



SHIRE OF WOODANILLING



SPECIAL MEETING OF COUNCIL Agenda 2 June 2020

A Special Council Meeting has been called by resolution of Council for 4pm on 2 June 2020 at the Recreation Pavilion on Yairabin Street Woodanilling. The purpose of the meeting is to consider the Feedlot Development Application for Lots 1 & 4 Youngs Road Beaufort River.

STEPHEN GASH
CHIEF EXECUTIVE OFFICER

SPECIAL MEETING OF COUNCIL AGENDA

1. PURPOSE OF MEETING

The meeting was called by resolution of Council on 19 May 2020 for the sole purpose of considering the Development Application for a Feedlot at Loc 1 & 4 Youngs Rd Beaufort River. No other business or presentations and questions not relating to the application will be considered.

2. CONDUCT OF MEETING

The meeting is being conducted whilst under Covid 19 restrictions and there may be limits on numbers within the venue at any one time depending on the size of the gallery. The meeting has been moved to the Recreation Pavilion to allow the greatest attendance of the public and supporting deputations also under 'e meeting' procedures outlined below.

Notice required for questions and deputations are outlined within the relevant section of the agenda below.

3. DECLARATION OF OPENING / ANNOUNCEMENT OF VISITORS

3.1. DISCLOSURE OF INTEREST AFFECTING IMPARTIALITY

Division 6 Subdivision 1 of the Local Government Act 1995 requires Council Members and Employees to declare any direct or indirect financial interest or general interest in any matter listed in this Agenda.

The Act also requires the nature of the interest to be disclosed in writing before the meeting or immediately before the matter be discussed.

NB: A Council member who makes a disclosure must not preside or participate in, or be present during, any discussion or decision making procedure relating to the declared matter unless the procedures set out in Sections 5.68 or 5.69 of the Act have been complied with.

DISCLOSURE OF INTEREST AFFECTING IMPARTIALITY

Disclosures of Interest Affecting Impartiality are required to be declared and recorded in the minutes of a meeting. Councillors who declare such an interest are still permitted to remain in the meeting and to participate in the discussion and voting on the particular matter. This does not lessen the obligation of declaring financial interests etc. covered under the Local Government Act.

To help with complying with the requirements of declaring Interests Affecting Impartiality the following statement is recommended to be announced by the person declaring such an interest and to be produced in the minutes.

"I (give circumstances of the interest being declared, eg: have a long standing personal friendship with the proponent). As a consequence there may be a perception that my impartiality on this matter may be affected. I declare that I will consider this matter on its merits and vote accordingly".

4. RECORD OF ATTENDANCE / APOLOGIES / LEAVE OF ABSENCE (PREVIOUSLY APPROVED)

Present:

Cr HR Thomson	Shire President	Cr T Brown	
Cr D Douglas	Deputy Shire President	Cr M Trimming	
Cr P Morrell		Stephen Gash	Chief Executive Officer
Cr S Jefferies		Sue Dowson	Deputy CEO
Geoffrey Lush	Planning Consultant		

Apologies:

Gallery:

5. RESPONSE TO PREVIOUS PUBLIC QUESTIONS TAKEN ON NOTICE

Nil

6. PUBLIC QUESTION TIME

Questions may be asked relating to the Development Application.

Questions are to be received by email to ceo@woodanilling.wa.gov.au by 4pm 1 June 2020 to enable an answer to be provided at the meeting.

7. PETITIONS / DEPUTATIONS / PRESENTATIONS

Any person wishing to make a presentations, statement or deputation to Council at the meeting, either in person or by electronic means is to make this request by email to ceo@woodanilling.wa.gov.au before 4pm on 1 June 2020.

Those wishing to present by videoconference will then be contacted with a link and brought online at the appropriate time.

Due to limited bandwidth the Shire is unable to broadcast the meeting proceedings live, other than to an adjacent area of the premises if there are more attendees than can be catered for under Covid 19 distancing guidelines.

8. OFFICER'S REPORTS

8.1. DEVELOPMENT APPLICATION - SHEEP FEEDLOT LOTS 1 & 4 YOUNGS ROAD BEAUFORT RIVER

Proponent	Edge Planning and Property
Owner	Benale Pty Ltd
Location/Address	Lots 1 and 4 Youngs Road Beaufort River
Author of Report	S Gash
Date of Meeting	17 March 2020
Previous Reports	
Disclosure of any Interest	None
File Reference	BA510
Attachments	1 Concept development plan 2 Existing conditions - locality 3 Existing conditions - subject land 4 Submissions summary 5 Applicant responses

BRIEF SUMMARY

To consider a development application for a sheep feedlot for a maximum of 90,000 sheep, employee quarters and supporting facilities, at Lots 1 and 4 Youngs Road, Beaufort River. The application has been lodged by Edge Planning and Property on behalf of Fletcher International Export Pty Ltd.

BACKGROUND

Application Summary

The proposed feedlot is for a maximum of 90,000 sheep which will be held between 35 and 70 days before being transported to the FIE abattoir at Narrikup. The design and operation of the feedlot is based upon the provisions of the Meat and Livestock Australia (MLA) National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems 2011.

The application includes a concept plan which is contained as Attachment 1.

The proposed development will consist of:

- i. Approximately 21 hectares being used for sheep pens (50m long by 25m wide). The maximum number of animals accommodated will depend upon the capacity of the pens;
- ii. A hardstand area of approximately 9 hectares for feed storage and operation facilities including the truck turning area; grain and silage bunkers and feedlot machinery and equipment;
- iii. Gravel extraction over an area of approximately 43 hectares;
- iv. A bunded controlled drainage area around the sheep pens which will divert surface water and waste to the effluent disposal area;
- v. A biosolid stockpile area for sheep manure;
- vi. A separate biosolid stockpile area for carcass management;
- vii. Sedimentation pond (6,500m³) and an evaporation pond (42,548m³) for capture and holding of effluent runoff;
- viii. A Feed Storage Shed of an unspecified size with an 8,000m² development foot print / building envelope;
- ix. A sheep processing area including; weighbridge, office hut, covered sheep weighing yards and unloading ramps;
- x. A water production bore; and
- xi. Accommodation for employees, which will include the existing dwellings and five transportable accommodation buildings for up to 16 people.

The 90,000 head capacity limit refers to the capacity of the sheep pens within the controlled drainage area as shown on the concept plan. Further information from the applicant states that proposed number of pens is 120 however the concept plan states that there will be 130 pens. Whether the 90,000 capacity is reached within this area is a function of the proposed stocking density. It is expected that the number of animals will fluctuate during the year and that the average number will be less than 90,000 head. However, the application has been lodged to allow for this capacity at anytime and any approval cannot realistically condition having reduced numbers over unspecified periods.

The sheep pens and hardstand area will occupy approximately 40 hectares. There is a 12m height difference across this area although the gradient is still low approximately 2 degrees. This area will be subject to earth working with a maximum cut depth of 1.6m and fill of 1.0m.

The gravel extraction is in four separate areas being setback 30m from the road boundaries and bushland. The application shows this as also including the pine plantation but this is not proceeding in this area. The excavation around the hardstand area will be several metres in depth to access gravel but will then be back filled and compacted.

The feedlot will operate 24/7 but with no activities occurring at night time. It is intended that the livestock delivery and departure will occur during daylight hours to facilitate supervision of loading and unloading. It is estimated that there will be approximately 12 staff employed along with several contractors.

The access to the feedlot development site will be from Youngs Road on the western boundary while access to the employee accommodation will be from the existing driveway. An internal connection will be provided from the existing house and employee accommodation to the feedlot development site, sheep processing area and office.

The concept development plan is scaled but not dimensioned and reference to areas and distances in this agenda report are approximate as they have been scaled from the plan. The application and reports do not use consistent terminology when referring to the subject land or the feedlot area. For the purposes of this agenda report the following terminology has been used:

- Subject land means the total area of Lots 1 and 4 over which the application has been made; and
- Feedlot development site means the feedlot area shown on the concept plan (Attachment 1) in the south western corner of the subject land.

Existing Conditions

A plan of the locality is contained in Attachment 2 and a plan showing the existing conditions for the subject land is contained as Attachment 3.

The subject land is comprised of Lots 1 and 4 DP21594. It is situated approximately 6.5kms west of Albany Highway with frontages to Youngs Road on its southern and western boundaries. Lot 4 is situated on the southern side of the property and Lot 1 is on the northern side. The overall property has an area of 424 hectares, being more than 1,600m wide (east - west) and 2,300m deep (north - south).

The subject land is predominantly cleared broad acre grazing and cropping land except for:

- 34 hectares of remnant vegetation contained in a Conservation Covenant under the Soil and Land Conservation Act; and
- A pine plantation of approximately 20 hectares managed by the Forest Products Commission.

The subject land has the following Title encumbrances:

- H548183 - Profit A' Prendre to CALM for plantation as approved by Council June 2009 and included Lots 2 & 3.

- G403295 - Memorial to Soil Commissioner, conservation covenant. Protected vegetation within Lot 1.

Lot 4 contains two dwellings, various sheds, a sheep yard and dams. There are also multiple water bores within Lot 1.

The subject land has an elevation of approximately 245m AHD on its northern boundary rising to 280m AHD in the centre of the property on the boundary between the two lots. There is a minor drainage line that runs from east to west in the south western portion of the subject land that has a low point of 261m AHD.

The feedlot development site has an area of approximately 105 hectares with frontages to Youngs Road of 840m on the southern boundary and 1,400m on the western boundary.

The surrounding land has generally been developed for broad acre rural uses with the Sattler Plantation to the north and a large block of remnant vegetation being approximately 270 hectares immediately to the west of the subject land and the feedlot development site.

Youngs Road is a formed gravel road with a 20m wide reserve and a 12m wide carriageway.

The Beaufort Paleochannel is partially located on the northern portion of the subject land. The paleochannel covers an area of approximately 6,300 hectares extending through the Shires of Woodanilling, Kojonup and West Arthur.

Works Application

The proposal is also subject to an application for a works approval under Division 3 Part V of the Environmental Protection Act 1986 being for:

- Category 55 – sheep feedlot
- Category 70 – Screening etc. of Material extracted from the ground.

In considering this the Department of Water and Environmental Regulation has requested that Council advise it that the proposal is consistent with the local Town Planning Scheme and provide it with any conditions of approval.

The works application deals with the design and construction of the facility and its potential impact upon the environment as prescribed under the Environmental Protection Act 1986. A number of these issues overlap with both Council's responsibilities and consideration of the development application. An Annual Environmental Report (AER) is proposed to be prepared and submitted to the Department of Water and Environmental Regulation (DWER) in accordance with the reporting conditions of the feedlot licence.

STATUTORY/LEGAL IMPLICATIONS

Agency Roles

The three main agencies with responsibilities relating to the application are listed below.

The Department of Water and Environmental Regulation (DWER) is responsible for all environment and water regulation including:

- Industrial emissions and discharges to the environment through a works approval and licensing process;
- Water licensing under the Rights in Water and Irrigation Act 1914; and
- Vegetation clearing and noise emissions.

The Department of Primary Industries and Regional Development (DPIRD) is responsible for a multitude of Acts focussing on Agriculture and Food, Fisheries, and Regional Development. In relation to the application the relevant focus includes regional development, biosecurity and agriculture management, animal welfare, soil and land conservation.

The Shire of Woodanilling is responsible for town planning, building approvals, environmental and health services, community development, bushfire management, infrastructure and property services.

Environmental/Town Planning Overlap

There is a statutory requirement for Council to have regard to environmental matters when considering an application and these are documented later in this report. However, as a general principle, where specific aspects of the use or development of land are controlled by an EPA licence or works approval, planning permit conditions should not attempt to control the same thing.

Planning permit conditions are fixed in time whereas EPA licence conditions can be reviewed and upgraded to reflect improvements to environmental best practice and changes in government policy. Licence conditions can provide a more flexible mechanism for controlling the detailed technical aspects of a use or development than planning permit conditions.

A further difficulty associated with planning permit conditions attempting to address technical aspects of a use or development is the risk of inconsistencies arising between the way in which language is used or understood in a planning or plain English context and the way in which it is used or understood in a technical context or within the environmental regime operating under the Environment Protection Act 1986. This can lead to confusion and lack of clarity when it comes to the administration and enforcement of conditions.

Planning Framework

The statutory planning framework is comprised of:

- State Planning Policies made under section 26 of the Act;
- Region planning schemes (not applicable to Woodanilling);
- Schedule 2: Deemed provisions for local planning schemes in the Planning and Development (Local Planning Schemes) Regulations 2015 ('Deemed Provisions');
- Local planning schemes and local planning policies; and
- Policies and guidance notices of the WAPC.

Specific reference is made to the following provisions while other components are referenced in the discussion of the issues.

State Planning Framework

State Planning Policy 1 State Planning Framework Policy (SPP 1) is the overarching State Planning Policy and brings together existing State and regional policies, strategies, plans and guidelines within a central State Planning Framework to provide context for decision-making on land use and development in Western Australia. The general principles in SPP 1 include:

- Community - Enable diverse, affordable, accessible and safe communities.
- Economy - Facilitate trade, investment, innovation, employment and community betterment.
- Environment - Conserve the State's natural assets through sustainable development.
- Infrastructure – Ensure infrastructure supports development.
- Regional development – Build the competitive and collaborate advantages of the regions.
- Governance – To build community confidence in development processes and practices.

Planning should take account of and give effect to these principles and related policies to ensure integrated decision-making across government.

The Premier has recently directed that local government give the economic objective and in particular the creation of jobs, priority in the current coronavirus emergency.

Town Planning Scheme No 1

The subject land is zoned Regional Rural zone in Town Planning Scheme No 1.

The application is classified as “animal husbandry - intensive” which is a discretionary (D) use. Animal husbandry - intensive means a premises used for keeping, rearing or fattening of pigs, poultry (for either egg or meat production), rabbits (for either meat or fur production) and other livestock in feedlots.

The classification of the proposed worker’s accommodation is dependent upon whether this is for permanent or transient workers. Transient Workforce Accommodation is a discretionary (D) use and means a dwelling for the temporary accommodation of transient workers and may be designed to allow transition to another use or may be designed as a permanent facility for transient workers and includes a contractor's camp and dongas.

Alternatively, where used for permanent workers it can be classified as dwellings. The development of more than one single dwelling house within the Regional Rural zone requires the approval of Council pursuant to clause 5.11.5. Group Dwellings are also a discretionary (D) use.

The worker’s accommodation is more accurately described as “workforce accommodation” which is not listed in the Zoning Table. It is defined in the Local Planning Scheme Regulations (Model Scheme Text) as meaning a premise, which may include modular or relocatable buildings, used

- (a) primarily for the accommodation of workers engaged in construction, resource, agricultural or other industries on a temporary basis; and
- (b) for any associated catering, sporting and recreation facilities for the occupants and authorised visitors.

Council can consider use that is not specifically mentioned in the Zoning Table in accordance with clause 4.4.2 of the Scheme where:

- It determines that the use is or may be consistent with the zone objectives; and
- Advertises the application for planning approval.

The Regional Rural Zone is intended primarily for the preservation of agriculturally productive land. Land classified as Regional Rural Zone within the Scheme Area is capable of high levels of agricultural production and is therefore a valuable resource worthy of protection. The objective for this zone is to provide for a range of rural pursuits such as broadacre and diversified farming which are compatible with the capability of the land and retain the rural character and amenity of the locality. Specific objectives include:

- To ensure the continuation of broad-acre farming as the principle land use in the District and encourage where appropriate the retention and expansion of agricultural activities;
- To protect the potential of agricultural land for primary production and to preserve the landscape and character of the rural areas;
- To consider other non-rural uses where they can be shown to be of benefit to the District and not detrimental to the natural resources or the environment;
- To provide for a range of rural pursuits such as broad-acre and diversified farming which are compatible with the capability of the land and retain the rural amenity and character of the locality;
- To provide for a range of commercial and light industrial land uses that are appropriately located and will not cause land conflicts or adverse impacts on the amenity and character of the zone;

- To prevent the fragmentation of broad-acre farming properties through the process of subdivision;
- To protect broad-acre agricultural land from land degradation and any further loss of biodiversity by:
 - (i) Minimising the clearing of remnant vegetation on public and private lands;
 - (ii) Encouraging the retention and protection of existing remnant vegetation;
 - (iii) Encouraging the development and protection of corridors of native vegetation;
 - (iv) Encouraging the development of environmentally acceptable surface and sub-surface drainage;
 - (v) Encouraging the rehabilitation of salt affected land;
 - (vi) Controlling the introduction and spread of alien species of flora and fauna;
 - (vii) Encouraging soil conservation through the application of cultural vegetational land management measures.

The minimum development setback from all lot boundaries for any building (clause 5.11.6) is 20 metres except for buildings used for commercial or industrial purposes which may be setback a further distance in accordance with the specific requirements of the local government as determined on a case-by-case basis.

Local Planning Policy - Beaufort Palaeochannel

Council prepared a draft Local Planning Policy for the Beaufort Palaeochannel in 2011. While this was advertised for public comment, it was never formally adopted by Council. This was due to the formation of a working group between the Shires of Kojonup, Woodanilling and West Arthur to seek assistance in researching and investigating the palaeochannel.

The policy was not adopted by Council as there was not the data or regulatory controls to administer at a regional level, noting independent planning approaches and varying levels of monitoring from other Shires.

POLICY IMPLICATIONS

The following State Planning Policies are potentially applicable to the application:

- SPP 1.0 State Planning Framework;
- SPP 2.0 Environment and Natural Resources;
- SPP 2.5 Rural Planning;
- SPP 2.9 Water Resource;
- SPP 3.4 Natural Hazards and Disasters;
- SPP 3.7 Planning in Bushfire Prone Areas; and
- SPP 4.1 Industrial Interface.

The following Local Planning Policies are potentially applicable to the application:

- LPP No 1 Permitted Uses;
- LPP No 5 Beaufort Palaeochannel; and
- LPP No 6 Bushfire.

FINANCIAL IMPLICATIONS

None

STRATEGIC IMPLICATIONS

The promotion of rural industries and the Shire's agricultural base.

CONSULTATION/COMMUNICATION

The application was advertised to surrounding property owners and referred to a number of government agencies. A summary of the submissions which were received is contained in Attachment 4.

- Forest Products Commission;

- Main Roads WA;
- Department of Water and Environmental Regulation including the Land Use Planning Branch (previous Department of Water)
- Department of Primary Industries and Regional Development including the Soil Commissioner

Councillors have been provided with copies of all of the submissions. As a result of the consultation and examination of the application the proponent has provided the responses tabulated in Attachment 5.

There has been ongoing liaison with officers from DWER and DPIRD regarding the application.

COMMENT

The following issues are highlighted for consideration.

Matters to be Considered (cl 67 of the deemed provisions)

In considering an application for development approval the local government is to have “due regard” to the matters contained in Clause 67 of the Deemed Provisions to the extent that, in the opinion of the local government, those matters are relevant to the development the subject of the application. These address amenity issues, the orderly and proper planning of the locality, gazetted State Planning Policies, local planning policies and any other relevant planning considerations.

The phrase 'due regard' means 'proper, genuine and realistic consideration' all of the facts.

The following issues are referenced with the relevant sub paragraphs of clause 67.

Orderly and proper planning (cl 67(a) - (g) of the deemed provisions)

The term 'orderly and proper planning' is a common planning term and relates to the planning framework including the applicable State Planning Policies and Scheme Objectives and Provisions.

The proposed use of animal husbandry - intensive and worker's accommodation are consistent with the objectives of the Regional Rural zone. It is then a question of whether the scale and intensity of the development is suitable for this site.

Amenity and compatibility (cl 67(c), (d), (m) and (n) of the deemed provisions)

The impact of the Proposed Development on the amenity of the locality is a central issue in the consideration of the application. Amenity is a fundamental but sometimes elusive concept in planning law. Amenity is defined in cl 1 of the deemed provisions to mean all those factors which combine to form the character of an area and include the present and future amenity.

The amenity of an area is comprised of many attributes. It may not only be concerned with physical surroundings but also the social and economic effects of proposed use or development. Likewise, 'amenity' may relate to the future as well as the present. The amenity (character) of any area will undergo change. This change can be slow and evolutionary or sudden which can create unwelcome impacts.

While some impact upon amenity is to be expected, it is determining when the nature and degree of that impact is not acceptable which can be difficult to quantify. As amenity values are affected, they transgress to being perceived as a nuisance through to a more quantifiable impact which might then be considered as pollution.

The amenity (character) of the immediate area and much of the municipality is of a rural nature, predominantly comprising of passive broad acre farming. However, the area within and adjacent to the Beaufort Palaeochannel has developed with more intensive activities due to the availability of water

including, two piggeries, an export abattoir, chicken processor, roadhouse/tavern and multiple plantations.

Clause 67(n) refers amenity of the locality including the following:

- (i) environmental impacts of the development;
- (ii) the character of the locality; and
- (iii) social impacts of the development.

These factors are inherently addressed in the consideration of the following issues.

Buffers (cl 67(c), (d), (f), (m), (n) and (o) of the deemed provisions)

A key measure to protect the amenity of an area is to ensure that potentially conflicting land uses have an appropriate separation distance. The consideration of buffers to the operation primarily relates to odour and noise while also potentially reducing any other associated impacts from other factors such as dust or landscape impacts.

SPP 4.1 Industrial Interface provides the foundation for land use planning to prevent land use conflict associated with industry and infrastructure facilities in Western Australia. It provides guidance on managing land use conflict and preventing adverse impacts, including the provision of statutory buffers in the Planning Scheme. It states that industrial land uses and infrastructure facilities in Rural zones should contain off-site impacts within the Rural zone, or within surrounding compatible land use zones and/or reserves.

Section 5.2.2(g) states that

- I. where the new or existing industrial land use/ infrastructure facility is a Prescribed Premises, the planning decision-maker should rely on technical environmental advice from the DWER in relation to the extent of potential off-site impacts;
- II. where the new or existing industrial land use/infrastructure facility is not a Prescribed Premises, or technical environmental advice from DWER is not available in relation to the extent of potential off-site impacts, the planning decision-maker should apply the separation distance recommended by the EPA in Environmental Protection Guidance Statement No.3 Separation Distances Between Industrial and Sensitive Land Uses. Where the separation distance is not achieved, the onus is on the proponent to demonstrate to the satisfaction of the planning decision-maker that the development will not generate off-site impacts on sensitive land uses and/or zones.

DWER have been unable to confirm that the proposed buffers are acceptable. It has advised that:

In general terms, DWER uses a risk-based framework when undertaking assessment of works approval and licence applications made under Part V Division 3 of the Environmental Protection Act 1986 (EP Act). Risk-based regulation ensures that DWER will regulate so that there is not an unacceptable risk of harm to public health or the environment, and so that licensing and approval decisions, including any conditions imposed on any approval, will be proportionate to the level of risk that the activity poses.

In line with the risk-based assessment framework, the Department takes separation distances into consideration on a case-by-case basis. While consideration may be given to EPA's guidance on separation distances, it is not a limiting factor in the Departments decision making process.

EPA Guidance Statement 3 Separation Distances Between Industrial and Sensitive Land Uses recommends a buffer between 1,000 - 2,000m for a non beef animal feedlot. The Guidance Statement does not quantify the size of the feedlot as regarding what buffer distance applies.

The buffer is typically measured from the source point to the nearest dwelling. This includes pens, handling facilities, sedimentation systems, holding ponds and manure stockpile and composting areas. This is estimated to be 1.2kms and the affected landowner has submitted that the buffer should be 2kms.

The National Guidelines provide for two types of buffers based upon fixed separation distances, or variable separation distances. Variable separation distances are based on the dispersion of odours from their source. It provides a complex formula for determining the buffer distance based upon multiple factors including stocking density, terrain, vegetation and surface roughness with the separation distances surrounding waste disposal areas for a Rural farm residence not owned by feedlot operator being 100 and 500m. It is unclear as to whether the consideration of the other factors in the formula would increase this distance.

The applicant has not provided any detailed odour study to justify the proposed buffer distances but is relying upon the generic buffers. The applicant has submitted that the reduction from 2,000m to 1,200m is reasonable given the nature of the operation, local weather conditions and the provision in the National Guidelines for a smaller distance.

It is also noted that there are multiple properties around the subject land that do not have any dwelling. Under the Town Planning Scheme, a single dwelling is a permitted (P) use. In accordance with Local Planning Policy No 1 Permitted Uses, no development application is required for a single dwelling in the Regional Rural zone where it complies with the Scheme setback of 20m. Local Planning Policy No 1 was adopted pursuant to Clauses 61(1)(i) and 61(2)(e) of the Deemed Provisions, which state that a Local Planning Policy may exempt development from requiring approval.

This means that a future dwelling could be located approximately 220m from the manure stockpile or 280m from the effluent ponds.

In accordance with the Environmental Protection Act 1986, the operators of an emitting industry must take all reasonable and practicable measures to prevent or minimise emissions from their premises. In simple terms it is up to the operator to ensure that the minimum required health and environmental standards are maintained even where a new dwelling is constructed closer to the facility.

The risk is on the operator as the general provisions of relevant Acts or the general conditions of any development approval apply to the nearest dwelling irrespective of the current conditions. The remedial measure for Council would be to modify its planning controls to make a dwelling a discretionary use within a defined buffer area, and so hence be able to direct that dwellings be located further away.

A further issue has been identified in that the manure and carcass stockpiles are located approximately 30m from Youngs Road. The National Guidelines recommend that for an unsealed road with less than 50 vehicles per day excluding feedlot traffic that there should be a minimum setback of 50m. Where the road has more than 50 vehicles per day, the setback should be increased to between 50 and 200m. It is considered that there is no substantial reason why the stockpiles cannot be moved further back within the property while noting that they must be below the bunded drainage area.

Water Supply (cl 67 (a), (c), (f), (n), and (o) of the deemed provisions)

Water will be required for the proposed operations including:

- Potable water for the worker's accommodation units;
- Sheep drinking water;
- Washdown and waste management;
- Dust suppression; and
- Bushfire management.

Water for the feedlot facility will be provided from a groundwater production bore located in the north east corner of Romney Park. Groundwater will be pumped to a holding tank of an unspecified size. The water supply to the dwellings and accommodation will be via rainfall capture (stand-alone tanks connected to roof gutters) and bore supply when required. The workers accommodation (dongas) won't have sufficient roof area for domestic catchment and will also need to rely on groundwater.

Water for the stock is proposed to be provided on the basis 4 litres / head / day.

DPIRD has advised that the application does not include enough information to verify that the proponent has access to sufficient water to meet the requirements of a 90,000 head sheep feedlot. The applicant has indicated that:

- a) Ground water investigations are continuing and that further information on groundwater can be provided;
- b) If insufficient water supply is located then less sheep will be held on site as per animal welfare requirements. It is the responsibility of Fletchers to provide sufficient water to address the mandatory components of the Guidelines, the Code along with statutory requirements.

The National Guidelines recommend that a minimum of 4 litres of water per head per day and up to 6.5 litres be provided during sustained hot and/or humid weather should be available on demand. At least 3 days water supply should be available in case of breakdown or emergency. This is consistent with DPIRD's recommendations for confined paddock feeding and feed lotting of sheep of between 4–6 litres per sheep per day.

Based upon a maximum capacity of 90,000 head this equates to:

- 131 ML per annum @ 4 litres per day; and
- 197 ML per annum @ 6 litres per day.

The applicant has indicated that while the maximum capacity might be 90,000 head that this number will not occur often or for all of the year and hence the actual water requirement will be much lower than stated above. In response to this, the application was made specifically for 90,000 head with no qualification as to when that number would apply and so any approval would allow for that to happen at any time of the year.

Local landowners are concerned with the potential impact of the water usage on their properties. Concern with water usage has been a documented issue in the area including that it is getting worse with a drying climate.

Information regarding the paleochannel originates from DPIRD investigations and the monitoring program established for the adjacent Sattler plantation in 2008. While DPIRD have advised that there is insufficient information on which to make any assessment of the impact of groundwater abstraction on the property on any of the neighbouring properties, it has also advised that

- a) The bores in the surficial aquifer are not artesian;
- b) To satisfy the estimated water requirements of a 90,000 head sheep feedlot multiple bores are likely to be required; and
- c) Using a simple analytical model and the hydraulic properties of the aquifer determined from DPIRD's modelling of the Sattler mixed forestry plantation if a single bore were pumped continually at 50kl/d, the 0.25m drawdown contour would extend about 640m from the bore and the 0.5m drawdown contour would extend 250m from the bore. If multiple bores are pumped at similar rates, drawdowns will increase.

DWER (Natural Resource Management) has confirmed that the Paleochannel is not proclaimed under the Rights in Water and Irrigation Act 1914 and as such the no licence is required for or able to be issued for non artesian ground water extraction.

Clearly from the above there is a statutory void in relation to water rights. The potential for Council to be responsible for the administration of development conditions in relation to this requires careful consideration and the options include:

- 1) Acknowledge that this is not a Council responsibility and it is a civil matter between landowners;
- 2) Seek to have the areas proclaimed under the Rights in Water and Irrigation Act 1914 which would then require approvals from DWER even for non artesian bores;
- 3) Regulate the extraction of groundwater as a condition of any development approval;
- 4) Require the implementation of a monitoring and possible remediation plan.

Council has previously accepted that the potential impacts upon groundwater was a relevant planning consideration for the Sattler Plantation. This only related to monitoring and remediation rather than controls over extraction. To implement any potential remediation measures that guarantee existing supplies it is necessary: -

- To have clearly defined “trigger” mechanisms.
- To have defined “trigger” mechanisms it is necessary to have a detailed monitoring program.
- To be able to monitor and assess any potential changes the monitoring program must have agreed base line data.

In practice the formulation of these measures for the Sattler Plantation become extremely complex and problematic while the monitoring program declined due to lack of funding.

The proposed production bores for the operation are located in the northern eastern portion of the property. There is a significant separation to properties to the west and south and this is much greater than the 640m shadow distance referred to by DPIRD. Given the size of the property and in particular being more than 1,600 wide it should be feasible to locate any production bores within the property so as to accommodate all or most of any draw down shadow.

This would preclude the use of the existing bores located near the eastern boundary other than for domestic purposes.

Bushfire Management (cl 67(c), (g), and (r) of the deemed provisions)

Portions of the subject land and the feedlot development site are designated as being bushfire prone.

Clause 6.5 of SPP3.7 Planning in Bushfire Prone Areas requires that any development application must be accompanied by a bushfire management plan which includes:

- a) a Bushfire Attack Level (BAL) Assessment or a BAL Contour Map to show the expected BAL ratings for the developed site. The BAL Contour Map shows the proposed BAL ratings based upon any clearing or landscaping;
- b) the identification of any bushfire hazard issues arising from the BAL Contour Map or the BAL assessment; and
- c) an assessment against the bushfire protection criteria requirements contained within the Guidelines demonstrating compliance within the boundary of the development site.

A draft Bushfire Management Plan has been submitted and this confirms that:

- the sheep holding pens will predominantly have a BAL-Low rating with some portions being BAL-12.5; and
- the worker’s accommodation site will have a moderate bushfire hazard level with potentially a BAL-Low or BAL-12.5 rating.

External to the feedlot development site, the remnant vegetation to the west of Youngs Road and in the adjacent conservation covenant area presents an extreme risk from the north-west and west of the proposed sheep feedlot pens.

SPP3.7 Guidelines classifies worker's accommodation as a 'vulnerable land use' and this is a use where:

- persons may be less able to respond in a bushfire emergency; or
- persons may be unaware of their surroundings and who may require assistance or direction in the event of a bushfire.

In particular this applies to transient workers and SPP3.7 requires any such proposal to be accompanied by an emergency evacuation plan.

The applicant has submitted that the workers accommodation is not considered a "vulnerable land use" as the proposed units are for permanent employees (not seasonal) and their associated accommodation/residence. The resident employees will be able to respond to a bushfire emergency and therefore are not subject to evacuation needs. People who are employed by Fletchers will be physically able to respond to an emergency, are not aged persons or not physically or mentally disabled, and the siting of the buildings does not present evacuation challenges from the site.

Proposed bushfire management measures include:

- a) Upgrading of internal access tracks to provide 6m horizontal and vertical clearance to vegetation with passing lanes every 200m.
- b) Provision of two standalone tanks for firefighting (10,000L min capacity) is to be located near the sheep processing area and the existing sheds in the east of the farm.
- c) Construction of the worker's accommodation units to a BAL-12.5 rating.
- d) Provision of a fast attack trailer/ute mounted unit with a minimum of 800L capacity is to be located on site during the summer months (15th November to 15th April inclusive) in the feedlot paddock
- e) Implementation of Construction Fire management Procedures; and
- f) Compliance with Council's Firebreak Notice.

Access and traffic issues (cl 67(s) and (t) of the deemed provisions)

The applicant has submitted that there will be the following volume of daily feed, stock movement and composting truck movements:

- 2.5 Sheep road trains per day (B double);
- 2.3 Feed trucks per day; and
- 0.3 Manure trucks per day.

In total, this amounts to 5.1 trucks visiting the premises per day or 10.2 total movements. These figures are based on a 90,000 stock head count at the feedlot and are the highest possible figures.

Main Roads WA has advised that the Youngs Rd / Albany Hwy intersection is marginally acceptable for low volume truck movements, and any significant increase in truck volumes poses some concerns. It has requested that a detailed traffic impact study be carried out, with allowances made for feed truck movements and confirmation of stock truck movement numbers.

It has confirmed that the intersection has the required minimum Safe Intersection Sight Distance of 300 metres and that no turning treatments (auxiliary lanes) are required.

As Youngs Road has less than 50 vehicles per day an additional 10 vehicle trips appears to be a significant increase. However, in design terms this is a very low number which cannot justify the imposition of additional requirements. A condition to undertake a feasibility study, fails a number of established planning principles as it is not reasonable or final and can't in itself require any road upgrading.

Feed Storage Shed (cl 67 (a), (m), and (n) of the deemed provisions)

The revised feedlot development site concept plan (Attachment 1) includes a proposed feed storage shed of an unspecified size with an 8,000m² development foot print / building envelope. As shown, this will be located across the existing lot boundaries and therefore does not meet the minimum 20m boundary setback required in the Scheme.

It will also be located on the high point of the property and consideration of this should include potential impact on surrounding landscape values including the proposed size, height, bulk etc of any building. This is likely to include requiring the use of non-reflective building materials.

As the feedlot development site is effectively a separate development area, then irrespective of the proposed feed shed, this is an argument for requiring the lot boundary to be relocated.

Vegetation (cl 67(c), (e), and (p) of the deemed provisions)

The construction of the feedlot development site will require the removal of approximately 1 hectare of White Gum woodland within the proposed hardstand area and isolated paddock trees in the cut and fill area. The drainage line on the western side of the evaporation pond will be revegetated from the farm dam to Youngs Road being approximately 300m.

The Soil Commissioner (DPIRD) has raised concerns with the proximity of the development to the conservation covenant bushland are requested that bushland needs to be protected including being fenced and ensuring that there is appropriate management of surface water run-off from the feedlot facilities/operations area.

The proposed gravel extraction area will be setback 30m from the conservation covenant bushland but the hardstand area will be setback 150m. The intervening area will then be rehabilitated as grassland.

It is expected that that there will be a 1:1 off set planting for any proposed tree removal. In addition, the existing screening vegetation along the road boundaries should be maintained and intensified where required. Additional planting within the feedlot development area can assist in reducing the visual impact of the operation.

Animal Welfare

A number of submissions raise issues relating to animal welfare. This is not considered to be a relevant town planning issue as it is dealt with under the Animal Welfare Act 2002 (Act) and DPIRD's Code of practice for sheep in Western Australia.

Noise

Noise emissions can originate from a variety of sources including plant, equipment compressors, and truck movements.

The Environmental Protection (Noise) Regulations 1997 are the principal statutory means of controlling noise emissions. Under these regulations the assigned outdoor noise levels for the noise received at any noise sensitive premises (ie a house) during various times of day is determined by the calculation of an influencing factor, which is then added to base levels.

The operation of the site would have to recognise the assigned noise levels at any given time. Given the separation distances to existing dwellings and the above controls, noise is not expected to be a problem.

Balance Area

The majority of the subject land will not be part of the core operation and will continue to be used for broad acre cropping and grazing. This may provide a supplementary feed supply or non-intensive stocking

areas for the feedlot, or it may be leased for separate farm operations. More importantly the balance of the site will provide a buffer of more than one kilometre to the properties to the east of the feedlot development site.

Economic Implications (cl 67(n) and (x) of the deemed provisions)

While the proposal creates a modest number of new jobs, it represents a substantial investment in the district of more than \$3.5 million dollars for its establishment. There is no assessment of what multiplier effects that this may locally.

It also represents a further recognition of the potential value of the Beaufort Paleochannel to the region for the promotion of agricultural activities.

Management Plans

The application includes the following management plans:

- Operational Environmental Management Plan;
- Water Management Plan;
- Bushfire Management Plan; and
- Construction Management Plan which includes gravel extraction.

DWER has advised that works approval or licence won't automatically require the implementation or compliance with management plans, and the Department won't approve, enforce or monitor the management plans in their entirety. Rather a works approval or licence may include specific conditions sourced from the management plan(s).

In effect Council will be responsible for the approval, administration and enforcement of the management plans where specific measures are not included in the works approval. The management plans will need to be updated to reflect the revised application details and any conditions of Council's approval while being consistent with any DWER works approval or licence.

An important issue for the ongoing operation is an effective communication local landowners and Council. This this tends to focus on potential complaints and the State Ombudsman promotes the following principles for complaint handling:

- Customer focus – the organisation is committed to effective complaints handling and values feedback through complaints.
- Visibility – information about how and where to complain is well publicised to customers, staff and other interested parties.
- Accessibility – the process for making a complaint and investigating it is easy for complainants to access and understand.
- Responsiveness – complaints are acknowledged promptly, addressed according to urgency, and the complainant is kept informed throughout the process.
- Objectivity and fairness – complaints are dealt with in an equitable, objective and unbiased manner. This will help ensure that the complaint handling process is fair and reasonable. Unreasonable complainants are not allowed to become a burden.
- Confidentiality – personal information related to complaints is kept confidential.
- Remedy – if a complaint is upheld, the organisation provides a remedy.
- Review – there are opportunities for internal and external review and/or appeal about the organisation's response to the complaint, and complainants are informed about these avenues.
- Accountability – accountabilities for complaint handling are clearly established, and complaints and responses to them are monitored and reported to management and other stakeholders.
- Continuous Improvement – complaints are a source of improvement for organisations.

The references to “customers” can mean both local landowners and the relevant responsible authorities including Council, DWER and DPIRD. The main requirement is to have a 24/7 contact point for any issues to be acknowledged and actioned.

SUMMARY/CONCLUSION

The application complies with the objectives in the Town Planning Scheme as:

- It is preserving agriculturally productive land and promoting primary production;
- It should not have any detrimental impact on the landscape and character of the area;
- With appropriate management it should not have any significant impact upon the amenity of the area;
- There is minimal vegetation clearing;
- The bushfire risk is able to be managed in an appropriate manner;
- The potential impact of ground water extraction is expected to be localised and predominantly contained within the subject land;
- No liquid waste water will be discharged off site; and
- It is creating economic benefits to the district.

The subject land is both physically capable of accommodating the development and suitable for this purpose.

The major issue reflected in the consideration of the application under the Deemed Provisions and the planning framework is the potential impact upon the environment and the amenity of the area. The operation will be subject to multiple regulations and code of practices. Any potential impacts are expected to be managed through:

- The DWER works approval and monitoring;
- Council’s development approval; and
- DPIRD’s control of animal welfare.

The issue then becomes whether the operation will have any negative impact on local residents. In accordance with the Environmental Protection Act 1986, the operators of an emitting industry must take all reasonable and practicable measures to prevent or minimise emissions from their premises. Environmental and health provisions are biased or orientated towards the residents and the obligation is on the operator to ensure that the facility is managed accordingly. Where there is inappropriate management, it will affect the long term viability of the operation.

The exercise of planning discretion is based upon the principle that the applicant will abide by their commitments documented within the application and any conditions of approval. The conditions of development approval may include general measures as much of the final detail and provisions for the operation will be included in the relevant management plans. These are subject to final approval of Council.

Assessment of the application in the context of the specific standards and requirements of Town Planning Scheme No 1 and the Deemed Provisions of the Planning and Development (Local Planning Schemes) Regulations 2015 has confirmed it will be generally compliant subject to appropriate conditions.

VOTING REQUIREMENTS

Simple Majority

OFFICERS RECOMMENDATION

- A That Council determine pursuant to Clause 4.4 of the Scheme that the proposed development of **worker's accommodation, including a number of associated improvements, on Lot 1 and 4 Youngs Road is consistent with the objectives of the land's current 'Regional Rural' zoning classification in Town Planning Scheme No 1** and may therefore be permitted in the zone.
- B That Council approve the use and development of Lots 1 and 4 DP21594 Youngs Road Beaufort River for the purpose a sheep feedlot (animal husbandry - **intensive**), **worker's accommodation and associated infrastructure** subject to the following conditions:
1. The maximum number of sheep to be kept at any one time within the feedlot development site (as shown on the endorsed plan) is 90,000 head.
 2. Prior to the commencement of the use hereby approved, the plan submitted with the application shall be modified by means of:
 - a) A scaled and dimensioned plan of the feedlot development site showing the setback and location of all proposed buildings and works including access roads.
 - b) Details of the proposed feed storage shed including its dimensions and materials.
 - c) Gravel extraction areas, setbacks, proposed depths and finished surface levels.
 - d) Showing a fire service access route connecting the between the western and eastern access driveways.
 - e) Relocation of the carcass and manure stockpiles so as to have a greater setback from Youngs Road.
 - f) **A plan of the worker's accommodation** site showing the proposed bushfire spatial measures for a 100m radius from the site including the proposed BAL ratings, building positions, and location of water supply.
 - g) The location of the proposed groundwater production bores.
 - h) Vegetation clearing and offset planting.
 - i) Existing and proposed landscape buffers.

The above modifications shall be to the requirements and satisfaction of the Council. An endorsed copy of this plan shall form part of the approval.
 3. Any use, additions to and further intensification of any part of the building or land (not the subject of this consent) shall be subject to a further development application and consent for that use.
 4. Prior to the commencement of the development hereby approved, the management plans submitted with the application shall be modified to the by means of:
 - a) Updating the provisions to reflect revisions to the application;
 - b) Conditions of approval including the works application;
 - c) An agreed communications strategy and complaints procedure;
 - d) Annual monitoring and review requirements.

The above modifications shall be to the requirements and satisfaction of the Council. An endorsed copy of each management plan shall form part of the approval.
 5. The prior approval of Council is required for any proposed groundwater production bore (other than for domestic purposes) that is to be used to supply water to the feedlot development site. In considering any application for this Council will have regard to the proposed setback of the bore from the boundary of the subject land, it proposed capacity and possible drawdown effect.
 6. The existing property boundary within the feedlot development area shall be realigned so that the feedlot development area is wholly contained within one lot. In the event that the Western

Australian Planning Commission does not approve this boundary realignment all proposed buildings shall be setback a minimum of 20m from the boundary.

7. **The proposed worker's accommodation units shall be sited so as to have either a BAL-Low or BAL-12.5 rating.** Where they have a BAL-12.5 rating then the units shall be constructed in accordance with Australian Standard AS3959 Construction of Buildings in Bushfire Prone Areas.
8. No polluted drainage shall be discharged beyond the boundaries of the subject land or into the conservation covenant bushland, watercourse or easement drain, but shall be so treated and/or absorbed on that lot to the satisfaction of Council.
9. The use hereby permitted shall not cause injury to or prejudicially affect the amenity of the locality by reason of the emission of smoke, dust, fumes, odour, noise, vibration, waste product or otherwise.
10. The site shall be so ordered and maintained as not to prejudicially affect the amenity of the locality by reason of appearance.
11. Any vegetation cleared for the development shall be replanted to the requirements and satisfaction of Council at 1:1 ratio.
12. A landscape buffer shall be provided along the boundary of Youngs Road adjacent to the feedlot development area to the requirements and satisfaction of Council.
13. Prior to the commencement of the use hereby permitted, the landscaping works as shown on the endorsed plan shall be provided and completed to the satisfaction of the Council and such works shall continue thereafter to be maintained to the satisfaction of the Council.
14. This approval shall expire if the development hereby permitted is not completed within two years of the date hereof, or within any extension of that time which, upon written application (made before or within 21 days after the expiry of the approval) to the Council, is granted by it in writing.

C That all landowners and agencies who made submissions be advised of the above.

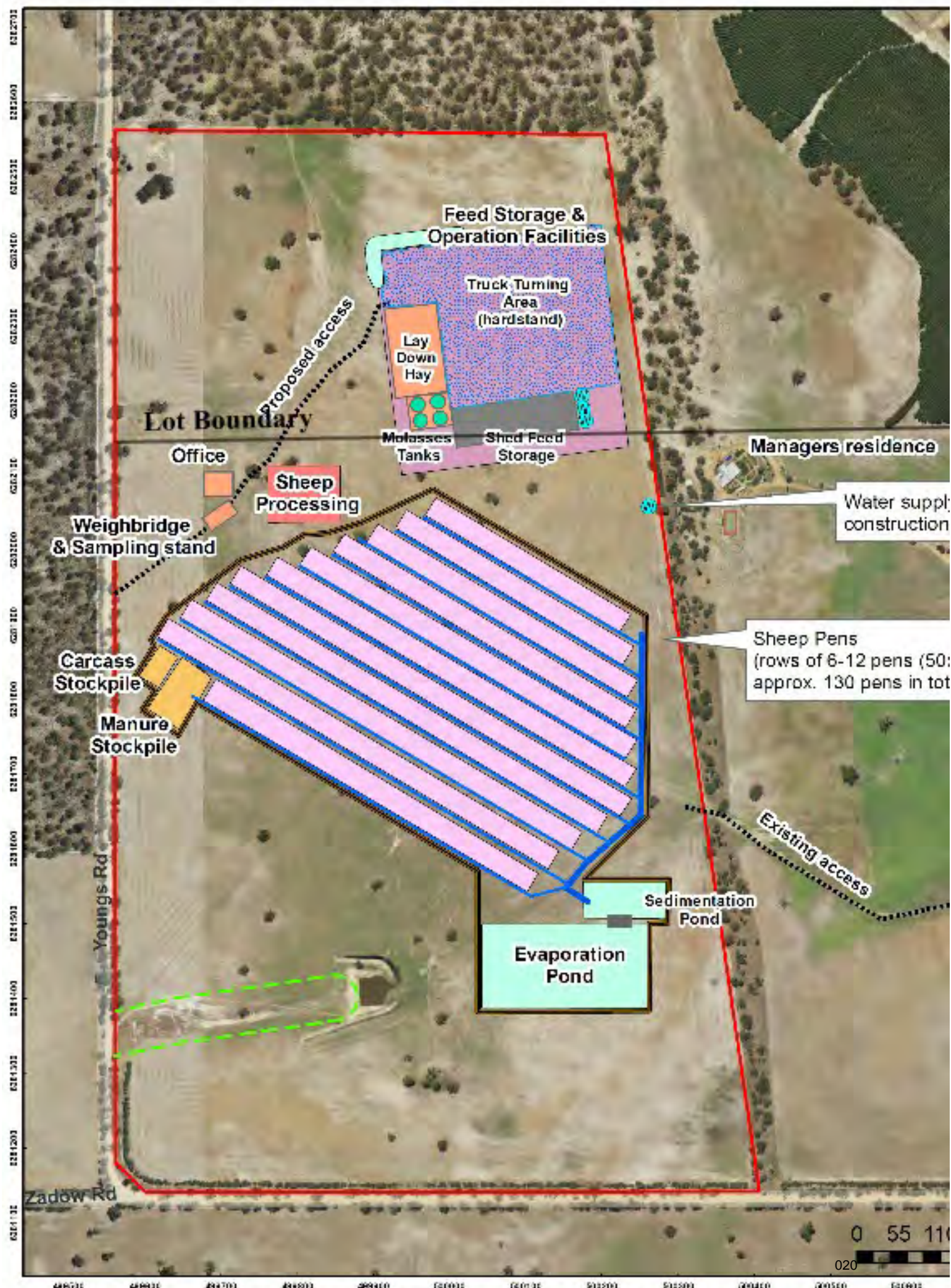
ATTACHMENTS

1 Concept development plan	page	20
2 Existing conditions – locality	page	21
3 Existing conditions - subject land	page	22
4 Submissions summary	page	23
5 Applicant responses	page	25

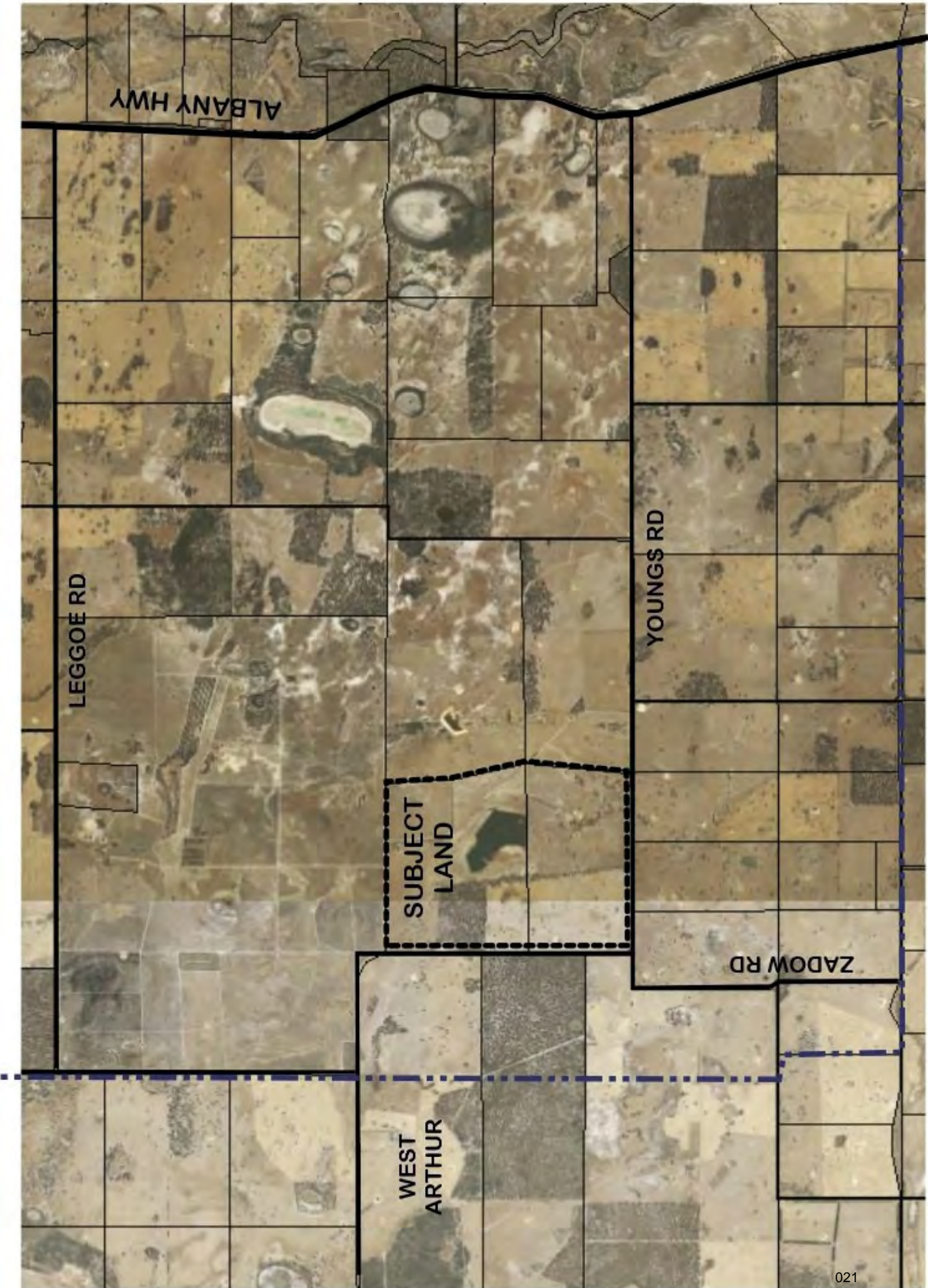
Geotechnical and other appendices to the Application are available from www.woodanilling.wa.gov.au

9.0 MEETING CLOSURE

ATTACHMENT 1 = FEEDLOT DEVELOPMENT SITE



ATTACHMENT 3 - EXISTING CONDITIONS SUBJECT LAND



ATTACHMENT 2 - EXISTING CONDITIONS SUBJECT LAND



Attachment 4 - Summary of Submissions

No	Submitter	Summary
1	Landowner	<ul style="list-style-type: none"> Concerned with water usage as this has been an ongoing problem that is getting worse with a drying climate. Effect on replenishment of the paleochannel. The usage rate of 4lpd is too little. Measurement of the distance to their dwelling / buffer is no correct. Will the rates for the feedlot be different? There are frequent dust storms in the area and stating that there will be no or minimal dust is a fallacy. Vehicle access to Albany Highway is already difficult. Proposed 48 hours to address offensive odours is not acceptable. Not clear who determines when it is offensive. Proposed benefits are not clear. Proposed holding capacity of the pens appears to be 78,000 sheep not 90,000.
2	Landowner	<ul style="list-style-type: none"> Proximity of sedimentation ponds, the manure stockpile area and the dead carcass pit to their house which is 1211m away. There should be a 2,000m as per the EPA Guidelines. Concerned with water impacts given that lack of understanding of the quantity and quality of water in the paleo channel. The mitigation of animals escaping and spreading disease to adjoining landholders has not been addressed and a standard ringlock type fence does not provide security.
3	Landowner	<ul style="list-style-type: none"> Concerned with water impacts, sustainability of supply and the risk of contamination of the Beaufort Palaeochannel. Much is unknown about the Beaufort Palaeochannel, including how much use it can sustain without affecting the current supply. Reports should be subject to a peer review by a hydrologist/environmental consultant before any development commences. Odour is likely to affect nearby properties. If the water supply was compromised either by excessive use or pollution it would have a major impact on their operations.
4	Landowner	<ul style="list-style-type: none"> Bio-security-boundary fencing and the control of this number of livestock. Control of odours from the site. Amount of water to be used. Control of animal manure/dust. Carcass disposal (dead livestock)
5	Transport Operator	Supports the application and the expansion of Western Australia's quality livestock population. As a transport operator he is one of many who will benefit from the application.
6	Shire of West Arthur	The Shire of West Arthur would like high consideration for the sustainability of the Beaufort paleochannel to be given in assessment of the application.
7	DWER	<p>The Paleochannel is not proclaimed under the Rights in Water and Irrigation Act 1914 and as such the Department does not manage the entire Palaeochannel resource. DWER only licences the use of water when a bore is artesian. Risks to the groundwater resource from over use include:</p> <ul style="list-style-type: none"> salt recycling / water quality impacts from pumping and the irrigation, groundwater drawdown reduced yield over time.

Attachment 4 - Summary of Submissions

No	Submitter	Summary
		<p>It is not known if the proposed water extraction is sustainable and if it will affect the viability and long term sustainability of the Beaufort Paleochannel.</p> <p>Any works approval or licence won't blanket require implementation or compliance with management plans, and the department won't approve, enforce or monitor the management plans in their entirety.</p>
8	DPIRD	<ul style="list-style-type: none"> References the use of the National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems. Specific measures are required to protect the bushland subject to the conservation covenant. There is insufficient information on which to make any assessment of the impact of groundwater abstraction on the property on any of the neighbouring properties. The development application includes a concept plan for the sheep feedlot but lacks specific information about the design and operation of the feedlot and further information is required. More detail is needed about the design, staged development and operation of the sheep feedlot, in particular to ensure there is an adequate water supply for the proposed sheep numbers, including in hotter summer months, and for other uses including allowance for wastage, trough cleaning, dust suppression and bushfire fighting. The water use is based upon 4l/d consumption but in hot weather sheep may drink up to 6l/d. Most bores in the surficial aquifer at Beaufort River are known to produce between 15 and 50kl/d (5 to 18ML/y), although one bore is estimated to yield as much as 200kl/d (73ML/y) (Table 1, Raper and George 2010). To satisfy the estimated water requirements of a 90,000 head sheep feedlot multiple bores are likely to be required. The bores in the surficial aquifer are not artesian and the property is not within a proclaimed groundwater area. Animal welfare issues including the need for shade and wind shelter in the feedlot, and the options that may be suitable.
	Main Roads WA	<p>The Youngs Rd / Albany Hwy intersection is marginally acceptable for low volume truck movements, a significant increase in truck volumes poses some concerns.</p> <p>While the intersection does not require significant turn treatments (auxiliary lanes) Main Roads requests that the intersection sweeps be widened to avoid the necessity of trucks stopping on Albany Hwy waiting for the intersection to clear and to be able to turn lane correct while not encroaching on the gravel shoulder of the intersection.</p> <p>Sight distance from Youngs Road to the North is 310 metres, to the south is 360 metres. These exceed the required minimum Safe Intersection Sight Distances (300 metres). Sight distances may increase with vegetation clearing, Main Roads will action this at the appropriate time.</p> <p>Main Roads requests that a detailed traffic impact study be carried out, with allowances made for feed truck movements and confirmation of stock truck movement numbers.</p>

Table 1 – Responses to comments raised by Shire of Woodanilling

No	Issue	Client response
1	The concept plans submitted with the application are difficult to read due to their reduction to include in the reports. Please provide two (2) copies of these as a separate plan sheets drawn to scale and dimensioned at a minimum A3 size.	Bio Diverse Solutions can provide 2 copies of the updated Concept Plans as requested at A3 size, please refer to Attachment A in the interim which shows the updated concept plan for the site. The updated concept plan shows increased detail in response to feedback from DWER. While noting this the feedlot footprint, including the sheep pens and evaporation pond, has not changed from the submitted and publicly advertised DA.
2	Confirmation of what area you are applying for a works approval / licence for and the measures you are proposing to restrict the use within this area, or alternatively if you are seeking approval for the use and associated activities to occur anywhere within this area.	In response, the boundary of the 'Subject area' applies to the 'Prescribed works' within a premises (as applying for in DWER Works Approval). No other activities outside of the prescribed premises is being sought from DWER. Please refer to Attachment A which details an updated concept plan for the site. The updated concept plan shows a shed feed storage, office and weighbridge/sampling shed. It would be preferable if the use/location can be approved through this DA. It is recognised there is a separate requirement to provide the Shire elevations, floor plans and supporting information, provide structural engineering and obtain a Building Permit. It is suggested this is addressed as a condition of the development approval.
3	As the subject land contains two (2) lots provide reasons why these should not be amalgamated.	Development can occur across multiple boundaries. Fletchers International Export Pty Ltd (Fletchers) will review the lot boundaries should all relevant approvals be obtained. This may result in the lot boundaries being realigned to contain all of the area subject to the Prescribed Works being on one title, with the balance area being on the other lot. This issue not deemed relevant to the DA.
4	Provide justification for the worker's accommodation not being considered as a vulnerable land use under SPP3.7 Planning in Bushfire Prone Areas and whether an evacuation plan is proposed to be prepared.	In considering the context of this BMP, the proposed development of the works accommodation is not considered a "Vulnerable land use" as defined under SPP as the proposed units are for permanent employees (not seasonal) and their associated accommodation/residence. Typical of most large farming operations. The resident employees will be able to respond to a bushfire emergency and therefore are not subject to evacuation needs. People who are employed by Fletchers will be physically able to respond to an emergency, are not aged persons or not physically or mentally disabled, and the siting of the buildings does not present evacuation challenges form the site. It is noted that the decision maker (SoW) has the ability to request a BEEP and this is entirely at their discretion.
5	An explanation of why the proposed holding capacity of the pens appears to be 78,000 sheep when the maximum proposed number is 90,000.	In response, at the concept stage 90 000 head is given as the maximum proposed number for the site, and it is expected that the actual number will be generally lower due to rotation of stock for maintenance and sales purposes. Fletchers seek development approval for 90,000 head to provide certainty for future operations. The proposed number of pens is currently 120, however this may eventuate to 150 pens, and the client would at all times be operating within the licenced stocking numbers.

No	Issue	Client response
6	Provide a response to the issues raised in the advice from DWER and DPIRD dated the 22 January as previously provided to you as the application lacks specific information about the design and operation of the feedlot to assess the application against the National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems and the Code of Practice for Sheep in Western Australia.	The client notes this comment, and has responded that all aspects of feedlot operations will align to National/ State procedures for sheep feedlot operations and commensurate with “ <i>National procedures and guidelines for intensive sheep and lamb feeding systems</i> ” (2011), and their requirements for animal welfare, as per their existing feedlot operations in NSW. A copy of the response to DWER is attached in Attachment E.
7	The WMP does not include enough information to verify that the proponent has access to sufficient water to meet the requirements of a 90,000 head sheep feedlot. The Code of Practice for Sheep states that sheep in feedlots may drink up to 6 L/day in hot weather.	Noted. Ground water investigations are current and subject to further site information. Understand requirements of licensing through DWER if required may be undertaken. Fletchers understand if insufficient water supply is located then less sheep will be held on site as per animal welfare requirements. It is the responsibility of Fletchers to provide sufficient water to address the mandatory components of the Guidelines, the Code along with statutory requirements. If required, Fletchers can provide necessary assurances that the Shire is indemnified for its decision relating to water availability.
8	Plans to manage dust and odour during operation including contingency plans and justification of proposed buffer distances.	<p>As per the response tabled to DWER on this issue (See Attachment E):</p> <p>The Operational Environmental Management Plan (OEMP) has dedicated sections to Solid Waste Management, Effluent Management, Dust and Odour during operations (Sections 5.2, 5.3, 5.4 and 5.5 respectively). It is noted that dust emissions from sheep is limited in daily operations, with sheep movements via lane ways or in the pens. Truck movements will only be via constructed roads, speed limits apply. Contingency plans are also covered in the OEMP Section 5.8 Environmental Incident Management. Dust is a serious issue to the animals and as such will not be tolerated on the property. The system does not generate dust, as known from Fletcher’s existing feedlot operation in Condobolin, NSW.</p> <p>Refer to Siting and Location Mapping Attachment B, the closest sensitive receptor is noted to be 1.2km away to the south west, while an empty residence is located to the east of the site approximately 1.6km to the pens. Analysis of Wagin (29km away) climate data available online is provided in Attachment B. The prevailing winds to the residence to the south west (i.e. north east prevailing winds) is <10 percentile (i.e. deemed calm) throughout the seasons. The prevailing westerly flow to the vacant house to the east is deemed a notable issue, however this residence is located 1.6km away and not deemed to be an issue with dust, and odour is to be managed through offsite export of carcass and solid wastes.</p> <p>EPA Guidance Statement 3 Separation Distances Between Industrial and Sensitive Land Uses (Attachment B) recommends a 1000 - 2000m buffer separation for an animal feedlot. The Guidance Statement does not quantify the size of the feedlot as regarding what buffer distance applies. This project is within these separation distances. Based on the climate data and proposed design and management measures, the buffer is considered appropriate.</p>

No	Issue	Client response
		See Attachment B. The National guidelines for intensive feed systems feedlot guide also has buffer distances to sensitive receptors with the closest being 100m to a rural farm and the highest 500m to a rural farm residence, this is exceeded by the proposal at Ronneby Park. (Refer to Attachment B)
9	An explanation of why noise during the operation will not affect surrounding properties.	The property is situated in a rural location, and as such fits within the fixed separation distances outlined in Table 6.1 (p27) of the “ <i>National procedures and guidelines for intensive sheep and lamb feeding systems</i> ” (2011). The feedlot is situated within low population density agricultural area which is approximately 8km from the Albany Highway. Noise will be commensurate with typical farming operations (i.e. seeding and harvest).
10	Details of the construction of the feed storage area and the nature of the feed to be stored.	<p>As per the response tabled to DWER on this issue:</p> <p>An updated concept plan is provided in Attachment A outlining the facilities to be provided in the feed storage and operational area. Risks to this area are fuel / oil from truck tractor spills. This would be handled as per the OEMP Section 5.8.3. Products to be stored in feed shed are predominantly Cereal Grains (similar to usual farm operations). Other storage items in this area include molasses, water and hay/silage as shown. All of this area would be captured in the stormwater detention as shown on the Concept plan (NE corner), treated as per the Water Management Plan (WMP) and slowly released. All of this area will be of a gravel finish and dust would be low. All effluent created by the feedlot is on the other side of the hill and handled by the bundled effluent drainage system.</p> <p>Feed storage - there are 2 potential odour sources:</p> <p>a) Silage (if used) is covered with only the face exposed, silage smell is deemed a very low risk and is comparable to usual farm operations.</p> <p>b) Cereal grain can get wet and smell. Any of this material will be treated as per OEMP 5.5. Wet cereal grain is a cost to the client and will be avoided. Localised dust occurs with tipping a bucket of grain into a mixer, in this instance water is added to minimise dust and assist with mixing. Dust is a serious issue to the animals and as such will not be tolerated on the property. All of these materials listed above are noted to be are non-hazardous. Water capture from roof top will assist in supply and stormwater from this area will be managed via the treated stormwater system.</p>
11	An assessment of the impact of groundwater abstraction on any of the neighbouring properties.	<p>The issue is acknowledged. Based on previous groundwater assessments, it appears there will be limited impact on neighbouring properties with draw down localised. Refer to Attachment C – Hydrological Mapping. The supply of water will be through the superficial aquifer, resources for water are presently being investigated in the CZ and CZA hydrogeological areas. Updated information on water supply will be forwarded to SoW when at hand.</p>
12	Details of the construction of the pen floors including materials, compaction and final permeability.	<p>As per the response tabled to DWER on this issue:</p> <p>Pen floor construction: The pens will be compacted gravel 100mm to 200mm with clay incorporated from material on onsite. Watered and rolled. Manure with microbial activity will</p>

No	Issue	Client response
		<p>"cap" the hardstand of the pen. Permeability in the pens is achieved from the manure layer. Because of the formation of low permeability soil/manure interface, clay lining is not required on pens (refer to National guidelines for beef cattle feedlots in Australia, 2012, Appendix C). Excerpt provided as Attachment D.</p> <p>Pen slope 2.5 to 4% slope from the top of the pen to the bottom. The pens will run with the natural slope hence the variation in slope % across the holding pens. Catch drains will convey the water from the pen away to the main drain. Constructed with 200mm gravel and incorporated clay. OEMP Table 3 (page 12) outlines the drain sizing and has dimensions and calculations. The drains will have a 1% to 2% slope which will take the water away to the bundled effluent system.</p>
13	The design and construction of the sedimentation and evaporation ponds and bunding to direct effluent run-off.	It is suggested this is addressed as a condition of the development approval, with the design undertaken by a dam engineer/civil engineer. It is anticipated DWER will also require this information as a condition of the Works Approval.
14	The management of the manure biosolids and animal carcass stockpiles, including additional information if composting is used to dispose of animal carcasses.	Please see response to Issue 15 regarding management of manure biosolids and animal carcass stockpiles, and biosolid material will be removed offsite as per the WMP.
15	Details of the construction and operation of the manure bio-solids area including an estimate of the likely number and frequency of truck movement required to remove material from the manure bio-solids area.	<p>Trucks are estimated to be required to move material from the manure bio-solids area and carcass stockpiles twice per week, and will be moved off site as per the WMP.</p> <p>Manure and carcassing composting hardstands will be made with clay and gravel creating an impervious layer to a permeability of 1×10^{-9}. Testing of this can be undertaken during construction to confirm the permeability ratio is met. Both pads will be raised and banded in the effluent system so no water from upstream can enter. The raising of the pads will also avoid any surface water interception and below ground water interception. All watershed in this area will be directed to the controlled drainage system. Clay liner material used for the manure and carcass area will meet the National guidelines for beef cattle feedlots in Australia (2012, Appendix C). See Attachment D for excerpt.</p>
16	Details of expected volumes or how to determine if the designated areas for waste treatment shown on the concept plan will be sufficient.	<p>The WMP has calculated volumes of waste water and the dams are sized and scaled to the anticipated volumes of waste water. In terms of sizing of biosolids and carcass waste areas, one – two trucks per week is considered to remove solid wastes (refer to Issue 15) however will be refined depending on sheep numbers and demand. Based on experience with current operations, it is expected that on average 5 stock will die per day on average, similar numbers are expected for this operation and sizing of carcass waste areas will be ascertained during construction periods and if needed during operations. The key element is the location of these within the bundled treatment system as per the WMP outlines.</p>
17	Defining who determines when odour will be consider offensive and why this may take 48 hours to address.	OEMP defines operations requirement. The Site Manager and staff will monitor daily and adjust operations if needed. In terms of Contingency Plans, refer to DWER response.

No	Issue	Client response
		Manure management - off site to disposal areas may need to be increased. The Site Manager and staff are responsible to address matters within 48 hours to coordinate trucks and movement of material as required. It is suggested this is addressed as a condition of the development approval. It is also expected to be addressed in the DWER Works Approval.
18	Proposed management of surface water run-off from the feedlot facilities/operations area to prevent any adverse impacts on the conservation covenant area.	As shown on the concept plan and discussed in the WMP the feed Storage and Operation Facilities will be contained and surface water directed to a small catchment (sized according to final dimensions of the area) and treated prior to entering any adjacent areas.
19	Justification as to why the proposed 30 metres separation between the gravel extraction area and the conservation covenant area is large enough to protect the vegetation from potentially contaminated water and dust.	In the absence of policy of this matter in the Shire of Woodanilling and based on other D/A's Bio Diverse Solutions has prepared on extractive industry, a 30m buffer is used to public roads and adjacent properties. The conservation covenant paddock is not a designated ESA and therefore does not require any other specific buffer. Refer to extract Attachment B. Buffer setbacks for extraction are considered sufficient by the proponent.
20	Justification as why no additional water supplies are required for dust suppression for the operation of the facility.	Please see response to Issue 8 regarding management of dust at the site, and refer to the updated concept plan provided as Attachment A. Water is to be used for dust suppression during construction (see Construction Management Plan) and will be used during operations. See OEMP Section 5.4. Water sources can be added into this section if required.
21	Clarify the provision of adequate shade and shelter from extreme weather events in the sheep feedlot.	The WA Code of Practice for Sheep in WA (2003) outlines the need for protection from extremes of weather which may be life threatening, and the need for site selection relatively protected from adverse weather. The current recommendation of shade provision of 0.4m ² per animal (Section 4.4, "National procedures and guidelines for intensive sheep and lamb feeding systems" (2011) is noted, although not a legal requirement as this stage. Provision of shelter will be achieved via the construction of pens by rubber belting, and the terrain is shielded from wind events in the west, north, east and south. Further buffer planting is proposed post construction to aid in shelter (single rows of trees as windbreaks). This approach is consistent with what occurs at Fletcher's existing feedlot operation in Condobolin, NSW. This issue is not deemed relevant to the DA.
22	Proposed measures to prevent animals escaping and spreading disease to adjoining properties.	Fletchers International Pty Ltd operates with a high level of Biosecurity. The site will be fully fenced and security gated. Neighbours animal entering property would be of more concern from biosecurity protocols, site security etc. site security for escape and entering the property is not deemed a concern. This issue is not deemed relevant to the DA.
23	Confirm where the measurements for the buffers have been taken from and why these do not apply to the whole of the licence area.	Refer to Attachment B – buffers and section, answer to question 8 and to question 19. Buffers are taken from the areas which will be licensed or have smell or odour from.

No	Issue	Client response
24	EPA Guidance Statement No 3 recommends a buffer generic buffer distance of 1,000 - 2,000m. Provide justification as to why a distance of 2,000m should not be applied.	Refer to Attachment B – buffers and section, answer to question 8 and to question 19. Buffers are taken from the areas which will be licensed or have smell or odour from. The “ <i>National procedures and guidelines for intensive sheep and lamb feeding systems</i> ” (2011) also has buffer distances to sensitive receptors with the closest being 100m to a rural farm and the highest 500m to a rural farm residence, this is exceeded by the proposal at Ronneby Park. It is noted there is sufficient space on all adjoining/nearby lots, including vacant lots, to locate a dwelling that has an appropriate buffer from areas which will be licensed or have smell or odour.
25	Provide an explanation of why applying for a ground water extraction licence (when there is no statutory requirement) will provide protection to existing water users.	As noted in question refer to groundwater earlier in question 11. When groundwater sources are verified and approvals are achieved further information on groundwater can be provided to the SoW. This may reveal there is no requirement to apply for a groundwater extraction license.
26	What contingency measures will be applied if the volume or quality of the groundwater is not appropriate or sustainable.	As noted in question refer to groundwater earlier in questions 7 and 11. In terms of contingency stock will be reduced/removed of site accordingly to animal welfare. Some stock may be grazed/watered on the wider farm as per current farming practises.
27	Details of the construction of the feed storage area and the nature of the feed to be stored.	See question 10. The proponent will get DA approval for building a shed and structural engineering will be required, DA condition can be applied, see DWER response.
28	Main Roads was have advised that the Youngs Rd / Albany Hwy intersection is marginally acceptable for low volume truck movements without any turning lanes. To substantiate this Main Roads have requested that a detailed traffic impact study be carried out, with allowances made for feed truck movements and confirmation of stock truck movement numbers.	Based on current operations, the client expects the following volume of daily feed, stock movement and composting truck movements: <ul style="list-style-type: none"> • 2.5 Sheep road trains per day (B double); • 2.3 Feed trucks per day; and • 0.3 Manure trucks per day. In total, this amounts to 5.1 trucks visiting the premises per day, these figures are based on a 90,000 stock head count at the feedlot and are the highest possible figures. There will be low volume truck movements associated with the operation, and is felt that there is no requirement for a detailed traffic impact study. Safety can be enhanced at the Youngs Road/Albany Highway intersection through clearing of roadside vegetation.

Prepared for Fletcher
International Exports Pty Ltd

Water Management Plan

Ronneby Park Sheep Feedlot



**BIO
DIVERSE
SOLUTIONS**

Bio Diverse Solutions

24th October 2019

DOCUMENT CONTROL

Title: Water Management Plan - Ronneby Park Sheep Feedlot

Location: Lot 1 and 4 Youngs Road, Beaufort River WA 6395

Author (s): Chiquita Cramer

Reviewer (s): Kathryn Kinnear

Job No.: MSC0249-002

Client: Fletcher International Exports Pty Ltd

REVISION RECORD

Revision	Summary	Revised By	Date
Draft Id 1	Internal QA review	C. Cramer	10/09/2019
Draft Id 2	Review by client and Craig Pippin	C. Cramer	10/09/2019
Final Id 1	Final Report issued to client	C. Cramer	3/10/2019
Final Id 2	Further review by client	C. Cramer	29/10/2019



Bio Diverse Solutions
29 Hercules Crescent
Albany WA 6330
08 9842 1575
www.biodiversesolutions.com.au
ABN 48 138 824 272

(C) Copyright: This document has been prepared by Bio Diverse Solutions for use by the client only, in accordance with the terms of engagement, and only for the purpose for which it was prepared.
Front cover photograph courtesy of Great Southern Geotechnics.

Table of Contents

1	INTRODUCTION	1
1.1	BACKGROUND	1
1.2	LOCATION	1
1.3	KEY DESIGN PRINCIPLES AND OBJECTIVES	2
1.4	REPORT AUTHOR	3
2	PROPOSED DEVELOPMENT	4
3	PRE-DEVELOPMENT ENVIRONMENT	5
3.1	EXISTING LAND USE	5
3.2	CLIMATE	5
3.3	TOPOGRAPHY	6
3.4	GEOLOGY AND SOILS	6
3.5	SURFACE WATER HYDROLOGY	7
3.6	HYDROGEOLOGY AND GROUNDWATER	8
3.7	WETLANDS	9
4	WASTE MANAGEMENT STRATEGY	10
4.1	MANURE	10
4.2	CARCASSES	10
4.1	EFFLUENT RUNOFF	10
4.1	POND SLUDGE	10
5	EFFLUENT MANAGEMENT STRATEGY	11
5.1	DRAINS	12
5.2	SEDIMENTATION POND	12
5.3	EVAPORATION POND	13
5.4	POND AND LINING	15
6	IMPLEMENTATION ACTIONS	16
6.1	PERFORMANCE INDICATORS	16
6.2	MONITORING PROGRAM	16
6.3	CONTINGENCY PLAN	18
7	REFERENCES	19

LIST OF TABLES

Table 1: Relevant Procedures and Guidelines
Table 2: Permeability Results
Table 3: Drain Sizing
Table 4: Sedimentation Pond Sizing
Table 5: Water Balance for Evaporation Pond Sizing

LIST OF FIGURES

Figure 1: Location Plan
Figure 2: Sheep Feedlot Concept Plan
Figure 3: Topography
Figure 4: Pre-development Hydrology and Hydrogeology
Figure 5: Effluent Management Plan

LIST OF APPENDICIES

Appendix A – Geotechnical Investigation (Great Southern Geotechnics, 2019)
Appendix B – Production Bore Certificate of Analysis (West Coast Analytical Services, 2019)

1 Introduction

1.1 Background

This Water Management Plan (WMP) has been prepared by Bio Diverse Solutions on behalf of Fletcher International Exports Pty Ltd ‘the Client’ in support of a Development Application for a 90,000 head of sheep feedlot at Ronneby Park, located near Beaufort River, Western Australia.

The WMP provides the framework for the application of total water cycle management to the proposed development and is consistent with all relevant guidelines, policies and legislations.

1.2 Location

Ronneby Park is located approximately 32kms north of Kojonup WA in the Shire of Woodanilling, accessible from Kojonup via Albany Hwy to the north (26kms) and west along Youngs Road (6kms) as shown on Figure 1. The Subject Site is surrounded by agricultural farm land.

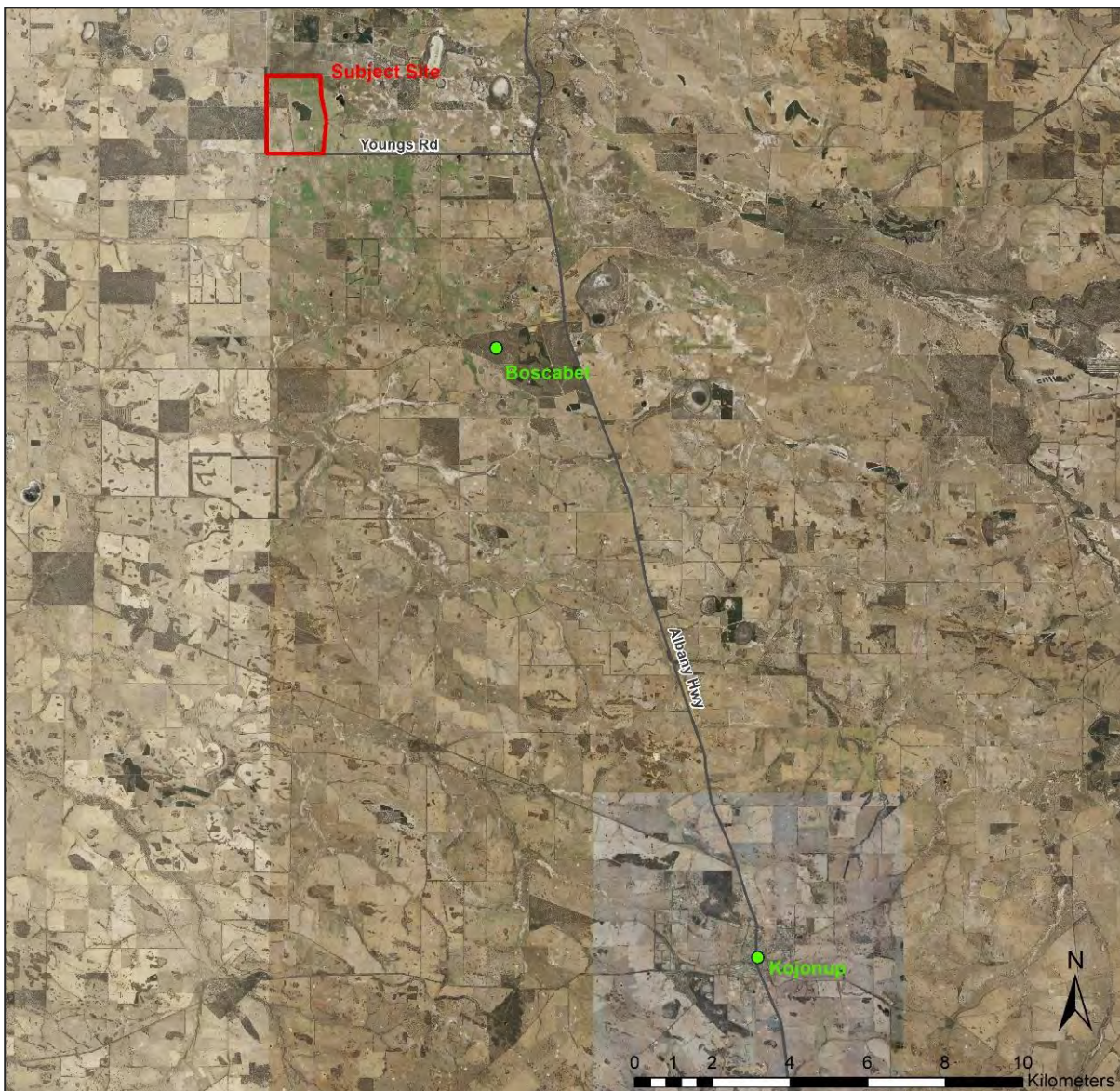


Figure 1: Location Plan

1.3 Key Design Principles and Objectives

The WMP employs the following key documents to define its content, key principles and objectives:

- National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems (MLA, 2011);
- Western Australian Guidelines for Biosolids Management (DEC, 2012); and
- Water quality protection note 33 – Nutrient and irrigation management plans (DWER, 2010).

1.3.1 National Procedures and Guidelines for Intensive Sheep and Lambing Systems (MLA, 2011)

Meat and Livestock Australia (MLA) released a *National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems* in 2011. The document was released to provide a guideline for best planning and management practices in relation to the development of a sheep feedlot. The document recommends procedures and guidelines for environmental protection and best management. Key procedures and guidelines identified in the document relevant to this WMP are shown in Table 1.

Table 1: Relevant Procedures and Guidelines

Category	Recommended Procedure/Guideline
Environmental Protection	<ul style="list-style-type: none"> • Intensive feeding systems be sited, constructed and operated so that underground and surface water resources do not become contaminated. • Where the site is to be located above groundwater resources at risk of infiltration/contamination an expert independent assessment should be conducted prior to establishment. • Groundwater management strategies should include infiltration reduction around the intensive feeding area and manure stockpiles. • Groundwater quality should be monitored on a regular basis. Monitoring frequency should be included in the intensive feeding system's environmental management plan. • Surface water management strategies should include management of; feeding area and manure stockpile runoff, effluent, contaminated sub-surface flow, and discharge of contaminated groundwater.
Site Selection	<ul style="list-style-type: none"> • The site has access to an adequate supply of suitable quality water to service the needs of all livestock on site and for dust and fire control. • The site not be developed in flood prone areas unless safeguards are incorporated. • Soil types at the site be suitable for or modified to suit water, manure and stock management. • A buffer zone be maintained between intensive feeding systems and watercourses.
Design and Construction	<ul style="list-style-type: none"> • Spillage and waste water drains directly into a drainage system. • A drainage system minimises the risk of groundwater and surface water contamination, and promotes the rapid drying of the pen surface after a rainfall event. This drainage system includes where appropriate: <ul style="list-style-type: none"> ➢ Diversion banks or drains upslope of outdoor feeding pens to divert external freshwater away from the complex. ➢ Drains within the controlled drainage area to convey runoff to the treatment and storage systems. ➢ Solids separation by gravity settling where the runoff is retained for sufficient time on a pond, terrace, or basin to allow the majority of the entrained solids to settle out by gravity. ➢ Holding or storage ponds of sufficient size to contain major storm events and/or extended periods of storage. • Where composting areas exist, all runoff from this area be controlled and managed.

1.4 Report Author

This Water Management Plan has been prepared by Chiquita Cramer, who has over 10 years of experience working as a hydrologist and hydrogeologist.

Chiquita Cramer has the following tertiary qualifications:

- Bachelor of Science in Natural Resource Management (University of Western Australia); and
- Graduate Certificate in Hydrogeology (University of Western Australia).

Chiquita completed a Bachelor of Science in Natural Resource Management in 2008 at the University of Western Australia. She then went on to work as a hydrologist and senior hydrologist at JDA Consultant Hydrologists in Perth where she worked for 8 years. Chiquita's experience includes preparation of multiple local and urban water management strategies, hydrological and hydraulic investigations, surface water and groundwater monitoring reports and hydrogeological reports. Tasks undertaken by Chiquita as part of her time at JDA and include project management, report writing, mapping using GIS software, field work including installation and monitoring of groundwater bores, modelling of stormwater and groundwater using various software programs and liaising with clients, sub-consultants and approving agencies.

Chiquita furthered her studies in 2012 by completing a Graduate Certificate in Hydrogeology and in 2017 she joined Bio Diverse Solutions to provide expertise in hydrology and hydrogeology to the company. Since joining Bio Diverse Solutions Chiquita has worked on several hydrological investigations and water management plans for a variety of developments.

This report has also been peer reviewed by Craig Pippin Director and Principal Engineer of Pippin Civil Engineering Pty Ltd.

Craig completed a Bachelor of Engineering (Civil) at Curtin University, a Diploma in Business (Frontline Management) and has studied project management through the education arm of Engineers Australia.

With over 23 years' experience in Civil Engineering, Craig has a thorough knowledge of the land development industry and its civil engineering requirements. During this extensive experience Craig has been involved with the complete range of civil infrastructure projects from minor servicing works to major master planned residential estates, taking projects from feasibility, through design to implementation, supervision and contract administration. Craig possesses an extensive knowledge of water and sewerage infrastructure reticulation, road design, stormwater drainage, local government requirements and the development process within Western Australia enabling clear, concise and practical solutions for any civil engineering project. With an extensive knowledge base in stormwater management and the implementation of Water Sensitive Urban Design (WSUD) Craig has undertaken numerous, Local Water Management Strategies, Urban Water Management Plans and Stormwater Strategies for residential, commercial and industrial developments. Craig has previously been involved as the Principal Engineer for several major residential estates within the South West of Western Australia and has extensive experience in the development of large-scale retirement/lifestyle village and strata developments.

2 Proposed Development

It is proposed the sheep feedlot be developed on a 108ha portion of Ronneby Park farm herein referred to as the Subject Site. The development will consist of;

- Approximately 130 sheep pens (50m long by 25m wide) designed to hold up to 600 head of sheep each;
- A biosolid stockpile area for sheep manure;
- A separate biosolid stockpile area for carcass management;
- Sedimentation and evaporation ponds for capture and treatment of effluent runoff;
- A sheep processing area for drop off/pick up, this will include a weighbridge/sampling stand and office/lunchroom/toilet facilities; and
- An area for feedlot facilities/operations which will include; truck turnaround areas, grain and silage bunkers and feedlot machinery and equipment.

A conceptual site plan of the proposed feedlot is shown on Figure 2.

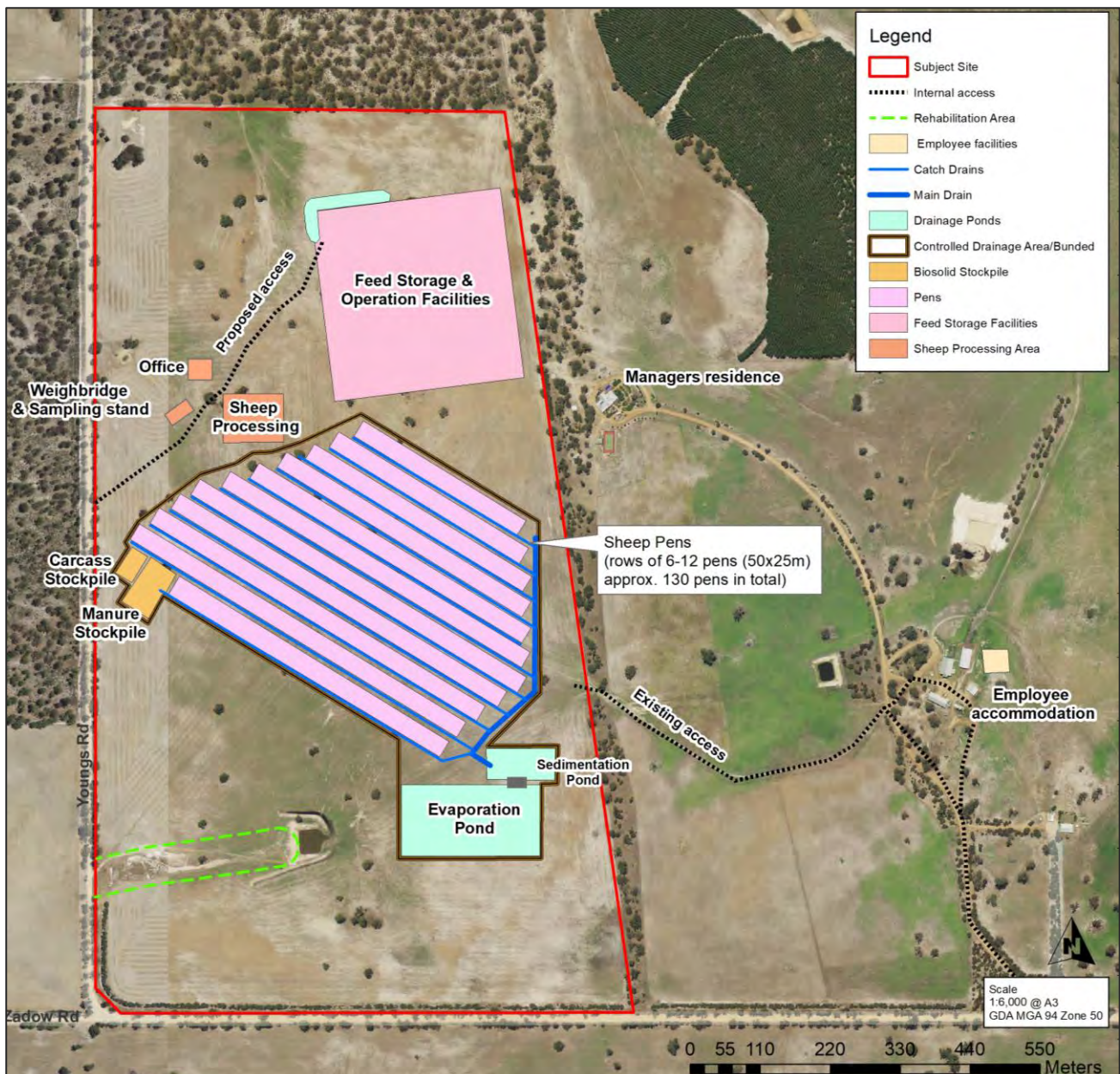


Figure 2: Sheep Feedlot Concept Plan

3 Pre-development Environment

3.1 Existing Land Use

The Subject Site consists of cleared agricultural land, the proposed development area is completely cleared except for a few scattered trees and there is one farm dam located towards the south of the Subject Site. Directly east of the development site, approximately 700m from the proposed feedlot, is agricultural sheds and sheep yards and to the north-west of that is a residential dwelling (approximately 300m from the proposed sheep pens and 120m from the proposed feed storage bunkers). The Subject Site is currently being used for livestock and has been used for cereal cropping in the past.



Photograph 1: View to the west across cleared Subject Site.



Photograph 2: View of dam at low point of Subject Site.



Photograph 3: View to the north across cleared Subject Site.



Photograph 4: View to the west in northern corner of the site.

3.2 Climate

The Subject Site is characterised by a Mediterranean climate with warm dry summers and cool wet winters. Rainfall data is observed from nearby Bureau of Meteorology (BoM) Boscabel site (Site No. 10520).

The long-term average annual rainfall is 521mm (1916 to 2019). This average has decreased between 2000 and present, to an average annual rainfall of 460mm, reflecting a 13% reduction compared to the long-term average, consistent with a general drying trend in the South West of WA.

The total rainfall distribution has also altered, with a reduction of average winter monthly rainfall, but no significant reduction in average summer monthly rainfall.

The average annual pan evaporation for the Subject Site area is approximately 1826mm (Luke et al, 1988).

3.3 Topography

A feature survey for the Subject Site was conducted by Caldwell Land Surveys (2019), topographic contours from the survey are shown on Figure 3. The Subject Site topography is undulating with a high point of 282.5mAH in the north east of the site and a low point of 257.5mAH in the north western corner of the site. There is also a valley that runs from east to west in the southern portion of the site that has a low point of 261mAH. The Subject Site topography will be altered as part of the proposed development to ensure adequate drainage of the sheep pens and associated facilities.

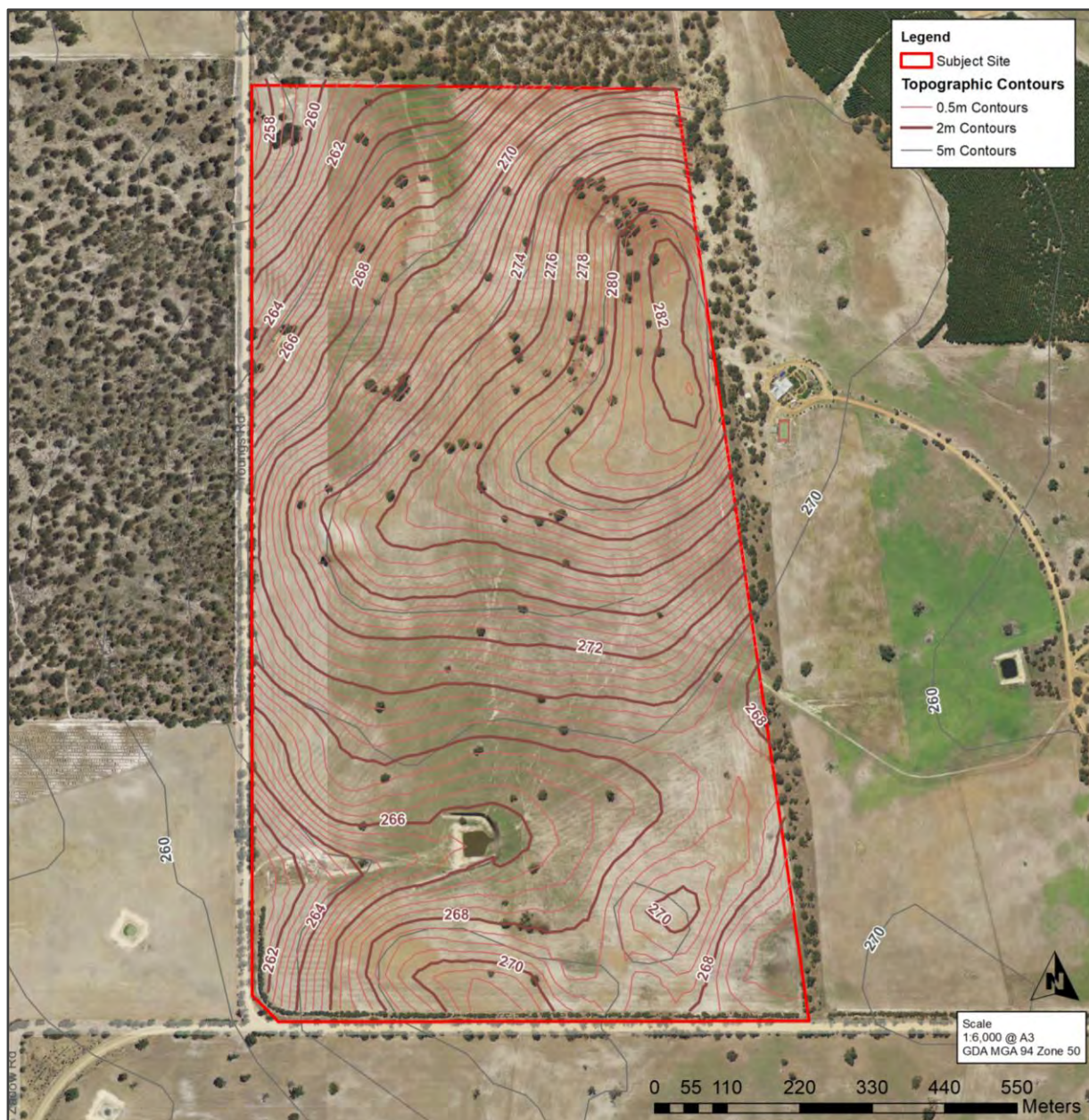


Figure 3: Topography

3.4 Geology and Soils

NRInfo (Department of Industries and Regional Development, 2019) classifies the soils within the Subject Site as the 'Boscabel System' characterised by; '*Gently undulating rises and narrow valley floors, in the south of the Eastern Darling Range. Sandy gravel mainly pale coloured, grey deep sandy duplex and pale deep sand. Wandoo-marri-jarrah woodland.*' And within the 'Boscabel 1 Subsystem' characterised by '*Sandy gravels, usually pale coloured, on broad hill crests and upper slopes, small swamps and lunettes scattered on this unit.*'

Soil testing was conducted at the Subject Site on the 29th – 31st July 2019 by Great Southern Geotechnics (GSG), the Geotechnical Investigation (GSG, 2019) has been included as Appendix A. The Geotechnical Investigation was conducted to assess the suitability of the site for the proposed development. Soil testing included soil analysis, photographic recording, logging of soil types, measuring of water table and laboratory analysis of permeability and Phosphorus Retention Index (PRI). In total 36 test pits were excavated and assessed within the Subject Site, 33 of the test pits were excavated to a depth of 2m and 3 test pits were excavated deeper (4-6m).

In summary the geotechnical investigation showed that soils across the proposed development area predominantly consisted of a shallow top soil layer of sand with silt (to approximately 100mm depth), over a sandy gravel layer, over a clayey gravel layer, over a sandy clay layer. Depths of layers varied depending on the location of the test pit within the landscape. Generally, the top of the sandy clay layer was between 600 and 1000mm depth. Lithological logs of the test pits are shown in Appendix A.

Permeability

Permeability testing was conducted on the sandy clays found at the Subject Site by Liquid Labs WA as part of the Geotechnical Investigation (Appendix A). Permeability results on the sandy clays are shown in Table 2, a map showing the location of the Test pits tested is shown in Appendix A.

Table 2: Permeability Results

Test Pit	TP1	TP9	TP13	TP22	TP24	TP25	TP26
Depth of clay layer (mm)	1600-2000	850-2000	1300-2000	1600-2000	2500-5200	500-2000	1500-5200
Coefficient of Permeability (m/s)	1.43×10^{-9}	1.14×10^{-10}	1.68×10^{-9}	2.83×10^{-9}	2.88×10^{-10}	5.32×10^{-10}	4.34×10^{-9}

Permeability results showed that the sandy clays found at the Subject Site had very low permeability (practically impermeable) and therefore are considered suitable for the operations of a sheep feedlot and the prevention of groundwater contamination.

3.5 Surface Water Hydrology

Surface water generally runs off the Subject Site towards a low point in the north west corner and a depression that runs from east to west in the southern portion of the Subject Site. There is a manmade dam within the depression, which appears to be surface water fed with some potential groundwater intrusion. Once the dam is full it overflows to the west where there is evidence of seasonal surface water flow. The proposed feedlot development is located over 100m from the depression area, in addition this area will be rehabilitated as part of development works. Rehabilitation will include native revegetation to 30 meters either side of the depression.

More broadly the Subject Site drains to the west and north west and is within the Hardy Estuary and Blackwood River Catchment.

The pre-development surface water hydrology of the site and surrounding areas is shown on Figure 4. The surface water hydrology outside of the Subject Site will be maintained post-development.

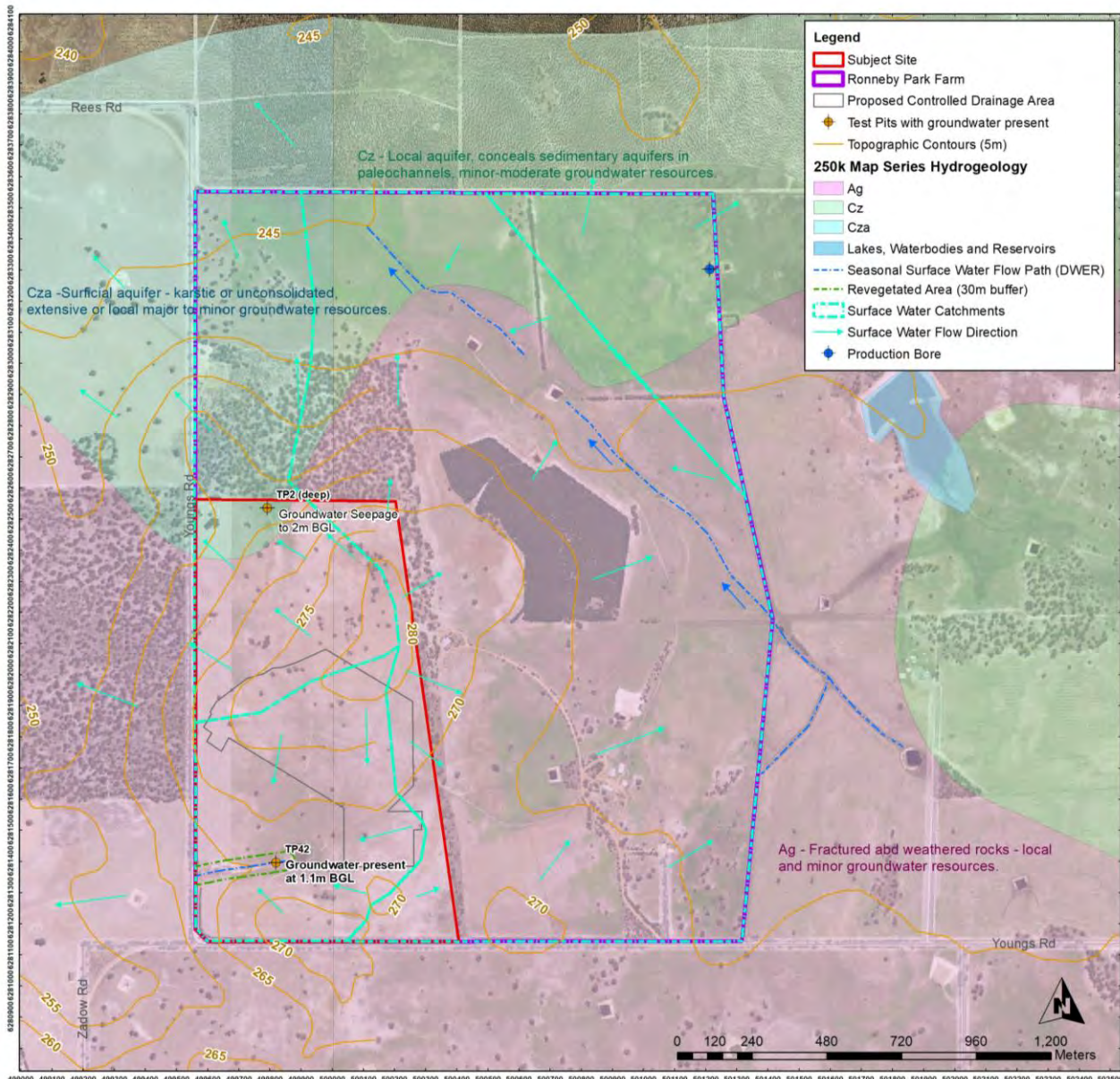


Figure 4: Pre-development Hydrology and Hydrogeology

3.6 Hydrogeology and Groundwater

Australian Geoscience Mapping and Department of Water and Environmental Regulation 250K Hydrogeological mapping (DWER, 2019) places the Subject Site within the 'Archaen Period (Ag)' with the geology described as; '*Granitoid rock, porphyritic and even-grained; subsurface generally weathered to clayey sand (indicated by lighter colour)*'. The aquifer is described as; '*Fractured and weathered rocks - local aquifer, minor groundwater resources.*' DWER 250K Hydrogeological mapping is shown on Figure 4.

DWER 250K Hydrogeological mapping is consistent with findings by Great Southern Geotechnics with groundwater encountered at only 2 test pits (TP2 and TP42). Groundwater at TP2 appeared to be the result of a perched water table with the less permeable sandy clay layer below the sandy gravel layer being dry and the test pit filling up from seepage through the more permeable sandy gravel layers above. TP42 consisted of a deeper sand layer (150-1000mm depth) compared with the other test pits within the Subject Site. The water table was found to be 1100mm BGL 24 hours after excavation (GSG, 2019). The test pits surrounding TP42 were found to be dry to a depth of up to 6m (TP24) indicating the groundwater at TP42 is likely the result of a localised perched water table within the highly permeable sand layer. The location of the two test pits with ground water present are shown on Figure 4.

There is one existing production bore located within Ronneby Park to the north east of the Subject Site (Figure 4). DWER 250K Hydrogeological mapping places the bore in the '*Cainozoic – Phanerozoic Period*' with the aquifer described as; '*Surficial aquifer - local aquifer, conceals sedimentary aquifers in paleochannels, minor-moderate groundwater resources*'. The groundwater in the production bore was found to be suitable for sheep feedlot operations, the water quality analysis of the bore water is included as Appendix B.

The Subject Site is not located within a Public Drinking Water Source Protection Area (DWER, 2019).

3.7 Wetlands

A desktop analysis of Department of Parks and Wildlife (DBCWA) Geomorphic Wetlands dataset (2019) found there are no known significant wetlands within the Subject Site or within a 5 kilometre radius of the Subject Site.

4 Waste Management Strategy

Management of waste in the form of manure, carcasses, effluent runoff and sludge from ponds is necessary to prevent contamination of downstream waterways/waterbodies, the environment and minimise injury/disease and allow sheep to stand and walk comfortably. Further information on the proposed waste management strategies and operational procedures at the feedlot is presented in the Operational Environmental Management Plan (BDS, 2019).

4.1 Manure

Manure will be collected from the feedlot pens on a regular basis and stockpiled in biosolids storage area(s). The interval between manure collection and stockpiling will vary depending on sheep numbers at any one time. There may be multiple manure stockpiles to avoid transporting times during collection, with all manure stockpiles located within the controlled drainage area. The stockpile(s) of manure will be removed off site on a regular basis by a licenced and approved third party operator.

4.2 Carcasses

The carcasses will be removed from the pens as soon as possible upon inspection and stockpiled in a separate biosolids stockpile where they will be composted with layers of manure to accelerate break down of organic matter and reduce odour. Once the carcass biosolids stockpile has reached capacity, it will be removed off site by a licenced and approved third party operator.

4.1 Effluent Runoff

The sheep pens, biosolids storage areas and the sheep processing area are contained via bunding within a controlled drainage area (CDA). The CDA ensures all effluent runoff from the feedlot complex as a result of rainfall is contained and directed via drains to a sedimentation pond. The sedimentation pond is designed to detain the runoff allowing the organic matter to settle out and the water to be evaporated. If the sedimentation pond reaches capacity it will overflow and be retained by a larger evaporating pond (Refer to Section 5 for further detail).

4.1 Pond Sludge

Once the effluent runoff reaches the sedimentation pond the organic matter within the effluent settles out and forms a sludge layer at the base of the pond. This sludge will be removed once its volume has reached approximately 10% of the pond's capacity or if a strong odour is detected from the pond. The sludge will be removed via excavator and stockpiled in the manure stockpile area. The sludge (and manure) will be transported off site by a licenced and third-party operator once stockpile(s) have reached capacity.

It is probable the sedimentation pond only requires desludging every few years (Refer to Section 5 and 6 for further detail).

It is not expected the evaporation pond will receive effluent runoff often/if ever however sludge removal here will occur in a similar manner to the sedimentation pond (Refer to Section 5 and 6 for further detail).

.

5 Effluent Management Strategy

The effluent management system for the proposed feedlot has been designed in accordance with the National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems (MLA, 2011). The key components of the drainage system for this development are;

- Earthworks will be undertaken to ensure the sheep pens, biosolids stockpile areas and sheep processing area drain towards one allocated low point (pond location).
- Diversion banks/bunds constructed around the sheep feedlot complex to capture all effluent runoff from the Controlled Drainage Area (CDA) and divert external freshwater upslope of the complex away from the CDA.
- Drains will be designed to capture runoff from the feedlot pens and all other surfaces within the sheep feedlot complex, ultimately conveying the runoff to the sedimentation pond. The drains are designed to convey flow rates from the 20yr ARI design storm event and will carry this flow at a non-scouring velocity.
- A sedimentation pond designed to capture and detain the peak flow from a 20yr ARI design storm event, overflowing to the evaporation pond at the 20yr ARI top water level via a broad low point in the bund which will be designed with large rock/ballast to trap sediment and allow water to pass.
- An evaporation pond designed to capture and retain effluent when/if capacity of the sedimentation system is exceeded. The evaporation pond is designed to hold and evaporate the runoff from a 90th percentile wet year.
- The sedimentation pond and evaporation pond will be underlain with a 300mm compacted clay lining which will have a permeability of $< 1 \times 10^{-9}$ m/day to minimise seepage to the groundwater.

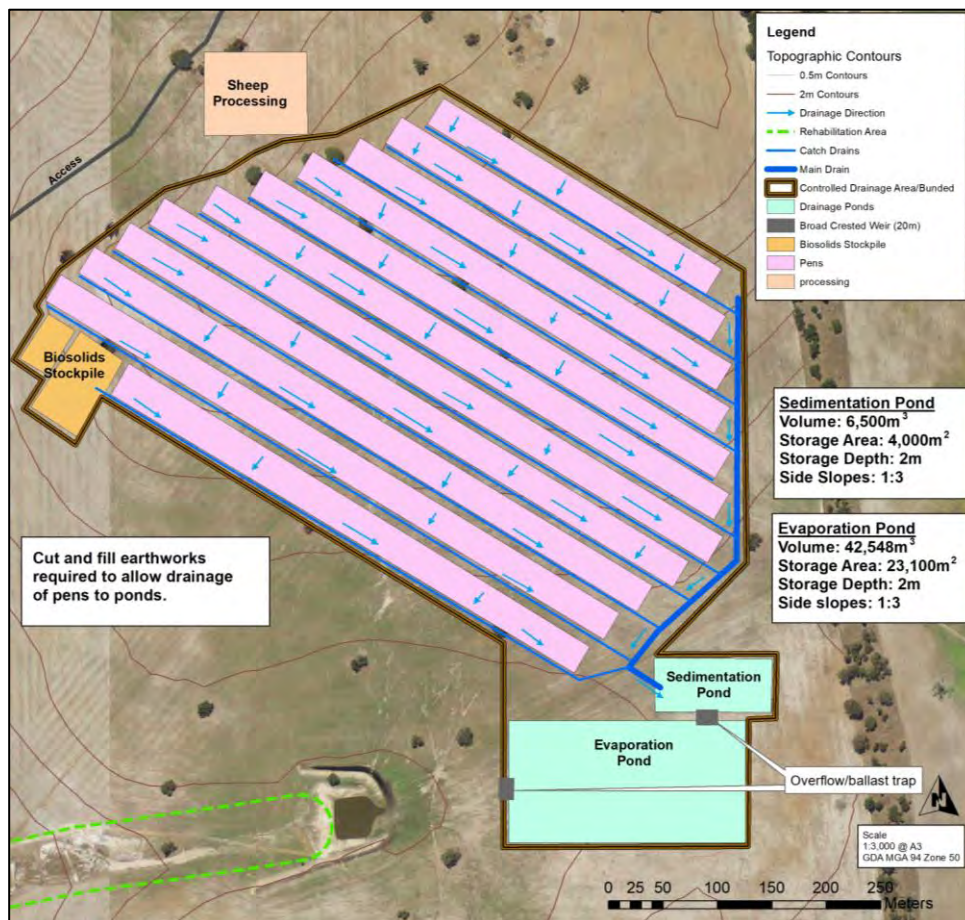


Figure 5: Effluent Management Plan

5.1 Drains

Catch drains are located between and to the downslope of each row of feedlot pens and designed to capture runoff from the pens and all other surfaces within the CDA, and ultimately convey that runoff via a main drain to the sedimentation pond. The drains are designed to ensure that pens drain quickly after rainfall, but that runoff is not so rapid that it scours excessive amounts of manure from the pen surface. The downslope gradient in feedlot pens will be approximately 2% consistent with the national guidelines (MLA, 2011). A conceptual plan of the catch and main drains are shown on Figure 5.

5.1.1 Drain Sizing

Drains are designed to carry the peak flow rates resulting from a design storm event with an ARI of 20 years. The design storm event for the CDA is the 30 min 20yr ARI storm event resulting in a peak flow rate of 2.71m³/s (Refer to Section 5.2.1).

The catch and main drains have been designed with a v-shaped cross-section. The manning's formula has been used to estimate the approximate size of the drains required to convey the peak 20yr ARI storm event. The approximate size of the catch and main drains required is shown in Table 3.

Table 3: Drain Sizing

	Drain side slope	Peak Flow (m ³ /s)	Drain Width (m)	Flow Depth (m)	Drain Depth (m)
Catch Drains	1:3	0.18	2.1	0.20	0.35
Main Drain	1:3	2.71	4.3	0.57	0.72

It is noted the sizing of the drains (Table 3) is based on the point in the drain with the highest flow (downstream end), drain sections further upstream may be constructed according to the incoming flow at that point. It is also assumed all feedlot drains and embankments will have a crest height, following postconstruction consolidation, at least 0.15 m above the design flow depth in a 20-year ARI design storm.

5.2 Sedimentation Pond

The objective of the sedimentation (or settling) process is to remove a large proportion of the solids from the effluent runoff generated from the majority of rainfall events which is expected to have a high organic matter content. The sedimentation process is achieved via gravity settling; where runoff is retained for sufficient time to allow the majority of the entrained solids to settle out.

Capturing the organic matter in the sedimentation system prior to entering the larger evaporation pond helps reduce odour emissions and reducing the rate of sludge deposition increases the interval between the de-sludging operations required to maintain the design storage volume in the evaporation pond.

5.2.1 Sedimentation Pond Sizing

The sedimentation pond for the CDA has been sized using the methods outlined in the National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems (MLA, 2011). This method uses the following formula;

$$V = Q_p \times (l/w) \times (z/v)$$

Where:

V = Sedimentation system volume (m³);

Q_p = Peak inflow from a design storm having a peak average recurrence interval (ARI) of 20yrs (m³/s);

l/w = Length to width ratio, where l is along the direction of flow;

z = A scaling factor, 6 for this site as it is using ponds (MLA,2011);

v = Flow velocity (m/s), maximum = 0.005 m/s (MLA, 2011).

The time of concentration (t_c) was calculated using the Bransby Williams method and used to determine the peak 20yr ARI design storm event. The peak inflow from the design storm event was calculated using the rational method;

$$Q_p = ciA$$

Where:

Q_p = Peak inflow from a design storm having a peak ARI of 20yrs (m^3/s);

c = Runoff coefficient (0.8 for this site consistent with Feedlot Guidelines (MLA, 2011));

i = Rainfall intensity of design storm (49.2mm/hr used based on a 30min 20yr ARI storm event (BOM, 2019)); and

A = Drainage Area (248,200 m^2).

A summary of the calculation is provided in Table 4 and a plan showing the sedimentation pond and its storage capacity is shown on Figure 5.

Table 4: Sedimentation Pond Sizing

t_c	Q_p (m^3/s)	l/w	V (m^3)
29 mins	2.71	2	6,500

Flow from the sedimentation pond to the evaporation pond is regulated by a control weir (broad crested weir) set at the peak 20yr ARI top water level. A minimum freeboard of 0.9 m is provided between the weir crest and the crest of the sedimentation pond embankment. The control weir will be 20m wide and is capable of discharging the peak flow from a 50-year ARI design storm without the system embankment overtopping. The depth of flow over the weir during a 30 min 50yr ARI storm event (3.46 m^3/s peak flow) was calculated to be less than 0.2m.

5.3 Evaporation Pond

The sedimentation system is designed in accordance with the sheep feedlot guidelines (MLA, 2011) to capture the majority of the organic matter from effluent runoff generated from the majority of rainfall events, however in wet years when the sedimentation system is at capacity the evaporation pond provides additional storage and evaporation capacity. The overflow from the sedimentation pond is still likely to contain substantial levels of organic matter and by capturing the runoff in the evaporation pond allows the microbial degradation of much of the organic matter that remains after the sedimentation system. Due to the substantial 'slug' loads these periodic inflows provide, this biological degradation is almost entirely anaerobic.

5.3.1 Evaporation Pond Sizing

The evaporation pond is designed to hold runoff from a 90th percentile wet year consistent with the National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems (MLA, 2011). A water balance using the precipitation from a 90th percentile wet year was adopted to calculate the volume requirement for the evaporation pond.

Rainfall data used in the water balance is from nearby BoM Boscabel site (Site No. 10520). The mean monthly rainfall data and the 90th percentile monthly rainfall data from the Boscabel site is shown in Table 5. Boscabel

average rainfall data is based on readings from 1916 to 2019, which is conservative for volume requirements as it does not allow for drying climate and reduced rainfall in more recent years.

As the total rainfall of individual 90th percentile months (939mm) is much larger than the actual annual 90th percentile rainfall total (640mm) (the chances of recording 12 consecutive 90th percentile months are low) monthly 90th percentile totals are adjusted so that;

$$MR_{adj} = (YR^{90} / \sum MR^{90}) \times MR^{90}$$

This method smooths the monthly rainfall to better reflect the seasonal patterns than does just using the 90th percentile 'wet year'.

Evaporation data used in the water balance is from BoM Kojonup site (Site No. 10582). This is the nearest available evaporation data. The monthly average evaporation (E_{pan}) for the site is shown in Table 5.

The water balance has been determined using the following equation;

$$\text{Change in storage volume} = V_{runoff} + (V_{precipitation} - V_{evaporation})$$

Where;

$$V_{runoff} = MR^{90}_{adj} \times A_{catchment} \times C_x \text{ (m}^3\text{);}$$

$$V_{precipitation} = MR^{90}_{adj} \times A_{pond} \text{ (m}^3\text{);}$$

$$V_{evaporation} = ER \times A_{water \text{ surface}} \text{ (m}^3\text{);}$$

C_x = runoff coefficient (0.4 used consistent with national guidelines (MLA, 2011);

$A_{catchment}$ = Controlled drainage area (248,200m²);

A_{pond} = pond area to centreline of embankment (m²);

$A_{water \text{ surface}}$ = surface area from which evaporation occurs (m²).

The storage capacity of the sedimentation pond has been subtracted from the storage volume required to determine the storage requirement of the evaporation pond. The water balance and total evaporation pond volume required is shown in Table 5.

Table 5: Water balance for evaporation pond sizing

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual /Total
Mean Rainfall (mm)	17	13	24	31	64	88	85	72	52	36	22	15	521
90 th %ile Monthly Rainfall (mm)	45	36	71	64	113	145	131	107	83	62	46	38	939
Adjusted 90 th %ile Monthly Rainfall (mm)	31	25	48	43	77	98	89	73	57	42	31	26	640
Mean Monthly Evaporation (E_{pan}) (mm)	239	190	164	93	59	42	43	56	75	112	156	223	1,452
Volume of Effluent Runoff (m ³)	2974	2385	4710	4207	7479	9573	8658	7095	5492	4081	3047	2524	62,228
Pond Surface Flux (precip - evap) (m ³)	-5832	-4648	-3184	-1322	663	1795	1470	631	-412	-1888	-3467	-5533	-
Change in Storage Volume (m ³)	-2857	-2263	1526	2885	8143	11367	10128	7727	5080	2193	-420	-3009	-
Storage Volume Required (m ³)	0	0	1526	2885	8143	11367	10128	7727	5080	2193	0	0	49,048
Storage Required (minus Sedimentation Storage (m ³))	-	-	-	-	-	-	-	-	-	-	-	-	42,548

A seepage factor was not used in the water balance, in general, most studies show that whilst there is some initial leakage of ponds, over time it is reduced significantly as a result of sealing due to physical, chemical and biological processes within the pond. The sealing of a pond floor is aided by clogging by microbes and particulate matter and the formation of a sludge blanket.

The evaporation pond spillway is designed in accordance with the Sheep Feedlot Guidelines (MLA, 2011) to discharge a 1 in 50yr ARI design storm event. The spillway from the evaporation pond is a 20m wide broad crested weir, the depth of flow during a 30 min 50yr ARI storm event (3.46m³/s flow rate) is less than 0.2m. A

minimum freeboard of 0.9 m is provided between the weir crest and the crest of the evaporation pond embankment.

5.4 Pond and lining

To minimise the risk of groundwater pollution, the sedimentation pond and evaporation pond will be lined with at least 300mm of low-permeability clay able to provide a design permeability of $<1 \times 10^{-9}$ m/s (~ 0.1 mm/d).

The clay will be sourced on site, Section 3.4 shows the permeability results of the clay found at the Subject Site. The sandy clay at 3 of the test pits analysed had a permeability of $<1 \times 10^{-9}$ m/s (~ 0.1 mm/d).

6 Implementation Actions

6.1 Performance Indicators

6.1.1 Drainage System

Satisfactory performance in drains occurs when:

- Drains have sufficient capacity so that they do not overtop in 'normal' circumstances.
- Feedlot catch drain and main drain performance is not impeded by excessive sedimentation or tall vegetation.
- significant scouring of drains does not occur (within design limits).

6.1.2 Sedimentation System

The following indicate satisfactory performance in the sedimentation system:

- Requires desludging only every few years (assuming desludging occurs when sludge takes up a maximum 10% of the design capacity of the pond).
- Spill frequency does not exceed a peak 1 in 20yr ARI storm event.
- Local groundwater quality should not be affected by seepage from the evaporation pond.
- No catastrophic failure of pond embankments.

6.1.3 Evaporation Pond

The following indicate satisfactory performance of the evaporation pond:

- Spill frequency does not exceed an average of one in 10 years.
- Biological activity in the ponds should provide for:
 - rapid stabilisation of the pond contents following a significant inflow
 - odour emissions remaining within acceptable limits.
- Local groundwater quality should not be affected by seepage from the evaporation pond.
- No catastrophic failure of pond embankments.
- It is anticipated the evaporation pond will very rarely if ever receive effluent from the sedimentation pond spillway.

6.2 Monitoring Program

The monitoring program has been designed to allow a quantitative assessment of hydrological impacts of the proposed development.

6.2.1 Drainage System

- Visual monitoring of sediment depth and vegetation height if growing.
- Visual monitoring of scouring and damage during cleaning operations.
- Quarterly inspections of embankments, with particular note of any potential structural problems (e.g. cracking or slumping of banks and batters) that might affect the integrity of the structure – noting the date of inspections and any significant outcomes of that inspection. One of the inspections will occur prior to winter rains.
- Records to be kept of the date of cleaning operations and of any repairs and maintenance.

6.2.1 Sedimentation System

- Visual monitoring of sludge depth in sedimentation pond following rainfall events to determine the depth of deposited material and the rapidity with which it dries.
- Visual monitoring of damage to, and condition of, the lining material during cleaning operations.
- Quarterly inspection of sedimentation system embankments with particular note of any potential structural problems (e.g. cracking or slumping) that might affect the integrity of the structure—noting the date of inspections and any significant outcomes of that inspection. One of the inspections will occur prior to winter rains.
- Records to be kept of dates of cleaning operations and of any repairs and maintenance.

6.2.2 Evaporation Pond

- Record and report any pond spills (including details of antecedent weather conditions, and any relevant management actions).
- Sample and analyse surface water from pond spillway where/if spillway overflows and enters the adjacent dam. Water quality parameters measured will be as per Groundwater Monitoring (Section 6.2.3).
- Record any desludging, cleaning and maintenance operations.
- Quarterly inspections of embankments, with particular note of any potential structural problems (e.g. cracking or slumping of banks and batters) that might affect the integrity of the structure – noting the date of inspections and any significant outcomes of that inspection). One of the inspections will occur prior to winter rains.

6.2.3 Groundwater Monitoring

- Quarterly monitoring of one groundwater monitoring bore downstream of the CDA and ponds is proposed. Groundwater was discovered at one test pit location downstream of the CDA during the Geotechnical Investigation (TP42) as shown on Figure 4. It is proposed the groundwater monitoring bore be located near TP42 within the localised perched water table. The groundwater table was not encountered up to 6m depth within the CDA and the proposed location of the ponds and therefore additional groundwater monitoring in this area is deemed unnecessary.
- Water quality parameters that will be measured as part of the monitoring program include;
 - pH
 - Electrical Conductivity/ Total Dissolved Solids
 - Total Phosphorus
 - Total Nitrogen
 - Total Kjeldahl Nitrogen
 - Ammonium
 - Nitrate and Nitrite
- It is recommended that at least one round of pre-development monitoring be conducted to establish baseline data and trigger values.

6.2.4 Climate Monitoring

A weather station will be installed within the facility. The weather station will monitor rainfall and wind speed and direction. The rainfall will be correlated to pond levels to ensure the capacity of the sedimentation and

evaporation pond is as designed (sedimentation pond designed to hold and a 20yr ARI design storm event and evaporation pond designed to hold a 90th percentile rainfall year).

6.3 Contingency Plan

Contingency Plans are developed to outline remedial action or a change if any operational problems or adverse environmental effects are detected.

The key risks of the effluent management strategy are;

- Overtopping or scouring out of drains, sedimentation ponds and evaporation ponds more frequently than design intension.
- Contamination of groundwater and/or adjacent surface waterways/bodies.

If overtopping or scouring of bunds/banks of the drains and ponds occurs more frequently than its design capacity the following contingency measures will be implemented:

- The design capacity of the drains and ponds will be reviewed and altered if required;
- An assessment of the structural integrity of the structure in question will be conducted, altering the structure accordingly.
- A review of the inspection/monitoring program, increasing inspections and remediating actions accordingly.

Trigger values for groundwater and surface water quality parameters will be determined by baseline (pre-development) monitoring and using the applicable guidelines. During assessment of quarterly groundwater quality readings and readings from any overflow from the evaporation pond spillway, if it appears that the trigger values are exceeded the following contingency measures will be implemented:

- The design capacity of the drains and ponds will be reviewed and altered if required;
- An assessment of the pond lining will be conducted to ensure it is functioning as intended;
- A review of the operating strategies with particular focus on waste management and removal will be conducted, with remediating actions put in place immediately.

The appropriate government authority will be notified if a significant non-conformance against any of the licence conditions or operating strategy commitments occurs. They will be notified as soon as the non-compliance has been made aware.

7 References

- Bureau of Meteorology (2013) *Climate Data Online*. <http://www.bom.gov.au/climate/data/>.
- Caldwell Land Surveys (2019) *Feature Survey- 670 Youngs Road, Beaufort River*. Survey prepared for the client.
- Engineers Australia (2001) *Australian Rainfall Runoff (ARR) A Guide to Flood Estimation*.
- Department of Environment and Conservation (2012) *Western Australian Guidelines for Biosolids Management*.
- Department of Industries and Regional Development (2019) *NRInfo soil mapping dataset*.
- Department of Parks and Wildlife (2019) *Geomorphic Wetlands Dataset*
- Department of Water & Environmental Regulation (2019) *Public Drinking Water Source Areas (PDWSA) Mapping dataset*.
- Department of Water & Environmental Regulation (2010) Water quality protection note 33 – Nutrient and irrigation management plans.*
- Department of Water & Environmental Regulation (2019) *250K Hydrogeological mapping dataset*.
- Great Southern Geotechnics (2019) *Geotechnical Investigation – 670 Youngs Road, Beaufort River*. Report prepared for the client.
- Luke, G.L, Burke, K.L. & O'Brien, T.M. (1988) *Evaporation data for Western Australia*
- Meat and Livestock Australia (2011) *National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems*.

Table 1 – Responses to comments raised by Shire of Woodanilling

No	Issue	Client response
1	The concept plans submitted with the application are difficult to read due to their reduction to include in the reports. Please provide two (2) copies of these as a separate plan sheets drawn to scale and dimensioned at a minimum A3 size.	Bio Diverse Solutions can provide 2 copies of the updated Concept Plans as requested at A3 size, please refer to Attachment A in the interim which shows the updated concept plan for the site. The updated concept plan shows increased detail in response to feedback from DWER. While noting this the feedlot footprint, including the sheep pens and evaporation pond, has not changed from the submitted and publicly advertised DA.
2	Confirmation of what area you are applying for a works approval / licence for and the measures you are proposing to restrict the use within this area, or alternatively if you are seeking approval for the use and associated activities to occur anywhere within this area.	In response, the boundary of the 'Subject area' applies to the 'Prescribed works' within a premises (as applying for in DWER Works Approval). No other activities outside of the prescribed premises is being sought from DWER. Please refer to Attachment A which details an updated concept plan for the site. The updated concept plan shows a shed feed storage, office and weighbridge/sampling shed. It would be preferable if the use/location can be approved through this DA. It is recognised there is a separate requirement to provide the Shire elevations, floor plans and supporting information, provide structural engineering and obtain a Building Permit. It is suggested this is addressed as a condition of the development approval.
3	As the subject land contains two (2) lots provide reasons why these should not be amalgamated.	Development can occur across multiple boundaries. Fletchers International Export Pty Ltd (Fletchers) will review the lot boundaries should all relevant approvals be obtained. This may result in the lot boundaries being realigned to contain all of the area subject to the Prescribed Works being on one title, with the balance area being on the other lot. This issue not deemed relevant to the DA.
4	Provide justification for the worker's accommodation not being considered as a vulnerable land use under SPP3.7 Planning in Bushfire Prone Areas and whether an evacuation plan is proposed to be prepared.	In considering the context of this BMP, the proposed development of the works accommodation is not considered a "Vulnerable land use" as defined under SPP as the proposed units are for permanent employees (not seasonal) and their associated accommodation/residence. Typical of most large farming operations. The resident employees will be able to respond to a bushfire emergency and therefore are not subject to evacuation needs. People who are employed by Fletchers will be physically able to respond to an emergency, are not aged persons or not physically or mentally disabled, and the siting of the buildings does not present evacuation challenges from the site. It is noted that the decision maker (SoW) has the ability to request a BEEP and this is entirely at their discretion.
5	An explanation of why the proposed holding capacity of the pens appears to be 78,000 sheep when the maximum proposed number is 90,000.	In response, at the concept stage 90 000 head is given as the maximum proposed number for the site, and it is expected that the actual number will be generally lower due to rotation of stock for maintenance and sales purposes. Fletchers seek development approval for 90,000 head to provide certainty for future operations. The proposed number of pens is currently 120, however this may eventuate to 150 pens, and the client would at all times be operating within the licenced stocking numbers.

No	Issue	Client response
6	Provide a response to the issues raised in the advice from DWER and DPIRD dated the 22 January as previously provided to you as the application lacks specific information about the design and operation of the feedlot to assess the application against the National Procedures and Guidelines for Intensive Sheep and Lamb Feeding Systems and the Code of Practice for Sheep in Western Australia.	The client notes this comment, and has responded that all aspects of feedlot operations will align to National/ State procedures for sheep feedlot operations and commensurate with <i>“National procedures and guidelines for intensive sheep and lamb feeding systems” (2011)</i> , and their requirements for animal welfare, as per their existing feedlot operations in NSW. A copy of the response to DWER is attached in Attachment E.
7	The WMP does not include enough information to verify that the proponent has access to sufficient water to meet the requirements of a 90,000 head sheep feedlot. The Code of Practice for Sheep states that sheep in feedlots may drink up to 6 L/day in hot weather.	Noted. Ground water investigations are current and subject to further site information. Understand requirements of licensing through DWER if required may be undertaken. Fletchers understand if insufficient water supply is located then less sheep will be held on site as per animal welfare requirements. It is the responsibility of Fletchers to provide sufficient water to address the mandatory components of the Guidelines, the Code along with statutory requirements. If required, Fletchers can provide necessary assurances that the Shire is indemnified for its decision relating to water availability.
8	Plans to manage dust and odour during operation including contingency plans and justification of proposed buffer distances.	<p>As per the response tabled to DWER on this issue (See Attachment E):</p> <p>The Operational Environmental Management Plan (OEMP) has dedicated sections to Solid Waste Management, Effluent Management, Dust and Odour during operations (Sections 5.2, 5.3, 5.4 and 5.5 respectively). It is noted that dust emissions from sheep is limited in daily operations, with sheep movements via lane ways or in the pens. Truck movements will only be via constructed roads, speed limits apply. Contingency plans are also covered in the OEMP Section 5.8 Environmental Incident Management. Dust is a serious issue to the animals and as such will not be tolerated on the property. The system does not generate dust, as known from Fletcher’s existing feedlot operation in Condobolin, NSW.</p> <p>Refer to Siting and Location Mapping Attachment B, the closest sensitive receptor is noted to be 1.2km away to the south west, while an empty residence is located to the east of the site approximately 1.6km to the pens. Analysis of Wagin (29km away) climate data available online is provided in Attachment B. The prevailing winds to the residence to the south west (i.e. north east prevailing winds) is <10 percentile (i.e. deemed calm) throughout the seasons. The prevailing westerly flow to the vacant house to the east is deemed a notable issue, however this residence is located 1.6km away and not deemed to be an issue with dust, and odour is to be managed through offsite export of carcass and solid wastes.</p> <p>EPA Guidance Statement 3 Separation Distances Between Industrial and Sensitive Land Uses (Attachment B) recommends a 1000 - 2000m buffer separation for an animal feedlot. The Guidance Statement does not quantify the size of the feedlot as regarding what buffer distance applies. This project is within these separation distances. Based on the climate data and proposed design and management measures, the buffer is considered appropriate.</p>

No	Issue	Client response
		See Attachment B. The National guidelines for intensive feed systems feedlot guide also has buffer distances to sensitive receptors with the closest being 100m to a rural farm and the highest 500m to a rural farm residence, this is exceeded by the proposal at Ronneby Park. (Refer to Attachment B)
9	An explanation of why noise during the operation will not affect surrounding properties.	The property is situated in a rural location, and as such fits within the fixed separation distances outlined in Table 6.1 (p27) of the <i>“National procedures and guidelines for intensive sheep and lamb feeding systems” (2011)</i> . The feedlot is situated within low population density agricultural area which is approximately 8km from the Albany Highway. Noise will be commensurate with typical farming operations (i.e. seeding and harvest) .
10	Details of the construction of the feed storage area and the nature of the feed to be stored.	<u>As per the response tabled to DWER on this issue:</u> An updated concept plan is provided in Attachment A outlining the facilities to be provided in the feed storage and operational area. Risks to this area are fuel / oil from truck tractor spills. This would be handled as per the OEMP Section 5.8.3. Products to be stored in feed shed are predominantly Cereal Grains (similar to usual farm operations). Other storage items in this area include molasses, water and hay/silage as shown. All of this area would be captured in the stormwater detention as shown on the Concept plan (NE corner), treated as per the Water Management Plan (WMP) and slowly released. All of this area will be of a gravel finish and dust would be low. All effluent created by the feedlot is on the other side of the hill and handled by the bunded effluent drainage system. Feed storage - there are 2 potential odour sources: a) Silage (if used) is covered with only the face exposed, silage smell is deemed a very low risk and is comparable to usual farm operations. b) Cereal grain can get wet and smell. Any of this material will be treated as per OEMP 5.5. Wet cereal grain is a cost to the client and will be avoided. Localised dust occurs with tipping a bucket of grain into a mixer, in this instance water is added to minimise dust and assist with mixing. Dust is a serious issue to the animals and as such will not be tolerated on the property. All of these materials listed above are noted to be are non-hazardous. Water capture from roof top will assist in supply and stormwater from this area will be managed via the treated stormwater system.
11	An assessment of the impact of groundwater abstraction on any of the neighbouring properties.	The issue is acknowledged. Based on previous groundwater assessments, it appears there will be limited impact on neighbouring properties with draw down localised. Refer to Attachment C – Hydrological Mapping. The supply of water will be through the superficial aquifer, resources for water are presently being investigated in the CZ and CZA hydrogeological areas. Updated information on water supply will be forwarded to SoW when at hand.
12	Details of the construction of the pen floors including materials, compaction and final permeability.	<u>As per the response tabled to DWER on this issue:</u> Pen floor construction: The pens will be compacted gravel 100mm to 200mm with clay incorporated from material on onsite. Watered and rolled. Manure with microbial activity will

No	Issue	Client response
		<p>“cap” the hardstand of the pen. Permeability in the pens is achieved from the manure layer. Because of the formation of low permeability soil/manure interface, clay lining is not required on pens (refer to National guidelines for beef cattle feedlots in Australia, 2012, Appendix C). Excerpt provided as Attachment D.</p> <p>Pen slope 2.5 to 4% slope from the top of the pen to the bottom. The pens will run with the natural slope hence the variation in slope % across the holding pens. Catch drains will convey the water from the pen away to the main drain. Constructed with 200mm gravel and incorporated clay. OEMP Table 3 (page 12) outlines the drain sizing and has dimensions and calculations. The drains will have a 1% to 2% slope which will take the water away to the bunded effluent system.</p>
13	The design and construction of the sedimentation and evaporation ponds and bunding to direct effluent run-off.	It is suggested this is addressed as a condition of the development approval, with the design undertaken by a dam engineer/civil engineer. It is anticipated DWER will also require this information as a condition of the Works Approval.
14	The management of the manure biosolids and animal carcass stockpiles, including additional information if composting is used to dispose of animal carcasses.	Please see response to Issue 15 regarding management of manure biosolids and animal carcass stockpiles, and biosolid material will be removed offsite as per the WMP.
15	Details of the construction and operation of the manure bio-solids area including an estimate of the likely number and frequency of truck movement required to remove material from the manure bio-solids area.	<p>Trucks are estimated to be required to move material from the manure bio-solids area and carcass stockpiles twice per week, and will be moved off site as per the WMP.</p> <p>Manure and carcassing composting hardstands will be made with clay and gravel creating an impervious layer to a permeability of 1×10^{-9}. Testing of this can be undertaken during construction to confirm the permeability ratio is met. Both pads will be raised and bunded in the effluent system so no water from upstream can enter. The raising of the pads will also avoid any surface water interception and below ground water interception. All watershed in this area will be directed to the controlled drainage system. Clay liner material used for the manure and carcass area will meet the National guidelines for beef cattle feedlots in Australia (2012, Appendix C). See Attachment D for excerpt.</p>
16	Details of expected volumes or how to determine if the designated areas for waste treatment shown on the concept plan will be sufficient.	The WMP has calculated volumes of waste water and the dams are sized and scaled to the anticipated volumes of waste water. In terms of sizing of biosolids and carcass waste areas, one – two trucks per week is considered to remove solid wastes (refer to Issue 15) however will be refined depending on sheep numbers and demand. Based on experience with current operations, it is expected that on average 5 stock will die per day on average, similar numbers are expected for this operation and sizing of carcass waste areas will be ascertained during construction periods and if needed during operations. The key element is the location of these within the bunded treatment system as per the WMP outlines.
17	Defining who determines when odour will be consider offensive and why this may take 48 hours to address.	OEMP defines operations requirement. The Site Manager and staff will monitor daily and adjust operations if needed. In terms of Contingency Plans, refer to DWER response.

No	Issue	Client response
		<p>Manure management - off site to disposal areas may need to be increased. The Site Manager and staff are responsible to address matters within 48 hours to coordinate trucks and movement of material as required.</p> <p>It is suggested this is addressed as a condition of the development approval. It is also expected to be addressed in the DWER Works Approval.</p>
18	Proposed management of surface water run-off from the feedlot facilities/operations area to prevent any adverse impacts on the conservation covenant area.	As shown on the concept plan and discussed in the WMP the feed Storage and Operation Facilities will be contained and surface water directed to a small catchment (sized according to final dimensions of the area) and treated prior to entering any adjacent areas.
19	Justification as to why the proposed 30 metres separation between the gravel extraction area and the conservation covenant area is large enough to protect the vegetation from potentially contaminated water and dust.	In the absence of policy of this matter in the Shire of Woodanilling and based on other D/A's Bio Diverse Solutions has prepared on extractive industry, a 30m buffer is used to public roads and adjacent properties. The conservation covenant paddock is not a designated ESA and therefore does not require any other specific buffer. Refer to extract Attachment B. Buffer setbacks for extraction are considered sufficient by the proponent.
20	Justification as why no additional water supplies are required for dust suppression for the operation of the facility.	Please see response to Issue 8 regarding management of dust at the site, and refer to the updated concept plan provided as Attachment A. Water is to be used for dust suppression during construction (see Construction Management Plan) and will be used during operations. See OEMP Section 5.4. Water sources can be added into this section if required.
21	Clarify the provision of adequate shade and shelter from extreme weather events in the sheep feedlot.	<p>The WA Code of Practice for Sheep in WA (2003) outlines the need for protection from extremes of weather which may be life threatening, and the need for site selection relatively protected from adverse weather. The current recommendation of shade provision of 0.4m² per animal (Section 4.4, "<i>National procedures and guidelines for intensive sheep and lamb feeding systems</i>" (2011) is noted, although not a legal requirement at this stage.</p> <p>Provision of shelter will be achieved via the construction of pens by rubber belting, and the terrain is shielded from wind events in the west, north, east and south. Further buffer planting is proposed post construction to aid in shelter (single rows of trees as windbreaks). This approach is consistent with what occurs at Fletcher's existing feedlot operation in Condobolin, NSW.</p> <p>This issue is not deemed relevant to the DA.</p>
22	Proposed measures to prevent animals escaping and spreading disease to adjoining properties.	Fletcher's International Pty Ltd operates with a high level of Biosecurity. The site will be fully fenced and security gated. Neighbours animal entering property would be of more concern from biosecurity protocols, site security etc. site security for escape and entering the property is not deemed a concern. This issue is not deemed relevant to the DA.
23	Confirm where the measurements for the buffers have been taken from and why these do not apply to the whole of the licence area.	Refer to Attachment B – buffers and section, answer to question 8 and to question 19. Buffers are taken from the areas which will be licensed or have smell or odour from.

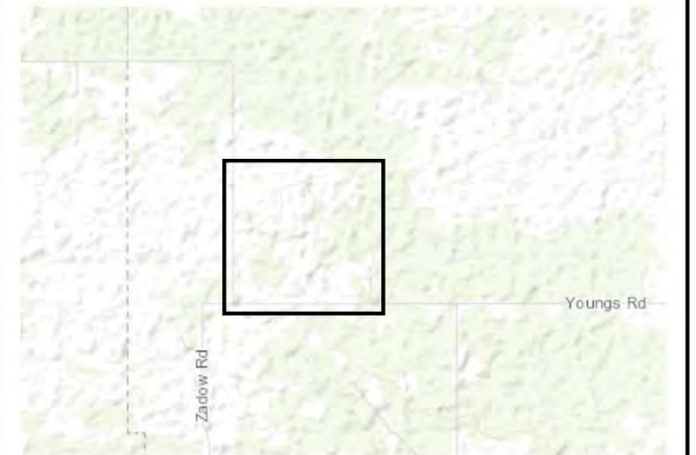
No	Issue	Client response
24	EPA Guidance Statement No 3 recommends a buffer generic buffer distance of 1,000 - 2,000m. Provide justification as to why a distance of 2,000m should not be applied.	Refer to Attachment B – buffers and section, answer to question 8 and to question 19. Buffers are taken from the areas which will be licensed or have smell or odour from. The <i>“National procedures and guidelines for intensive sheep and lamb feeding systems” (2011)</i> also has buffer distances to sensitive receptors with the closest being 100m to a rural farm and the highest 500m to a rural farm residence, this is exceeded by the proposal at Ronneby Park. It is noted there is sufficient space on all adjoining/nearby lots, including vacant lots, to locate a dwelling that has an appropriate buffer from areas which will be licensed or have smell or odour.
25	Provide an explanation of why applying for a ground water extraction licence (when there is no statutory requirement) will provide protection to existing water users.	As noted in question refer to groundwater earlier in question 11. When groundwater sources are verified and approvals are achieved further information on groundwater can be provided to the SoW. This may reveal there is no requirement to apply for a groundwater extraction license.
26	What contingency measures will be applied if the volume or quality of the groundwater is not appropriate or sustainable.	As noted in question refer to groundwater earlier in questions 7 and 11. In terms of contingency stock will be reduced/removed of site accordingly to animal welfare. Some stock may be grazed/watered on the wider farm as per current farming practises.
27	Details of the construction of the feed storage area and the nature of the feed to be stored.	See question 10. The proponent will get DA approval for building a shed and structural engineering will be required, DA condition can be applied, see DWER response.
28	Main Roads was have advised that the Youngs Rd / Albany Hwy intersection is marginally acceptable for low volume truck movements without any turning lanes. To substantiate this Main Roads have requested that a detailed traffic impact study be carried out, with allowances made for feed truck movements and confirmation of stock truck movement numbers.	Based on current operations, the client expects the following volume of daily feed, stock movement and composting truck movements: <ul style="list-style-type: none"> • 2.5 Sheep road trains per day (B double); • 2.3 Feed trucks per day; and • 0.3 Manure trucks per day. In total, this amounts to 5.1 trucks visiting the premises per day, these figures are based on a 90,000 stock head count at the feedlot and are the highest possible figures. There will be low volume truck movements associated with the operation, and is felt that there is no requirement for a detailed traffic impact study. Safety can be enhanced at the Youngs Road/Albany Highway intersection through clearing of roadside vegetation.

Attachment A

Updated concept plan showing facilities in feed storage area



29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575



Overview Map Scale 1:100,000

Legend

- Subject Site
- Internal access
- Rehabilitation Area
- Catch Drains
- Main Drain
- W Water Tank
- Controlled Drainage Area/Bunded
- Drainage Ponds
- Molasses Tanks
- Biosolid Stockpile
- Pens
- Feed Storage Facilities
- Sheep Processing Area
- Employee facilities



Scale
1:6,000 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT

Fletchers International WA
670 Youngs Road
Beaufort River WA

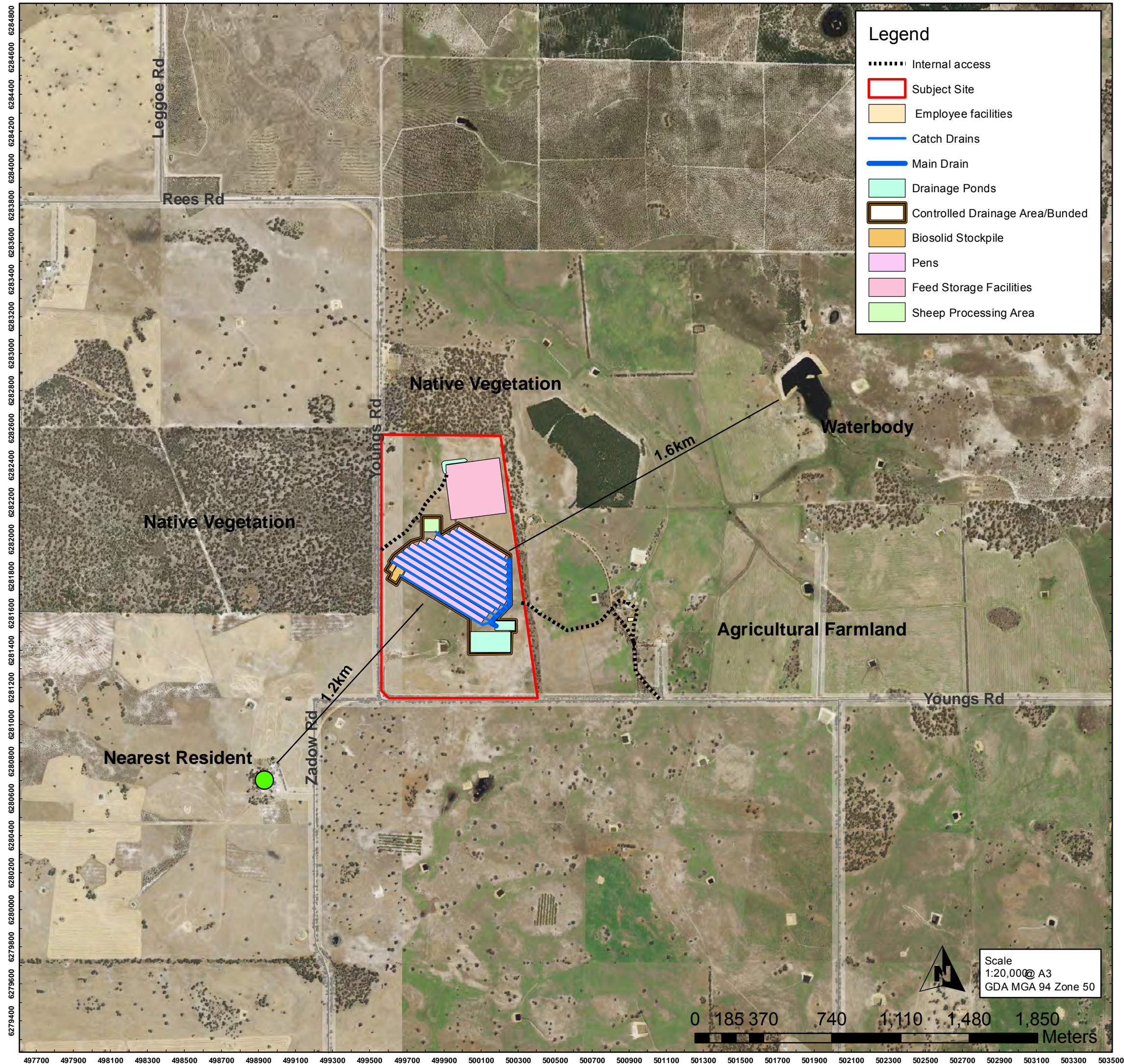
Feedlot Concept Plan

STATUS	FILE	DATE
FINAL	MSC0249	05/03/2020

Attachment B

Siting and Location Mapping

Buffers and prevailing winds to site



29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575



Overview Map Scale 1:100,000

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastral and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Fletcher's International WA
670 Youngs Road
Beaufort River WA

Siting and Location

STATUS	FILE	DATE
FINAL	MSC0249	13/8/2019

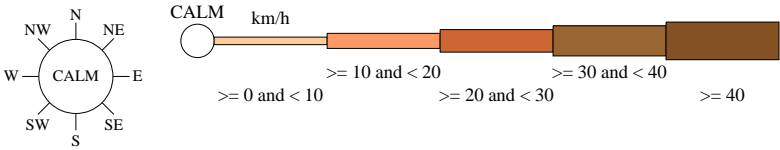
Rose of Wind direction versus Wind speed in km/h (03 Nov 1970 to 12 Aug 2019)

Custom times selected, refer to attached note for details

WAGIN

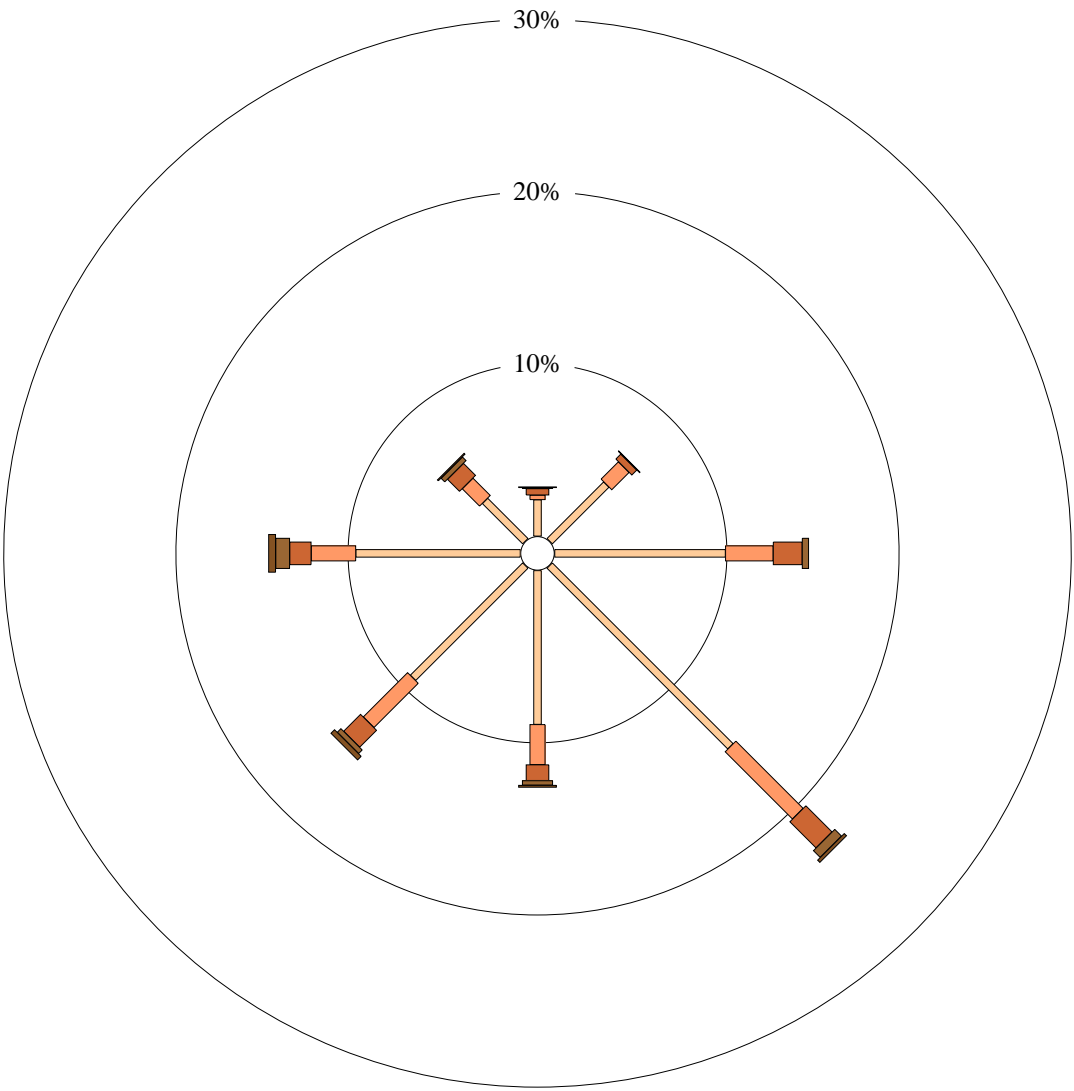
Site No: 010647 • Opened Jan 1891 • Still Open • Latitude: -33.3075° • Longitude: 117.3403° • Elevation 256m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



3 pm Jan
1378 Total Observations

Calm 5%



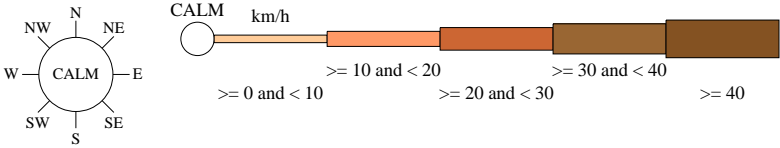
Rose of Wind direction versus Wind speed in km/h (03 Nov 1970 to 12 Aug 2019)

Custom times selected, refer to attached note for details

WAGIN

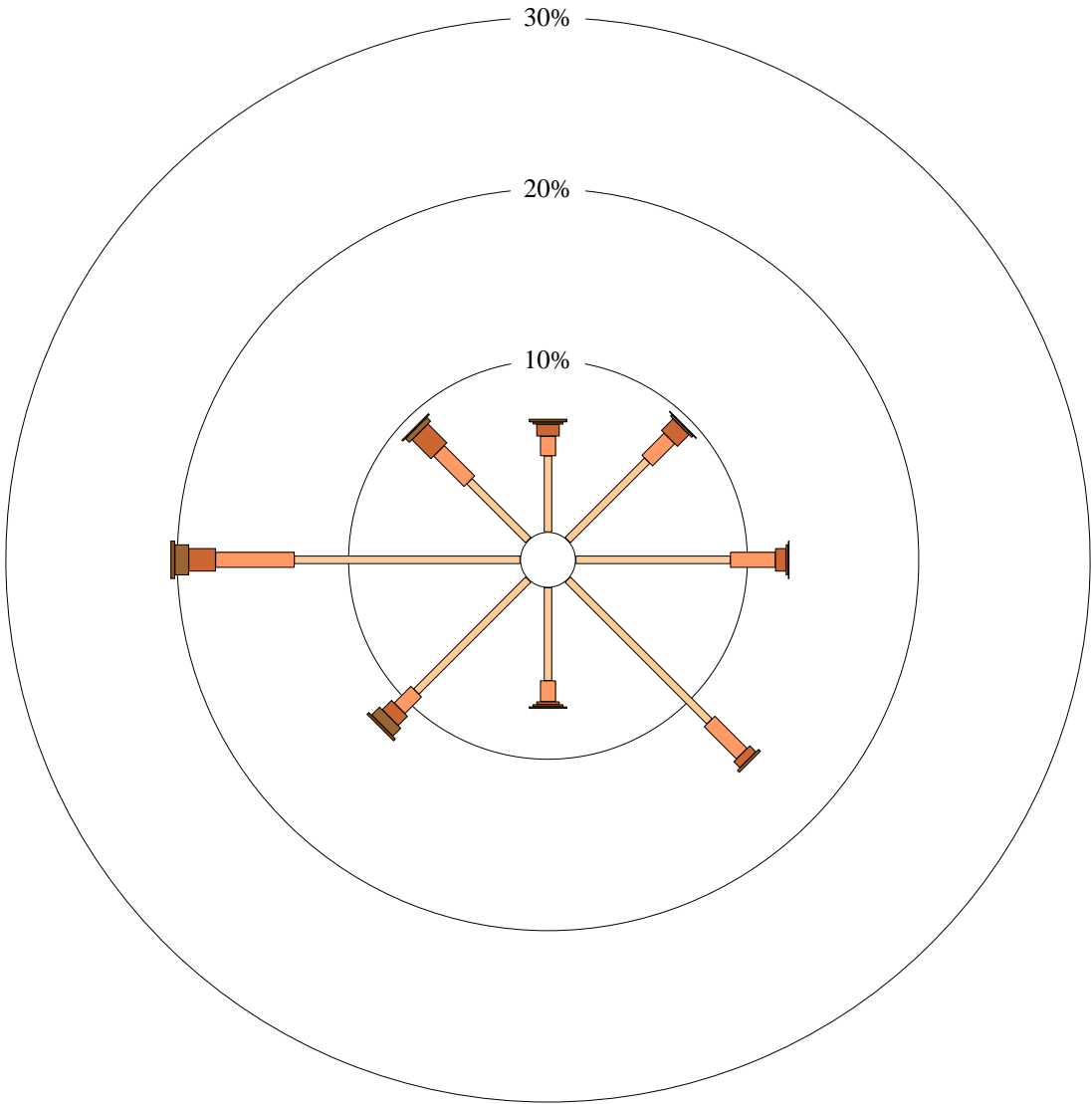
Site No: 010647 • Opened Jan 1891 • Still Open • Latitude: -33.3075° • Longitude: 117.3403° • Elevation 256m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



3 pm Apr
1322 Total Observations

Calm 8%



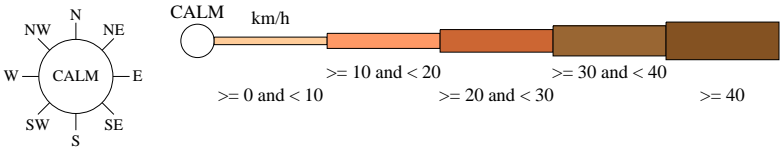
Rose of Wind direction versus Wind speed in km/h (03 Nov 1970 to 12 Aug 2019)

Custom times selected, refer to attached note for details

WAGIN

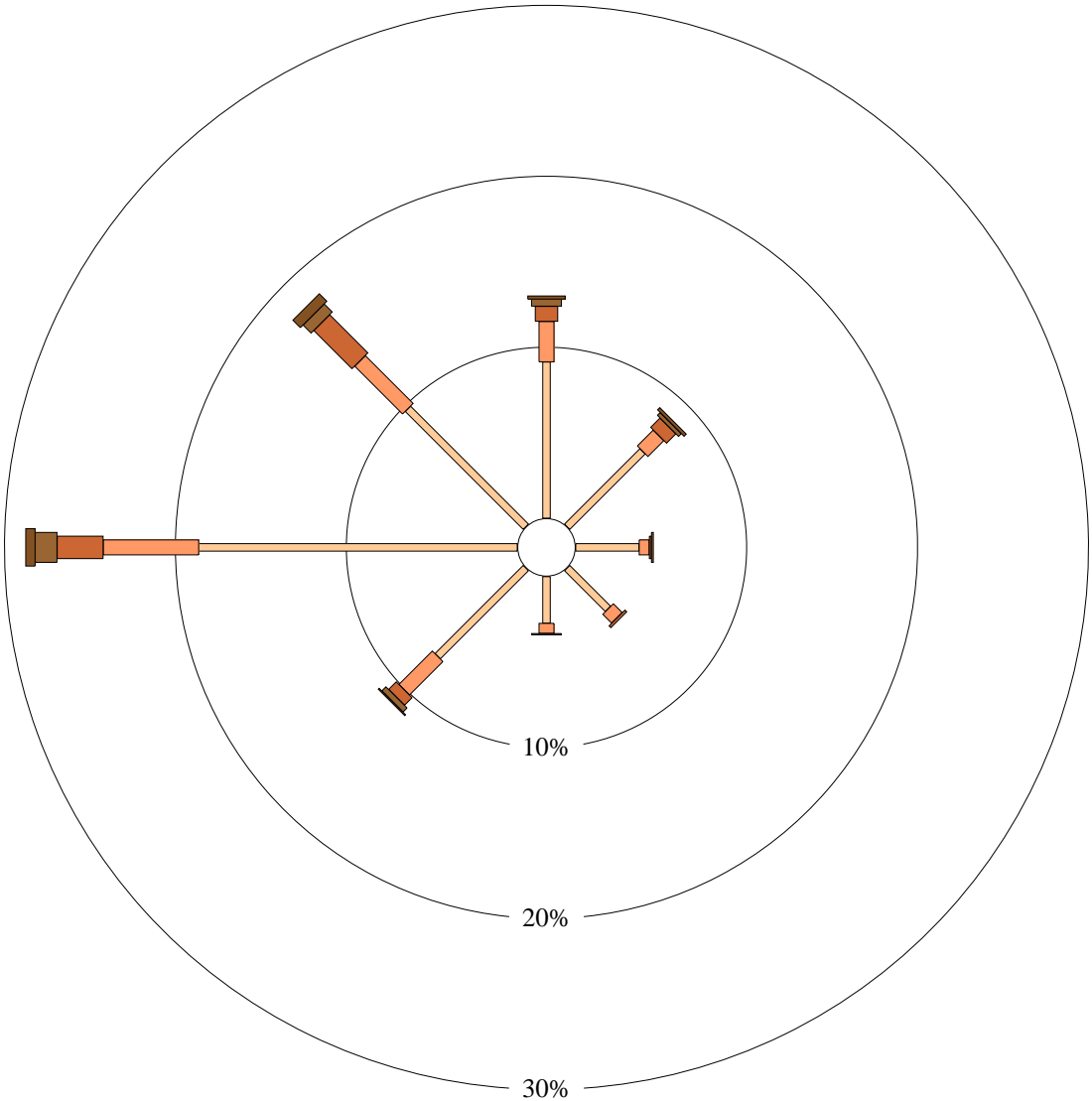
Site No: 010647 • Opened Jan 1891 • Still Open • Latitude: -33.3075° • Longitude: 117.3403° • Elevation 256m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



3 pm Jul
1380 Total Observations

Calm 8%



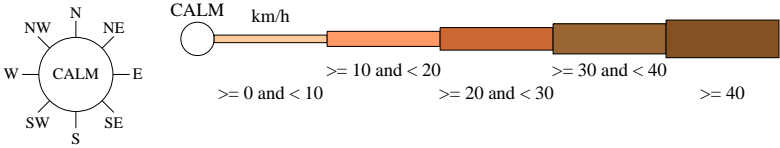
Rose of Wind direction versus Wind speed in km/h (03 Nov 1970 to 12 Aug 2019)

Custom times selected, refer to attached note for details

WAGIN

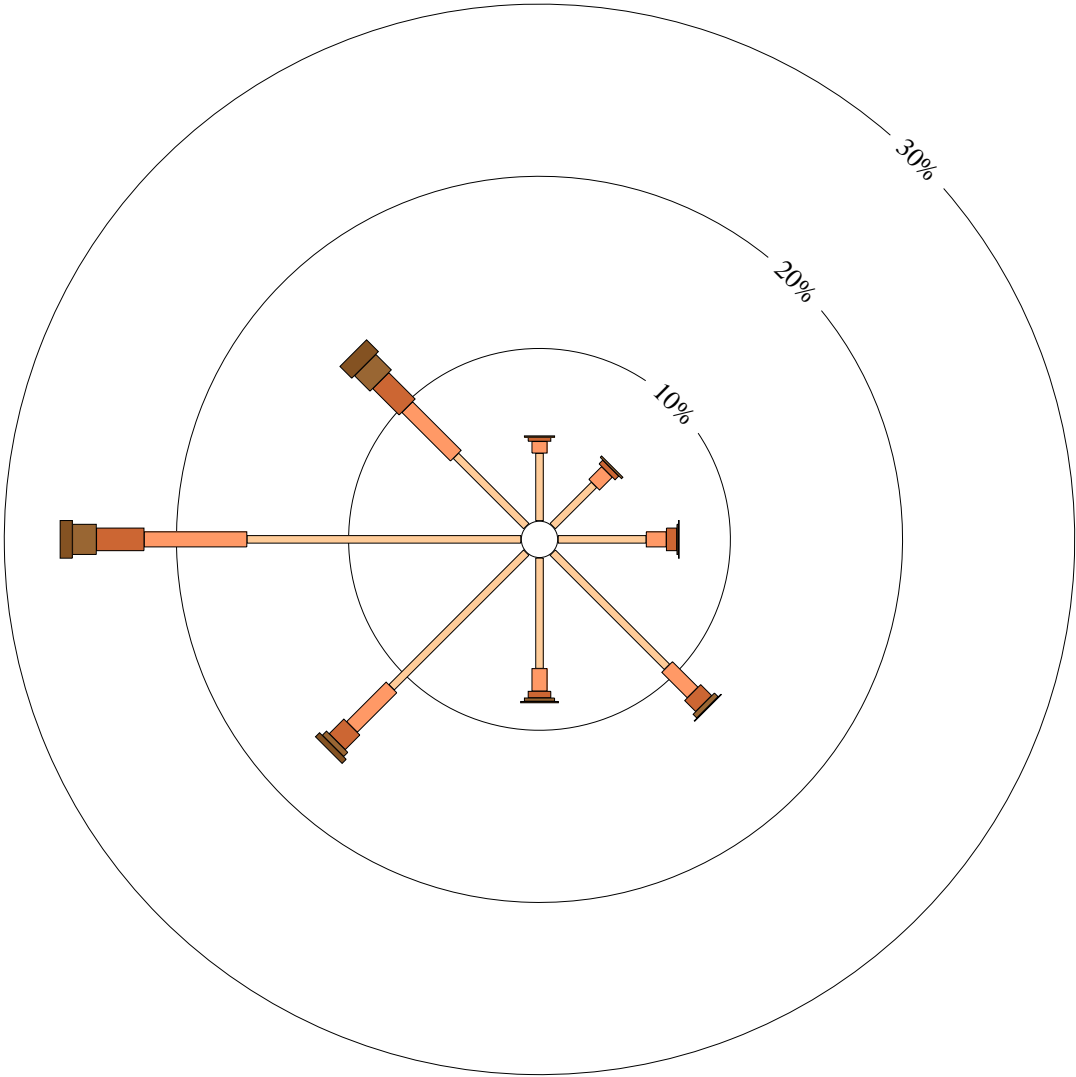
Site No: 010647 • Opened Jan 1891 • Still Open • Latitude: -33.3075° • Longitude: 117.3403° • Elevation 256m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



3 pm Oct
1343 Total Observations

Calm 5%



EPA separation distances (2005)

Industry	Description of industry	DoE Licence or Registration category (*)	Key Government agencies for advice or approval:	Code of Practice (CoP) / environmental requirement:	Impacts					Buffer distance in metres and qualifying notes
					Gaseous	Noise	Dust	Odour	Risk	
Joinery & wood working premises	production of wooden furniture & household items such as doors, kitchen fittings, flooring & mouldings		local gov't	CoP - 1995, being revised		√	√	√		100-300, depending on size
Liquid Petroleum (LP) gas retailing – above ground tanks	LP gas storage & handling at automotive retail outlets – up to 8000L tank – 8000L to 16 000L tank		DoIR, local gov't	AS 1596 Supplement No.1 - 1994				√	√	55 for sensitive uses & up to 8000L tank, 85 for sensitive uses & from 8000L to 16 000L 15 for residential uses
– underground tanks	LP gas storage & handling at automotive retail outlets – up to 65 000L tank		DoIR, local gov't	AS 1596 Supplement No.1 - 1994				√	√	55 for sensitive uses & 15 for residential uses
Livestock saleyard or holding pen	holding of live animals pending sale, shipment or slaughter	√ (55)	DAWA, WRC, local gov't			√	√	√		at least 1000, depending on size
Malt-works	malt production from grain		local gov't			√	√	√		500

EPA Separation distances Draft (2015)

DRAFT Environmental Assessment Guideline No. X
Separation distances between industrial and sensitive land uses

September 2015

Industry	Description of industry	Relevant codes of practice (CoP) and regulations	Emissions type or risk	Recommended separation distance in metres
Abattoir	slaughtering of animals – facility with wastewater treatment ponds	Environmental Protection (Abattoirs) Regulations 2001	Noise, dust, odour	1000
	slaughtering of animals – facility without wastewater treatment ponds	Environmental Protection (Abattoirs) Regulations 2001		500
Abrasive blasting operations	metal or other material is cleaned or abraded by blasting with any abrasive material	Environmental Protection (Abrasive Blasting) Regulations 1998	Noise, dust	case by case
Aluminium production	using electrolytic fusion technique		Gaseous, noise, dust, risk	case by case
Ammonia import/export	loading or unloading ammonia from ships and storage		Gaseous (NH ₃), risk	case by case
Ammonium nitrate import/export	loading or unloading ammonium nitrate from ships and storage		Risk	case by case
Ammunition production	includes explosives and fireworks		Risk	case by case
Animal feed manufacturing	manufacture or processing of animal food		Noise, dust and odour	500
Animal feedlot (cattle)	intensive rearing of cattle	National Guidelines for Beef Cattle Feedlots in Australia (Meat and Livestock Australia) 2012	Noise, dust and odour	1000 for noise and dust; S-Factor calculation for odour and at least 5 km from towns – refer to National Guidelines
Animal feedlot (sheep)	intensive rearing of sheep	National Procedures and Guidelines for Intensive Sheep and Lamb feeding Systems (Meat and Livestock Australia) 2011	Noise, dust and odour	1000
Aquaculture	propagation or rearing of aquatic fauna, with supplementary feeding, in pond, tanks or natural waterways	See Aquaculture Council of WA website in relation to the following Environmental Code of Practice for the Sustainable Management of WA's Aquaculture Industry: • Abalone • Pearl • Land-Based Finfish	Noise, odour	100-300

General Development Requirements

Notwithstanding the specific requirements as detailed within Table One, the following general requirements shall apply to all extractive industry proposals:

- 1) No excavation is to occur within 200 metres of a residence not located on the subject property;
- 2) Buffers in accordance with EPA requirements to be accommodated within the boundaries of the subject property;
- 3) The proposed pit is to be setback a minimum of 30 metres from any public road;
- 4) No excavation is to occur within 50 metres of a water course or body;
- 5) The clearing of remnant vegetation to access basic raw materials is discouraged, however where vegetation is affected as part of the proposal Council will consider the advice from the Department of Environment and Conservation;
- 6) Any extractive industry should not be located within visually obvious locations (locations obvious from major roads, townsites and tourist nodes);
- 7) Class 1 and 2 industries are to provide a written statement verifying that they have complied with all conditions of their planning scheme consent at the time of annual renewal. Class 2 industries may be asked to comply with the Local Law requirements applying to Class 3 operations in regards to annual renewal requirements; at the time of licence approval where the type or size of operation dictates a higher level of monitoring is required.
- 8) New development shall be sited and designed to ensure that known reserves of basic raw materials and minerals shown on the following plans are not unreasonably precluded from future extraction.

National procedures and guidelines for intensive sheep and lamb feeding operations- separation distances

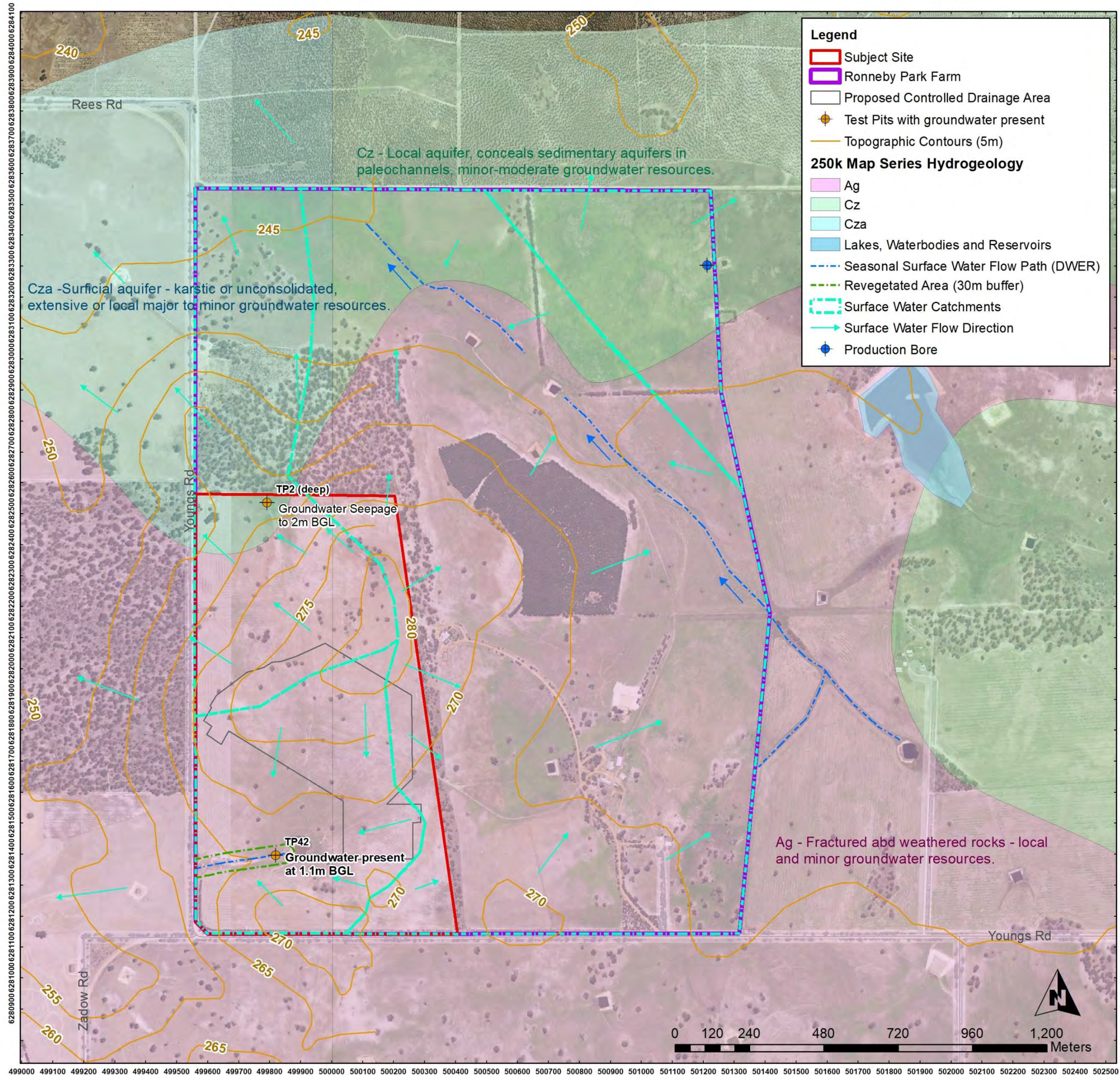
not immediately ploughed in).				
Table 6-7 - Separation distances surrounding waste disposal areas.				
Disposal method	Distance in metres			
	A	B	C	D
Large towns >2000 persons	500	100	150	200
Towns >100 persons	500	500	100	150
Small towns >20 persons	200	400	500	100
Rural farm residence not owned by feedlot	100	300	400	500
Public area (minimum value)	50	100	150	200
Public road - except as below	50	100	150	200
Public road - unsealed with less than 50 vehicles per day excluding feedlot traffic	50	50	50	50
Major watercourse	100	200	200	200

Environment and design

	Other watercourses	50	100	100	100
	Property boundary	20	20	20	20

Attachment C

Hydrological Mapping



29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575



Overview Map Scale 1:100,000

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Fletchers International WA
670 Youngs Road
Beaufort River WA

Hydrology and Topography

STATUS	FILE	DATE
DRAFT	MSC0249	25/7/2019

Attachment D

National guidelines for beef cattle feedlots in Australia, 2012, Appendix C

Table C.1 Specifications for clay liner materials

Soil characteristic	Acceptability criterion	Test method
Percentage fines	More than 25% passing 75 μm sieve	AS 1289 3.6
	More than 15% passing 2 μm sieve	
Liquid Limit	Less than 70	AS 1289 3.1.2
Plasticity Index	More than 15	AS 1289 3.3.1
Emerson class number	5 to 6	AS 1289 3.8.1

Areas to be clay lined within the controlled drainage area include:

- effluent catch drain
- sedimentation system
- holding ponds
- manure stockpile and composting pad
- any area where contaminants are stored or handled.

Because of the formation of a low permeability soil-manure interface layer, clay lining is not generally required on the feedlot pen and yard areas.

Trafficability of clay lined materials

The liner should be trafficable for cattle and equipment. To ensure that the integrity of the liner is maintained, the depth of the liner should be sufficient to ensure that equipment does not damage it during harvesting of manure. The minimum depth recommended for the clay liner is 300 mm after compaction. Periodic repair of the liner will be necessary due to the wear and tear associated with cattle traffic and normal cleaning operations.

The mechanical strength of liners can be tested using the Californian Bearing Ratio (CBR) test, which was developed for measuring the load-bearing capacity of soils used for building roads. The test is performed by measuring the pressure required to penetrate a soil sample with a plunger of standard area in both the saturated and dry conditions at a specified compaction. The minimum standard for CBR wet and dry is 20%.

Particular attention should be applied to the load-bearing capability of areas where cleaning or harvesting of dry waste is undertaken, including:

- feedlot pens
- effluent catch drain
- sedimentation system
- manure stockpile and composting pad.

Appendix E

DWER response March 2020



29 Hercules Crescent
Albany WA 6330
9841 3936
enquiry@biodiversesolutions.com.au
ABN 48 138 824 272
Job ref: MSC0249

6th March 2020

Peter Johns
Environmental Officer
Department of Water and Regulation
Locked Bag 10
Joondalup WA 6919

**Works Approval Application
“Ronneby Park” Youngs Road Beaufort River Site
Request for further information**

Dear Peter,

I refer to the letter dated 14th February 2020 from the Department of Water and Regulation requesting further information for the application for a Works Approval under the Environmental Protection Act 1986 (DER2019/00598). Please see attached Table 1 which corresponds to “Schedule 1” as per your correspondence.

Attachments A-D also provide further information to support the application as requested. We note that there are some areas of this application which are deemed by Fletchers International Pty Ltd as **sensitive material (commercial in confidence)** and would request that this information (namely Attachment B from Condobolin Feedlot) is not distributed into the public arena. The type of grains to be stored in the storage shed is a commercially sensitive issue and as such unless specifically requested from DWER, this information is withheld from this document.

Please feel free to contact me if you have any further information requests. Unfortunately, Chiquita Cramer from our office is on extended leave and I am assisting on the project until she returns.

Thank you for your attention to this matter, feel free to contact me to discuss any aspect of the Works Approval Application.

Kind regards,

Kathryn Kinnear
Director, Principal Environmental/Bushfire Consultant
Bio Diverse Solutions

Table 1 DWER responses

Information requirements	Specifications (including professional accreditation requirements)	Client response
Design and construction of the sheep pens	Details of the pen floors including materials, compaction and final permeability.	Pen floor construction: The pens will be compacted gravel 100mm to 200mm with clay incorporated from material on onsite. Watered and rolled. Manure with microbial activity will “cap” the hardstand of the pen. Permeability in the pens is achieved from the manure layer. Because of the formation of low permeability soil/manure interface, clay lining is not required on pens (refer to National guidelines for beef cattle feedlots in Australia, 2012, Appendix C). excerpt provided Attachment A.
	Detail, including sketch or plan diagram of how the pens are designed to facilitate drainage and manure collection, including details of dimensions and materials for bunding to direct effluent run-off.	<p>Drainage and Manure collection: Pen slope 2.5 to 4% slope from the top of the pen to the bottom. The pens will run with the natural slope hence the variation in slope % across the holding pens. Catch drains will convey the water from the pen away to the main drain. Constructed with 200mm gravel and incorporated clay.</p> <p>OEMP Table 3 (page 12) outlines the drain sizing and has dimensions and calculations. The drains will have a 1% to 2% slope which will take the water away to the bunded effluent system.</p> <p>Manure collection will be carried out in the pen with a dedicated machine. The drains will be trimmed with the same dedicated machine.</p> <p>Some typical drawings of the Condobolin Feedlot and the drainage cross sections are provided in Attachment B. Note these are not for Ronneby Park construction but indicative for DWER Works Approval purposes only, this data is sensitive material and not for public dissemination.</p>
	Plans to manage dust and odour during operation including contingency plans.	The Operational Management Plan (OEMP) has dedicated sections to Solid Waste Management, Effluent management, Dust and Odour during operations (Sections 5.2, 5.3, 5.4 and 5.5 respectively). It is noted that dust emissions from sheep is limited in daily operations, with sheep movements via lane ways or in the pens. Truck movements will only be via constructed roads, speed limits apply. Contingency plans are also covered in the OEMP Section 5.8 Environmental Incident Management. Dust is a serious issue to the animals and as such will not be tolerated on the property. The system does not generate dust, as known from existing feedlot in Condobolin Feedlot.

Information requirements	Specifications (including professional accreditation requirements)	Client response
Design, construction, and operation of the manure bio-solids area	Details of construction of the base that the bio-solids will be standing including permeability if not constructed from concrete.	Manure and carcassing composting hardstands will be made with clay and gravel creating an impervious layer to a permeability of 1×10^{-9} . Testing of this can be undertaken during construction to confirm the permeability ratio is met. Both pads will be raised and bunded in the effluent system so no water from upstream can enter. The raising of the pads will also avoid any surface water interception and below ground water interception. All watershed in this area will be directed to the controlled drainage system. Clay liner material used for the manure and carcass area will meet the National guidelines for beef cattle feedlots in Australia, 2012, Appendix C). See Attachment A for excerpt.
Design, construction and operation of the carcass composting area	Details of construction of the base of the carcass composting area including permeability if not constructed from concrete.	
Map showing the location of native vegetation protected under the <i>Soil and Land Conservation Act 1945</i>	The Certificate of Title for Lot 1 on Plan 21594 lists a memorial under the act (G403295) and Profit a' Prendre (H548183) Please provide a sketch map or aerial photograph showing the location of the protected area.	A map outlining the conservation covenant area protected under the <i>Soil and Land Conservation Act 1945</i> is shown in Attachment C. This is fenced from stock and regenerating well. Site photographs demonstrating this is provided Attachment C.
Feed storage area	Details of the construction of the feed storage area and the nature of the feed to be stored.	<p>An updated concept plan is provided in Attachment D outlining the facilities to be provided in the feed storage and operational area. Risks to this area are fuel / oil from truck tractor spills. This would be handled as per the OEMP Section 5.8.3. Products to be stored in feed shed are predominantly Cereal Grains (similar to usual farm operations). Other storage items in this area include molasses, water and hay/silage as shown. All of this area would be captured in the stormwater detention as shown on the Concept plan (NE corner), treated as per the WMP and slowly released. All of this area will be of a gravel finish and dust would be low. All effluent created by the feedlot is on the other side of the hill and handled by the bunded effluent drainage system.</p> <p>Feed storage - there are 2 potential odour sources:</p> <ul style="list-style-type: none"> a) Silage (if used) is covered with only the face exposed, silage smell is deemed a very low risk and is comparable to usual farm operations. b) Cereal grain can get wet and smell. Any of this material will be treated as per OEMP 5.5. Wet cereal grain is a cost to the client and will be avoided. <p>Localised dust occurs with tipping a bucket of grain into a mixer, in this instance water is added to minimise dust and assist with mixing. Dust is a serious issue to the animals and as such will not be tolerated on the property. All of these materials listed above are noted to be non-hazardous. Water capture from roof top will assist in supply and stormwater from this area will be managed via the treated stormwater system.</p>

Attachment A

National guidelines for beef cattle feedlots in Australia, 2012, Appendix C

Table C.1 Specifications for clay liner materials

Soil characteristic	Acceptability criterion	Test method
Percentage fines	More than 25% passing 75 µm sieve	AS 1289 3.6
	More than 15% passing 2 µm sieve	
Liquid Limit	Less than 70	AS 1289 3.1.2
Plasticity Index	More than 15	AS 1289 3.3.1
Emerson class number	5 to 6	AS 1289 3.8.1

Areas to be clay lined within the controlled drainage area include:

- effluent catch drain
- sedimentation system
- holding ponds
- manure stockpile and composting pad
- any area where contaminants are stored or handled.

Because of the formation of a low permeability soil-manure interface layer, clay lining is not generally required on the feedlot pen and yard areas.

Trafficability of clay lined materials

The liner should be trafficable for cattle and equipment. To ensure that the integrity of the liner is maintained, the depth of the liner should be sufficient to ensure that equipment does not damage it during harvesting of manure. The minimum depth recommended for the clay liner is 300 mm after compaction. Periodic repair of the liner will be necessary due to the wear and tear associated with cattle traffic and normal cleaning operations.

The mechanical strength of liners can be tested using the Californian Bearing Ratio (CBR) test, which was developed for measuring the load-bearing capacity of soils used for building roads. The test is performed by measuring the pressure required to penetrate a soil sample with a plunger of standard area in both the saturated and dry conditions at a specified compaction. The minimum standard for CBR wet and dry is 20%.

Particular attention should be applied to the load-bearing capability of areas where cleaning or harvesting of dry waste is undertaken, including:

- feedlot pens
- effluent catch drain
- sedimentation system
- manure stockpile and composting pad.

Attachment B

Typical drawings from Condobolin Feedlot

Not for general dissemination DWER file note only

Appendix A

Geotechnical Investigation (Great Southern Geotechnics, 2019)



Geotechnical Investigation

Fletchers International WA
Fletcher Proposed Feedlot Project

Tuesday, 17 September 2019

GREAT SOUTHERN GEOTECHNICS

1.0 INTRODUCTION

*As authorised by Farron Fletcher from Fletchers International WA
a Geotechnical Investigation for the proposed Feedlot project on Lot 670 Youngs Rd, beufort River WA
was preformed on the **29/07/2019***

2.0 GENERAL

This purpose of the investigation was to determine the following:

- surface site conditions
- subsurface soil profile
- subsurface soil characteristics
- Depth of ground water tables.

3.0 SITE INVESTIGATION

Site conditions and Test pit locations were recorded and are shown in Appendix 1

The field investigation consisted of **54** boreholes excavated on-site to depths of up to **5.2** m using a Caterpillar 319DI 20 tonne Excavator with a 900mm trenching bucket.

These test holes were located across the proposed feedlot and surrounding infastucture.

All soil layers encountered were visually assessed and classified on-site.

IMPORTANT NOTE: The test pits have been spread so that they are representative of the subsurface materials across the intended reconstruction area, however, soil conditions may change dramatically over short distances and our investigations may not locate all soil variations across the site.

4.0 LABORATORY TESTING

Results of any relevant Laboratory testing preformed are shown in **Appendix 2.** (Test Results)

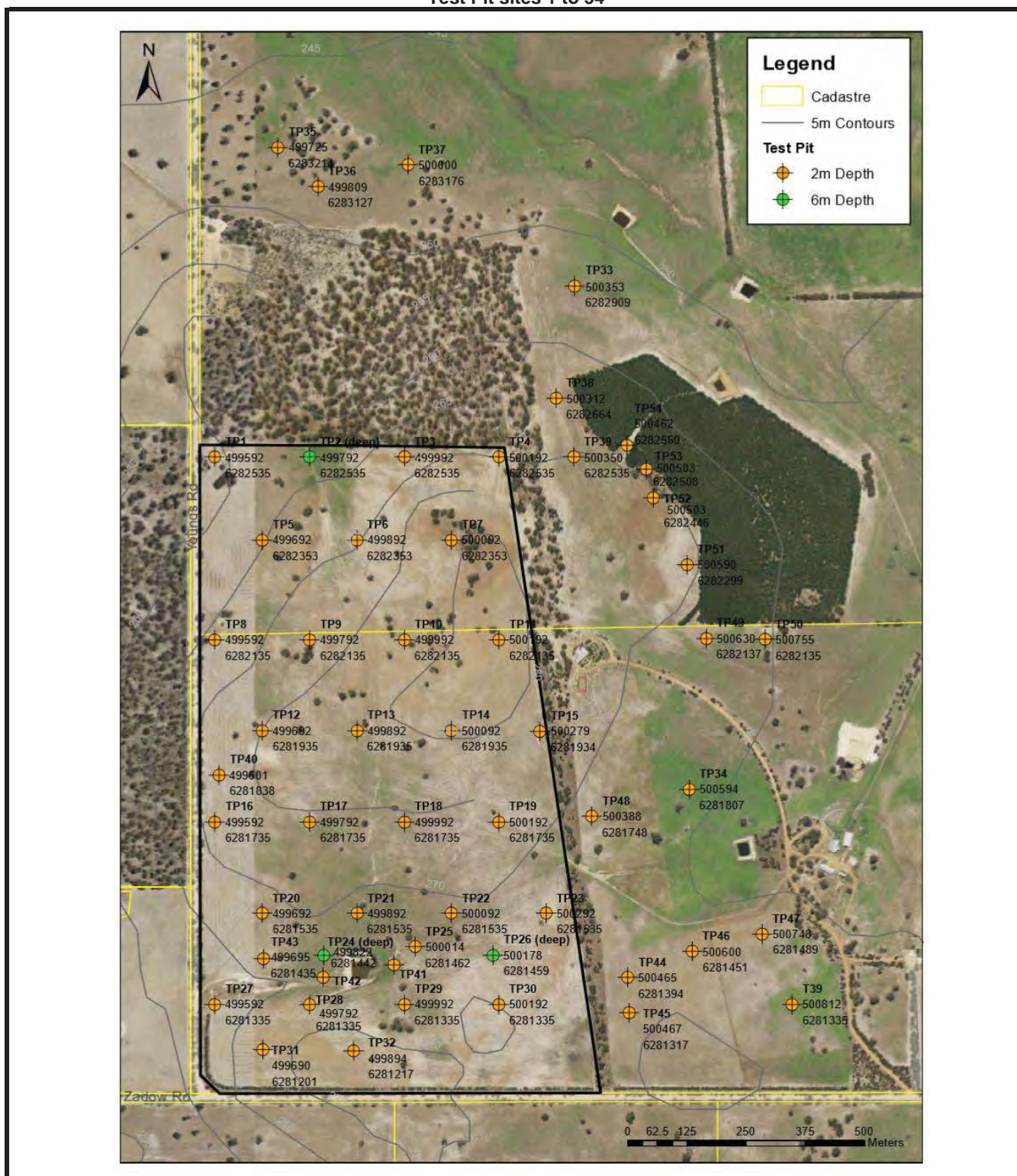
This report and associated documentation was undertaken for the specific purpose described in the report and shall not be relied on for other purposes. This report was prepared solely for the use by the Fletchers international and any reliance assumed by other parties on this report shall be at such parties own risk.



Appendix 1

Test Pit Logs

**Figure 1 - Fletcher Proposed Feedlot Project
Test Pit sites 1 to 54**

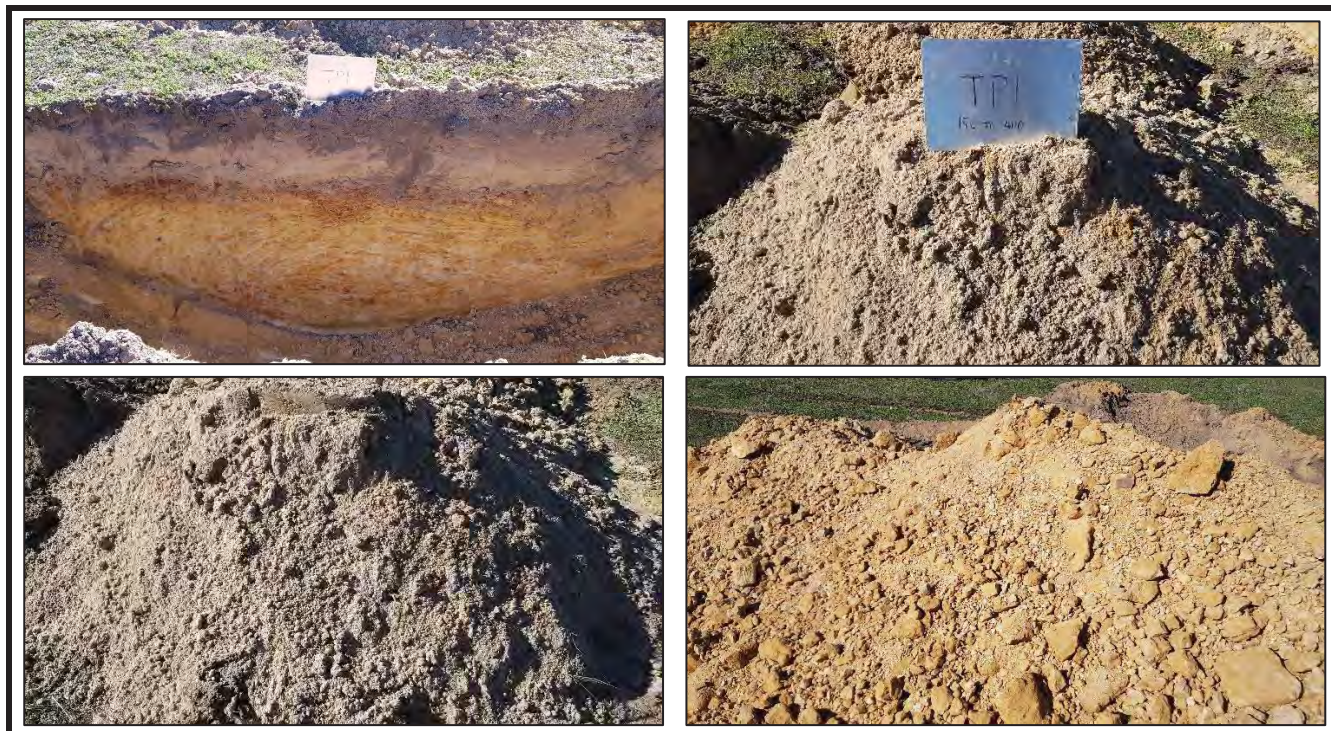



GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 1 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP1 Sample No. 1919G1			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 29/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	MD		No water table encountered.		
150 - 400	250	SAND: Light grey, fine to coarse.	M	L-MD				
400 - 600	200	Sandy GRAVEL: Brown, fine to medium, sub rounded to sub angular. <small>Fine to medium grained sand.</small>	M	MD				
600 - 2000	1400	Sandy CLAY: Low to medium plasticity, light brown mottled orange.	M	St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2000					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 1 - Excavation



Test Pit No. 1 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	3	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP2 Sample No. 1919G2				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		3.8 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 600	450	Sandy GRAVEL: Light brown/grey, fine to medium, sub rounded. Fine to medium grained sand.		M-W	MD				
600 - 2300	1700	Sandy CLAY: Low to medium plasticity, light brown mottled orange/white/red. (Trace brown, fine to medium sub rounded to sub angular gravel).		M	St	MC			
2300 - 3800	1500	Sandy CLAY: Low to medium plasticity, white mottled red/orange.		M	St				
Comments				Pit Terminated at: (mm) below ground level					
				✓ or ✕					
Water noted seeping into pit through the sandy clay layer 600mm to 2300mm				Target Depth					
24hrs later water level reached 1200mm above base of test pit.				✓ 3800					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 2 - Excavation



Test Pit No. 2 - Spoil



GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 5 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP3 Sample No. 1919G3		Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan						
Date Commenced: 29/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.3 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Brown/Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
100 - 600	500	Sandy GRAVEL: Light brown, fine to medium, sub rounded. Fine to medium grained sand.	M	MD				
600 - 1500	900	Sandy GRAVEL: Brown, fine to coarse, sub rounded. Fine to medium grained sand. Contains approx. 5-10% boulders up to 300mm diameter.	M	MD				
1500 - 2300	800	Gravelly CLAY: Low plasticity, red/orange. Fine to medium, sub rounded gravel.	M-W	F-St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2300					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 3 - Excavation



Test Pit No. 3 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP3

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 7 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP4 Sample No. 1919G4			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 29/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
100 - 1200	1100	Sandy GRAVEL: Light brown to brown, fine, sub rounded to sub angular. Fine to medium grained sand.	M	MD				
1200 - 2000	800	Sandy CLAY: Low to medium plasticity, red mottled grey /orange.	M	St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2000					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 4 - Excavation



Test Pit No. 4 - Spoil



GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 9 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP5 Sample No. 1919G5			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 29/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
150 - 450	300	Sandy GRAVEL: Light brown, fine to medium, sub rounded to rounded. Fine to medium grained sand.	M	MD				
450 - 850	400	Gravelly CLAY: Low to medium plasticity, light brown/orange. Fine to medium, sub rounded to sub angular gravel. Fine to medium grained sand.	M	F-St				
850 - 2000	1150	Sandy CLAY: Low to medium plasticity, brown/red mottled orange.	M	St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2000					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 5 - Excavation



Test Pit No. 5 - Spoil

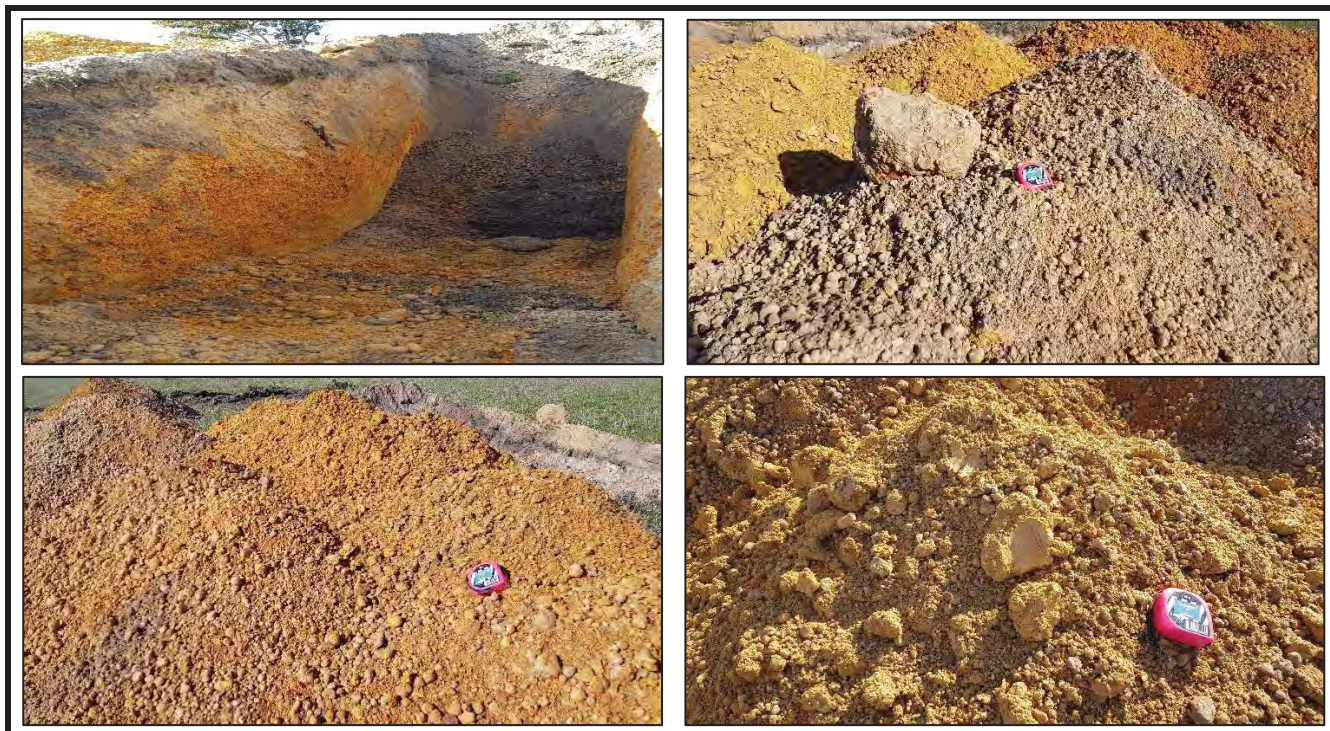


w1726 1919G1-20 0

Test Pit No. 6 - Excavation



Test Pit No. 6 - Spoil

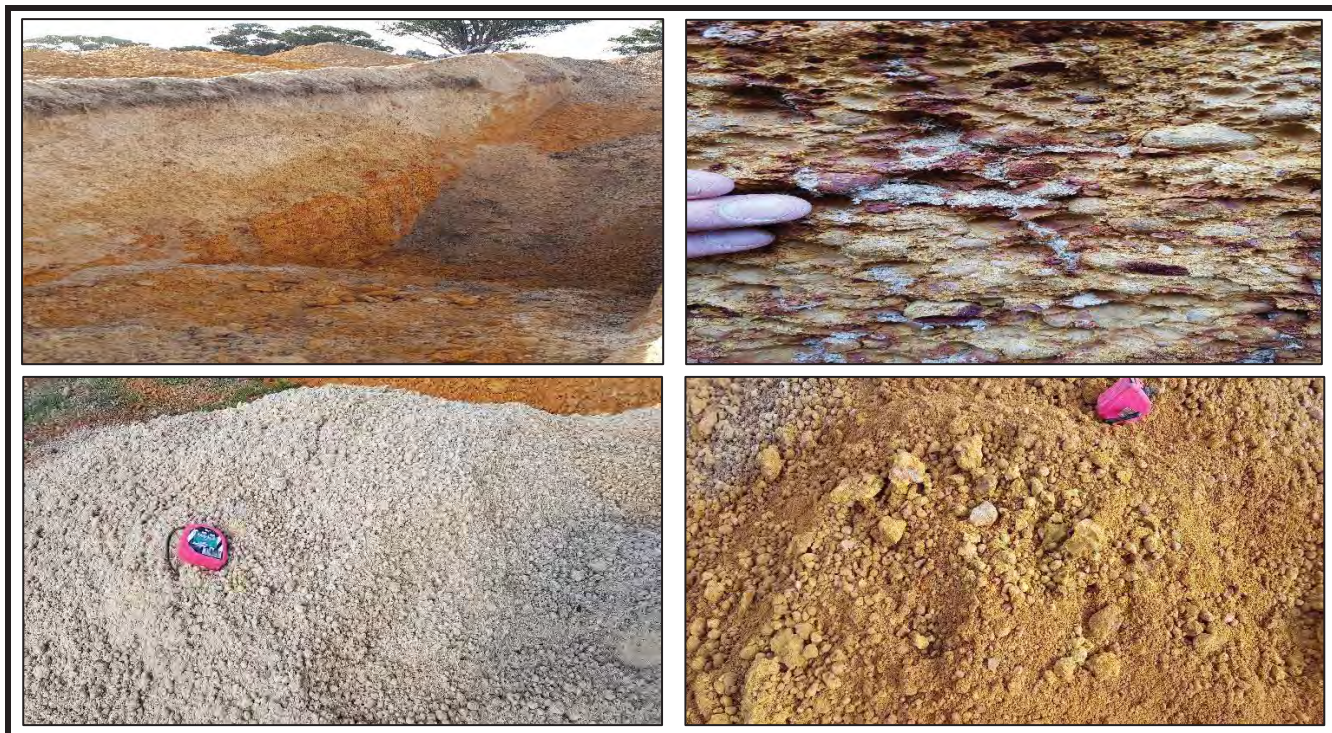



GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 13 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP7 Sample No. 1919G7			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 29/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
100 - 1000	900	Sandy GRAVEL: Light brown, fine to medium, rounded to sub rounded. <small>Fine to medium grained sand. Contains approx. 5-10% boulders up to 400mm diameter.</small>	M	MD				
1000 - 2000	1000	Clayey GRAVEL: Low to medium plasticity, brown/orange. <small>Fine to medium, sub rounded to rounded gravel. Fine to medium grained sand.</small>	M	D				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2000					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength			Rock		Cementation		Water	
Cohesive	Non-Cohesive				Water first Encountered			
VS - Very Soft	VL - Very Loose	EL - Extremely Low		IN - Indurated	Moisture			
S - Soft	L - Loose	VL - Very Low		PC - Poorly Cemented	D - Dry M - Moist W - Wet			
F - Firm	MD - Medium Dense	L - Low		MC - moderately Cemented	General			
St - Stiff	D - Dense	M - Medium		WC - Well Cemented	N/A - Not Applicable			
VSt - Very Stiff	VD - Very Dense	H - High			N/D - Not Determined			
H - Hard	CO - Compact	VH - Very High						
		EH - Extremely High						

Test Pit No. 7 - Excavation



Test Pit No. 7 - Spoil

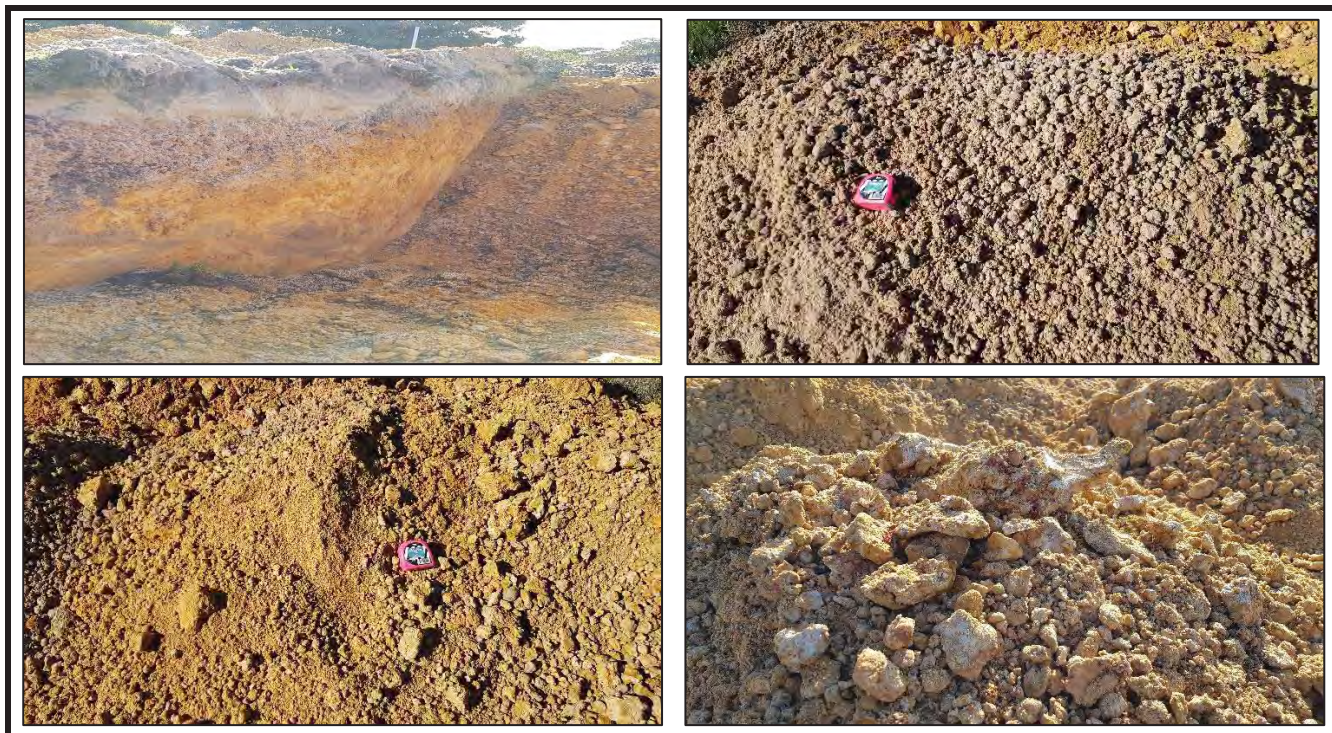


 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	15	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP8 Sample No. 1919G8				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
100 - 350	250	SAND with silt: Light grey, fine to medium.		M	L-MD				
350 - 550	200	Sandy GRAVEL: Light grey/ brown, fine to medium, sub rounded to sub angular. Fine to medium grained sand.		W	MD				
550 - 750	200	Clayey GRAVEL: Low plasticity, brown/orange. Fine to medium, sub rounded to sub angular gravel. Fine to medium grained sand.		M	MD				
750 - 2000	1250	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange. Fine to medium grained sand.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level					
				✓ or ✕					
Water noted seeping into pit through the sandy GRAVEL layer 350mm to 550mm				Target Depth					
24hrs later water level reached 250mm above base of test pit.				✓ 2000					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 8 - Excavation



Test Pit No. 8 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP8

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 17 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP9 Sample No. 1919G9		Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan						
Date Commenced: 29/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	D	L-MD		No water table encountered.		
100 - 550	450	Sandy GRAVEL: Light brown/grey, fine to medium, sub rounded to sub angular. Fine to medium grained sand.	D	MD				
550 - 850	300	Sandy GRAVEL with clay: Low plasticity, light brown/orange. Fine to medium, sub rounded gravel. Fine to medium grained sand.	M	MD				
850 - 2000	1150	Sandy CLAY: Low to medium plasticity, light brown/orange to light brown/orange mottled red/grey.	M	F-St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2000					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 9 - Excavation




Test Pit No. 9 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP9


 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	19	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP10 Sample No. 1919G10				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
100 - 650	550	Sandy GRAVEL: Light brown/grey, fine to medium, sub rounded to sub angular. Fine to medium grained sand. Contains approx. 5-10% boulders up to 400mm diameter.		M	MD				
650 - 950	300	Sandy GRAVEL with clay: Low plasticity, light brown/orange. Fine to medium, sub rounded gravel. Fine to medium grained sand.		M	MD				
950 - 2000	1050	Sandy CLAY: Low to medium plasticity, light brown/orange to light brown/orange mottled red.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level					
				✓ or ✗					
				Target Depth					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered Moisture D - Dry M - Moist W - Wet General N/A - Not Applicable N/D - Not Determined					
Cohesive	Non-Cohesive								
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented						

Test Pit No. 10 - Excavation



Test Pit No. 10 - Spoil

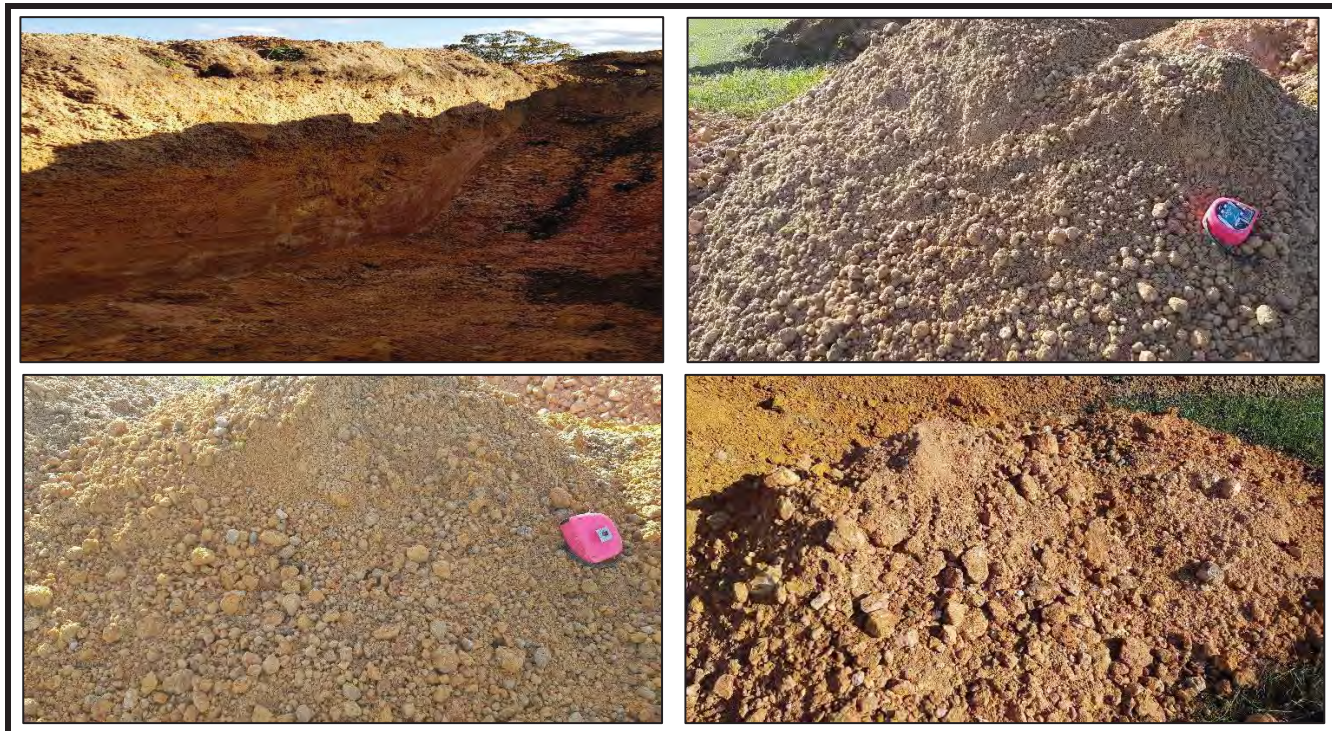


 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	21	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP11 Sample No. 1919G11				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
100 - 550	450	Sandy GRAVEL: Light brown/grey, fine to medium, sub rounded to sub angular. Fine to medium grained sand.		M	MD				
550 - 850	300	Sandy GRAVEL with clay: Low plasticity, brown/orange. Fine, sub rounded gravel. Fine to medium grained sand.		M	F				
850 - 1500	650	Sandy CLAY: Low to medium plasticity, light brown/orange.		M	F-St				
1500 - 2000	500	Sandy CLAY: Low to medium plasticity, light brown/white mottled red/orange		M	St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth ✓ 2000					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 11 - Excavation



Test Pit No. 11 - Spoil

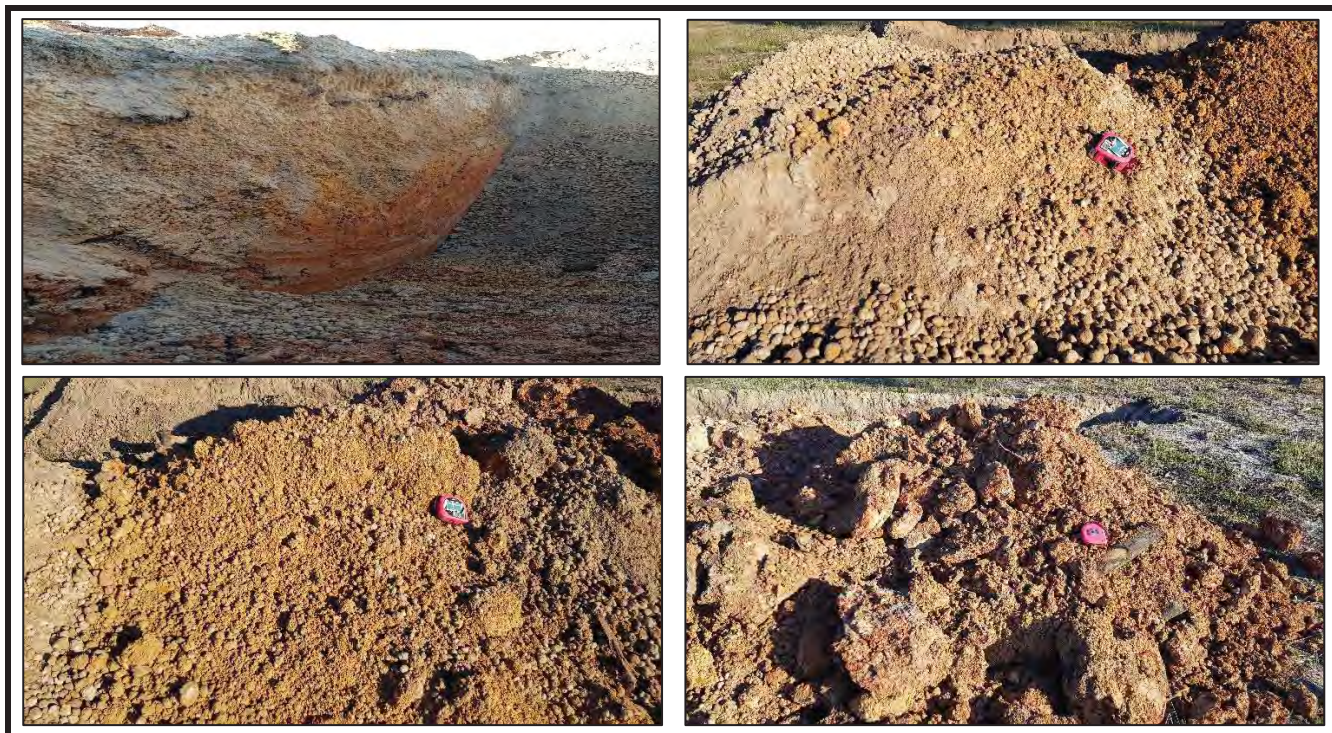


GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 23 of 108					
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP12 Sample No. 1919G12			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan						
Date Commenced: 29/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)					
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test	
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	D	L-MD		No water table encountered.			
100 - 750	650	Sandy GRAVEL: Light brown, fine to medium, sub rounded. Fine to medium grained sand.	M	MD					
750 - 1050	300	Clayey GRAVEL: Low to medium plasticity, light brown/orange. Fine to medium, sub rounded gravel. Fine to medium grained sand.	M-W	F					
1050 - 2000	950	Sandy CLAY: Low to medium plasticity, red/grey mottled. Fine to medium grained sand.	M	F					
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕						
			Target Depth		✓	2000			
			Cave In						
			Refusal						
			Near Refusal						
			Flooding						
			Lack of Reach						
Materials Consistency/Strength				Rock		Cementation		▼ Water Water first Encountered	
Cohesive		Non-Cohesive		EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High		IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		Moisture	
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard		VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact						D - Dry M - Moist W - Wet	
								General	
								N/A - Not Applicable N/D - Not Determined	

Test Pit No. 12 - Excavation



Test Pit No. 12 - Spoil




GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 25 of 108																														
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP13 Sample No. 1919G13		Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan																																
Date Commenced: 29/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)																														
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test																										
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	MD		No water table encountered.																												
150 - 400	250	SAND: Grey, fine to medium.	M	L-MD																														
400 - 1300	900	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange/red.	M	F																														
1300 - 2000	700	Sandy CLAY: Medium to high plasticity, red mottled white.	M-W	F-St																														
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕																															
			Target Depth ✓ 2000																															
			Cave In																															
			Refusal																															
			Near Refusal																															
			Flooding																															
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2">Materials Consistency/Strength</th> <th rowspan="2">Rock</th> <th rowspan="2">Cementation</th> </tr> <tr> <th>Cohesive</th> <th>Non-Cohesive</th> </tr> <tr> <td>VS - Very Soft</td> <td>VL - Very Loose</td> <td>EL - Extremely Low</td> <td rowspan="5"> IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented </td> </tr> <tr> <td>S - Soft</td> <td>L - Loose</td> <td>VL - Very Low</td> </tr> <tr> <td>F - Firm</td> <td>MD - Medium Dense</td> <td>L - Low</td> </tr> <tr> <td>St - Stiff</td> <td>D - Dense</td> <td>M - Medium</td> </tr> <tr> <td>VSt - Very Stiff</td> <td>VD - Very Dense</td> <td>H - High</td> </tr> <tr> <td>H - Hard</td> <td>CO - Compact</td> <td>VH - Very High</td> <td>EH - Extremely High</td> </tr> </table>			Materials Consistency/Strength		Rock	Cementation	Cohesive	Non-Cohesive	VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented	S - Soft	L - Loose	VL - Very Low	F - Firm	MD - Medium Dense	L - Low	St - Stiff	D - Dense	M - Medium	VSt - Very Stiff	VD - Very Dense	H - High	H - Hard	CO - Compact	VH - Very High	EH - Extremely High	Lack of Reach					
			Materials Consistency/Strength				Rock	Cementation																										
			Cohesive	Non-Cohesive																														
			VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented																												
			S - Soft	L - Loose	VL - Very Low																													
F - Firm	MD - Medium Dense	L - Low																																
St - Stiff	D - Dense	M - Medium																																
VSt - Very Stiff	VD - Very Dense	H - High																																
H - Hard	CO - Compact	VH - Very High	EH - Extremely High																															
			▼ Water Water first Encountered																															
			Moisture D - Dry M - Moist W - Wet																															
			General N/A - Not Applicable N/D - Not Determined																															

Test Pit No. 13 - Excavation



Test Pit No. 13 - Spoil

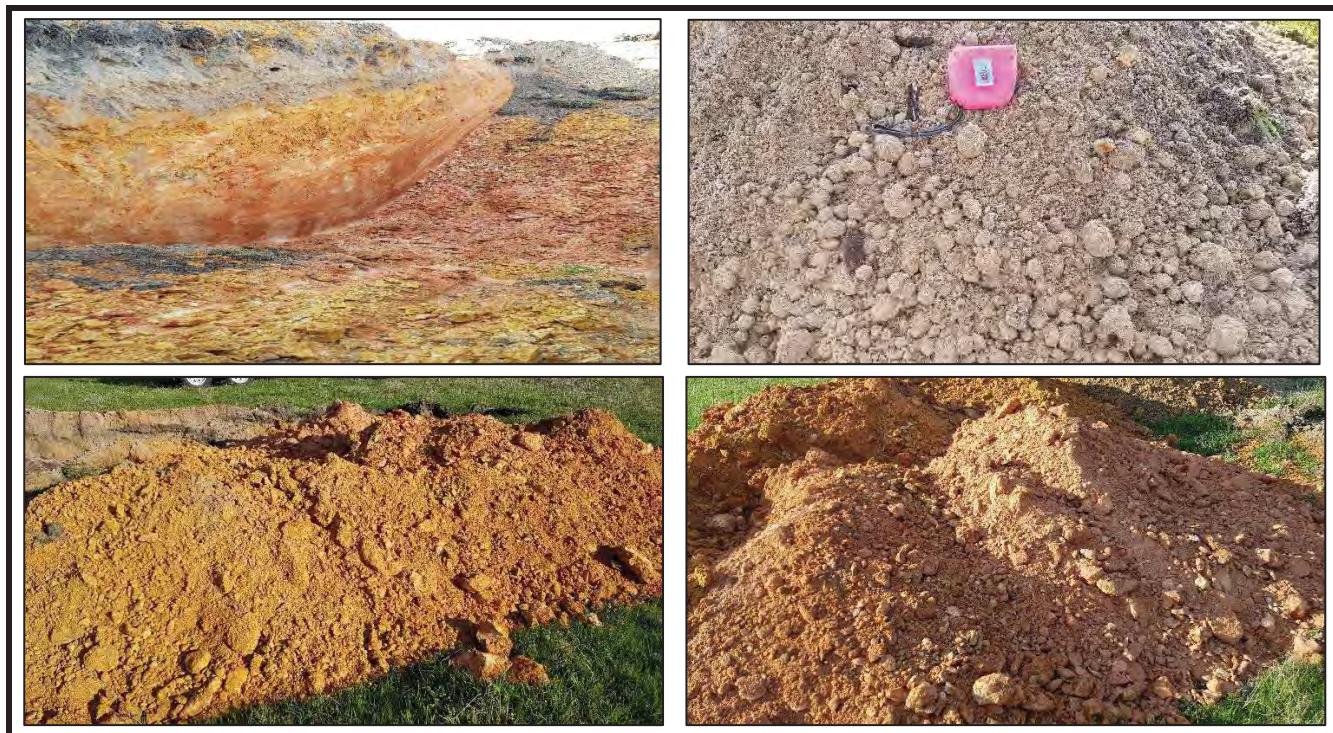



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	27	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP14 Sample No. 1919G14				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 200	200	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
200 - 400	200	SAND: Light grey, fine to medium.		M	L-MD				
400 - 550	150	Sandy GRAVEL: Light brown/grey, fine to medium, sub rounded. Fine to medium grained sand.		M	MD				
550 - 1000	1450	Sandy CLAY: Low to medium plasticity, light brown/orange.		M	F				
1000 - 2000	1000	Sandy CLAY: Low to medium plasticity, light brown/orange mottled red.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth <input checked="" type="checkbox"/> 2000					
				Cave In <input type="checkbox"/>					
				Refusal <input type="checkbox"/>					
				Near Refusal <input type="checkbox"/>					
				Flooding <input type="checkbox"/>					
				Lack of Reach <input type="checkbox"/>					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 14 - Excavation



Test Pit No. 14 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	29	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP15 Sample No. 1919G15				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 600	450	Sandy GRAVEL: Light brown/grey, fine to medium, sub rounded to sun angular. Fine to medium grained sand.		M	MD				
600 - 900	300	Gravelly CLAY: Low to medium plasticity, light brown/orange. Fine, sub rounded gravel. Fine to medium grained sand.		M	F				
900 - 2000	1100	Sandy CLAY: Low to medium plasticity, light brown/orange to light brown/orange mottled red.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level					
				✓ or ✕					
				Target Depth					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered Moisture D - Dry M - Moist W - Wet General N/A - Not Applicable N/D - Not Determined					
Cohesive	Non-Cohesive								
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated						
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High							
H - Hard	CO - Compact	VH - Very High							
		EH - Extremely High							

Test Pit No. 15 - Excavation



Test Pit No. 15 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

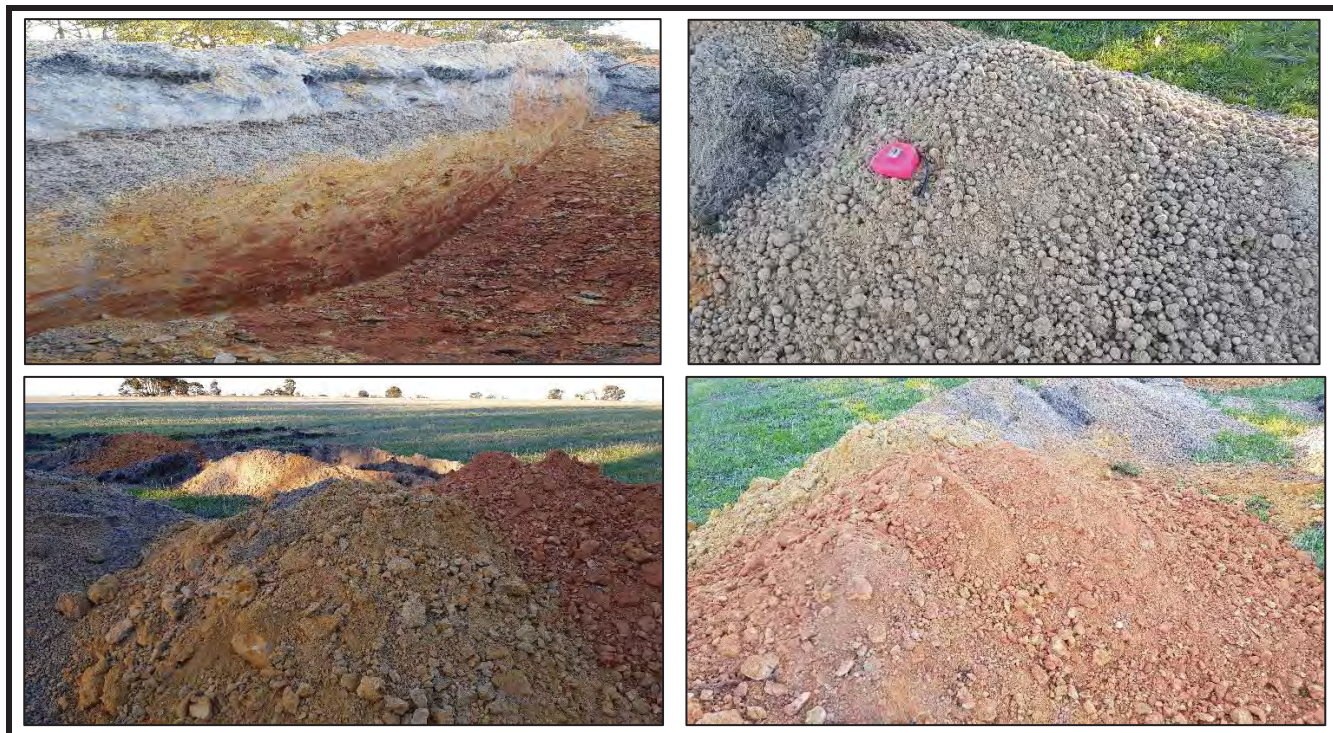
Test Pit No: TP15


w1726 1919G1-20 0

Test Pit No. 16 - Excavation



Test Pit No. 16 - Spoil




 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	33	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP17 Sample No. 1919G17				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 500	350	SAND: Light grey, fine to medium.		M	L-MD				
500 - 600	100	Gravelly SAND: Light grey, fine to medium. Fine, sub rounded to sub angular gravel.		M	L-MD				
600 - 850	250	Sandy GRAVEL: Brown, fine to coarse, sub rounded to sub angular. Fine to medium grained sand.		M	MD				
850 - 1000	150	Sandy GRAVEL: Brown/grey, fine, sub rounded to sub angular. Fine to medium grained sand.		W	MD				
1000 - 2000	1000	Sandy CLAY: Medium to high plasticity, light brown/orange mottled red/grey.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented	General					
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented	N/A - Not Applicable					
St - Stiff	D - Dense	M - Medium	WC - Well Cemented	N/D - Not Determined					
VSt - Very Stiff	VD - Very Dense	H - High							
H - Hard	CO - Compact	VH - Very High							
		EH - Extremely High							

Test Pit No. 17 - Excavation



Test Pit No. 17 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	35	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP18 Sample No. 1919G18				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
100 - 450	350	SAND: Light grey, fine to medium.		M	L-MD				
450 - 700	250	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded to sub angular. Fine to medium grained sand.		M	MD				
700 - 900	200	Gravelly CLAY: Low plasticity, grey/brown. Fine to coarse, sub rounded to sub angular gravel. Fine to medium grained sand.		M	F				
900 - 1300	400	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange. Fine to medium grained sand.		M	F-St				
1300 - 2000	700	Sandy CLAY: Low to medium plasticity, grey mottled red/orange. Fine to medium grained sand.		M	St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth ✓ 2000					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 18 - Excavation



Test Pit No. 18 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP18


GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919		Report 1919/1		Sheet 37 of 108	
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP19 Sample No. 1919G19				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan			
Date Commenced: 29/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)			
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.	
150 - 300	150	SAND: Light grey, fine to medium.	M	L-MD			
300 - 700	400	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded to sub angular. Fine to medium grained sand.	M	MD			
700 - 900	200	Gravelly CLAY: Low plasticity, grey/brown. Fine to medium, sub rounded gravel. Fine to medium grained sand.	M	F			
900 - 2000	1100	Sandy CLAY: Low to medium plasticity, light brown/grey mottled red/orange. Fine to medium grained sand.	M	F-St	MC		
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕				
			Target Depth <input checked="" type="checkbox"/> 2000 Cave In <input type="checkbox"/> Refusal <input type="checkbox"/> Near Refusal <input type="checkbox"/> Flooding <input type="checkbox"/> Lack of Reach <input type="checkbox"/>				
Materials Consistency/Strength		Rock	Cementation	Water Water first Encountered Moisture D - Dry M - Moist W - Wet General N/A - Not Applicable N/D - Not Determined			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented				

Test Pit No. 19 - Excavation



Test Pit No. 19 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	39	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP20 Sample No. 1919G20				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		30/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 250	100	SAND: Light grey, fine to medium.		M	L-MD				
250 - 550	300	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded to sub angular. Fine to medium grained sand.		M	MD				
550 - 700	150	Sandy GRAVEL with clay: Low plasticity, brown/orange. Fine to medium, sub rounded to sub angular gravel. Fine to medium grained sand.		M	MD				
700 - 1100	400	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange. Fine to medium grained sand.		M	F-St				
1100 - 2000	900	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange/red/white. Fine to medium grained sand.		M	St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth <input checked="" type="checkbox"/> 2000 Cave In <input type="checkbox"/> Refusal <input type="checkbox"/> Near Refusal <input type="checkbox"/> Flooding <input type="checkbox"/> Lack of Reach <input type="checkbox"/>					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered Moisture D - Dry M - Moist W - Wet General N/A - Not Applicable N/D - Not Determined					
Cohesive VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	Non-Cohesive VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented						

Test Pit No. 20 - Excavation



Test Pit No. 20 - Spoil



w1726 1919G21-40 0

Test Pit No. 21 - Excavation



Test Pit No. 21 - Spoil



GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 43 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP22 Sample No. 1919G22			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 30/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
100 - 400	300	SAND: Light grey, fine to medium.	M	L-MD				
400 - 600	200	Sandy GRAVEL: Light brown/grey, fine to medium, sub rounded to sub angular. Fine to medium grained sand.	M	MD				
600 - 750	150	Sandy GRAVEL with clay: Low plasticity, brown/orange. Fine to medium, sub rounded to sub angular gravel. Fine to medium grained sand.	M	MD				
750 - 1600	850	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange. Fine to medium grained sand.	M	F				
1600 - 2000	400	Silty CLAY: Low to medium plasticity, light brown/white.	M	F-St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth		✓	2000		
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water				
Cohesive	Non-Cohesive			Water first Encountered				
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented	Moisture				
				D - Dry M - Moist W - Wet				
				General				
				N/A - Not Applicable N/D - Not Determined				

Test Pit No. 22 - Excavation



Test Pit No. 22 - Spoil

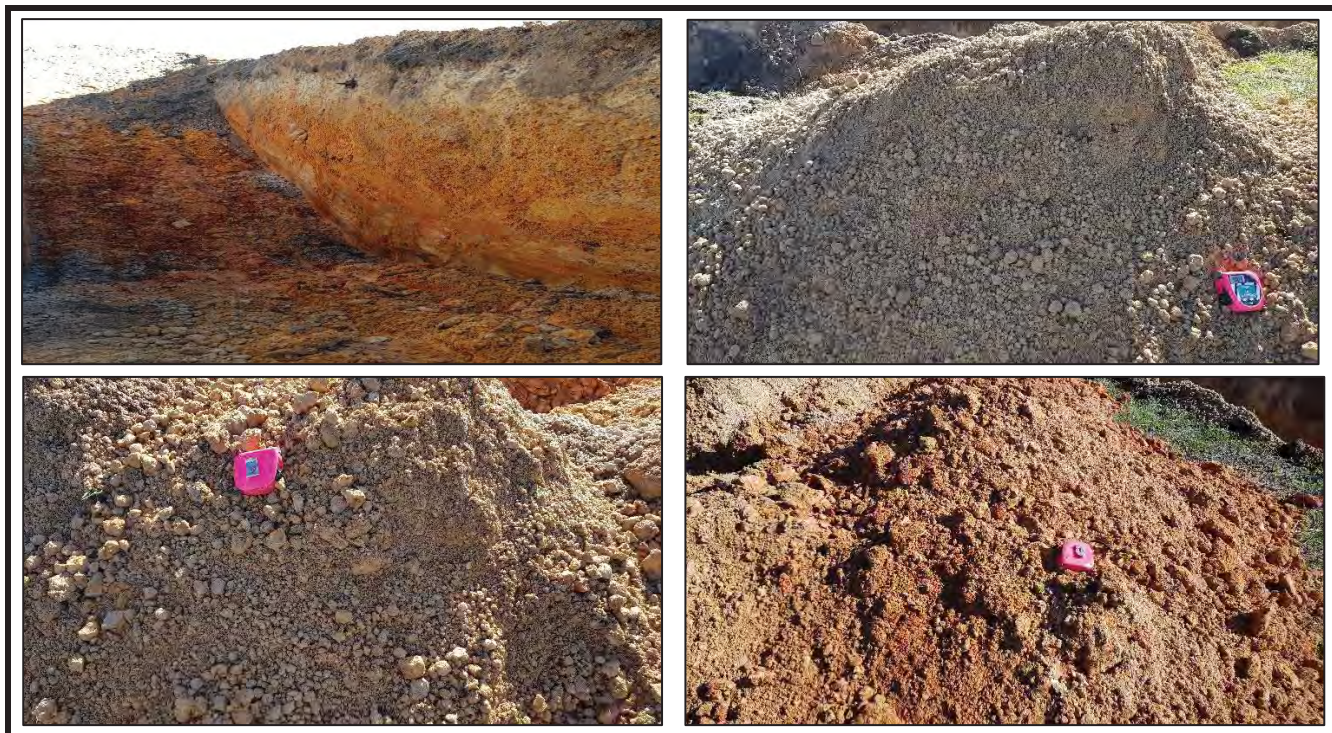


GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 45 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP23 Sample No. 1919G23			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 30/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
150 - 550	400	Sandy GRAVEL: Light brown/grey, fine to medium, sub rounded to sub angular. Fine to medium grained sand.	M	MD				
550 - 800	250	Sandy GRAVEL with clay: Low plasticity, brown/orange. Fine to medium, sub rounded to sub angular gravel. Fine to medium grained sand.	M	MD				
800 - 2000	1200	Sandy CLAY: Low to medium plasticity, light brown/grey mottled red/orange. Fine to medium grained sand.	M	F-St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water			
Cohesive	Non-Cohesive				Water first Encountered			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		Moisture			
				D - Dry M - Moist W - Wet				
				General				
				N/A - Not Applicable N/D - Not Determined				

Test Pit No. 23 - Excavation



Test Pit No. 23 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP23


GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 47 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP24 Sample No. 1919G24			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 30/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 5.2 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
150 - 550	400	SAND with silt: Light grey/brown, fine to medium.	M	L-MD				
550 - 800	250	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded to sub angular. Fine to medium grained sand. Contains approx. 5-10% cobbles.	M	MD				
800 - 2500	1700	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange.	M	F-St				
2500 - 5200	2700	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange/pink/white.	D	St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 5200					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 24 - Excavation



Test Pit No. 24 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	49	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP25 Sample No. 1919G25				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		30/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
100 - 300	200	SAND: Light grey, fine to medium.		M	L-MD				
300 - 500	200	Sandy GRAVEL: Light brown/grey, fine to medium, sub rounded. Fine to medium grained sand.		M	MD				
500 - 2000	1500	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange.		M	F				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength				▼ Water Water first Encountered					
Cohesive		Non-Cohesive		Rock		Cementation		Moisture	
VS - Very Soft		VL - Very Loose		EL - Extremely Low		IN - Indurated		D - Dry M - Moist W - Wet	
S - Soft		L - Loose		VL - Very Low		PC - Poorly Cemented			
F - Firm		MD - Medium Dense		L - Low		MC - moderately Cemented			
St - Stiff		D - Dense		M - Medium		WC - Well Cemented			
VSt - Very Stiff		VD - Very Dense		H - High					
H - Hard		CO - Compact		VH - Very High					
				EH - Extremely High				General	
								N/A - Not Applicable	
								N/D - Not Determined	

Test Pit No. 25 - Excavation



Test Pit No. 25 - Spoil




w1726 1919G21-40 0

Test Pit No. 26 - Excavation



Test Pit No. 26 - Spoil




 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	53	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP27 Sample No. 1919G27				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		30/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
100 - 600	500	SAND: Light grey, fine to medium.		M	L-MD				
600 - 1000	400	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded to sub angular. Fine to coarse, angular grained sand.		M-W	MD				
1000 - 2000	1000	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange. Fine to medium grained sand.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth ✓ 2000					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 27 - Excavation



Test Pit No. 27 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	55	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP28 Sample No. 1919G28				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		30/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150- 450	300	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded. Fine to medium grained sand.		M	MD				
450 - 750	300	Sandy GRAVEL trace clay: Low plasticity, light brown/orange. Fine to medium, sub rounded gravel. Fine to medium grained sand.		M	MD				
750 - 2000	1250	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange. Fine to medium grained sand.		M-D	F-St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth ✓ 2000					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 28 - Excavation



Test Pit No. 28 - Spoil



GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 57 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP29 Sample No. 1919G29		Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan						
Date Commenced: 30/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
150 - 300	150	SAND: Grey, fine to medium.	M	L-MD				
300 - 500	200	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded. Fine to medium grained sand.	M	MD				
500 - 2000	1500	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange. Fine to medium grained sand.	M	F-St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2000					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 29 - Excavation



Test Pit No. 29 - Spoil



GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 59 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP30 Sample No. 1919G30			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 30/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
100 - 350	250	SAND: Light grey, fine to medium.	M	L-MD				
350 - 2000	1650	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange/red to grey mottled orange/red. Fine to medium grained sand.	M	F-St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2000					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 30 - Excavation



Test Pit No. 30 - Spoil




GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 61 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP31 Sample No. 1919G31			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 30/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
100 - 650	550	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded to sub angular. Fine to medium grained sand.	M	MD				
650 - 2000	1450	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange/red. Fine to medium grained sand.	M	F-St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2000					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 31 - Excavation



Test Pit No. 31 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	63	of	108	
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP32 Sample No. 1919G32				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan						
Date Commenced:		30/07/2019		Logged By:		M.Coffey		Excavation Dimensions:		
				Depth		2.0 (m)		Width 0.9 (m)		
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test	
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components								
0 -150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.			
150 - 550	400	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded to sub angular. Fine to medium grained sand. Contains approx. 5-10% cobbles.		M-W	MD					
550 - 1000	450	Sandy GRAVEL trace clay: Low plasticity, light brown/orange. Fine to medium, sub rounded to sub angular gravel. Fine to medium grained sand.		M	MD					
1000 - 2000	1000	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange/red. Fine to medium grained sand.		M	F-St					
Comments				Pit Terminated at: (mm) below ground level						
				✓ or ✕						
				Target Depth						
				Cave In						
				Refusal						
				Near Refusal						
				Flooding						
				Lack of Reach						
Materials Consistency/Strength				<div> <div> <div>Cohesive</div> <div>Non-Cohesive</div> </div> <div> <div>Rock</div> <div>Cementation</div> </div> </div>						
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard		VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact		EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High		IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		<div> <div>Water</div> <div>Moisture</div> <div>General</div> </div>		
						Water first Encountered				
						D - Dry M - Moist W - Wet				
						N/A - Not Applicable N/D - Not Determined				

Test Pit No. 32 - Excavation



Test Pit No. 32 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP32


w1726 1919G21-40 0

Test Pit No. 33 - Excavation



Test Pit No. 33 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	67	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP34 Sample No. 1919G34				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		30/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		1.8 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 950	800	SAND: Light grey, fine to medium.		M	L-MD				
950 - 1800	850	Sandy CLAY: Low to medium plasticity, grey mottled red. Fine to medium grained sand.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level					
				✓ or ✗					
				Target Depth ✓ 1800					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered Moisture D - Dry M - Moist W - Wet General N/A - Not Applicable N/D - Not Determined					
Cohesive VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	Non-Cohesive VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented						

Test Pit No. 34 - Excavation




Test Pit No. 34 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP34

 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	69	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP35 Sample No. 1919G35				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
100 - 300	200	SAND: Light grey, fine to medium.		M	L-MD				
300 - 700	400	Sandy GRAVEL trace clay: Low plasticity, light grey. Fine to medium, sub rounded to sub angular gravel. Fine to medium grained sand. Contains approx. 5-10% boulders up to 400mm diameter.		M	L-MD				
700 - 1500	800	Gravelly CLAY: Low to medium plasticity, light brown mottled orange. Fine to medium, sub rounded to sub angular gravel. Fine to medium grained sand.		M	F-St				
1500 - 2000	500	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange/red. Fine to medium grained sand. Contains some cemented sand pockets.		M	St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth ✓ 2000					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 35 - Excavation



Test Pit No. 35 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP35

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 71 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP36 Sample No. 1919G36			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 29/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 150	150	(Topsoil) SAND with silt: Grey/brown, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
150 - 500	350	Sandy GRAVEL: Brown, fine to medium, sub rounded. Fine to medium grained sand.	M	MD				
500 - 850	350	Sandy GRAVEL with clay: Low plasticity, brown/orange. Fine to medium, sub rounded gravel. Fine to medium grained sand.	M	MD				
850 - 1700	950	Sandy CLAY: Medium plasticity, light brown/orange to light brown/white.	M	St				
1700 - 2000	300	Clayey SAND with silt: Low plasticity, white. Fine to medium grained sand.	M	St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2000					
			Cave In <input type="checkbox"/>					
			Refusal <input type="checkbox"/>					
			Near Refusal <input type="checkbox"/>					
			Flooding <input type="checkbox"/>					
			Lack of Reach <input type="checkbox"/>					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 36 - Excavation



Test Pit No. 36 - Spoil




GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 73 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP37 Sample No. 1919G37			Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 29/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
150 - 550	400	SAND: Grey, fine to medium.	M	L-MD				
550 - 1100	650	Sandy GRAVEL trace clay: Low plasticity, brown/orange. Fine to medium, sub rounded to sub angular gravel. Fine to medium grained sand.	M	MD				
1100 - 2000	900	Sandy CLAY: Low plasticity, light brown/white mottled orange.	M	F				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2000					
			Cave In <input type="checkbox"/>					
			Refusal <input type="checkbox"/>					
			Near Refusal <input type="checkbox"/>					
			Flooding <input type="checkbox"/>					
			Lack of Reach <input type="checkbox"/>					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 37 - Excavation



Test Pit No. 37 - Spoil




 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	75	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP38 Sample No. 1919G38				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
100 - 750	650	Sandy GRAVEL: Light grey/brown, fine to medium, sub rounded to rounded. Fine to medium grained sand.		M	MD				
750 - 2000	1250	Clayey GRAVEL: Low plasticity, brown/red. Fine to medium, sub rounded gravel.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level					
				✓ or ✕					
				Target Depth					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength				<div> <div> <div>Cohesive</div> <div>Non-Cohesive</div> </div> <div> <div>Rock</div> <div>Cementation</div> </div> </div>					
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard		VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact		EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High		IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		<div> <div>▼ Water</div> <div>Water first Encountered</div> </div> <div> <div>Moisture</div> <div>D - Dry M - Moist W - Wet</div> </div> <div> <div>General</div> <div>N/A - Not Applicable N/D - Not Determined</div> </div>	

Test Pit No. 38 - Excavation



Test Pit No. 38 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	77	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP39 Sample No. 1919G39				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
100 - 400	300	SAND with silt: Light grey, fine to medium.		M	L-MD				
400 - 600	200	Sandy GRAVEL with clay: Low plasticity, brown/orange. Fine to coarse, sub rounded to sub angular gravel. Fine to medium grained sand.		M	MD				
600 - 2000	1400	Sandy CLAY: Low to medium plasticity, light brown mottled orange/red/grey. Fine to medium grained sand.		M	F				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 39 - Excavation



Test Pit No. 39 - Spoil

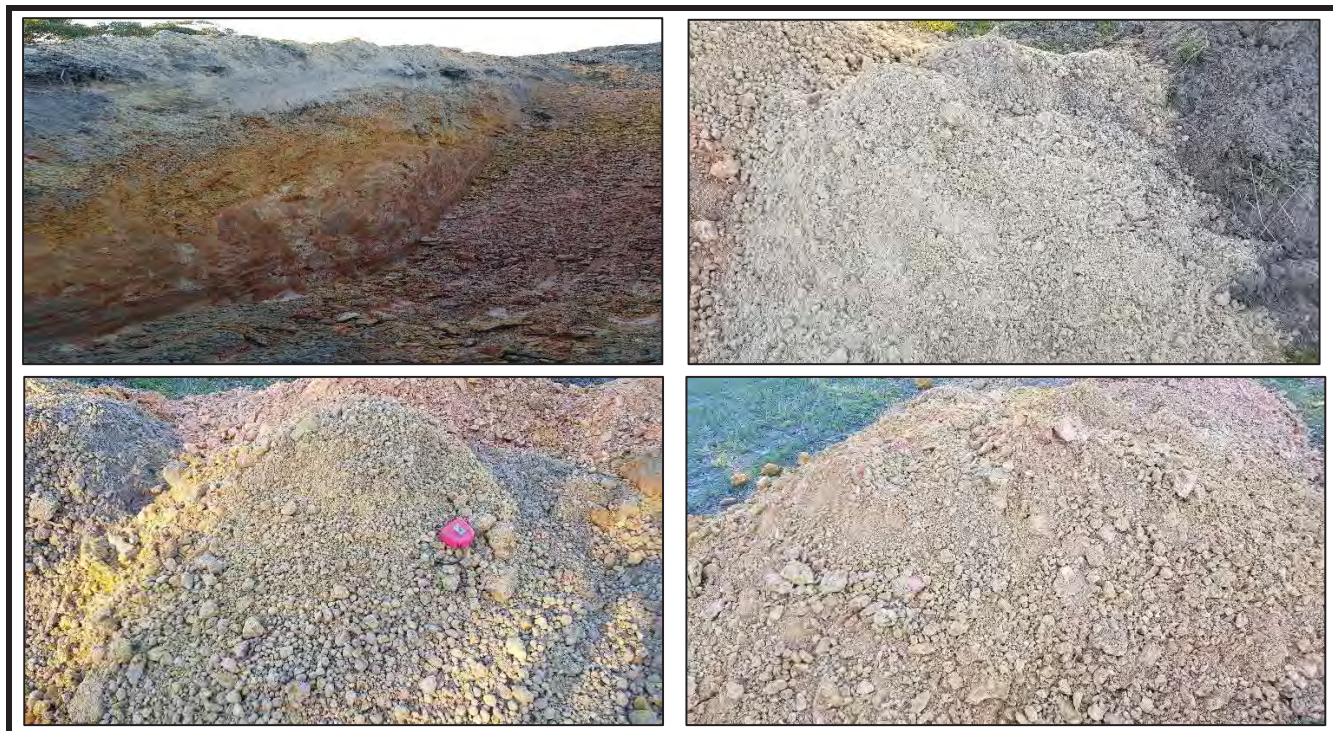


w1726 1919G21-40 0

Test Pit No. 40 - Excavation




Test Pit No. 40 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP40


 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	81	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP41 Sample No. 1919G41				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		30/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 200	200	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
200 - 500	300	SAND: Light grey, fine to medium.		M	L-MD				
500 - 800	300	SAND: Light grey/brown, fine to medium.		M-W	L-MD				
800 - 1800	1000	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange.		M	F				
1800 - 2000	200	Sandy CLAY: Low to medium plasticity, grey mottled light brown/orange.		M	F-St				
		Fine to coarse grained sand.							
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 41 - Excavation



Test Pit No. 41 - Spoil




 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	83	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP42 Sample No. 1919G42				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		30/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		water table at 1100mm below existing ground level 24hrs after excavation		
150 - 1000	850	SAND: Light grey, fine to medium, angular to sub angular.		M-W	L-MD				
1000 - 2000	1000	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level					
				✓ or ✕					
Water seeping in test pit over sandy CLAY layer.				Target Depth					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered Moisture D - Dry M - Moist W - Wet General N/A - Not Applicable N/D - Not Determined					
Cohesive	Non-Cohesive								
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated						
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High							
H - Hard	CO - Compact	VH - Very High							
		EH - Extremely High							

Test Pit No. 42 - Excavation



Test Pit No. 42 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	85	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP43 Sample No. 1919G43				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		30/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 400	250	Gravelly SAND: Light grey/brown, fine to medium. Fine to medium, sub rounded to sub angular gravel.		M	MD				
400 - 700	300	Sandy GRAVEL: Brown/orange, fine to medium, sub rounded to sub angular. Fine to medium grained sand.		M	MD				
700 - 900	200	Sandy GRAVEL: Brown/grey, fine to medium, sub rounded to sub angular. Fine to medium grained sand.		M-W	MD				
900 - 2000	1100	Sandy CLAY: Low to medium plasticity, grey mottled red. Fine to medium grained sand.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth ✓ 2000					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered Moisture D - Dry M - Moist W - Wet General N/A - Not Applicable N/D - Not Determined					
Cohesive VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	Non-Cohesive VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented						

Test Pit No. 43 - Excavation



Test Pit No. 43 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP43

w1726 1919G41-54 0

Test Pit No. 44 - Excavation



Test Pit No. 44 - Spoil




w1726 1919G41-54 0

Test Pit No. 45 - Excavation



Test Pit No. 45 - Spoil




 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	91	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP46 Sample No. 1919G46				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		1.6 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 1000	850	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded to sub angular. diameter.		M	MD-D				
1000 - 1200	200	Sandy GRAVEL: Brown/orange, fine to medium, sub rounded to sub angular. Fine to medium grained sand.		M	MD				
1200 - 1600	400	Sandy CLAY: Low to medium plasticity, light brown/orange mottled red. Fine to medium grained sand.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level					
				✓ or ✕					
Cobbles & boulders could be seen across the surface in this area.				Target Depth ✓ 1600					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered Moisture D - Dry M - Moist W - Wet General N/A - Not Applicable N/D - Not Determined					
Cohesive VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	Non-Cohesive VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented						

Test Pit No. 46 - Excavation



Test Pit No. 46 - Spoil

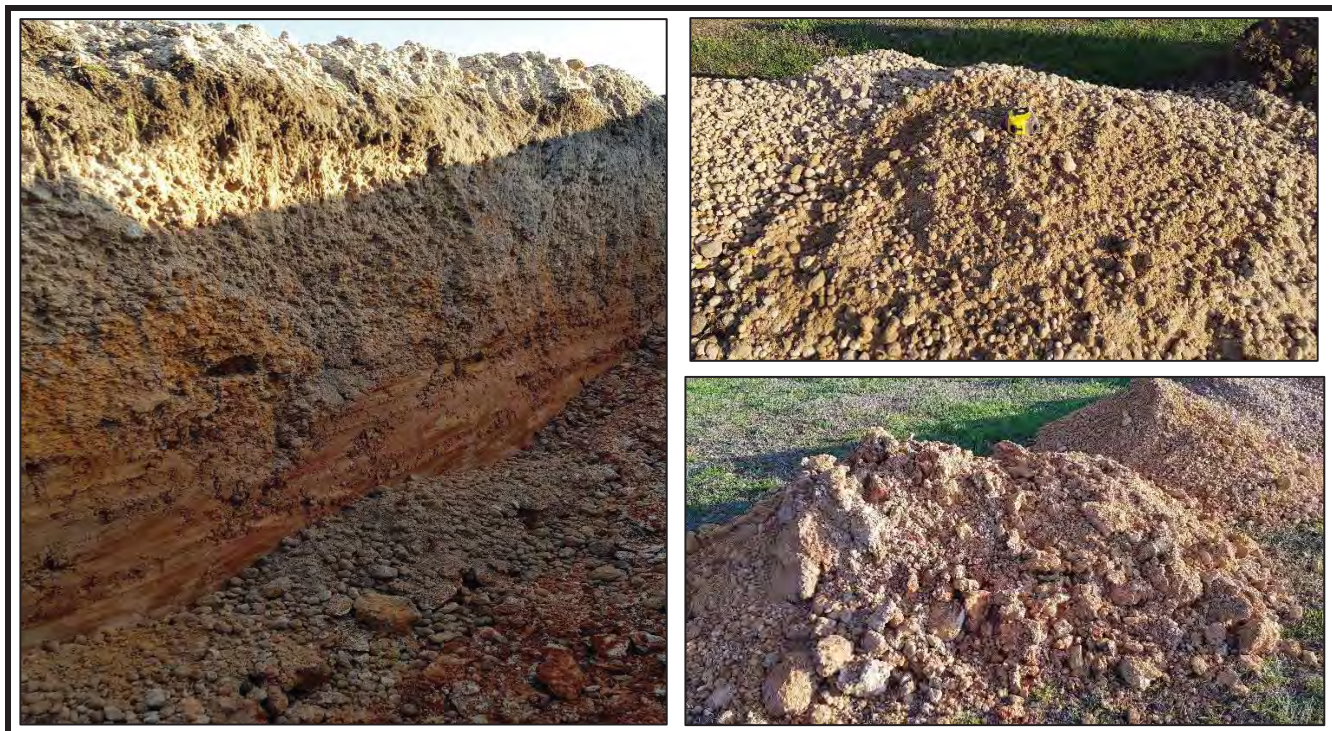


 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	93	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP47 Sample No. 1919G47				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		30/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		1.2 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 400	250	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded to sub angular. Fine to medium grained sand. Contains approx. 5-10% cobbles.		M	MD				
400 - 650	250	Sandy GRAVEL trace clay: Low plasticity, brown/orange, fine to medium, sub rounded to sub angular. Fine to medium grained sand.		M	MD				
650 - 1200	550	Sandy CLAY: Low to medium plasticity, light brown/grey mottled red. Fine to medium grained sand.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth ✓ 1200					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 47 - Excavation




Test Pit No. 47 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP47

 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	95	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP48 Sample No. 1919G48				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		30/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		1.6 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 500	350	Sandy GRAVEL: Light brown/grey, fine to medium, sub rounded to sub angular. Fine to medium grained sand.		M	MD				
500 - 750	250	Sandy GRAVEL: Brown/orange, fine to medium, sub rounded to sub angular. Fine to medium grained sand.		M	MD	PC			
750 - 1500	750	Sandy CLAY: Low to medium plasticity, light brown/grey mottled orange. Fine to medium grained sand.		M	St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength				▼ Water Water first Encountered					
Cohesive		Non-Cohesive		Rock		Cementation		Moisture	
VS - Very Soft		VL - Very Loose		EL - Extremely Low		IN - Indurated		D - Dry M - Moist W - Wet	
S - Soft		L - Loose		VL - Very Low					
F - Firm		MD - Medium Dense		L - Low		PC - Poorly Cemented			
St - Stiff		D - Dense		M - Medium		MC - moderately Cemented			
VSt - Very Stiff		VD - Very Dense		H - High		WC - Well Cemented			
H - Hard		CO - Compact		VH - Very High					
				EH - Extremely High				General	
								N/A - Not Applicable	
								N/D - Not Determined	

Test Pit No. 48 - Excavation




Test Pit No. 48 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP48


 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	97	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP49 Sample No. 1919G49				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		31/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		1.9 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 1100	950	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded to sub angular. Fine to medium grained sand.		M	MD				
1100 - 1600	500	Sandy GRAVEL with clay: Low plasticity, light brown/orange, fine to medium, sub rounded to sub angular. Fine to medium grained sand.		M	MD				
1600 - 1900	300	Sandy CLAY with gravel: Low to medium plasticity, brown/orange. Fine to medium, sub rounded to sub angular. Fine to medium grained sand.		M	F-St				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive	Non-Cohesive			Moisture					
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated	D - Dry M - Moist W - Wet					
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented						
F - Firm	MD - Medium Dense	L - Low	MC - moderately Cemented						
St - Stiff	D - Dense	M - Medium	WC - Well Cemented						
VSt - Very Stiff	VD - Very Dense	H - High		General					
H - Hard	CO - Compact	VH - Very High		N/A - Not Applicable					
		EH - Extremely High		N/D - Not Determined					

Test Pit No. 49 - Excavation



Test Pit No. 49 - Spoil




 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	99	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP50 Sample No. 1919G50				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced: 31/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 1.2 (m) Width 0.9 (m)					
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
100 - 500	400	SAND: Light brown/white, fine to medium.		M	L-MD				
500 - 1200	700	Sandy CLAY with gravel: Low to medium plasticity, brown/orange. Fine to medium, sub rounded to sub angular. Fine to medium grained sand.		M	F				
Comments				Pit Terminated at: (mm) below ground level ✓ or ✕					
				Target Depth ✓ 1200					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered					
Cohesive VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	Non-Cohesive VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented	Moisture D - Dry M - Moist W - Wet					
				General N/A - Not Applicable N/D - Not Determined					

Test Pit No. 50 - Excavation



Test Pit No. 50 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	101	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP51 Sample No. 1919G51				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		29/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		0.55 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey/brown, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 400	250	Sandy GRAVEL: Light brown, fine to medium, sub rounded. Fine to medium grained sand.		M	MD				
400 - 550	150	Sandy CLAY: Medium to high plasticity, red mottled light brown. Fine to medium grained sand.		M	F				
Comments				Pit Terminated at: (mm) below ground level					
				✓ or ✕					
				Target Depth ✓ 550					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered Moisture D - Dry M - Moist W - Wet General N/A - Not Applicable N/D - Not Determined					
Cohesive VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	Non-Cohesive VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented						

Test Pit No. 51 - Excavation



Test Pit No. 51 - Spoil




GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 103 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP52 Sample No. 1919G52		Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan						
Date Commenced: 31/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 1.6 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
150 - 500	350	Sandy GRAVEL: Light brown/grey, fine to coarse, sub rounded to sub angular. Fine to medium grained sand.	M	MD				
500 - 850	350	Sandy CLAY with gravel: Low to medium plasticity, brown/orange. Fine to medium, sub rounded to sub angular. Fine to medium grained sand.	M	F				
850 - 1400	550	Sandy CLAY: Low to medium plasticity, orange/red. Fine to medium grained sand.	M	F-St				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 1400					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 52 - Excavation



Test Pit No. 52 - Spoil



 GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No	1919	Report	1919/1	Sheet	105	of	108
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP53 Sample No. 1919G53				Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan					
Date Commenced:		31/07/2019		Logged By:		M.Coffey		Excavation Dimensions:	
				Depth		2.0 (m)		Width 0.9 (m)	
Depth Below Surface (mm)	Layer Depth (mm)	Material Description		Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
		SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components							
0 - 150	150	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.		M	L-MD		No water table encountered.		
150 - 750	600	Sandy GRAVEL: Brown, fine to coarse, sub rounded to sub angular. Fine to medium grained sand.		M	MD-D				
750 - 1550	800	Sandy GRAVEL: Brown, fine to coarse, sub angular to angular. Fine to medium grained sand. Contains Approximately 40% boulders up to 800mm diameter. Excavates as a sandy GRAVEL but consists of a conglomerate formation.		D	VD				
1550 - 2000	450	Sandy CLAY with gravel: Low to medium plasticity, light brown/red. Fine to medium, sub rounded to sub angular. Fine to medium grained sand.		D	VSt				
Comments				Pit Terminated at: (mm) below ground level					
				✓ or ✕					
				Target Depth ✓ 2000					
				Cave In					
				Refusal					
				Near Refusal					
				Flooding					
				Lack of Reach					
Materials Consistency/Strength		Rock	Cementation	▼ Water Water first Encountered Moisture D - Dry M - Moist W - Wet General N/A - Not Applicable N/D - Not Determined					
Cohesive	Non-Cohesive								
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented						

Test Pit No. 53 - Excavation



Test Pit No. 53 - Spoil



GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING		Job No 1919	Report 1919/1	Sheet 107 of 108				
Client: Fletchers International WA Project: Fletcher Proposed Feedlot Project Project No.: N/A Location: 670 Youngs Road, Beaufort River WA Test Pit No.: TP54 Sample No. 1919G54		Operator/Contractor: GSG Equipment type: Caterpillar 319DI 20 tonne Excavator Excavation Method : 900mm trenching bucket. Position: Refer to site plan						
Date Commenced: 31/07/2019		Logged By: M.Coffey		Excavation Dimensions: Depth 2.0 (m) Width 0.9 (m)				
Depth Below Surface (mm)	Layer Depth (mm)	Material Description <small>SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components</small>	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 100	100	(Topsoil) SAND with silt: Grey, fine to medium. Roots & root fibres.	M	L-MD		No water table encountered.		
100 - 750	650	SAND: Yellow, fine to medium.	M	L-MD				
750 - 1600	850	Sandy GRAVEL: Yellow/light brown. Fine to medium, sub rounded to sub angular Fine to medium grained sand.	M	MD				
1600 - 2000	400	Sandy CLAY with gravel: Low to medium plasticity, light brown/red. Fine to medium, sub rounded to sub angular. Fine to medium grained sand.	M	F				
Comments			Pit Terminated at: (mm) below ground level ✓ or ✕					
			Target Depth ✓ 2000					
			Cave In					
			Refusal					
			Near Refusal					
			Flooding					
			Lack of Reach					
Materials Consistency/Strength		Rock	Cementation		▼ Water Water first Encountered			
Cohesive	Non-Cohesive				Moisture D - Dry M - Moist W - Wet			
VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense CO - Compact	EL - Extremely Low VL - Very Low L - Low M - Medium H - High VH - Very High EH - Extremely High	IN - Indurated PC - Poorly Cemented MC - moderately Cemented WC - Well Cemented		General N/A - Not Applicable N/D - Not Determined			

Test Pit No. 54 - Excavation



Test Pit No. 54 - Spoil



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 1919
Client: Fletchers International WA
Project: Fletcher Proposed Feedlot Project

Test Pit No: TP54



Appendix 2

Test Results

GREAT SOUTHERN GEOTECHNICS



5a 209 Chester Pass Road, Milpara WA 6330

Mobile: 0407 903 297 Email: Info@gsgeotechnics.com

DRY DENSITY & MOISTURE CONTENT RELATION OF SOIL TEST REPORT

Sheet 1 of 7

AS 1289.5.2.1

Report No.	1905 /1	Date Sampled	29/07/2019
Job No.	1905	Date Received	31/07/2019
Client	Fletchers International WA	Date Tested	14/08/2019
Client No.	QU-0159	Sample No.	1905G1
Project	Fletcher Proposed Feedlot Project	Curing Period Water	121 hour(s)
Road	Youngs Road, Beaufort River	Curing Period Stabilizer	N/A hour(s)
Section	Permeability Testing	Stabilizer Added	N/A %
Layer Type	In Situ	Sampling Method	AS 1289.1.2.1-6.5: In-situ material
Material Description	Sandy CLAY	Preparation Method	AS 1289.1.1
Test Depth (mm)	600mm to 2000mm	Location Details	Test Pit 1
		LL Determined By	Estimated

Oversize Material

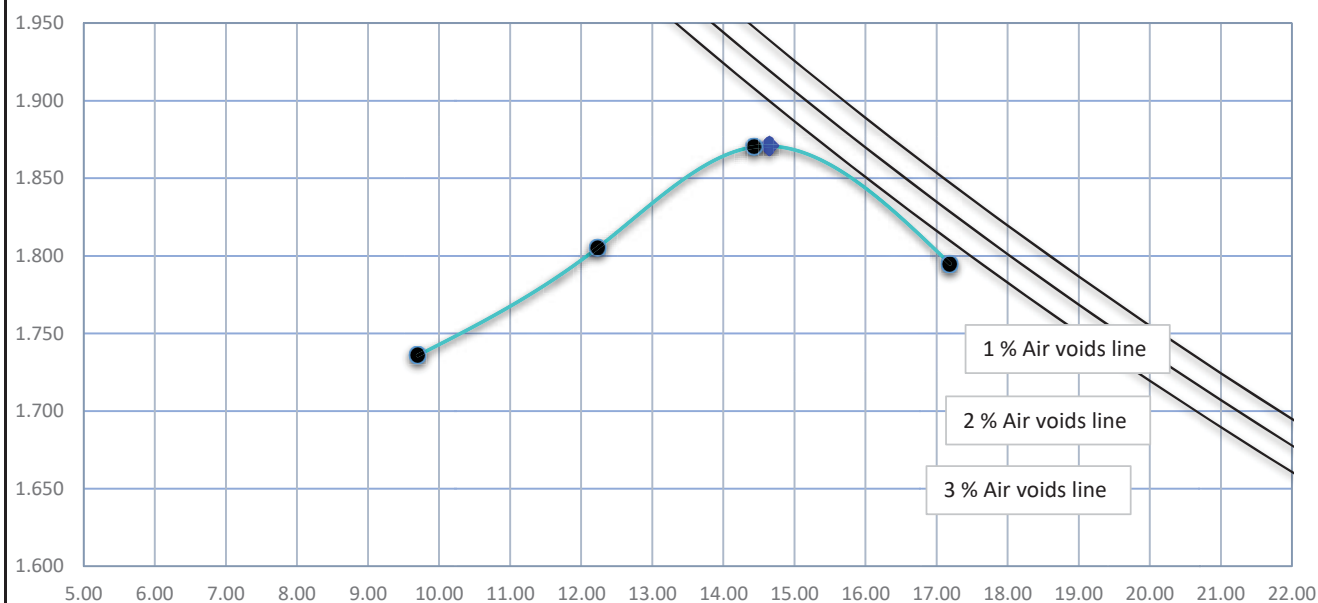
Retained 19.0mm	0	%
Retained 37.5mm	0	%

Laboratory Moisture & Density Results

Moisture Content (%)	9.5	12.0	14.5	17.0	
Dry Density (t/m ³)	1.74	1.81	1.87	1.79	

Dry Density vs. Moisture Content

Dry Density (t/m³)



< Optimum Moisture Content (%) >

Maximum Dry Density (t/m ³)	1.87
Optimum Moisture Content (%)	14.5



Comments

Distribution

Laboratory File / Farron Fletcher

Approved Signatory:

Name: M.COFFEY
Function: Laboratory Manager
Date: 17-September-2019

GREAT SOUTHERN GEOTECHNICS



5a 209 Chester Pass Road, Milpara WA 6330

Mobile: 0407 903 297 Email: Info@gsgeotechnics.com

DRY DENSITY & MOISTURE CONTENT RELATION OF SOIL TEST REPORT

Sheet 2 of 7

AS 1289.5.2.1

Report No.	1905 /1	Date Sampled	29/07/2019
Job No.	1905	Date Received	31/07/2019
Client	Fletchers International WA	Date Tested	14/03/2019
Client No.	QU-0159	Sample No.	1905G2
Project	Fletcher Proposed Feedlot Project	Curing Period Water	125 hour(s)
Road	Youngs Road, Beaufort River	Curing Period Stabilizer	N/A hour(s)
Section	Permeability Testing	Stabilizer Added	N/A %
Layer Type	In Situ	Sampling Method	AS 1289.1.2.1-6.5: In-situ material
Material Description	Sandy CLAY	Preparation Method	AS 1289.1.1
Test Depth (mm)	850mm to 2000mm	Location Details	Test Pit 9
		LL Determined By	Estimated

Oversize Material

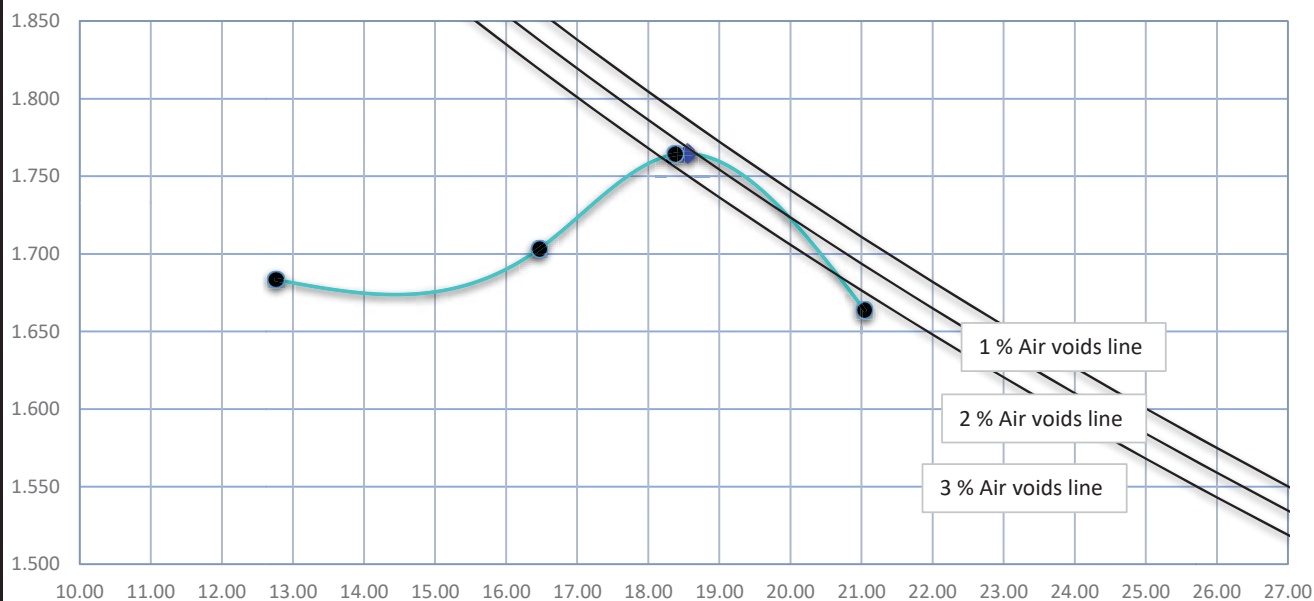
Retained 19.0mm	0	%
Retained 37.5mm	0	%

Laboratory Moisture & Density Results

Moisture Content (%)	13.0	16.5	18.5	21.0	
Dry Density (t/m ³)	1.68	1.70	1.76	1.66	

Dry Density vs. Moisture Content

Dry Density (t/m³)



< Optimum Moisture Content (%) >

Maximum Dry Density (t/m ³)	1.76
Optimum Moisture Content (%)	18.5



Comments

Distribution

Laboratory File /Fallon Fletcher

Approved Signatory:

Name: M.COFFEY
Function: Laboratory Manager
Date: 17-September-2019

GREAT SOUTHERN GEOTECHNICS



5a 209 Chester Pass Road, Milpara WA 6330

Mobile: 0407 903 297 Email: Info@gsgotechnics.com

DRY DENSITY & MOISTURE CONTENT RELATION OF SOIL TEST REPORT

Sheet 3 of 7

AS 1289.5.2.1

Report No.	1905 /1	Date Sampled	29/07/2019
Job No.	1905	Date Received	31/07/2019
Client	Fletchers International WA	Date Tested	14/05/2019
Client No.	QU-0159	Sample No.	1905G3
Project	Fletcher Proposed Feedlot Project	Curing Period Water	120 hour(s)
Road	Youngs Road, Beaufort River	Curing Period Stabilizer	N/A hour(s)
Section	Permeability Testing	Stabilizer Added	N/A %
Layer Type	In Situ	Sampling Method	AS 1289.1.2.1-6.5: In-situ material
Material Description	Sandy CLAY	Preparation Method	AS 1289.1.1
Test Depth (mm)	1300mm to 2000mm	Location Details	Test Pit 13
		LL Determined By	Estimated

Oversize Material

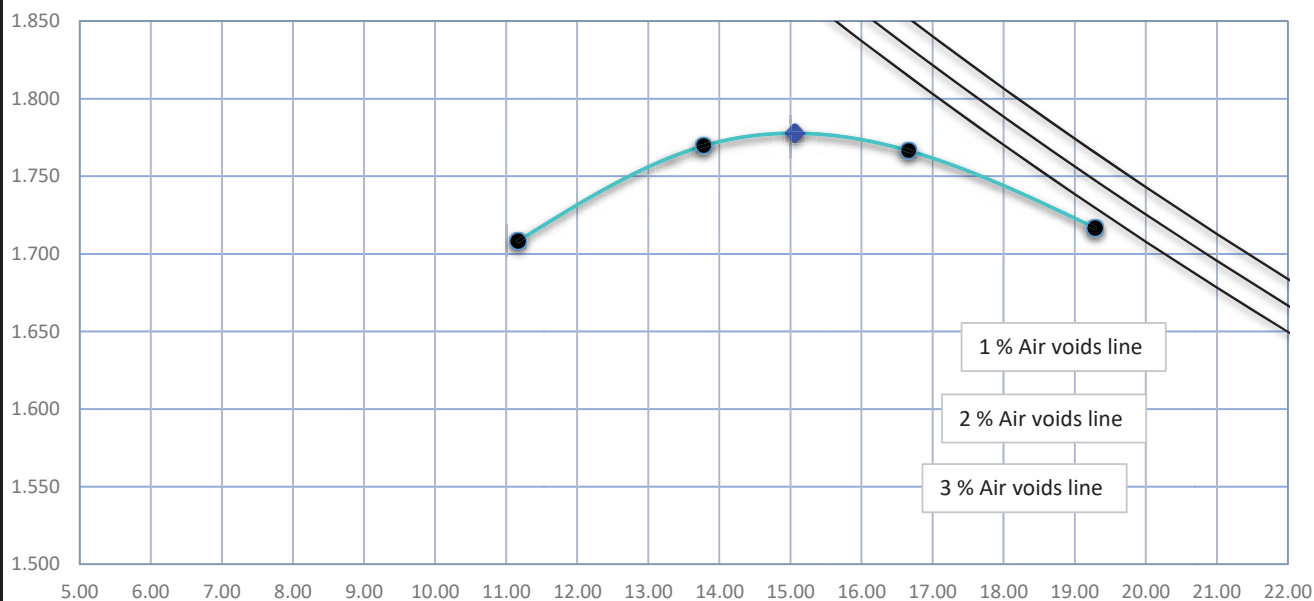
Retained 19.0mm	0	%
Retained 37.5mm	0	%

Laboratory Moisture & Density Results

Moisture Content (%)	14.0	16.5	19.5		11.0
Dry Density (t/m ³)	1.77	1.77	1.72		1.71

Dry Density vs. Moisture Content

Dry Density (t/m³)



< Optimum Moisture Content (%) >

Maximum Dry Density (t/m ³)	1.78
Optimum Moisture Content (%)	15.0



Comments

Distribution

Laboratory File / Fallon Fletcher

Approved Signatory:

Name: M.COFFEY
Function: Laboratory Manager
Date: 17-September-2019

GREAT SOUTHERN GEOTECHNICS

5a 209 Chester Pass Road, Milpara WA 6330

Mobile: 0407 903 297 Email: Info@gsgeotechnics.com



DRY DENSITY & MOISTURE CONTENT RELATION OF SOIL TEST REPORT

Sheet 4 of 7

AS 1289.5.2.1

Report No.	1905 /1	Date Sampled	29/07/2019
Job No.	1905	Date Received	31/07/2019
Client	Fletchers International WA	Date Tested	14/08/2019
Client No.	QU-0159	Sample No.	1905G4
Project	Fletcher Proposed Feedlot Project	Curing Period Water	124 hour(s)
Road	Youngs Road, Beaufort River	Curing Period Stabilizer	N/A hour(s)
Section	Permeability Testing	Stabilizer Added	N/A %
Layer Type	In Situ	Sampling Method	AS 1289.1.2.1-6.5: In-situ material
Material Description	Sandy CLAY	Preparation Method	AS 1289.1.1
Test Depth (mm)	1600mm to 2000mm	Location Details	Test Pit 22
		LL Determined By	Estimated

Oversize Material

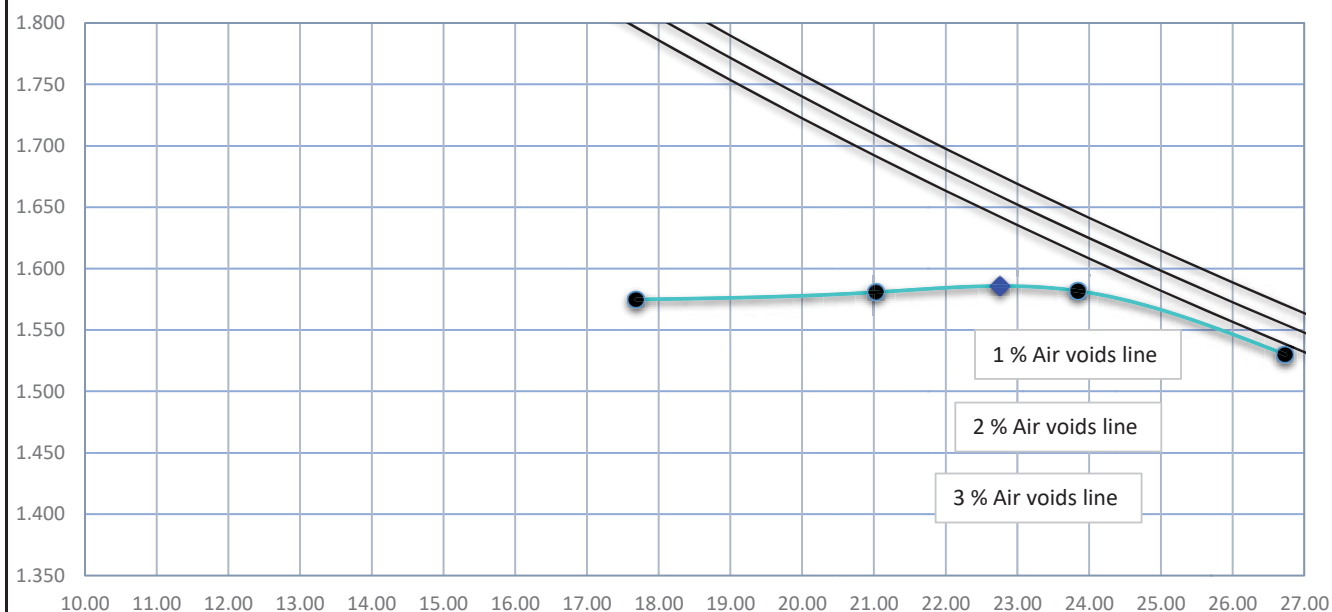
Retained 19.0mm	0	%
Retained 37.5mm	0	%

Laboratory Moisture & Density Results

Moisture Content (%)	17.5	21.0	24.0	26.5	
Dry Density (t/m ³)	1.57	1.58	1.58	1.53	

Dry Density vs. Moisture Content

Dry Density (t/m³)



< Optimum Moisture Content (%) >

Maximum Dry Density (t/m ³)	1.59
Optimum Moisture Content (%)	23.0



Comments

Distribution

Laboratory File / Fallon Fletcher

Approved Signatory:

Name: M.COFFEY
Function: Laboratory Manager
Date: 17-September-2019

GREAT SOUTHERN GEOTECHNICS



5a 209 Chester Pass Road, Milpara WA 6330

Mobile: 0407 903 297 Email: Info@gsgotechnics.com

DRY DENSITY & MOISTURE CONTENT RELATION OF SOIL TEST REPORT

Sheet 5 of 7

AS 1289.5.2.1

Report No.	1905 /1	Date Sampled	29/07/2019
Job No.	1905	Date Received	31/07/2019
Client	Fletchers International WA	Date Tested	14/08/2019
Client No.	QU-0159	Sample No.	1905G5
Project	Fletcher Proposed Feedlot Project	Curing Period Water	125 hour(s)
Road	Youngs Road, Beaufort River	Curing Period Stabilizer	N/A hour(s)
Section	Permeability Testing	Stabilizer Added	N/A %
Layer Type	In Situ	Sampling Method	AS 1289.1.2.1-6.5: In-situ material
Material Description	Sandy CLAY	Preparation Method	AS 1289.1.1
Test Depth (mm)	500mm to 2000mm	Location Details	Test Pit 25
		LL Determined By	Estimated

Oversize Material

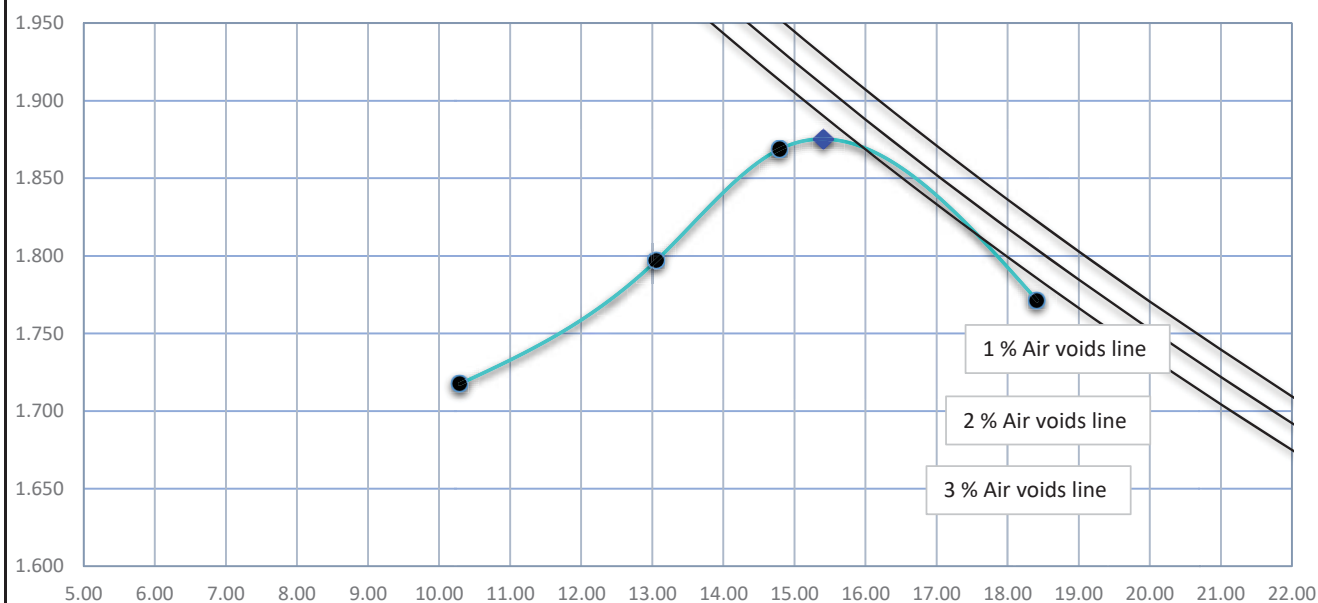
Retained 19.0mm	0	%
Retained 37.5mm	0	%

Laboratory Moisture & Density Results

Moisture Content (%)	10.5	13.0	15.0	18.5	
Dry Density (t/m ³)	1.72	1.80	1.87	1.77	

Dry Density vs. Moisture Content

Dry Density (t/m³)



< Optimum Moisture Content (%) >

Maximum Dry Density (t/m ³)	1.88
Optimum Moisture Content (%)	15.5



Comments

Distribution

Laboratory File / Fallon Fletcher

Approved Signatory:

Name: M.COFFEY
Function: Laboratory Manager
Date: 17-September-2019

GREAT SOUTHERN GEOTECHNICS

5a 209 Chester Pass Road, Milpara WA 6330

Mobile: 0407 903 297 Email: Info@gsgeotechnics.com



DRY DENSITY & MOISTURE CONTENT RELATION OF SOIL TEST REPORT

Sheet 6 of 7

AS 1289.5.2.1

Report No.	1905 /1	Date Sampled	29/07/2019
Job No.	1905	Date Received	31/07/2019
Client	Fletchers International WA	Date Tested	14/08/2019
Client No.	QU-0159	Sample No.	1905G6
Project	Fletcher Proposed Feedlot Project	Curing Period Water	121 hour(s)
Road	Youngs Road, Beaufort River	Curing Period Stabilizer	N/A hour(s)
Section	Permeability Testing	Stabilizer Added	N/A %
Layer Type	In Situ	Sampling Method	AS 1289.1.2.1-6.5: In-situ material
Material Description	Sandy CLAY	Preparation Method	AS 1289.1.1
Test Depth (mm)	1500mm to 5200mm	Location Details	Test Pit 26
		LL Determined By	Estimated

Oversize Material

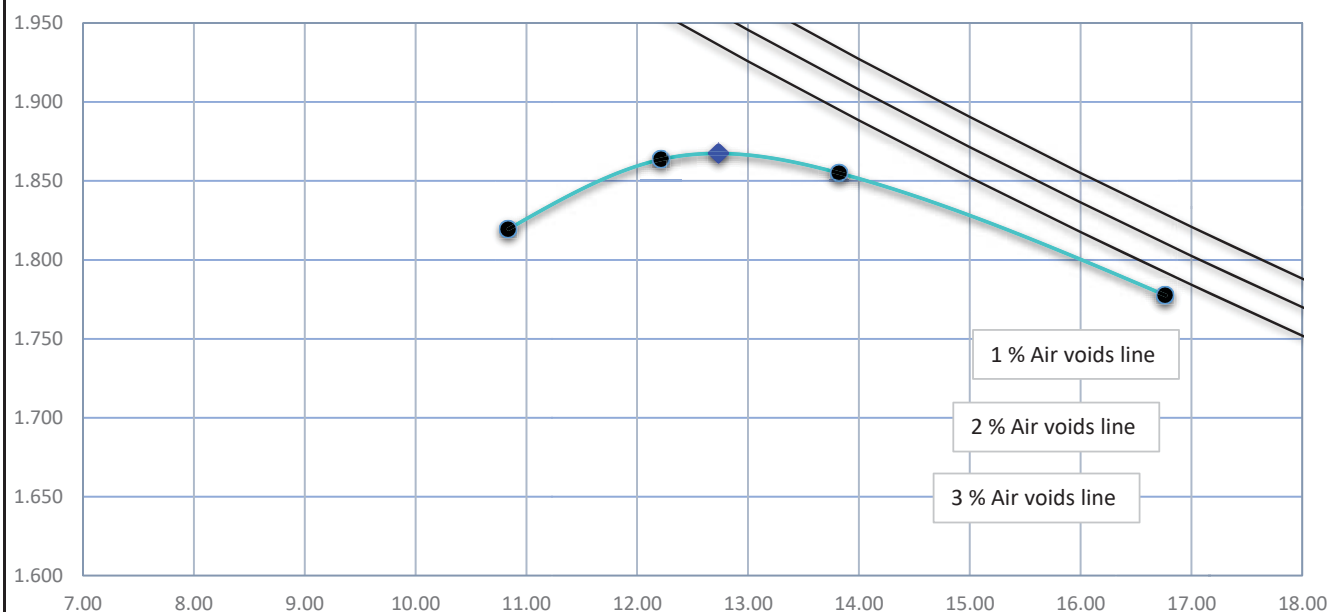
Retained 19.0mm	0	%
Retained 37.5mm	0	%

Laboratory Moisture & Density Results

Moisture Content (%)	11.0	12.0	14.0	17.0	
Dry Density (t/m ³)	1.82	1.86	1.85	1.78	

Dry Density vs. Moisture Content

Dry Density (t/m³)



< Optimum Moisture Content (%) >

Maximum Dry Density (t/m ³)	1.87
Optimum Moisture Content (%)	12.5



Comments

Distribution

Laboratory File / Fallon Fletcher

Approved Signatory:

Name: M. COFFEY
Function: Laboratory Manager
Date: 17-September-2019

GREAT SOUTHERN GEOTECHNICS



5a 209 Chester Pass Road, Milpara WA 6330

Mobile: 0407 903 297 Email: Info@gsgeotechnics.com

DRY DENSITY & MOISTURE CONTENT RELATION OF SOIL TEST REPORT

Sheet 7 of 7

AS 1289.5.2.1

Report No.	1905 /1	Date Sampled	29/07/2019
Job No.	1905	Date Received	31/07/2019
Client	Fletchers International WA	Date Tested	14/08/2019
Client No.	QU-0159	Sample No.	1905G7
Project	Fletcher Proposed Feedlot Project	Curing Period Water	48 hour(s)
Road	Youngs Road, Beaufort River	Curing Period Stabilizer	N/A hour(s)
Section	Permeability Testing	Stabilizer Added	N/A %
Layer Type	In Situ	Sampling Method	AS 1289.1.2.1-6.5: In-situ material
Material Description	Sandy CLAY	Preparation Method	AS 1289.1.1
Test Depth (mm)	2500mm to 5200mm	Location Details	Test Pit 24
		LL Determined By	Estimated

Oversize Material

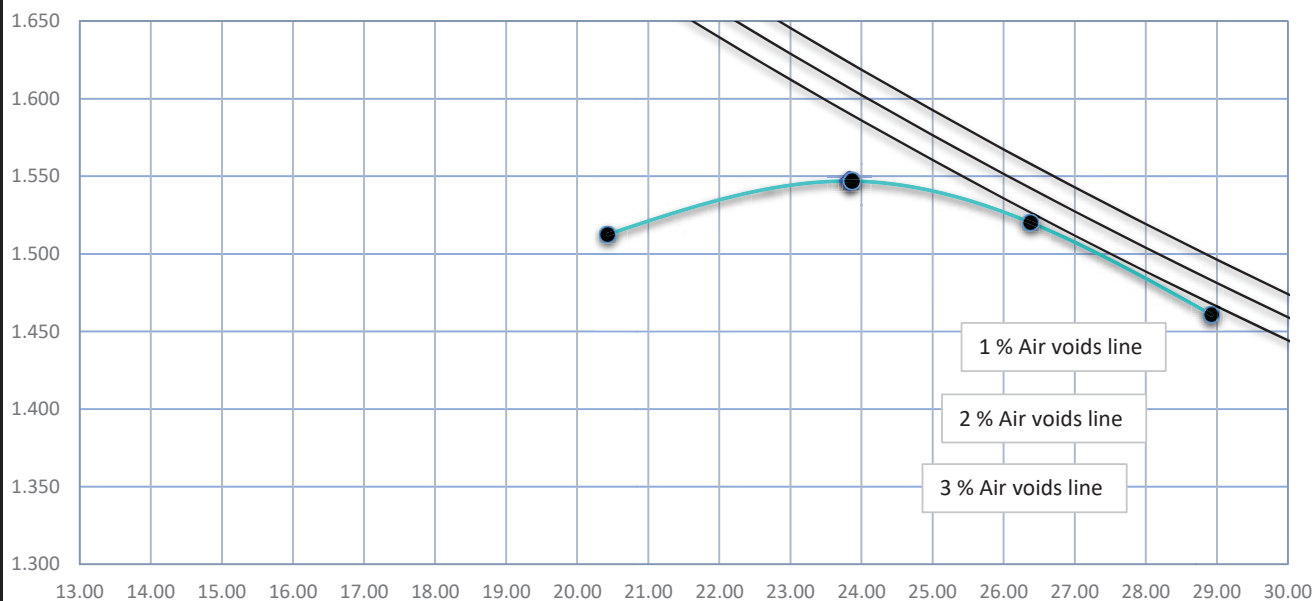
Retained 19.0mm	0	%
Retained 37.5mm	0	%

Laboratory Moisture & Density Results

Moisture Content (%)	20.5	24.0	26.5	29.0	
Dry Density (t/m ³)	1.51	1.55	1.52	1.46	

Dry Density vs. Moisture Content

Dry Density (t/m³)



< Optimum Moisture Content (%) >

Maximum Dry Density (t/m ³)	1.55
Optimum Moisture Content (%)	24.0



Comments

Distribution

Laboratory File / Fallon Fletcher

Approved Signatory:

Name: M.COFFEY
Function: Laboratory Manager
Date: 17-September-2019



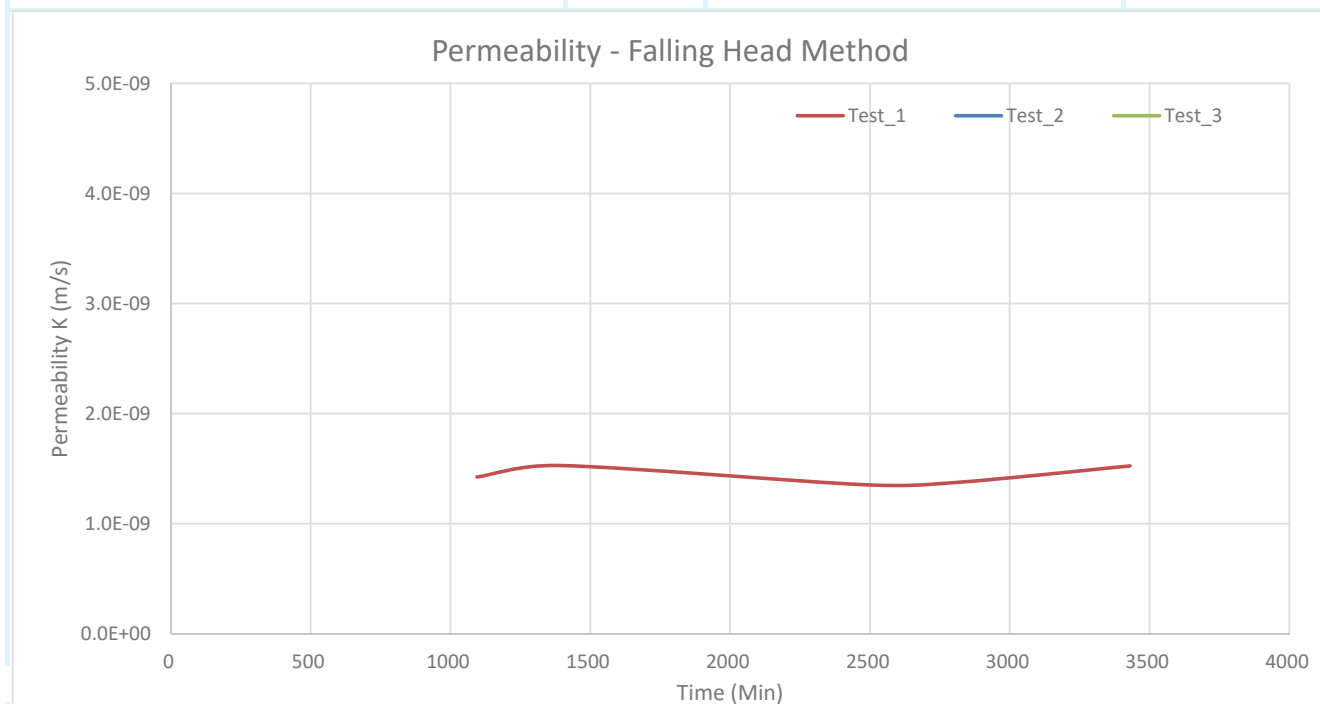
FALLING HEAD PERMEABILITY TEST REPORT

AS 1289.6.7.2, 2.1.1, 5.2.1

Client	Fletchers International WA	Ticket No.	S3603
Client Address	520 Settlement Rd, Narrikup WA 6326	Report No.	LLS19/3570 _1_FHPERM
Project	Fletcher Proposed Feedlot Project	Sample No.	LLS19/3570
Location	670 Youngs Road, Beaufort River WA	Sampled By	Client
Sample Identification	Test Pit 1, 600mm to 2000mm (1905G1)		
Sampling Method:	Sampled by Client, Tested as Received	Date Tested	22/08/2019

Specimen conditions at test

Laboratory Density Ratio (%)	94.3	Laboratory Moisture Ratio (%)	98.9
Compactive Effort	Modified	% Retained on 19mm Sieve	0.0
Surcharge (kPa)	3	Date tested	22/08/2019



Coefficient of Permeability K_{20} (m/s)

1.43E-09

Comments:



Accredited for compliance with ISO/IEC 17025 - Testing
Accreditation No. 19872
This document may not be reproduced except in full

Approved Signatory

Name
Function
Issue Date

Ryan Grieve
Technical Manager
12-September-2019

≠ NATA Accreditation does not cover the performance of this service



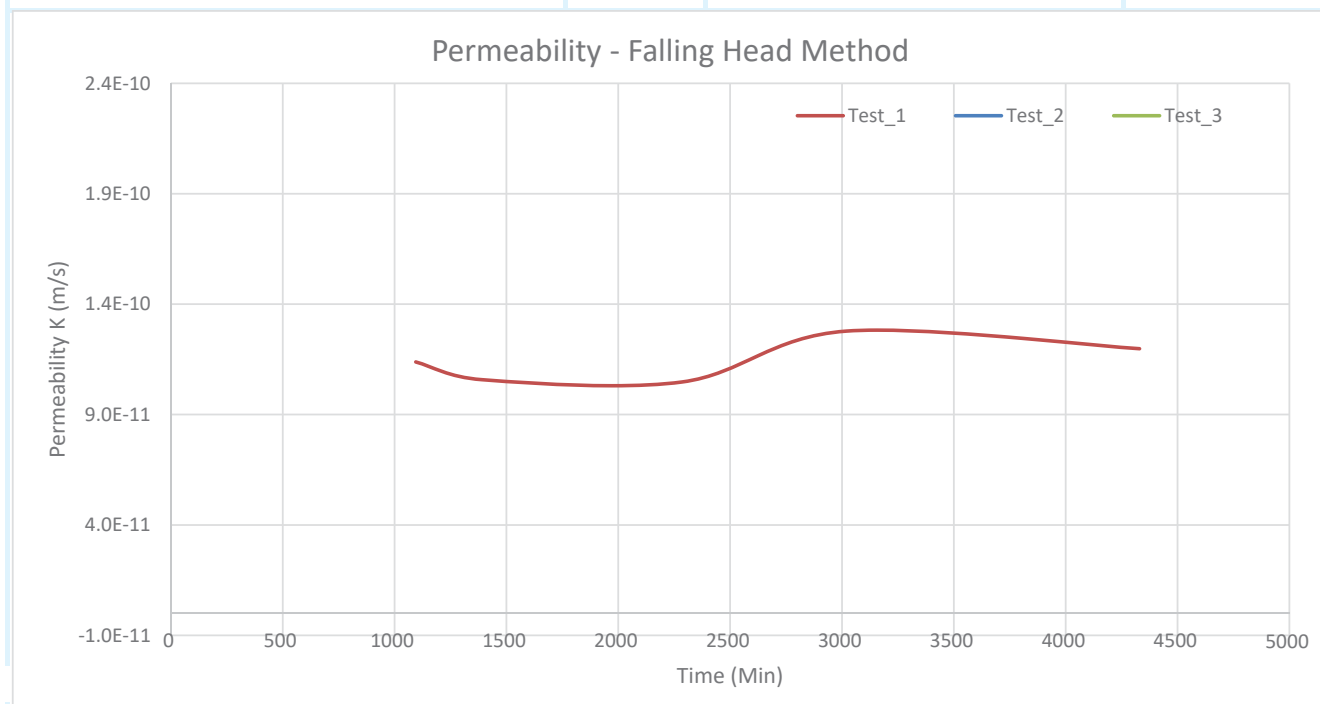
FALLING HEAD PERMEABILITY TEST REPORT

AS 1289.6.7.2, 2.1.1, 5.2.1

Client	Fletchers International WA	Ticket No.	S3603
Client Address	520 Settlement Rd, Narrikup WA 6326	Report No.	LLS19/3571 _1_FHPERM
Project	Fletcher Proposed Feedlot Project	Sample No.	LLS19/3571
Location	670 Youngs Road, Beaufort River WA	Sampled By	Client
Sample Identification	Test Pit 9, 850mm to 2000mm (1905G2)		
Sampling Method:	Sampled by Client, Tested as Received	Date Tested	22/08/2019

Specimen conditions at test

Laboratory Density Ratio (%)	95.2	Laboratory Moisture Ratio (%)	98.8
Compactive Effort	Modified	% Retained on 19mm Sieve	0.0
Surcharge (kPa)	3	Date tested	22/08/2019



Coefficient of Permeability K_{20} (m/s)

1.14E-10

Comments:



Accredited for compliance with ISO/IEC 17025 - Testing
Accreditation No. 19872
This document may not be reproduced except in full

Approved Signatory

Name
Function
Issue Date

Ryan Grieve
Technical Manager
12-September-2019

≠ NATA Accreditation does not cover the performance of this service



FALLING HEAD PERMEABILITY TEST REPORT

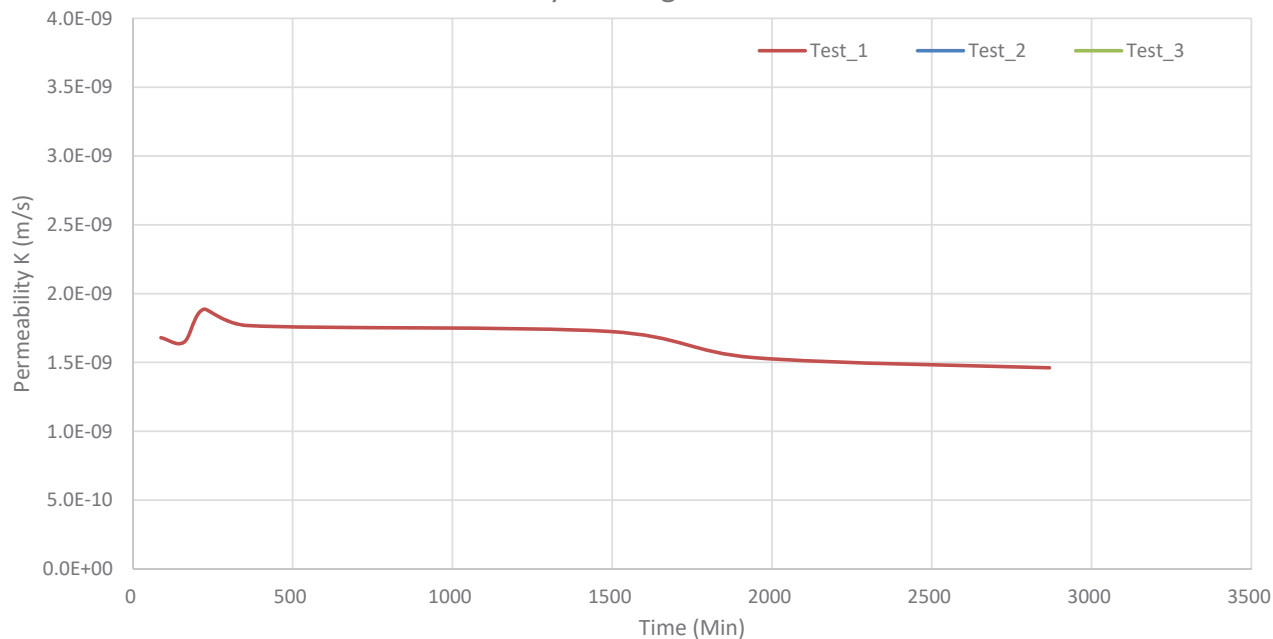
AS 1289.6.7.2, 2.1.1, 5.2.1

Client	Fletchers International WA	Ticket No.	S3603
Client Address	520 Settlement Rd, Narrikup WA 6326	Report No.	LLS19/3572 _1_FHPERM
Project	Fletcher Proposed Feedlot Project	Sample No.	LLS19/3572
Location	670 Youngs Road, Beaufort River WA	Sampled By	Client
Sample Identification	Test Pit 13, 1300mm to 2000mm (1905G3)		
Sampling Method:	Sampled by Client, Tested as Received	Date Tested	29/08/2019

Specimen conditions at test

Laboratory Density Ratio (%)	95.3	Laboratory Moisture Ratio (%)	98.8
Compactive Effort	Modified	% Retained on 19mm Sieve	0.0
Surcharge (kPa)	3	Date tested	29/08/2019

Permeability - Falling Head Method



Coefficient of Permeability K_{20} (m/s)

1.68E-09

Comments:



Accredited for compliance with ISO/IEC 17025 - Testing
Accreditation No. 19872
This document may not be reproduced except in full

Approved Signatory

Name

Function

Issue Date

Ryan Grieve

Technical Manager

12-September-2019

≠ NATA Accreditation does not cover the performance of this service



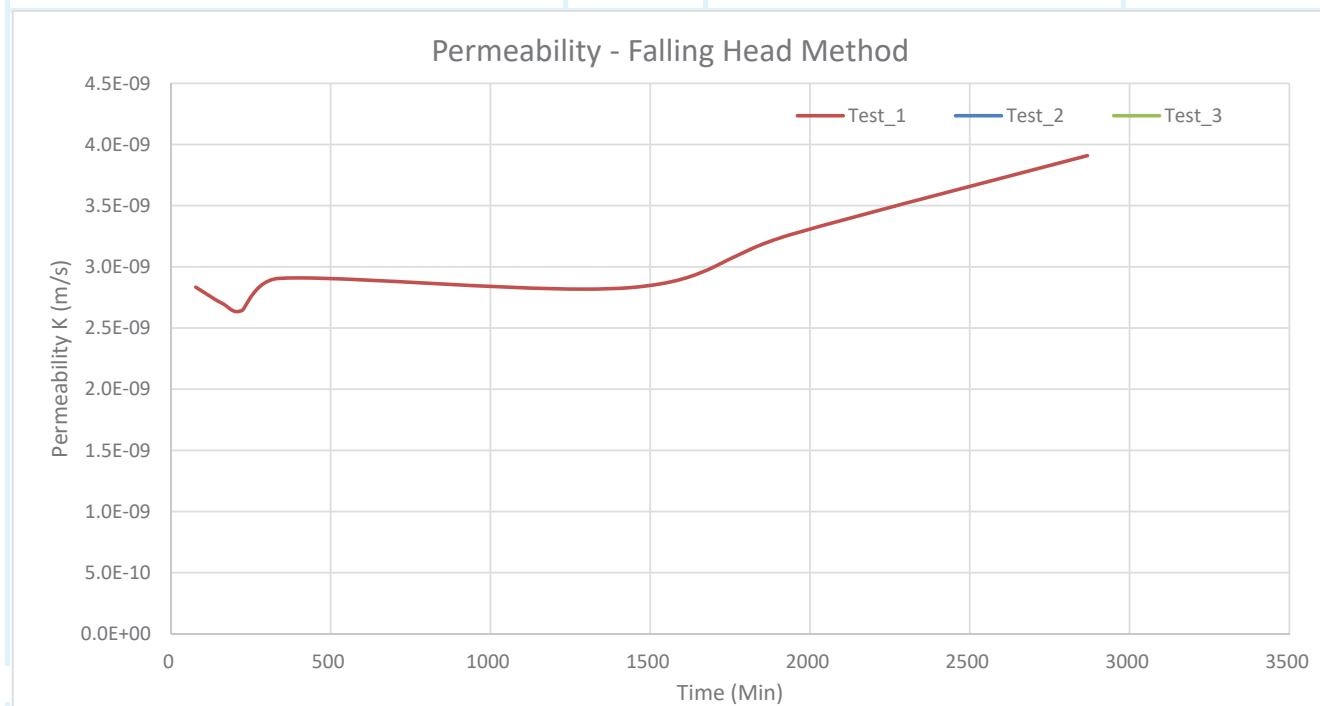
FALLING HEAD PERMEABILITY TEST REPORT

AS 1289.6.7.2, 2.1.1, 5.2.1

Client	Fletchers International WA	Ticket No.	S3603
Client Address	520 Settlement Rd, Narrikup WA 6326	Report No.	LLS19/3573 _1_FHPERM
Project	Fletcher Proposed Feedlot Project	Sample No.	LLS19/3573
Location	670 Youngs Road, Beaufort River WA	Sampled By	Client
Sample Identification	Test Pit 22, 1600mm to 2000mm (1905G4)		
Sampling Method:	Sampled by Client, Tested as Received	Date Tested	2/09/2019

Specimen conditions at test

Laboratory Density Ratio (%)	94.3	Laboratory Moisture Ratio (%)	100.4
Compactive Effort	Modified	% Retained on 19mm Sieve	0.0
Surcharge (kPa)	3	Date tested	2/09/2019



Coefficient of Permeability K_{20} (m/s)

2.83E-09

Comments:



Accredited for compliance with ISO/IEC 17025 - Testing
Accreditation No. 19872
This document may not be reproduced except in full

Approved Signatory

Name
Function
Issue Date

Ryan Grieve
Technical Manager
12-September-2019

≠ NATA Accreditation does not cover the performance of this service



FALLING HEAD PERMEABILITY TEST REPORT

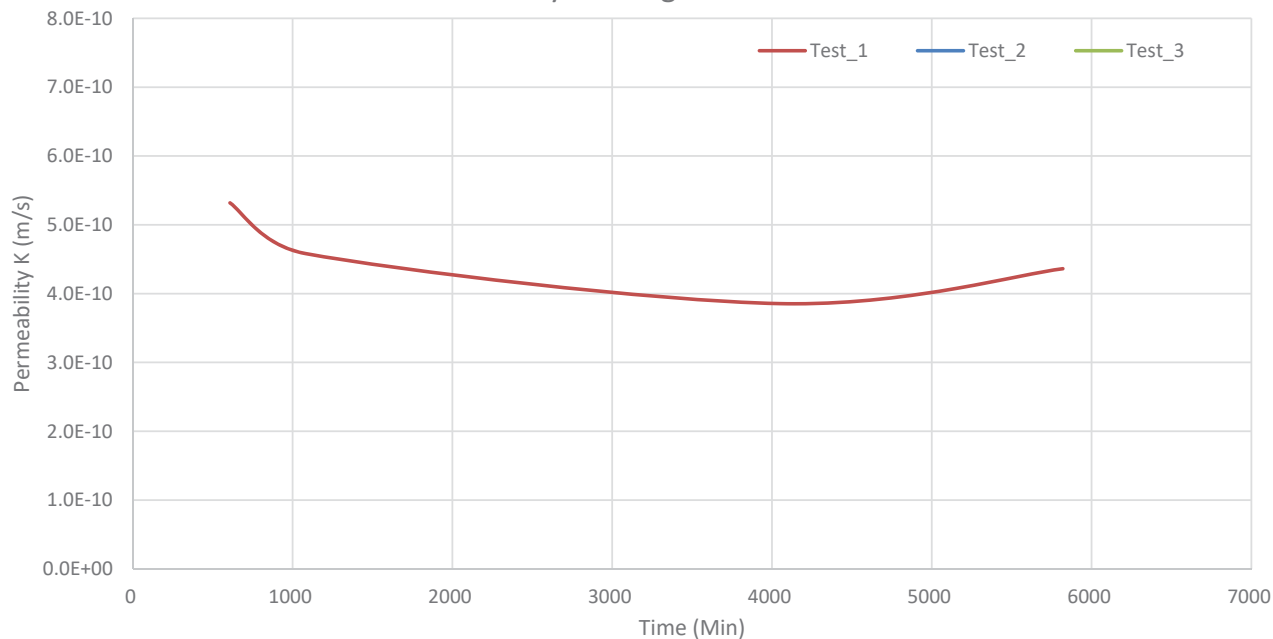
AS 1289.6.7.2, 2.1.1, 5.2.1

Client	Fletchers International WA	Ticket No.	S3603
Client Address	520 Settlement Rd, Narrikup WA 6326	Report No.	LLS19/3574 _1_FHPERM
Project	Fletcher Proposed Feedlot Project	Sample No.	LLS19/3574
Location	670 Youngs Road, Beaufort River WA	Sampled By	Client
Sample Identification	Test Pit 25, 500mm to 2000mm (1905G5)		
Sampling Method:	Sampled by Client, Tested as Received	Date Tested	5/09/2019

Specimen conditions at test

Laboratory Density Ratio (%)	94.1	Laboratory Moisture Ratio (%)	103.5
Compactive Effort	Modified	% Retained on 19mm Sieve	0.0
Surcharge (kPa)	3	Date tested	5/09/2019

Permeability - Falling Head Method



Coefficient of Permeability K_{20} (m/s)

5.32E-10

Comments:



Accredited for compliance with ISO/IEC 17025 - Testing
Accreditation No. 19872
This document may not be reproduced except in full

Approved Signatory

Name
Function
Issue Date

Ryan Grieve
Technical Manager
12-September-2019

≠ NATA Accreditation does not cover the performance of this service



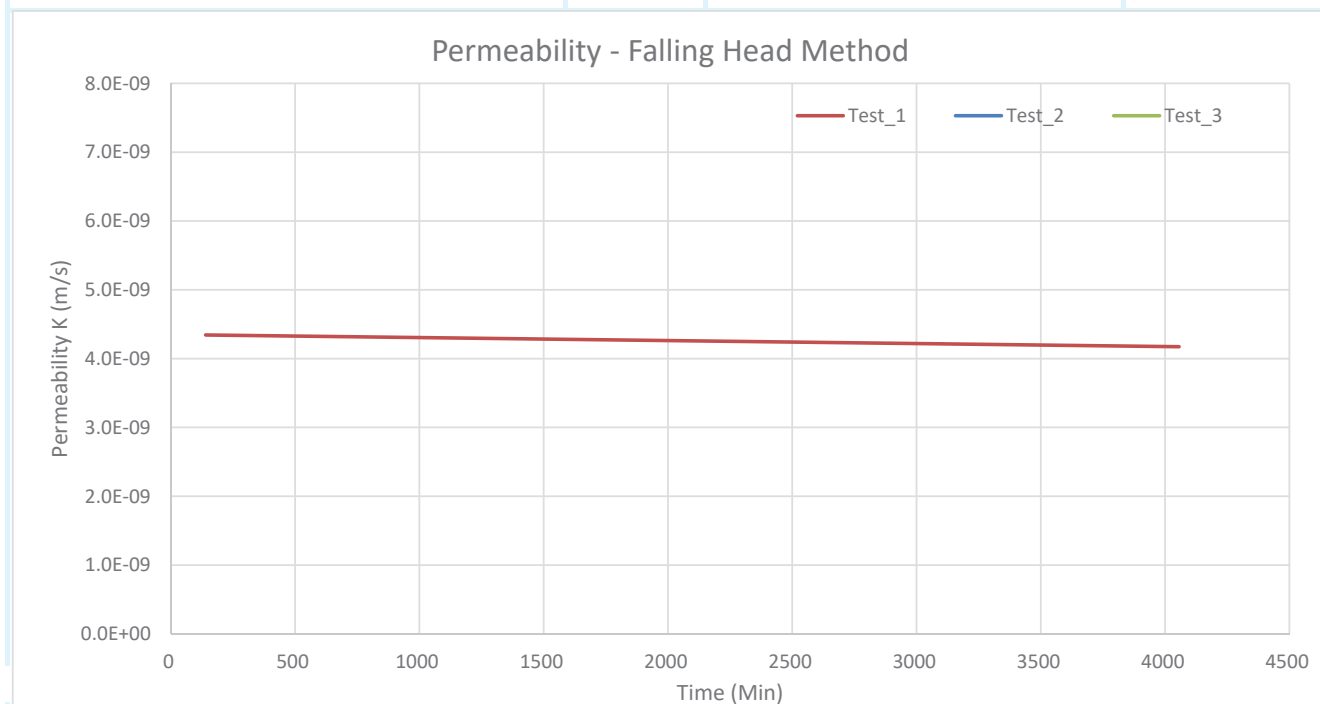
FALLING HEAD PERMEABILITY TEST REPORT

AS 1289.6.7.2, 2.1.1, 5.2.1

Client	Fletchers International WA	Ticket No.	S3603
Client Address	520 Settlement Rd, Narrikup WA 6326	Report No.	LLS19/3575 _1_FHPERM
Project	Fletcher Proposed Feedlot Project	Sample No.	LLS19/3575
Location	670 Youngs Road, Beaufort River WA	Sampled By	Client
Sample Identification	Test Pit 26, 1500mm to 5200mm (1905G6)		
Sampling Method:	Sampled by Client, Tested as Received	Date Tested	22/08/2019

Specimen conditions at test

Laboratory Density Ratio (%)	95.4	Laboratory Moisture Ratio (%)	100.7
Compactive Effort	Modified	% Retained on 19mm Sieve	0.0
Surcharge (kPa)	3	Date tested	29/08/2019



Coefficient of Permeability K_{20} (m/s)

4.34E-09

Comments:



Accredited for compliance with ISO/IEC 17025 - Testing
Accreditation No. 19872
This document may not be reproduced except in full

Approved Signatory

Name

Function

Issue Date

Ryan Grieve

Technical Manager

12-September-2019

≠ NATA Accreditation does not cover the performance of this service



FALLING HEAD PERMEABILITY TEST REPORT

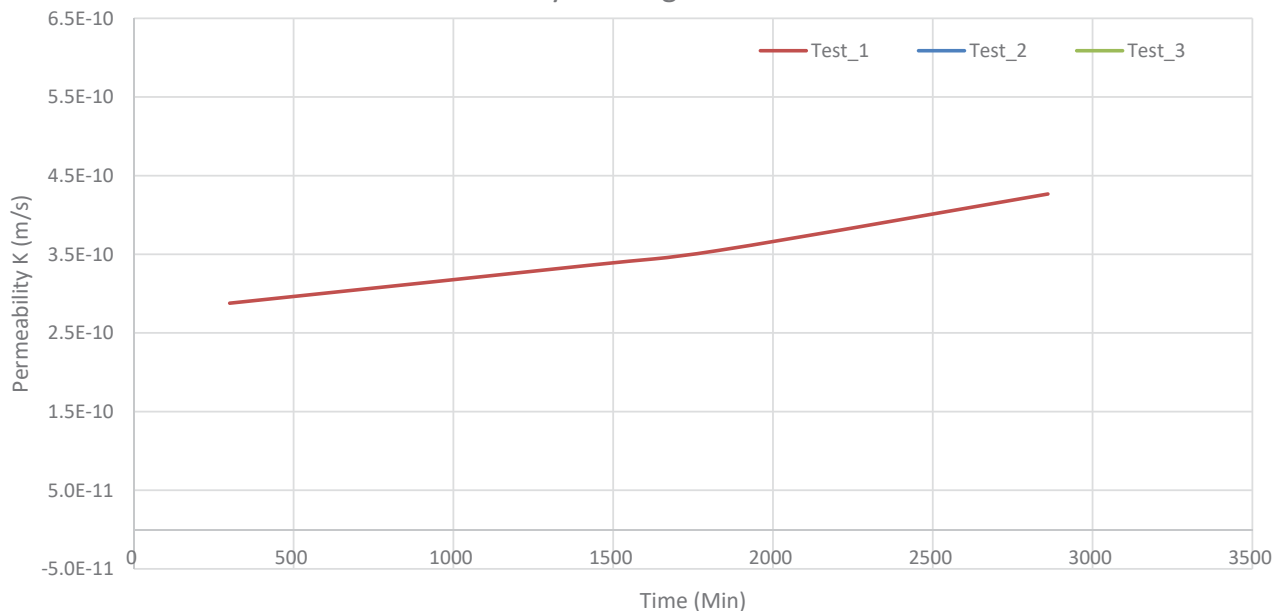
AS 1289.6.7.2, 2.1.1, 5.2.1

Client	Fletchers International WA	Ticket No.	S3603
Client Address	520 Settlement Rd, Narrikup WA 6326	Report No.	LLS19/3702 _1_FHPERM
Project	Fletcher Proposed Feedlot Project	Sample No.	LLS19/3702
Location	670 Youngs Road, Beaufort River WA	Sampled By	Client
Sample Identification	Test Pit 24, 2500mm to 5200mm (1905G7)		
Sampling Method:	Sampled by Client, Tested as Received	Date Tested	7/09/2019

Specimen conditions at test

Laboratory Density Ratio (%)	95.7	Laboratory Moisture Ratio (%)	99.7
Compactive Effort	Modified	% Retained on 19mm Sieve	0.0
Surcharge (kPa)	3	Date tested	7/09/2019

Permeability - Falling Head Method



Coefficient of Permeability K_{20} (m/s)

2.88E-10

Comments:



Accredited for compliance with ISO/IEC 17025 - Testing
Accreditation No. 19872
This document may not be reproduced except in full

Approved Signatory

Name

Function

Issue Date
















Ryan Grieve

Technical Manager

12-September-2019

≠ NATA Accreditation does not cover the performance of this service





COLOURS

	BLACK - BROWN (bk)		BLUE (bl)		ORANGE (or)
	BROWN (br)		BLUE - GREEN (bl/gr)		RED (rd)
	GREY - BROWN (gy/br)		GREEN (gr)		RED - BROWN (rd/br)
	GREY (gy)		YELLOW (yl)		PINK (pk)
	BLUE - GREY (bl/gy)		YELLOW - BROWN (yl/br)		PURPLE (pr)

MOISTURE CONDITION OF SOIL

TERM	DESCRIPTION
Dry	Cohesive soils; hard and friable or powdery, well dry of plastic limit. Granular soils; cohesionless and free-running.
Moist	Soil feels cool, darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	Soil feels cool, darkened in colour. Cohesive soils usually weakened and free water forms on hands when handling. Granular soils tend to cohere and free water forms on hands when handling.

PARTICLE SHAPES

ANGULAR	SUB-ANGULAR	SUB-ROUNDED	ROUNDED
			

PARTICLE SIZES

BOULDERS	COBBLES	COARSE GRAVEL	MEDIUM GRAVEL	FINE GRAVEL	COARSE SAND	MEDIUM SAND	FINE SAND	SILT	CLAY
>200mm	63-200mm	20-63mm	6-20mm	2.36-6mm	0.6-2.36mm	0.2-0.6mm	0.075-0.2mm	0.002-0.075mm	<0.002mm

GRAIN SIZE

SOIL TYPE (ABBREV.)	CLAY (CL)	SILT (SI)	←	SAND (SA)	→	←	GRAVEL (GR)	→	COBBLES (CO)
SIZE	< 2µm	2-75µm	Fine 0.075-0.2mm	Medium 0.2-0.6mm	Coarse 0.6-2.36mm	Fine 2.36-6mm	Medium 6-20mm	Coarse 20-63mm	63-200mm
SHAPE & TEXTURE	Shiny	Dull	← angular or subangular or subrounded or rounded →						
FIELD GUIDE	Not visible under 10x	Visible under 10x	Visible by eye	Visible at < 1m	Visible at < 3m	Visible at < 5m	Road gravel	Rail ballast	Beaching

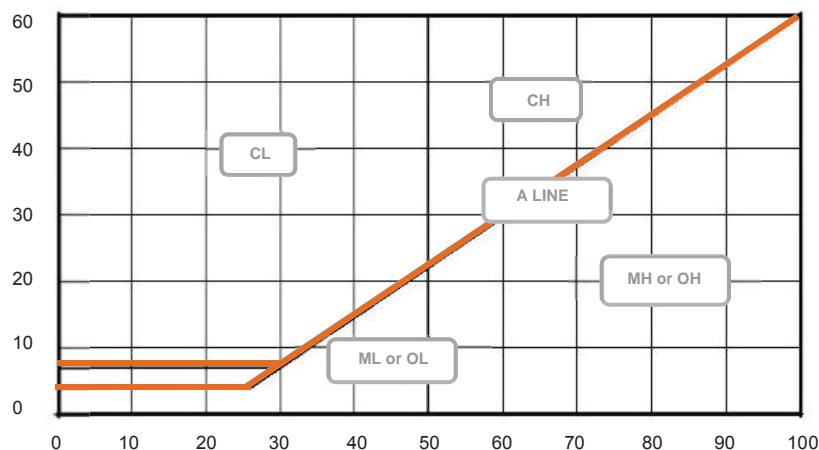
CLASSIFICATION CHART

Explanatory Notes

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60mm and basing fractions on estimated mass)					GROUP SYMBOLS	TYPICAL NAMES	
COARSE GRAINED SOILS More than 50% of material less than 63 mm is larger than 0.075 mm	GRAVELS More than 50% of coarse fraction is larger than 2.36mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		GW	Well graded gravels, gravel-sand mixtures, little or no fines	
			Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength		GP	Poorly Graded gravels and gravel-sand mixtures, little or no fines, uniform gravels	
		GRAVELS WITH FINES (Appreciable amount of fines)	Dirty' materials with excess of non-plastic fines, zero to medium dry strength		GM	Silty gravels, gravel-sand-silt mixtures	
			'Dirty' materials with excess of plastic fines, medium to high dry strength		GC	Clayey gravels, gravel-sand-clay mixtures	
	SANDS More than 50% of coarse fraction is smaller than 2.36mm	CLEAN SANDS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength		SW	Well graded sands, gravelly sands, little or no fines	
			Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength '		SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands	
		SANDS WITH FINES (Appreciable amount of fines)	Dirty' materials with excess of non-plastic fines, zero to medium dry strength		SM	Silty sands, sand-silt mixtures	
			'Dirty' materials with excess of plastic fines, medium to high dry strength		SC	Clayey sands, sand-clay mixtures	
FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm	IDENTIFICATION PROCEDURES ON FRACTIONS <0.2mm						
	SILTS AND CLAYS Liquid limit less than 50	DRY STRENGTH	DILATANCY	TOUGHNESS			
		None to low	Quick to slow	None		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with low plasticity. Silts of low to medium Liquid Limit.
		Medium to high	None to very slow	Medium		CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
		Low to medium	Slow	Low		OL	Organic silts and organic silt-clays of low to medium plasticity.
	SILTS AND CLAYS Liquid limit greater than 50	Low to medium	Slow to none	Low to medium		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, silts of high Liquid Limit.
		High to very high	None	High		CH	Inorganic clays of high plasticity.
		Medium to high	None to very slow	Low to medium		OH	Organic clays of high plasticity
	HIGHLY ORGANIC SOILS	Readily identified by colour, odour, spongy feel and frequently by fibrous texture			Pt	Peat and other highly organic soils	

PLASTICITY CHART

For laboratory classification of fine grained soils



PLASTICITY

DESCRIPTIVE TERM	OF LOW PLASTICITY	OF MEDIUM PLASTICITY	OF HIGH PLASTICITY
Range Of Liquid Limit (%)	≤ 35	> 35 ≤ 50	> 50

DESCRIPTION OF ORGANIC OR ARTIFICIAL MATERIALS

PREFERRED TERMS	SECONDARY DESCRIPTION
Organic Matter	Fibrous Peat/ Charcoal/ Wood Fragments/ Roots (greater than approximately 2mm diameter)/ Root Fibres (less than approximately 2mm diameter)
Waste Fill	Domestic Refuse/ Oil/ Bitumen/ Brickbats/ Concrete Rubble/ Fibrous Plaster/ Wood Pieces/ Wood Shavings/ Sawdust/ Iron Filings/ Drums/ Steel Bars/ Steel Scrap/ Bottles/ Broken Glass/ Leather

CONSISTENCY - Cohesive soils

TERM	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD
Symbol	VS	S	F	St	VSt	H
Undrained Shear Strength (kPa)	< 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
SPT (N) Blowcount	0 - 2	2 - 4	4 - 8	8 - 15	15 - 30	> 30
Field Guide	Exudes between the fingers when squeezed	Can be moulded by light finger pressure	Can be moulded by strong finger pressure	Cannot be moulded by fingers. Can be indented by thumb nail	Can be indented by thumb nail	Can be indented with difficulty with thumb nail

CONSISTENCY - Non-cohesive soils

TERM	VERY LOOSE	LOOSE	MEDIUM DENSE	DENSE	VERY DENSE	COMPACT
Symbol	VL	L	MD	D	VD	CO
SPT (N) Blowcount	0 - 4	4 - 10	10 - 30	30 - 50	50 - 100	> 50/150 mm
Density Index (%)	< 15	15 - 35	35 - 65	65 - 85	85 - 95	> 95
Field Guide	Ravels	Shovels easily	Shovelling very difficult	Pick required	Pick difficult	Cannot be picked

MINOR COMPONENTS

TERM	TRACE	WITH
% Minor Component	Coarse grained soils: < 5% Fine grained soils: <15%	Coarse grained soils: 5 - 12% Fine grained soils: 15 - 30%
Field Guide	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary components	Presence easily detectable by feel or eye, soil properties little different to general properties of primary component

GEOLOGICAL ORIGIN

	TYPE	DETAILS
TRANSPORTED SOILS	Aeolian Soils	Deposited by wind
	Alluvial Soils	Deposited by streams and rivers
	Colluvial Soils	Deposited on slopes
	Lacustrine Soils	Deposited by lakes
	Marine Soils	Deposited in ocean, bays, beaches and estuaries
FILL MATERIALS	Soil Fill	Describe soil type, UCS symbol and add 'FILL'
	Rock Fill	Rock type, degree of weathering, and word 'FILL'.
	Domestic Fill	Percent soil or rock, whether pretrucible or not.
	Industrial Fill	Percent soil, whether contaminated, particle size & type of waste product, i.e. brick, concrete, metal

STRENGTH OF ROCK MATERIAL

TERM	SYMBOL	IS(50)	(MPA)	FIELD GUIDE TO STRENGTH
Extremely Low	EL	≤0.03		Easily remoulded by hand to a material with soil properties.
Very Low	VL	>0.03	≤0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxle sample by hand. Pieces up to 3 cm thick can be broken by finger pressure.
Low	L	>0.1	≤0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	>0.3	≤1.0	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
High	H	>1	≤3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	VH	>3	≤10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High	EH	>10		Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported
Extremely Weathered Rock	XW	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water.
Distinctly Weathered Rock	DW	Rock strength usually changed by weathering. Rock may be highly discoloured, usually be ironstaining. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores.
Slightly Weathered Rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh Rock	FR	Rock shows no sign of decomposition or staining.

Appendix B

Production Bore Certificate of Analysis (West Coast Analytical Services, 2019)

CERTIFICATE OF ANALYSIS

Attention: Peter Gill
Fletcher International WA
PO Box 680, Albany, 6331
Tel: (08) 9892 4021 (direct)

West Coast Analytical Services

2460 Porongurup Road
Mount Barker WA 6324
Ph/Fax 0898531169
Mob 0407798236
westcoastlab@skymesh.com.au

REPORT No.	2019098F
Issue Date:	14/07/2019

Client ID	FIWA
Lab ID	RombyPk
sample ID	190627-472F
Sampling Date	21/06/2019
Receiving Date	27/06/2019

Analyte	Test Method	Units	LOR	Test Result
Calcium (Ca)	APHA 3120B	mg/L	0.5	16.6
Magnesium (Mg)	APHA 3120B	mg/L	0.5	47.3
Sodium (Na)	APHA 3120B	mg/L	0.5	402
Potassium (K)	APHA 3120B	mg/L	0.5	22.1
Ammonium as N	APHA 4500-NH3	mS/cm	0.02	0.42
Barium (Ba)	APHA 3125A	mg/L	0.002	0.016
Strontium (Sr)	APHA 3125A	mg/L	0.002	0.150
Sulphate (SO ₄)	APHA 4110B	mg/L	1	56
Chloride (Cl)	APHA 4500-CL	mg/L	10	760
Fluoride (f)	APHA 4500- F	mg/L	0.20	0.30
Nitrate as N	APHA 4500-NO3-I	mg/L	0.01	1.86
Boron (B)	APHA 3120B	mg/L	0.02	0.10
Total Dissolved Solids	APHA 2540 C	mg/L	5	1410
pH	APHA 4500-H	NA	Na	7.1
Iron (Total) Fe	APHA 3111B	mg/L	0.01	0.57

LOR = Limit of reporting

NK = Not Known

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.
All pages of this report have been checked and approved for release.

Charles Williams
Proprietor/Laboratory Manager



NATA Accredited Laboratory 15513
Accredited for compliance with
ISO/IEC 17025 - Testing

