at least 6 months of the year. During the remainder of the year, water is removed through evapotranspiration and infiltration. For most years, the detention basins are dry during summer months.

3 Wastewater Sources and Management

3.1 Stormwater

This section addresses stormwater generated within the ring road areas and between the noise bunds. This area generates stormwater from roof runoff, roads and the vegetated swales within the area. The remaining site drainage will continue to remain the same for all intents and purposes and will be managed as currently occurs at the site.

3.1.1 Stormwater Volume

Precipitation rates for event based modelling were calculated using *AusIFD*, a program developed by Engineers Australia for the determination of design average rainfall intensities and temporal patterns for locations within Australia. The Intensity-Frequency-Duration rainfall graph utilised for the assessment is shown below as Figure 2.

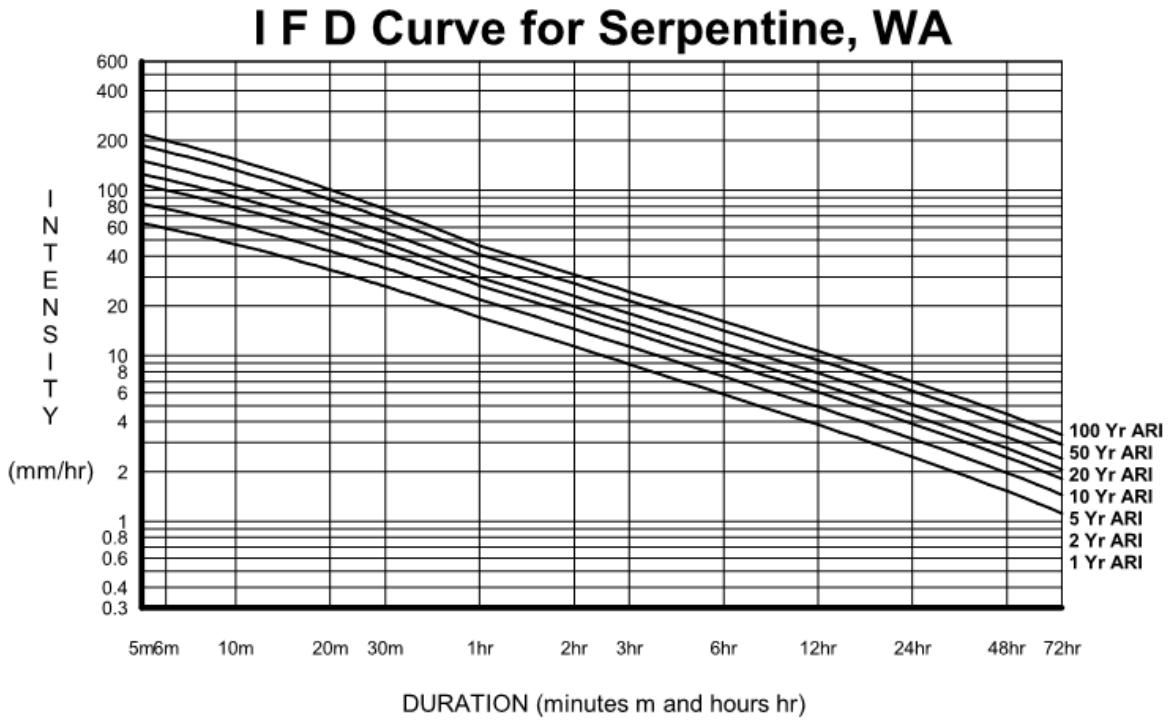

Figure 2 - Intensity-Frequency-Duration of Rainfall

For each unit, the 1 year ARI 72 hour duration event will generate 3,150 kL of runoff. Throughout the course of a year, the volume of stormwater that can be expected under different conditions is presented in Table 3.

Table 3 - Annual Water Inputs Received by Detention Basins

ARI	Rainfall (mm)	Northern Basin (kL)	Southern Basin (kL)
1 Year	850	51,144	46,477
10 Year	1015	60,680	55,042
100 Year	1165	71,533	64,885

The composition of catchment area is detailed in Table 4 below.

Table 4 - Catchment Composition

Area Type	Runoff Efficiency	% of Catchment Area	% of Contribution
Roof	95%	75	75
Road	95%	25	25

3.1.2 Stormwater Quality

During the wet season, there is generally three wash-down periods. During a 1 Year ARI year, there is a modelled total outflow of approximately 39,000 kL from each detention basin. Table 5 presents the annual average water quality from the detention basins.

Table 5 - Annual Average Water Quality at Detention Basin Outlet

Flow Regime	Volume	% Annual Flow	Pollutant	Concentration (mg/L)
Stormwater Runoff Only	31,111 kL	80%	TSS	8.4
			TN	1.26
			TP	0.08
Combined Stormwater and Washdown Water	7,800 kL	20%	TSS	31
			TN	3
			TP	1.09
Annual Average	38,911 kL	100%	TSS	12.9
			TN	1.6
			TP	0.28

The comparison of the average pre-development and predicted operational water quality at the detention basins is presented in Table 6. The results indicate that the predicted operational water quality is an improvement on the pre-development water quality for the three key parameters of total suspended solids, total nitrogen and total phosphorous.

Table 6 - Comparison of Detention Basin Quality

Parameter	Pre-Development Quality	Predicted Operational Quality
Total Suspended Solids (TSS)	180 mg/L	12.9 mg/L
Total Nitrogen (TN)	4 mg/L	1.6 mg/L
Total Phosphorous (TP)	0.45 mg/L	0.28 mg/L

The nutrient load generated by stormwater is minimal. The peak loads are associated with roof runoff from the site and from the roads. The contaminant concentration typically observed from these sources, as listed in Australian Runoff Quality (ARQ) (Engineers Australia, 2006) is presented in Table 7. The potential for dust generation resulting from the broiler shed operations and loadings have resulted in the mean value being used for the road stormwater quality rather than a lower end value. It has been assumed that the water collected over the swale and detention basin will have no suspended solids or nutrients.

Table 7 - Mean Roof and Road Stormwater Quality

Parameter	Roof Runoff	Rural Road Runoff
Total Suspended Solids (TSS)	70 mg/L	70 mg/L
Total Nitrogen (TN)	NA	2.1 mg/L
Total Phosphorous (TP)	0.13 mg/L	0.25 mg/L

The catchment area of the sheds is made up of the different areas of roofing, roads and grassed areas, as presented in Table 8. The stormwater runoff concentration was determined as weighted average concentration of these sources, based upon their likely contribution to the stormwater.

Table 8 - Anticipated Stormwater Quality (Prior to Treatment)

Parameter	Roof Quality
Total Suspended Solids (TSS)	42 mg/L
Total Nitrogen (TN)	2.1 mg/L
Total Phosphorous (TP)	0.16 mg/L

3.2 Process Water

3.2.1 Process Water Sources

Process water flows associated with the broiler operations are:

- Wash-down water;
- Evaporative cooler condensate; and

- Drinking water for the chickens.

The water released during the operation of the evaporative coolers is not present in quantities significant enough to impact upon the drainage system.

The drinking water from the chickens is excreted as chicken manure, which is incorporated into the poultry litter (the chicken manure combined with the sawdust). Therefore, this process water stream does not end up in the drainage system. The only process water stream that is passed through the drainage management system is the shed wash down water. The sheds are washed down following each cycle, with around six cycles occurring annually. Wash-down process occurs over a period of 7 to 10 days. The process employed at the site is consistent with the approach recommended in *the Environmental Code of Practice for Poultry Farms in Western Australia* (WABGA et al, 2004). This includes:

- Collecting the poultry litter by skid steer loader or similar and loading into a covered truck (avoiding any preventable spillage or dust creation) for offsite disposal as a fertiliser;
- Remaining litter collected through sweeping and blowing;
- Final wash-down using a high pressure spray to remove any residual material; and
- Disinfection using formaldehyde prior to the next batch of chickens.

3.2.2 Process Water Volume

Approximately 15 kL of water is required for each shed during wash-down. Allowing for 1 mm of wetting losses, approximately 12.3 kL of water is discharged from each shed. Therefore, each PPU will discharge around 98 kL of wash-down water over a period of 3 - 5 days. The wash-down water is released over a nine hour period.

3.2.3 Process Water Quality

ProTen utilises a wash-down process consistent with the methodology presented in the *Environmental Code of Practice for Poultry Farms in Western Australia*. According to this document, this process results in "a very low level of nutrients in wash-down water", and this was confirmed in discussion with the Department of Water (Pers Comm. Peter Ryan, 22/10/2007). Although the *Environmental Code of Practice for Poultry Farms in Western Australia* provides values for the concentrations of litter at harvesting, it has not been possible to locate literature that indicates the likely nutrient constituents of the wash-down water.

The typical concentration of nutrients within the broiler shed-wash down water at removal is presented in Table 9 below:

Table 9 - Nutrient Concentration of Wash-Down Water

Pollutant	Concentration
Total Suspended Solids (TSS)	2,500 mg/L
Total Nitrogen (TN)	65 mg/L
Total Phosphorus (TP)	45 mg/L

4 Management Measures

4.1 General Management

The following general management measures will be implemented at the site to minimise the potential for adverse impacts on the environment:

- Maintenance and management of the stormwater treatment system using best management practice;
- All staff are to be made aware of the appropriate nutrient management procedures including:
  - Cleaning and disposal off-site of any spillages during the cleaning procedures;
  - Appropriate disposal of dead birds;
  - No parking or driving on swales; and
  - Appropriate housekeeping procedures regarding littering and fertiliser usage on-site;
- Bunds will be routinely inspected for erosion and repaired as required;
- Additional mowing may be necessary before or during summer to reduce the risk posed by fire, but the minimum length of 90 mm should be maintained throughout if possible;
- Swales will be grassed with kikuyu grass to reduce the velocity of water passing through the swale system;
- Clippings of kikuyu grass will be disposed of away from water systems and preferably exported off site to be composted with shed litter;
- Swales will have periodic replacement of yellow sand lining, as required;
- Herbicides will not be used within 10 metres of the stormwater management facilities;
- Glyphosate will be used as the selected herbicide;
- Spraying will be avoided during windy conditions;
- No replanting of native species will be undertaken during two weeks of spraying;
- Any noxious weeds observed at the Site should be reported to the Department of Primary Industries and Regional Development via the MyPestGuide Reporter app;
- Wastes with significant quantities of nutrients will be transported in covered vehicles;
- Any onsite fuelling will take place on hardstand areas, preferably bunded to manage spills;
- The washing of vehicles will be undertaken on bunded hardstand areas to prevent the release of nutrients and chemicals into the waterways; and
- Formaldehyde used to disinfect the broiler sheds following the wash-down will be applied with shed doors closed, to prevent the chemical entering the stormwater treatment system.

4.2 Inspection Routines

4.2.1 Swales

The swales will be inspected during late summer/early autumn each year, prior to the autumn flush. Each inspection will involve the following:

- Removal of litter for appropriate off-site disposal;
- Mowing to a length to match the design flow depth of 90 mm (the 1 in 1 year ARI storm design flow levels through the drainage swales) – the grass clippings are to be disposed of off-site;
- Trimming of any sedges present within the swale, with offsite disposal of the clippings;
- Weed control;
- Inspect the swales for evidence of ponding, and remove blockage or fill as necessary with soil that is properly tamped and seeded; and
- Inspection for erosion. Where erosion has occurred, addressed using fill material and appropriate stabilising material (geotextiles, etc.), and replant.

Maintenance will be carried out on the swales prior to winter (April - May) and following major storm events (those with >58 mm/yr in 24 hours – the equivalent to a 1 in 1 year ARI storm event), including:

- Clear any accumulated debris and blockages; and
- Repair any damaged areas within the channel (such as repairing ruts or holes with soil that is properly tamped and seeded).

4.2.2 Detention Basins

Accumulated litter and debris in the detention basin will be removed prior to winter, and then during the middle and end of the wet season, where it is safe to do so. Biannual inspections and maintenance will be undertaken to assess the following:

- Sediment accumulation (accumulated sediment will be removed from the basin once the accumulated sediment volume exceeds 10% of the basin volume);
- Pest burrows will be filled and sealed as appropriate; and
- Structural integrity and blockages of the outlet (blockages will be removed through the use of suction wherever possible as opposed to flushing). Where flushing is utilised, the slurry will be dried on a sealed area and disposed of off-site at an appropriate facility.

5 Monitoring Program

The purpose of the monitoring program is to ensure that there is no decrease in the quality of both surface water and groundwater as a result of operations at the Henderson poultry production farm.

The area which poses most likely risk to the surface water quality is the water sourced from the broiler sheds. As a result, the monitoring program focuses on the two units of broiler sheds and their receiving drains.

The groundwater monitoring program aligns with the *Operating Strategy for Groundwater Bores PB1 and PB2* (SLR, 2021).

5.1 Objective

The objective of the monitoring program is to assess the quality of both surface water and groundwater, to ensure no detrimental impacts to the environment occur as a result of the operational activities at the site.

5.2 Sampling Location and Methodology

Figure 3 details the sampling locations for both surface water and groundwater monitoring.

5.2.1 Surface Water

Sampling is undertaken at the two drainage basins onsite - Detention Basin 1 (DB1) and Detention Basin 2 (DB2) (see Figure 3). The detention basins collect the stormwater and wash down runoff from the poultry production sheds.

Surface water sampling is conducted (when water is present) from three locations at each detention basin. These include:

- The outlet point of the basin;
- Upstream of the basin within the receiving drain; and
- Within the receiving drain downstream of the basin.

The results are assessed against the criteria set out in Table 10 below.

Table 10 - Surface Water Detention Basin Runoff Criteria (GHD, 2007)

Pollutant	Concentration
Total Suspended Solids (TSS)	180 mg/L
Total Nitrogen (TN)	4 mg/L
Total Phosphorus (TP)	0.45 mg/L

Figure 3 - Sampling Locations

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LOT 701 HENDERSON ROAD, HOPELAND, WA
SAMPLING LOCATIONS

FIGURE 3

5.2.2 Groundwater

Groundwater monitoring is undertaken at the two production bores (PB1 and PB2) to monitor the impacts of water extraction from the bores on the Leederville Aquifer groundwater levels and quality (see **Figure 3**). The results of the sampling are assessed against the criteria listed in **Table 11.**

Table 11 - Groundwater Criteria, Frequency and Reporting

Parameter	Criteria	Frequency	Reporting
Groundwater Level		**Quarterly**	**Quarterly**
Groundwater Level - PB1 and PB2	Below 1 metres AHD		
Groundwater Level Drawdown - PB1	More than 4.8 metres drawdown		
Groundwater Level Drawdown - PB2	More than 12.6 metres drawdown		
Groundwater Quality		**Quarterly**	**Quarterly**
pH	5.5 - 8.5		
Total Dissolved Solids	1,090 mg/L		
Electrical Conductivity	1,650 mg/L		
Total Nitrogen	-		
Total Phosphorus	-		
Total Kjeldahl Nitrogen (TKN)	-		
Nitrate + Nitrite (NOx)	-		
Ammonia as N	-		
Major ions (Na, K, Ca, Mg, NH_4, Cl, SO_4, NO_3, HCO_3, CO_3)*	-	Annually (within one of the quarterly events)	Annually

5.3 Frequency

As per Table 11, sampling of the two production bores for total nitrogen (TN), total phosphorous (TP), electrical conductivity (EC), pH and total dissolved solids (TDS) occurs on a quarterly basis, during the months of March, June, September and December, to identify potential impacts on groundwater quality. All results are recorded in a site database and reviewed every six months.

On the recommendation of DWER, major ions analysis is required for a short period (as determined appropriate by DWER) with a sampling frequency of once per year.

Meter readings are also recorded at each bore on a monthly basis to calculate extraction volumes and ensure the Department of Water licence allocation of 115,500 kL/annum is not exceeded.

5.4 Reporting

Following each quarterly sampling event, a report is prepared, and a copy is sent to The Shire.

An annual water quality report is also prepared for DWER detailing the surface water and groundwater results throughout the year. This is also sent on to The Shire.

6 References

Department of Water (2009) Operational Policy No. 5.12 – Hydrogeological Reporting Associated with a Groundwater Well Licence

Department of Water (2010) Operating Policy 5.08 – Use of Operating Strategies in the Water Licensing Process

Engineers Australia (2006) Australian Runoff Quality

GHD (2007) Drainage and Nutrient Management Plan

SLR Consulting (2021) Drainage and Nutrient Management Plan

GHD (2008) Groundwater Investigation and Hydrogeological Assessment

GHD (2008) Operating Strategy for Groundwater Bores PB1 and PB2

SLR (2017) Operating Strategy for Groundwater Bores PB1 and PB2

SLR Consulting (2021) Operating Strategy for Groundwater Bores

Western Australian Broiler Growers Association Poultry Farmers Association of Western Australia (2004). Environmental code of practice for poultry farms in Western Australia.

APPENDIX A
APPROVED OPERATING STRATEGY FOR GROUNDWATER BORES (2021)

OPERATING STRATEGY FOR GROUNDWATER BORES

Henderson Poultry Production Farm

Prepared for:

ProTen Limited

SLR Ref: 630.11395
Version No: V7
November 2020

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
10 Kings Road
New Lambton NSW 2305 Australia
(PO Box 447 New Lambton NSW 2305)
T: +61 2 4037 3200
E: newcastleau@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with ProTen Limited (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
630.11395	Version 1	June 2011	Eryn Bath	Eryn Bath	Eryn Bath
630.11395	Version 2	July 2016	Andrew Macdonald	Derwin Lyons	Eryn Bath
630.11395	Version 3	September 2016	Andrew Macdonald	Derwin Lyons	Derwin Lyons
630.11395	Version 4	January 2017	Andrew Macdonald	Derwin Lyons	Samantha Roberts
630.11395	Version 5	February 2017	Samantha Roberts	Derwin Lyons	Samantha Roberts
630.11395	Version 6	October 2019	Samantha Hayes	Nathan Archer	Nathan Archer
630.11395	Version 7	November 2020	Ashish Mishra	Angus McFarlane	Angus McFarlane

CONTENTS

DOCUMENT REFERENCES

TABLES

CONTENTS

FIGURES

Licence details	Name(s)
Name of licence applicant/ licensee	ProTen Investments Managements Pty Ltd
Name of development project or purpose	The Henderson Poultry Production Farm
Legal description and address of where: a) water is taken	Lot 701 Henderson Road, Hopeland, Western Australia
b) water is used	Lot 701 Henderson Road, Hopeland, Western Australia

"I understand that the commitments given in the attached operating strategy will be a condition of an associated water licence if approved and that a breach of a commitment or any licence condition may be an infringement of the Rights in Water and Irrigation Act 1914":

	Signature	Date	Printed name
Person Legally responsible for water licence		16/3/2021	JULIAN JOHNSON
Approved by Department of Water and Environmental Regulation delegated authority			

1 Introduction

1.1 Background

The Henderson Poultry Production Farm (the "Development") was granted Development Approval PO 2435/02 on the 14 September 2007 by Serpentine Jarrahdale Shire located within Lot 701 Henderson Road, Hopeland, Western Australia (WA), approximately 50 kilometres (km) south-southeast of Perth (the "Development Site"). The Development comprises two poultry production units (PPU), where broiler birds are grown for human consumption. Each PPU comprises eight tunnel-ventilated fully-enclosed climate-controlled poultry sheds, with associated support infrastructure and staff amenities, and has the capacity to house up to 480,000 birds (combined total site capacity of 960,000 birds). The layout of the development is shown in Figure 1.

This Operating Strategy for Groundwater Bores (Strategy) applies to the extraction of groundwater from the two production bores PB1 and PB2 within the Development Site that service the water requirements of the poultry farm, along with associated operational and management issues. This Strategy has been prepared in consideration of the Western Australian Department of Water and Environmental Regulation (DWER) Operational Policy 5.08 – Use of Operating Strategies in the Water Licensing Process (2011). The Strategy will remain in force for the operating life of the licence held under Section 5C of the Western Australian Rights in Water and Irrigation Act 1914 (RWI Act) for the groundwater production bores identified as PB1 and PB2.

This revision to the Strategy has been prepared to incorporate the new regulations for metering the taking of water as required under the Rights in Water and Irrigation Amendment Regulations 2018 (Department of Water and Environmental Regulation, 2018).

1.2 Key Contacts

1.2.1 ProTen

The implementation of this Strategy is to be undertaken by the ProTen staff members listed in Table 1.

Table 1 ProTen Contacts

Key Contact	Company Position	Contact Details
Joubert De Lange	Farm Manager	Ph: 0438 679 043 Email: henderson@proten.com.au
Julian Johnson	WA Regional Manager	Ph: 0406 484 474 Email: julianj@proten.com.au
Bill Williams	Chief Executive Officer	Ph: 02 6964 2346 / 0447 062339 Email: bwilliams@proten.com.au

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REGIONAL LOCALITY

FIGURE 1

1.2.2 Regulatory Authorities

Table 2 lists the contact details for the regulatory authorities that have an interest in the water management aspects of the development.

Table 2 Regulatory Authorities and Stakeholders Contacts

Regulatory Authority	Key Contact	Contact details
Serpentine Jarrahdale Shire	Matt Sargenson Manager Heath	Ph: 08 9526 1107 Email: msargeson@sjshire.wa.gov.au
	Rachel Hellema Environmental Health Officer	Ph: 08 9526 1111 Email: rhellema@sjshire.wa.gov.au
Department of Water and Environmental Regulation	Carlie Slodecki A/Program Manager – Water Licensing, Peel Region	Ph: 08 9550 4210 Email: carlie.slodecki@dwer.wa.gov.au
	Tavonga Chipangura Natural Resource Management Officer, Water Licensing	Ph: 08 9550 4217 Email: tavonga.chipangura@dwer.wa.gov.au

1.3 Reporting

The Annual Monitoring Summary Report will be submitted to the DWER by the 31 December of each year and will reflect the reporting period from the 1 December to the 30 November. The Annual Monitoring Summary Report will be prepared in compliance with the Operational Policy No. 5.12 – Hydrogeological Reporting Associated with a Groundwater Well Licence (DWER 2009).

Water meter readings for each water year are reported to the DWER by the 31 December of each year and also included in the Annual Water Monitoring Report that is submitted to the DWER by the 31 December each year. As recommended by DWER, the meter readings must be submitted via the department's Water Online portal, unless otherwise approved by the department. To enable the online submission of meter readings, meters must be registered in the Water Online portal against the relevant water licence.

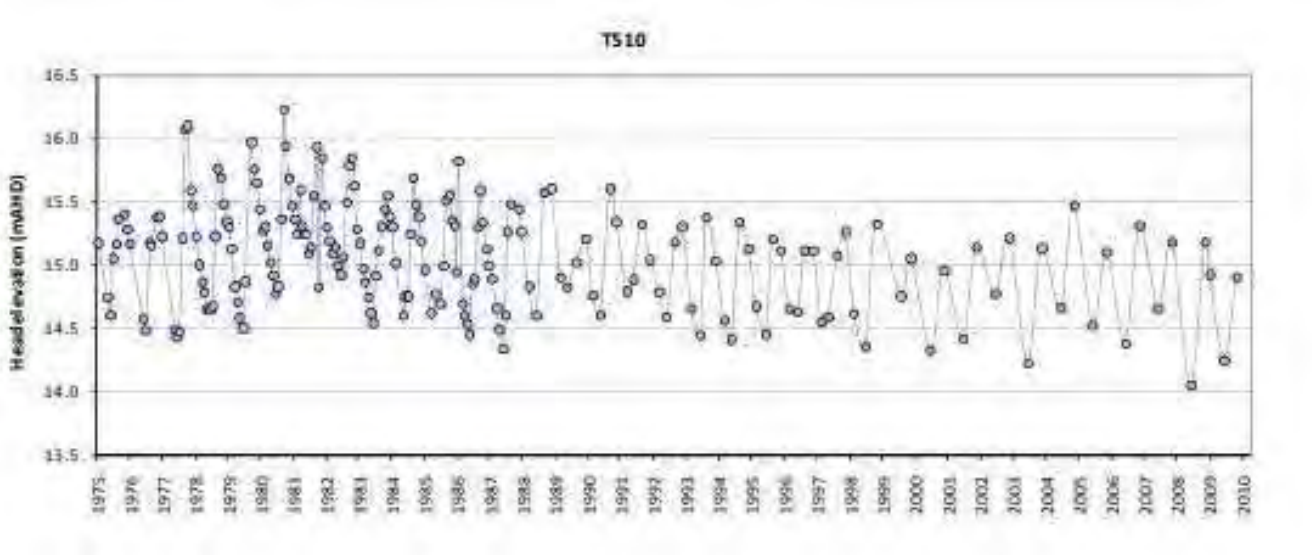
2 Operational Water Supply

2.1 Hydrogeological Setting

The site is located within Serpentine Groundwater Management Area, on the Swan Coastal Plain between the Darling Scarp and the Serpentine River. There are two major aquifers present at the location that are relevant to the site operations, the Superficial Aquifer and Leederville Aquifer.

The average saturated thickness of the Superficial Aquifer is about 10 m and consists mainly of sandy sediments of the Bassendean Sand with an average transmissivity of less than 100 m^2/day (Davidson, 1995). The salinity levels are observed between 500 to 1,000 mg/L (measured as total dissolved solids). Groundwater recharge of the superficial aquifer is predominantly via direct rainfall infiltration (Davidson, 1995). The Superficial Aquifer at the site location is comprised of the Quaternary Guildford Formation (Qg) (or Guildford Clay). The Guildford Clay is predominately of alluvial origin and described as pale grey, blue, but mostly brown silty and slightly sandy clay. It commonly contains lenses of fine-to coarse-grained very poorly sorted conglomeratic sand at its base (Davidson & Yu 2008). The bore construction and lithology log from the closest DWER monitoring bore T510 (AWRC:61410115) shows that the base of the Guildford Formation in the area is 12 m below ground level (mBGL). The Hydrograph monitoring bore T510 (AWRC:61410115), constructed in the Superficial Aquifer, displayed in Figure 2 shows a shallow water table that is generally between 14 to 16 m AHD and displays seasonal water level variation. Monitoring at the site has shown that the site is subject to inundation, with the water table rising to the ground surface during periods of increased rainfall recharge in winter.

Figure 2 Hydrograph of bore T510 (AWRC:61410115)



Underlying the superficial aquifer is the Leederville Aquifer. The Leederville Aquifer is a major aquifer present beneath the entire coastal plain except near the Swan Estuary. It has a maximum saturated thickness of about 550 m and salinity levels of between 500 to 1,000 mg/L (Davidson, 1995). The Leederville Aquifer is a multilayer groundwater flow system consisting of discontinuous interbedded sandstone, siltstone and shales. Recharge is from the superficial aquifer where the two aquifers are in direct contact and from upward flow from the underlying Yaragadee Aquifer where the deeper confining layer is absent (Davidson, 1995).

Groundwater is anticipated to be encountered at approximately 2.5 meters below ground level (mbgl) in the Superficial Aquifer (SLR, 2017a). The clay layer beneath the site (approximately 12 to 14 m thick) consists of sand and clay associated with the Guildford Clay, and has resulted in the development of a perched aquifer which can lead to the inundation of low-lying areas on a seasonal basis (SLR, 2017a). Inundation occurs because the aquifer fills to capacity in winter.

2.2 Groundwater Extraction

A water supply is required to meet the operational requirements for the Development Site. The water supply is extracted from groundwater resources at the Site by two production bores known as PB1 and PB2. Approximately 115 ML of potable water is required for the site, which is sourced from the Leederville Aquifer.

Extracted groundwater is temporarily stored in a storage tank and distributed through the water supply network across the site. The following table contains a summary of the bore details. In accordance with the requirements of the Rights in Water and Irrigation Amendment Regulations 2018 licensees must install a water meter on each water draw-point to accurately measure the quantity of water being extracted.

Details of the production bores and associated water meters are included in Table 3.

Table 3 Production Bore and Water Meter Details

		Bore ID	
		PB1	PB2
Location	Easting	396,560	6,414,489
	Northing	396,589	6,414,778
Date Constructed		April 2008	April 2008
Main Casing	Drilled (mbgl)	98	85
	Blank Interval (mbgl)	0 to 80	0 to 69
	Slotted Interval (mbgl)	80 to 98	69 to 85
Airlift Data	Discharge (L/s)	10	8
	Total Dissolved Solids (TDS) (mg/L)	980	900
	pH	6.4	6.5
	Stick-up (mbgl)	0.3	0.6
	Depth to Water (mbgl)	12.94	11.94
Water Meter Details	ID/Serial Number#	BP1 / 060925105	BP2 / 060925085
	Installation Date	April 2008	April 2008
	Meter Reading at Time on Installation (kL)	18,356	18,747
	Reading frequency	Monthly	Monthly

Note: mbgl metres below ground level; L/s litres per second; mg/L milligrams per litres
There is no type or brand name marked on the meters.

Table 4 lists the pump settings, maximum installed capacity and maximum monthly extraction from each of the production bores.

Table 4 Bore Specifications and Capacities

Bore ID	Installed Capacity			Maximum Annual Extraction (ML)
	Pump	Pump Setting (mbgl)	Design Yield (L/s)	
PB1	2*CRE 20-7	45	5.8	115
PB2	2*CRE 20-7	60	5.8	115

Note: mbgl metres below ground level; L/s litres per second; ML megalitres

Water meters are serviced and calibrated according to the installation guidelines every three years and water use is recorded on a monthly basis. The DWER will be notified within seven days if a malfunction of a meter is detected.

3 Groundwater Monitoring

The groundwater monitoring program is designed to monitor the impacts of bore operations on local groundwater levels and quality, and identify potential impacts on groundwater dependent vegetation within the vicinity of the production bores. The monitoring data is recorded in a database and reviewed every six months to identify any potential impacts from the groundwater extraction. The monitoring results and interpretation of the results are reported to the DWER annually within the Annual Aquifer Review.

3.1 Production Bores

The monitoring program for the production bores follows the method set out in the Drainage and Nutrient Management Plan (SLR, 2017a). As listed in Table 5, parameters are measured on a regular basis within the two production bores (PB1 and PB2).

3.1.1 Groundwater Level Monitoring

Water meter readings for each water year are reported to the DWER by the 31 December of each year and also included in the Annual Water Monitoring Report that is submitted to the DWER by the 31 December each year.

Water levels are monitored quarterly within the two production bores, which were installed prior to the commencement of the poultry development, to identify potential impacts from the extraction on regional groundwater levels. All results are recorded in a site database and reviewed every six months.

3.1.2 Groundwater Quality Monitoring

Sampling of the two production bores for total nitrogen (TN), total phosphorous (TP), electrical conductivity (EC), pH and total dissolved solids (TDS) occurs on a quarterly basis, during the months of March, June, September and December, to identify potential impacts on groundwater quality. All results are recorded in a site database and reviewed every six months.

On recommendations of DWER, the concentration of TP and TN at the production bores has been reviewed. The time-series plots of TP at the production bores PB2 And PB2 indicates an increasing trend over last 5 years (Figure 3). DWER recommended that the Leederville aquifer production bores are generally not useful for monitoring nutrient (TN, TP) outputs given their depth and confined nature. DWER also indicated that there may be leakage occurring from the overlying superficial aquifer or vertical flow within the annulus of the bores. On the recommendation of DWER, the major ions analysis is also proposed to be undertaken with the addition of TP, for a short period given the increase identified. DWER agreed that given the volume of the licence, the frequency can be reduced to one sampling event per year.

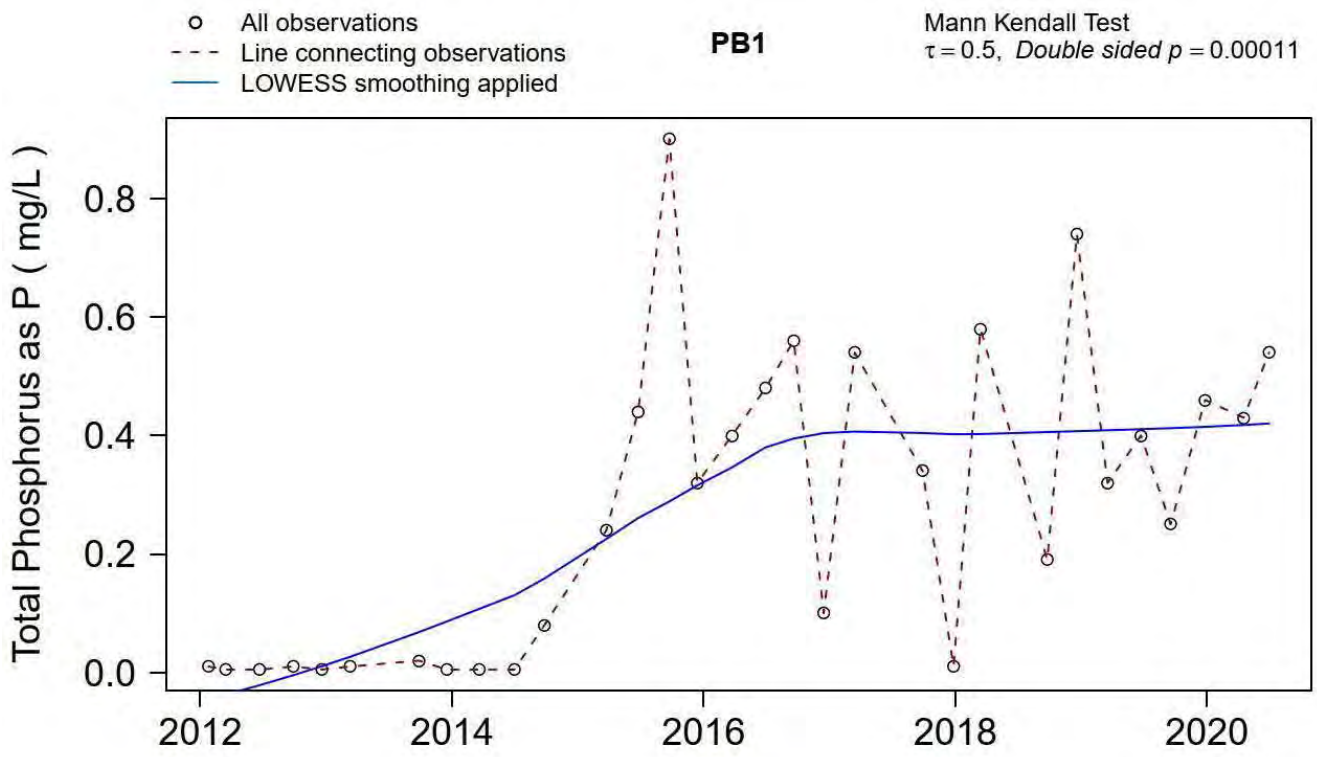
Therefore, it is proposed that the major ions at the production bores should also be analysed once a year.

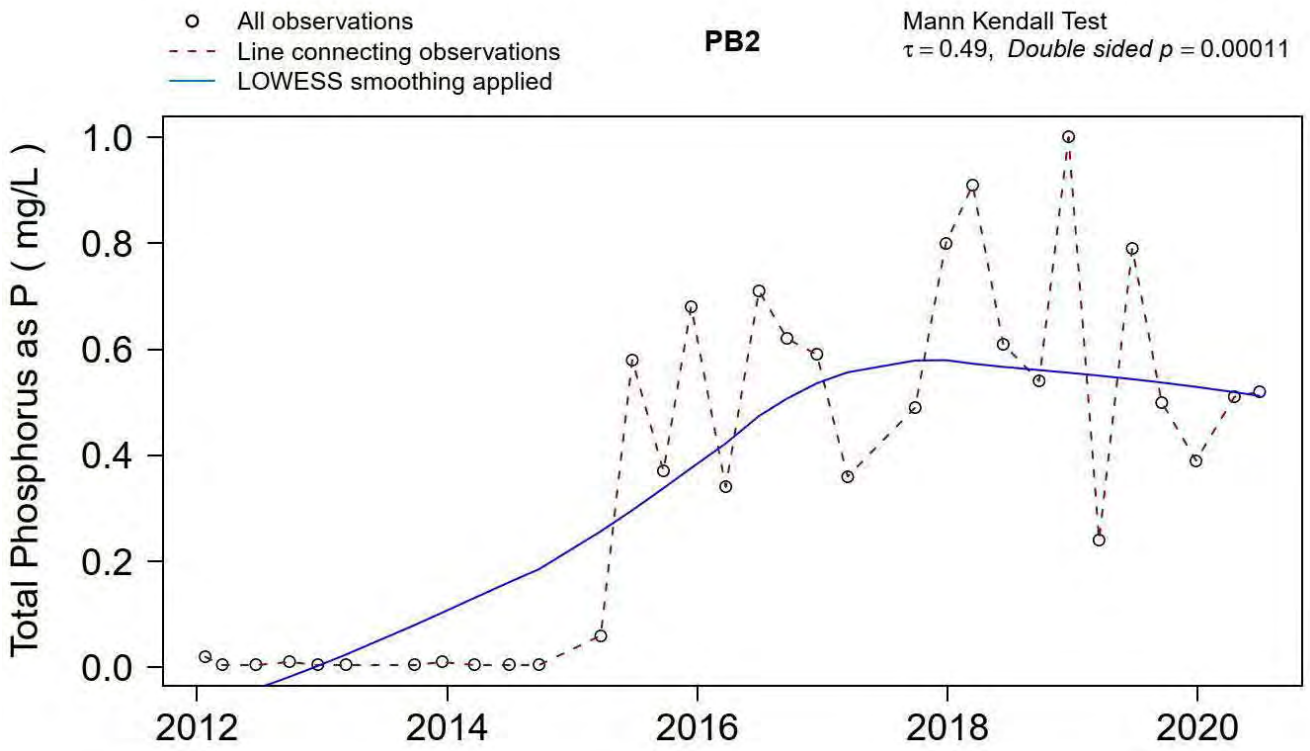
Table 5 Groundwater Monitoring Program - Production Bores

Sampling Site	Parameter	Frequency	Reported
PB1 and PB2	Water Use (Meter Readings)#	Monthly	Annually
	Water level	Quarterly	Quarterly
	Electrical conductivity (EC)		
	pH		
	Total dissolved solids (TDS)		
	Total phosphorus (TP)		
	Total nitrogen (TN)		
	Total Kjeldahl Nitrogen (TKN)		
	Nitrate + Nitrite (NOx)		
	Ammonia as N		
	Major ions (Na, K, Ca, Mg, NH_4, Cl, SO_4, NO_3, HCO_3, CO_3)*	Annually (with one of the quarterly events)	Annually

If a malfunction of the meter is detected the DWER will be notified within seven days. *These analytes are added recently (November 2020) on recommendation by DWER.

Figure 3 Time-series plots of total Phosphorus at PB1 and PB2





3.2 Monitoring Bores

Four superficial monitoring bores (GW1-4) were installed when the property was developed (GSS Environmental, 2011) as detailed in the original Operating Strategy. Monitoring was discontinued in 2016 based on advice from the department given the lack of bore construction information. DWER recommended that monitoring of groundwater levels and basic groundwater quality is to be re-established in the superficial monitoring bores (at least one upstream and one downstream) in an email from Carlie Slodecki (DWER) to Samantha Hayes (SLR) dated 13 August 2020. Following recommendations of DWER, these superficial monitoring bores will be readded in the groundwater monitoring network. The water level and nutrients (TN and TP) will be measured at an upstream bore (GW01) and downstream bore (GW02). The parameters to be measured on a regular basis within the two monitoring bores (GW01 and GW02) have been listed in Table 6.

Table 6 Groundwater Monitoring Program - Monitoring Bores

Sampling Site	Parameter	Frequency	Reported
GW01 and GW02	Water level	Quarterly	Quarterly
	Total phosphorus (TP)		
	Total nitrogen (TN)		
	Major ions (Na, K, Ca, Mg, NH_4, Cl, SO_4, NO_3, HCO_3, CO_3)*	Annually (with one of the quarterly events)	Annually

The sampling locations are presented in Figure 4.

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LOT 701 HENDERSON ROAD, HOPELAND, WA
SAMPLING LOCATIONS

FIGURE 4

4 Contingency Plan

Given the nature and scale of the farm and groundwater extraction, we do not believe that a detailed contingency plan is required within this Operating Strategy. However, contingency actions have been identified below to minimise the potential for adverse impacts if there is a need to reduce the volume of groundwater that can be extracted. Possible triggers for a reduction in water allocation include, but are not limited to, the following:

- Drought;
- Unexpected aquifer response;
- Decline in groundwater levels;
- Changes to groundwater quality; and
- Degradation or evident stress of the surrounding environment.

Table 7 contains updated triggers levels for groundwater levels and groundwater quality at which the implementation of contingency actions would be considered. On recommendation from DWER, the groundwater level trigger for PB1 and PB2 was reviewed and revised. Water levels in the production bores have historically ranged between 1 m AHD and 8 m AHD, and no decreasing trend in water level is observed (Figure 5). As such, the 3 m AHD trigger, which has been breached each year, is not an appropriate trigger level. Therefore, as recommended by DWER, the trigger level is amended to 1 m AHD. Similarly, water level at GW01 and GW02 have historically ranged from 15 m AHD to 18 m AHD. As such, the water level trigger for GW01 and GW02 has been set at 15 m AHD. The water level readings must be taken at least 8 hours after cessation of pumping to avoid pump influence causing non-representative groundwater level trigger exceedance.

DWER also recommended reviewing the trigger levels for EC and TDS. On reviewing it was observed that the changes in the EC and TDS are within historical range and the current trigger levels are appropriate and suitable (Figure 6).

Figure 5 Groundwater levels at PB1 and PB2 in mAHD

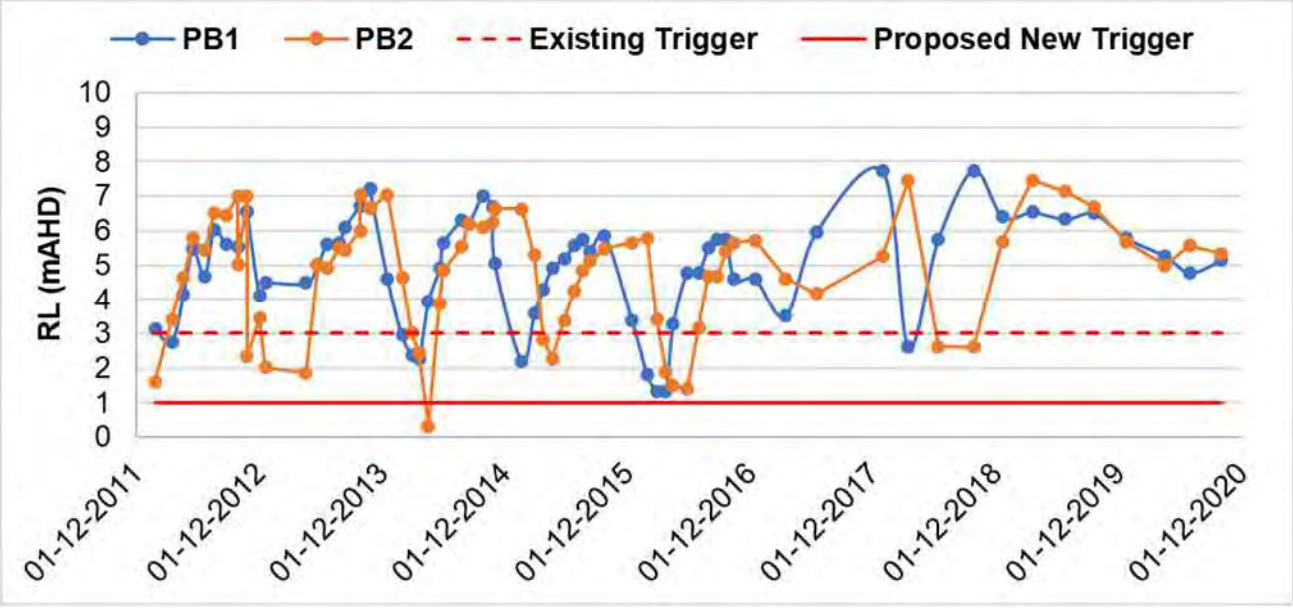

Figure 6 EC and TDS at PB1 and PB2 along with the Current Trigger

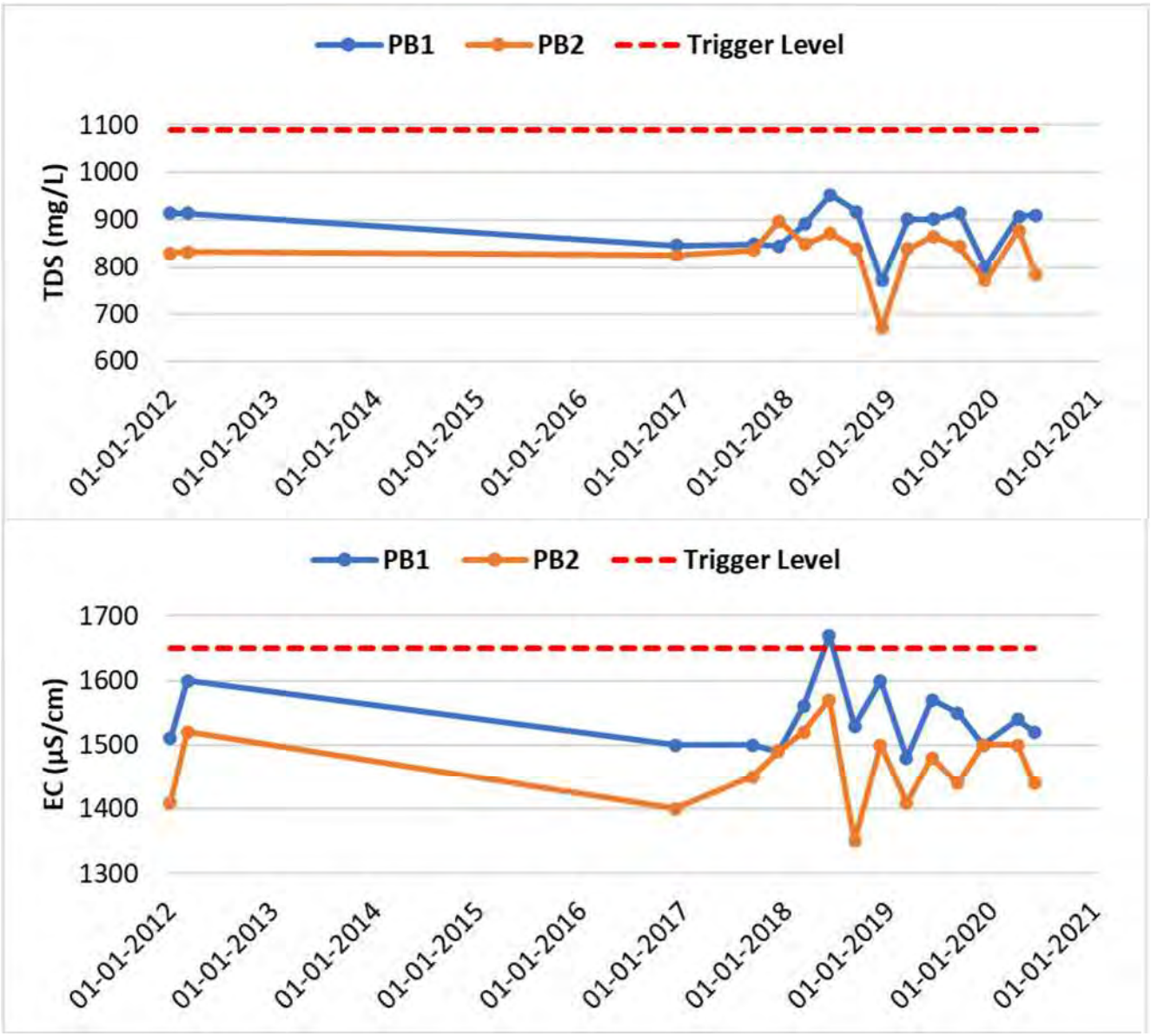

Table 7 Trigger Levels for Contingency Actions

Parameter	Trigger Level	Comment
Groundwater Level		
Groundwater Level – PB1 and PB2	Below 1 metres AHD	
Groundwater level – GW01 and GW02	Below 15 metres AHD	
Groundwater Quality		
pH	Outside range – 5.5 to 8.5	Neutral pH range
Total Dissolved Solids	Above 1,090 mg/L	10% above background level[1]
Electrical Conductivity	Above 1,650 mg/L	10% above background level[1]
Total Nitrogen	Increasing long-term trend or significant spike	No background level[1] or guideline value available
Total Phosphorus	Increasing long-term trend or significant spike	No background level[1] or guideline value available

[1] – as reported in the Hydrogeological Assessment (GHD 2008)

Contingency actions have been identified to minimise the potential impacts on groundwater resources. A tiered approach to contingency actions will be implemented as outlined below:

- Tier 1 – At a point where a parameter is outside the specified range or exceeds the relevant trigger level, the affected bore(s) are to be resampled immediately. If the follow up result remains outside the specified range or still exceeds the relevant trigger level, Tier 2 will be implemented. If the follow up result is within the specified range or does not exceed the relevant trigger level, a return to routine monitoring will occur; and
- Tier 2 – Further investigation in consultation with the DWER is required regarding the trigger breaches. Monthly monitoring will be undertaken until the parameter is inside the specified range/below the relevant trigger level, until investigation into the cause of the breaches is concluded as agreed with the DWER, or other contingency actions such as those outlined below are implemented in consultation with the DWER.

It is emphasised that the fact that the licensed water allocation may not be guaranteed at all times is a commercial risk of the operator (ProTen). If such a time presents itself, the following contingency actions will be considered for implementation in consultation with the DWER:

- Investigation – engaging a suitable and experience specialist/consultant to undertake a groundwater investigation and hydrogeological analysis in order to investigate the cause of the issue and the extent of the impact(s), as well as identify possible mitigation measures to remedy the cause, ameliorate the impact(s) and/or avoid re-occurrence;
- Shutting Down the Affected Bore – the cumulative annual extraction rate from the bores is 115 megalitres, which is less than half the rate modelled by GHD in 2008 prior to the establishment of the bores. On this basis, GHD (2008) concluded that either bore is capable of supplying the fully 115 megalitre allocation with minimal implications (including increased drawdown and environmental impacts);

- Destocking – reducing the operating capacity of the poultry complex until the required water supply can be obtained. The poultry sheds can be gradually destocked to reduce the demand and utilisation of water. In the unlikely event that water availability ceases all together and an alternative water source can be accessed, the complex will likely be forced to cease operating until such time that acceptable water supply become available; and
- Alternative Water Sources – the purchase of water from off-site is also an option while the licensed allocation is reduced.

Based on these available contingency actions, there should not be any impact or disadvantage to other local water users should the licensed allocation to the poultry complex be reduced.

The groundwater monitoring program, along with the six monthly review of monitoring data and the Annual Aquifer Review, will help to ensure that any unacceptable or unexpected changes to the groundwater system are identified. In the event that any of the triggers are identified as part of the regular monitoring activities, ProTen will notify DWER and any instructions will be adhered to.

5 Water Use Efficiency Measures

While the production bores have been installed and equipped to sustain the total water demand of the project, the water supply system has a number of water efficiency measures built into it. The key measures are outlined below:

- Water lines, with nipple drinkers and drip trays, run the length of each poultry shed and are automatically supplied by the external water storage tanks. This method of providing drinking water, as opposed to traditional cup drinkers, minimises water consumption by reducing water spillage and evaporation;
- The poultry sheds are cleaned and sanitised at the end of each production cycle using high-pressure low-volume hoses. With only six production cycles occurring each year, the volume of water utilised for cleaning purposes is minimal;
- Automatic control systems continuously monitor internal shed conditions and adjust the ventilation system to suit ensuring that water is only used for cooling when necessary; and
- Regular inspections and maintenance of water supply infrastructure is undertaken to identify and make repairs.

6 Summary of Commitments

The following summarises the previous commitments outlined in this report:

- The licensee will comply with this operating strategy as a condition of Water Resource Licence No. GWL172830(2) for the taking of water from the Serpentine (Perth - Leederville) Water Resource Management Area;
- The licensee will carry out and report to the department on the following monitoring program:

Table 8 Monitoring Program (summary of Section 3)

Sampling Site	Parameter	Frequency	Reported
PB1 and PB2	Water Use (Meter Readings)#	Monthly	Annually
	Water level	Quarterly	Quarterly
	Electrical conductivity (EC)		
	pH		
	Total dissolved solids (TDS)		
	Total phosphorus (TP)		
	Total nitrogen (TN)		
	Total Kjeldahl Nitrogen (TKN)		
	Nitrate + Nitrite (NOx)		
	Ammonia as N		
	Major ions (Na, K, Ca, Mg, NH_4, Cl, SO_4, NO_3, HCO_3, CO_3)	Annually (with one of the quarterly events)	Annually
GW01 and GW02	Water level	Quarterly	Quarterly
	Total phosphorus (TP)		
	Total nitrogen (TN)		
	Major ions (Na, K, Ca, Mg, NH_4, Cl, SO_4, NO_3, HCO_3, CO_3)	Annually (with one of the quarterly events)	Annually

- The licensee shall inform the DWER of any likely breach in the commitments of this operating strategy within 14 days of the licensee being aware of the possible breach. This also includes the implementation of a contingency response; and
- An annual water use (metering) report and the compliance (monitoring) report to be reported within 30 days after the end of the water year in accordance with the regulations, in formats described in Strategic policy 5.03 and Operational policy 5.12 respectively.

7 References

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Davidson, W.A. (1995). Hydrogeology and Groundwater Resources of the Perth Region Western Australia. Geological Survey of Western Australia. Department of Minerals and Energy.

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ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
5 Foelsche Street
Darwin NT 0800
Australia
T: +61 8 8998 0100
F: +61 2 9427 8200

GOLD COAST
Ground Floor, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

ROCKHAMPTON
rockhampton@slrconsulting.com
M: +61 407 810 417

SYDNEY
2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TAMWORTH
PO Box 11034
Tamworth NSW 2340
Australia
M: +61 408 474 248
F: +61 2 9427 8200

TOWNSVILLE
Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

NELSON
5 Duncan Street
Port Nelson 7010
New Zealand
T: +64 274 898 628

NEW PLYMOUTH
Level 2, 10 Devon Street East
New Plymouth 4310
New Zealand
T: +64 0800 757 695

APPENDIX C

Landscape and Vegetation Management Plan

CLIENTS | PEOPLE | PERFORMANCE

ProTen Ltd

Lot 701 Henderson Road, Hopeland

Landscape and Vegetation Management Plan

December 2007

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

Table Index

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Appendices

1. Introduction

ProTen Ltd has received conditional approval from the Shire of Serpentine Jarrahdale (SJ Shire) to construct and operate a poultry farm at Lot 701 Henderson Road, Hopeland. The approval is conditional on the development and implementation of a Landscape and Vegetation Management Plan (LVMP).

GHD also commissioned the services of Landcare Serpentine – Jarrahdale to assist in identifying the recommended flora species.

This LVMP recommends the preferred flora species to be used for screening and rehabilitation purposes as well as the ongoing management.

2. Existing Flora and Vegetation

GHD completed a flora and vegetation assessment in April 2007 as part of the original Development Application. The following points are noted from that study.

- A total of four (4) vegetation types were delineated for the project area, however; for the most part, the project area is predominately cleared. Field surveys noted that only scattered remnant overstorey trees remained and the understorey vegetation was comprised of predominately weedy pasture grasses. All vegetation types within the project area were considered *Degraded* to *Completely Degraded*;
  - Aerial photography with the associated vegetation types and quality are contained in Figures 1 and 2 in Appendix A.
- Flora within the project area is described as having low biological diversity. A total of 57 plant taxa (24 natives) from 27 families were recorded;
- No Declared Rare or Priority Listed flora species were recorded within the project area;
- A total of 33 weed species were observed within the project area, accounting for approximately 58% of the total flora found. Weeds were present across the entire project area, and in some cases dominated the floristic composition of vegetation types (i.e. vegetation type 1 – Cleared pasture);
- The Declared Plant *Gomphocarpus fruticosus* (Narrowleaf Cottonbush) was observed to be growing within the project area. The locations where this was observed is shown in Figure 2. Any occurrences of this Declared Plant should be controlled using recommended methods outlined by the Western Australian Department of Agriculture and Food. A copy of these methods is contained within Appendix B; and
- The project area has negligible habitat value. Some remnant overstorey trees may provide refuge or food resources for native bird species, and individual Marri (*Corymbia calophylla*) trees may be utilised occasionally by black cockatoo species for feeding. Retention of remnant overstorey trees, where possible, within the project area would be considered advantageous for the conservation of some site fauna habitat, particularly for bird species that may utilise the site as a 'flyway'.

3. Flora Species and Management

3.1 Flora Species

Landcare Serpentine – Jarradale and GHD ecologists worked collaboratively to identify the most appropriate flora species that will be used on the site and these are shown in Table 1. Figure 3 within Appendix A also indicates the locations pf where plantings will occur.

Table 1 Recommended Plant Species for Lot 701 Henderson Road, Hopeland

Species	Size	Habitat	Number
Juncus pallidus	herb	wet/dry/marginal	1000
Patersonia occidentalis	herb	dry	132
Baeckea camphorosmae	Small shrub	marginal	132
Beaufortia elegans	Small Shrub	marginal	132
Hypocalymma angustifolium	Small Shrub	marginal	132
Acacia pulchella	Small Shrub	dry	132
Hovea trisperma	Small Shrub	dry	132
Pericalymma ellipticum	Small Shrub	marginal	132
Allocasuarina humilis	Medium shrub	Marginal/dry	132
Calothamnus sanguieus	Medium shrub	marginal/dry	132
Melaleuca thymoides	Medium Shrub	marginal/dry l	132
Melaleuca lateritia	Medium Shrub	dry	132
Kunzea glabrescens	Medium shrub	Marginal/wet	132
Astartea fasicularis	Medium Shrub	marginal	132
Hakea varia	Medium Shrub	dry	132
Melaleuca lateritia	Medium Shrub	dry	132
Regelia inops	Medium Shrub	marginal	132
Beaufortia elegans	Medium Shrub	marginal	132
Jacksonia sternbergiana	Tall Shrub	marginal	132
Adenanthos cygnorum	Tall Shrub	dry	132
Melaleuca incana	Tall Shrub	dry	132
Viminaria preissii	Tall Shrub	marginal	132

Species	Size	Habitat	Number
Agonis linearifolia	Small Tree	marginal	141
Banksia attenuata	Medium Tree	dry	141
Banksia menziesii	Medium Tree	dry	141
Banksia littoralis	Medium Tree	wet	141
Banksia illicifolia	Medium Tree	marginal	141
Melaleuca rhaphiophylla	Medium Tree	wet	141
Melaleuca preissiana	Medium Tree	wet	141
Corymbia callophylla	Tall Tree	dry	141
Eucalyptus marginata	Tall Tree	dry	141
Eucalyptus rudis	Tall Tree	wet/marginal	141
		Total	**4090**

A diagram of recommended tree lines and seedling densities is shown in Appendix C.

3.2 Management

September to October

» Chemical weed control with knockdown chemical spray e.g. Glyphosate along proposed tree lines and bunds to be planted.

Establish stock-proof fencing where necessary around areas to be planted.

» Recommended minimum fencing standards for long term protection of revegetation from stock:

  – Conventional - 5 strands with 3 barbed and 2 plain wires, split jarrah or equivalent or galvanised posts at 4m spacings.
  – Electric – 5 strands plain wire with split jarrah or equivalent or galvanised posts at 8m spacings with plastic droppers.
  – Ringlock – 2 strands plain wire with ringlock, split jarrah or equivalent or galvanised posts at 4m spacings.

November to December

» Order seedlings from a native plant supplier.

January to April

» Deep rip tree lines 3m apart to at least 50 - 70cm depth. Mound along tree the lines if the area is inundated with water for extended periods. Ripping will not be possible along bunds.

» If there are competitive weeds such as couch or kikuyu, disc or rotary hoe along rip lines.

May

» Spray weeds along riplines with a knockdown and residual mix of herbicide e.g. Glyphosate and Simazine. Do the same on the outward slopes of the bunds.

» Do not plant for 2 weeks after spraying with residual chemical.

June to July

» Plant seedlings 2m apart along the riplines, ensuring that there is a random distribution of trees and shrubs, and different species. Use the same spacing for planting on the bunds, but in a random manner i.e. seedlings on the bunds will not need to be in rows. Only medium to large and low shrubs and grasses/herbs will be suitable for planting on the bunds i.e. avoid planting tree species at these locations.

» Use tree guards if necessary. This is recommended if there is likely to be grazing from kangaroos, rabbits or grasshoppers. Monitor the seedlings over their first summer to ensure they do not heat up – there needs to be a gap between the ground and the bottom of the tree guards.

» Return the plant trays and pots to the nurseries.

November to December

» Spray or bran bait for grasshopper control, if required (check if there are grasshoppers in the summer prior to planting).

Ongoing maintenance

» Monitor weed growth, particularly in spring and autumn at least 2 years following planting – spot spraying with a knockdown chemical along tree lines may be necessary.

» Monitor the seedlings during their first summer. If it is very hot and dry it is recommended to water the seedlings 2 or 3 times during the first summer, for example with a fire-fighting unit. Ensure that the seedlings are watered deeply. DO NOT just water the surface of the soil.

» If there are a number of fatalities during the first summer, carry out infill planting in the following winter using the recommended species list.

» Remove tree guards when seedlings are emerging from the top.

4. Other Information

This LVMP has been developed to meet SJ Shire development requirements. Table 2 specifies and comments on the development conditions.

Table 2 Landscape and Vegetation Management Plan Requirements

Requirements	Comment
1) Include a scaled map of the development, which can be placed as an overlay over a recent (since 2003) aerial photograph of the whole of Lot 701 Henderson Road.	Figures 1 and 2 show aerial photography of the project site.
2) Locate on the map, and both identify and describe how existing indigenous vegetation is to be protected or is not to be retained as a result of driveways, fences, drains and other surface water features, firebreaks, power lines and other access ways and services plus proposed buildings and other structures;	The poultry farm has been designed to minimise the amount of clearing. Please note that a Clearing Permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations* 2004 has been submitted to the Department of Environment and Conservation. Note that this LVMP proposes more plantings in and around the small of vegetation in the southwest of the Lot 701.
3) Locate on the map and both identify and describe the management of existing exotic vegetation.	The flora and vegetation assessment states that most of Lot 701 comprises of exotic vegetation. Figures 2 indicates the site is degraded and there is little value in mapping exotic vegetation. Weed management procedures have been specified in Section 3.2.
4) Locate on the map and identify both the types and magnitudes of weed infestations and describe weed management to be undertaken.	Please refer to above (3) above
5) Locate proposed revegetation works on the map and describe the species, densities, soil preparation and plant protection to provide complete screening of all existing and proposed poultry sheds from the roads and adjoining properties, maximise nutrient uptake from surface waters and surrounding soils, reconnect remnant vegetation with visual screen plantings and provide habitat for local woodland and wetland fauna.	Revegetation works are shown in Figure 3 and management actions are shown in Section 3.2 of this LVMP.

Requirements	Comment
Describe ongoing management of vegetation on site.	Refer to Section 3.2.
Clearly state auditable vegetation management targets including weed control and revegetation outcomes for audit at the time of vegetation management bond return and thereafter as follows.	Refer to Section 3.2.
Visual screens are to include a minimum of six rows of trees and shrubs and must be no less than 10 metres wide;	Refer to Appendix C.
Stems within visual screens are to be planted at minimum densities of one stem per three metres along rows that are no more than two metres apart.	Refer to Appendix C.
Visual screening is to include a mixture of trees and shrubs such that no more than one third of the plants are trees.	Refer to Appendix C and recommended flora species.
Sedges and rushes to be planted around the settling pond are to be clumped with densities of four stems per metre squared within clumps and interspersed with other local wetland species.	Refer to Appendix C and recommended flora species.
Required stem densities relate to a time when a minimum of 80% of the plants have survived at least two summer seasons and this is to be achieved initially within three years after development approval is given and thereafter maintained.	As the project is already significantly cleared of vegetation, this criterion is not considered to be relevant.
All plants are to be of locally native species indicative of neighbouring woodland and wetland communities.	Refer to Table 1.
Achieve a plant diversity of at least 80% of the plant species that are listed within the dominant shoreline ground cover, medium shrub, tall shrub and tree categories for the relevant woodland and wetland communities on the Shire Planting List.	As the project is already significantly cleared of vegetation, this criterion is not considered to be relevant.
Maintain a weed burden at levels not likely to threaten the native species.	Weed management will ongoing and will be done as per the management actions in Section 3.2.
Locate fire breaks on the map.	Figure 3 shows fire breaks.

Requirements	Comment
All earthen bunds are to be vegetated to the satisfaction of the Shire.	Figure 3 shows the revegetation plan.

Appendix A

Figures

396000 396400 396800

6415000

6414500

PUNRAK RD

HENDERSON RD

LEGEND

- Cadastral Boundary - Landgate - 20070927
- Lot Boundary - Landgate - 20070927
- Easement - Landgate - 20070330

New Site Infrastructure - GHD - 20071116

- New Roads
- Sheds

Vegetation Type - GHD - 200703

- Cleared Paddock - Isolated trees in drains
- *Eucalyptus rudis & Melaleuca rhaphiophylla* trees over pasture
- *Corymbia calophylla* over pasture
- Rehabilitated drain

MAP UNITS PROJECTED IN MGA ZONE 50
NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
AERIAL PHOTOGRAPHY SOURCED FROM DLI - 2006 PERTH METRO MOSAIC
REPRODUCED BY PERMISSION OF THE DEPT. OF LAND INFORMATION,
PERTH, WESTERN AUSTRALIA, COPYRIGHT LICENCE 30/2004

SCALE

40 0 40 80 120m

1:4,000 at A3

LOCALITY MAP

PERTH - SOUTH METRO

CREATED BY	CHECKED	APPROVED
NT/KI	CR	

HORIZONTAL DATUM: GDA 94 **PROJECTION:** MGA ZONE 50
HEIGHT DATUM: NA **METADATA RECORDED:** 100%

DATE	FILE LOCATION
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REVISION	**DRAWING NO**
1	6119300-G2

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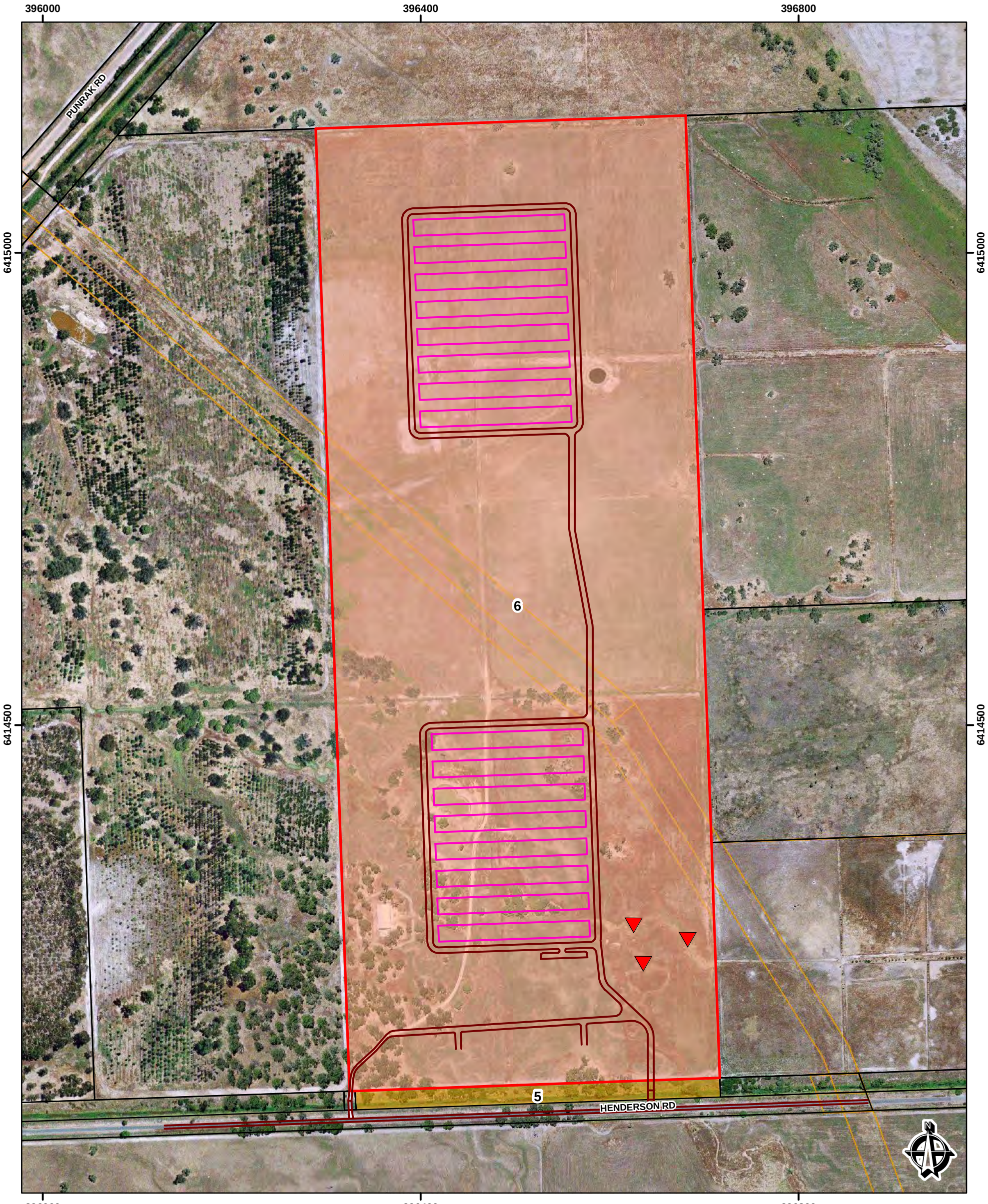
GHD CLIENTS | PEOPLE | PERFORMANCE

POULTRY FARM
LOT 701 HENDERSON RD, HOPELAND

Figure 1 - Vegetation Type
Landscape and Vegetation Management Plan



LEGEND

- Location of Declared Plants *Gomphocarpus fruticosus* - GHD - 200703
- Cadastral Boundary - Landgate - 20070927
- Lot Boundary - Landgate - 20070927
- Easement - Landgate - 20070330

New Site Infrastructure - GHD - 20071116

- New Roads
- Sheds

Vegetation Condition

1. Pristine or nearly so
2. Excellent
3. Very Good
4. Good
5. Degraded
6. Completely degraded

MAP UNITS PROJECTED IN MGA ZONE 50
NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
AERIAL PHOTOGRAPHY SOURCED FROM DLI - 2006 PERTH METRO MOSAIC
REPRODUCED BY PERMISSION OF THE DEPT. OF LAND INFORMATION,
PERTH, WESTERN AUSTRALIA, COPYRIGHT LICENCE 30/2004

SCALE

40 0 40 80 120m

1:4,000 at A3

LOCALITY MAP

PERTH - SOUTH METRO

CREATED BY	CHECKED	APPROVED
NT/KI	CR	

HORIZONTAL DATUM: GDA 94 **PROJECTION:** MGA ZONE 50
HEIGHT DATUM: NA **METADATA RECORDED:** 100%

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1	6119300-G3

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POULTRY FARM
LOT 701 HENDERSON RD, HOPELAND

Figure 2 - Vegetation Condition
Landscape and Vegetation Management Plan

396000 396400 396800

6415000

6414500

PUNRAK RD

HENDERSON RD

LEGEND

Easement - Landgate - 20070330

Cadastral Boundary - Landgate - 20070927

Lot Boundary - Landgate - 20070927

New Site Infrastructure - GHD - 20071116

Bund

New Road

Fence

Sheds

Fire Break & Rehabilitation Area - GHD - 20071213

20m Additional Rehab area

4m Firebreak

Additional Rehabilitation near structure

MAP UNITS PROJECTED IN MGA ZONE 50
NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
AERIAL PHOTOGRAPHY SOURCED FROM DLI - 2006 PERTH METRO MOSAIC
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PERTH, WESTERN AUSTRALIA, COPYRIGHT LICENCE 30/2004

SCALE

40 0 40 80 120m

1:4,000 at A3

LOCALITY MAP

PERTH - SOUTH METRO

CREATED BY	CHECKED	APPROVED
KI	ML	

HORIZONTAL DATUM: GDA 94 **PROJECTION:** MGA ZONE 50
HEIGHT DATUM: NA **METADATA RECORDED:** 100%

DATE	FILE LOCATION
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REVISION	**DRAWING NO**
0	6119300-G14

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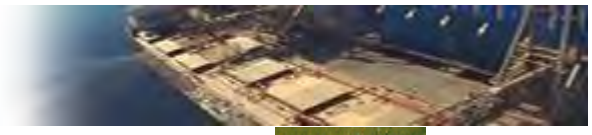
POULTRY FARM
LOT 701 HENDERSON RD, HOPELAND

Figure 3 - Fire break & Rehabilitation Areas
Landscape and Vegetation Management Plan

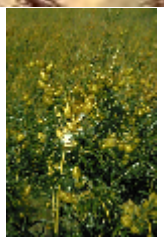
Appendix B

Information Relating to *Gomphocarpus fruticosus* (Narrowleaf Cottonbush)

Department of Agriculture and Food
Government of Western Australia



Declared plant in Western Australia



Cotton bush (*Gomphocarpus fruticosus*)

Printable version

See also: Control Method | Weed description | Declared plants list

Category: P1, P4
Location: For the municipal districts of Albany (C), Augusta-Margaret River (S), Beverley (S), Boddington (S), Boyup Brook (S), Bridgetown-Greenbushes (S), Brookton (S), Bunbury (C), Busselton (S), Capel (S), Collie (S), Corrigin (S), Cranbrook (S), Cuballing (S), Cunderdin (S), Dardanup (S), Denmark (S), Donnybrook-Balingup (S), Dowerin (S), Esperance (S), Goomalling (S), Harvey (S), Kellerberrin (S), Kondinin (S), Koorda (S), Kulin (S), Lake Grace (S), Mandurah (C), Manjimup (S), Mount Marshall (S), Murray (S), Nannup (S), Narrogin (S), Northam (S), Northam (T), Pingelly (S), Plantagenet (S), Quairading (S), Ravensthorpe (S), Serpentine-Jarrahdale (S), Tammin (S), Toodyay (S), Trayning (S), Wandering (S), Waroona (S), Wickepin (S), Williams (S), Wyalkatchem (S), York (S).

Category: P1, P3
Location: For the municipal districts of Broomehill (S), Dumbleyung (S), Gnowangerup (S), Jerramungup (S), Katanning (S), Kent (S), Kojonup (S), Tambellup (S), West Arthur (S), Woodanilling (S).

Standard Control Codes (these may vary for individual plants)

P1 REQUIREMENTS Prohibits movement	The movement of plants or their seeds is prohibited within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder.
P3 REQUIREMENTS Aims to control infestation by reducing area and/or density of infestation	The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants:- - Within 100 metres inside of the boundaries of the infestation - within 50 metres of roads and highwater mark on waterways - within 50 metres of sheds, stock yards and houses Treatment must be done prior to seed set each year. Of the remaining infested area:- Where plant density is 1-10 per hectare treat 100% of infestation.

	Where plant density is 11-100 per hectare treat 50% of infestation. Where plant density is 101-1000 per hectare treat 10% of infestation. Properties with less than 2 hectares of infestation must treat the entire infestation. Additional areas may be ordered to be treated.
P4 REQUIREMENTS Aims to prevent infestation spreading beyond existing boundaries of infestation.	The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants:- - within 100 metres inside of the boundaries of the infested property - within 50 metres of roads and highwater mark on waterways - within 50 metres of sheds, stock yards and houses Treatment must be done prior to seed set each year. Properties with less than 2 hectares of infestation must treat the entire infestation. Additional areas may be ordered to be treated.
Special considerations	In the case of P4 infestations where they continue across property boundaries there is no requirement to treat the relevant part of the property boundaries as long as the boundaries of the infestation as a whole are treated. There must be agreement between neighbours in relation to the treatment of these areas .

Control Method

Recommended herbicides	:	- When actively growing - spring to December Glyphosate Garlon™ 600

Herbicide	:	Glyphosate (various trade names)
Active ingredient	:	360, 450, 490/500 and 540 g/litre and 680 g/kg glyphosate
Rates of dilution for spot spraying	:	1:100 for 360 g/L formulation
Amount of product per 10 litres water	:	- 100 mL for 360 g/L formulation - 80 mL for 450 g/L formulation - 70 mL for 490/500 g/L formulation - 65 mL for 540 g/L formulation - 50 g for 680 g/kg formulation
Rate of product per hectare	:	Not Recommended
Wetting agent	:	Wetting agent and/or summer spraying oil may be

dilution		beneficial
Time of application	:	When actively growing. September - December before fruit forms.
Remarks	:	This is effective on mature bushes, regrowth and seedlings, provided good coverage is achieved.Where low volume/low pressure pumps are being used the rates should doubled.
More information and other control methods	:	ı Slash established bushes during winter, and burn, cultivate or grub seedlings and regrowth. ı Roundup Biactive® or Razor® preferred treatment in wet areas or along water courses near shallow water.

Herbicide	:	Garlon™ 600 (various trade names)
Active ingredient	:	600 g/litre triclopyr
Amount of product per 10 litres water	:	30 mL
Rate of product per hectare	:	Not Recommended
Wetting agent dilution	:	Use crop-oil such as Uptake® @ 500 mL 100 L, or DC-Trate @ 1 L / 100 L
Time of application	:	Spring - December
Remarks	:	Use in place of glyphosate when annual pastures are still growing to avoid damage to grasses.
More information and other control methods	:	Grazon™ DS is also reasonably effective but further work is required. Dicamba is effective on seedlings.

Weed Description

Family: Asclepiadaceae
Form: Shrub – Perennial
Status: Present in WA
(click to view image)

An erect slender shrub 1-2 metres high, with narrow opposite leaves, and bladder-like fruit. All parts of the plant exude a milky white sap when damaged. It reproduces by seed and suckers.

Stems: Pale green, 60-180 cm covered with short whitish downy hairs when young.
Leaves: Dull green, occasionally with shiny upper surface. They are 5-12 cm long, 6-18 mm wide tapering to a point and are opposite each other in pairs.
Flowers: White or creamy with 5 fringed waxy lobes turned sharply outwards. They are formed in a loose drooping cluster of 3-10 flowers in the leaf axils.
Fruit: Inflated pod, egg shaped, tapering to a point, inflated pod 6 cm long, 2-2.5 cm wide covered with long soft bristles (1 cm long). Attached to the plant by an S 'shaped stalk.
Seeds: Contained within a thin walled sack that is separated from the outer wall by an air space. Brown coloured, flattened and egg shaped about 6 mm long and 3 mm wide with a tuft of silky hairs about 3 cm long at one end.

Other relevant information related to this topic:

- Western Australia Quarantine and Inspection Service
- Permitted and quarantine species list
- Farmnote 43/03
- Permit for minor off-label-use of a registered agvet chemical product (Permit number - per4984)
- Off-label permit (olp) for use of a registered agvet chemical product (Permit numb per4590)

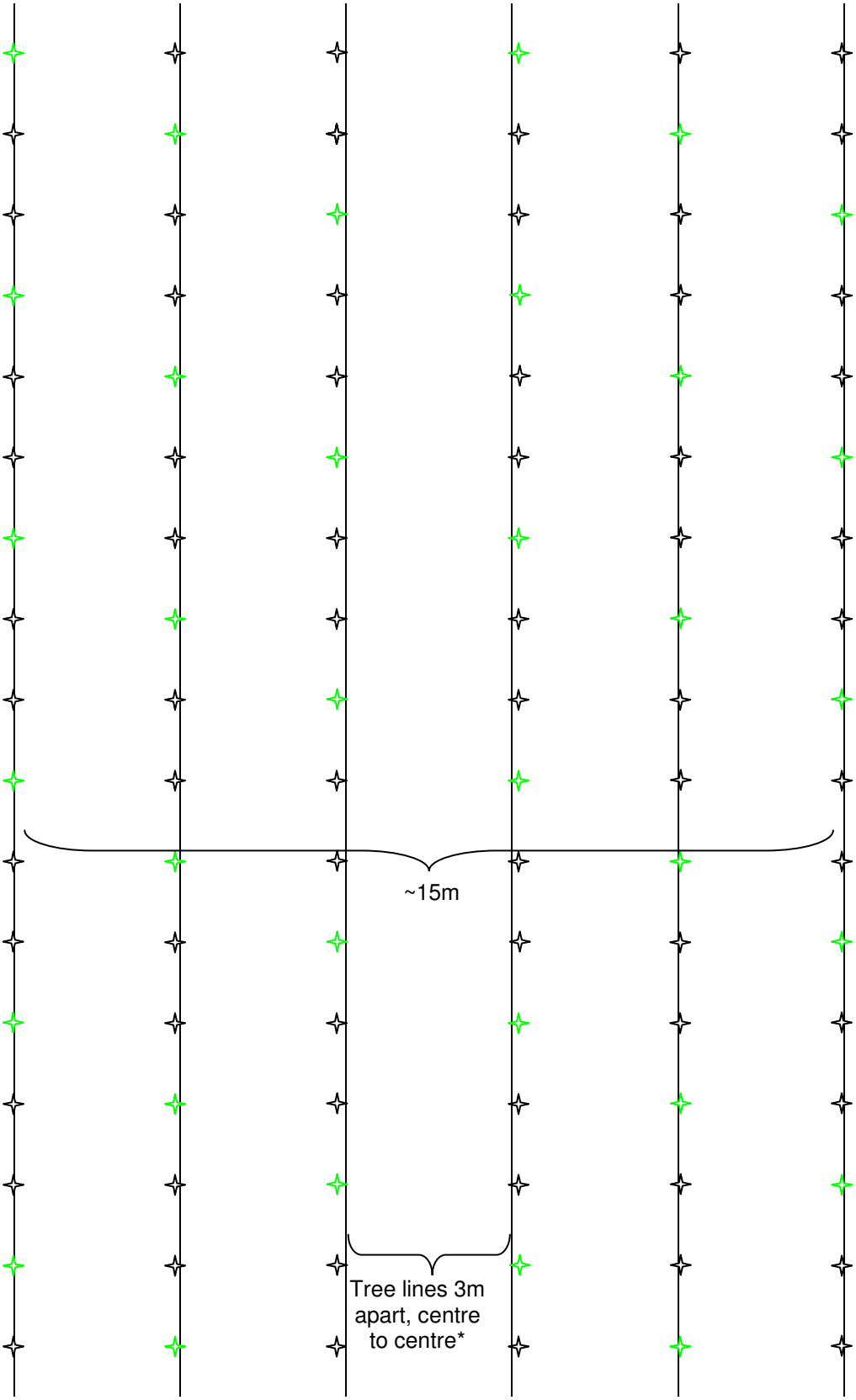
Appendix C

Diagram of tree lines and seedling density Lot 701 Henderson Rd Serpentine

Lot 701 Henderson Rd, Serpentine
Revegetation plan for buffer planting

Diagram of tree lines and seedling density

✧ Indicates recommended placement of tree species according to proportion of trees to shrubs/ground covers



*Note: Prepared tree lines are approximately 1m wide, which equates to the edges of the rows being 2m apart

GHD Pty Ltd ABN 39 008 488 373

GHD House, 239 Adelaide Tce. Perth, WA 6004
P.O. Box Y3106, Perth WA 6832
T: 61 8 6222 8222 F: 61 8 6222 8555 E: permail@ghd.com.au

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	A Nagle	C Gwynne		C Gwynne		19/12/07

ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

NEWCASTLE CBD
Suite 2B, 125 Bull Street
Newcastle West NSW 2302
Australia
T: +61 2 4940 0442

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000

AUCKLAND
Level 4, 12 O'Connell Street
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628