Given the use of the facility by mining personnel, it is anticipated there will be very few vulnerable people at the site, other than those potentially being unfamiliar with the layout. There will be members of the public using part of the facility, and while some may be Onslow residents, some may also be visitors to the town. These people would be expected to be representative of the general population, and could be impaired, young, elderly or sick/injured, as well as unfamiliar with their surroundings.

While it is expected vulnerable occupants would typically be accompanied by an able-bodied adult, that will be able to provide assistance, however if this is not the case, then this would be the responsibility of the ERT and other staff. In these instances, the Chief Fire Warden or nominated delegate, should arrange for a staff member or another responsible guests or visitor, to assist the vulnerable occupant/s throughout the bushfire emergency.

In the case of sickness or injury, there may be need for an ambulance to render professional medical attention. The ability to get an ambulance during a bushfire emergency will be variable depending on the nature and extent of the bushfire. It may be possible to evacuate these occupant/s to a hospital depending on the nature sickness or injury and the bushfire. The pre-emptive relocation of such vulnerable occupants should be a primary consideration during a bushfire emergency.

3.2 Communication Equipment and Strategy

Communication systems are critical to enable the onsite ERT to relay status and actions to occupants during a bushfire in order to manage the emergency and the recovery, as well as communicate with offsite emergency services.

The following communication systems are expected to be available for use during a bushfire emergency (TBC):

- Mobile phones
- Two-way handheld radios/walkie talkies
- Mobile loudspeakers
- Onsite PA/Fire Occupant Warning systems
- Battery powered radio to receive radio information
- Noticeboards depicting emergency management map and daily bushfire advice
    - Administration building (TBC)

3.3 Vehicular Access

The primary vehicular access to the local area is via Third Avenue, which extends to the south-west via First Street, Second Avenue and Simpson Street.

Within the development, vehicular access is via the internal driveway and the carpark.

Perimeter firebreaks are also provided for fire appliance use only.

3.4 Pedestrian Access

Pedestrian access within, to and from the site, is available via running/walking tracks throughout the site, with gates at the main entrance and the egress gates in the south-west providing access to Onslow. The egress gates will be locked for normal use, but can be unlocked in a bushfire emergency to enable rapid pedestrian egress to Onslow.

3.5 Fire fighting and other Emergency Equipment

The development has the following onsite firefighting equipment available for use by emergency personnel:

- Onsite fire hydrant system including firewater tanks with suction from booster connection
- Street hydrants throughout the residential areas
- Fire hose reels
- Portable fire extinguishers
- First aid kits

All equipment should be maintained annually (as a minimum) in accordance with equipment specifications and the relevant Australian standards.

3.6 Vegetation Management and Building Bushfire Construction

These main vegetation management and landscaping treatments around the site to reduce bushfire spread and impact on buildings and people are as follows:

- Nominated Asset Protection Zones (APZs; highly modified low vegetation zone) along the key interfaces between buildings and unmanaged vegetation
- Low threat vegetation throughout the entire village

The bushfire construction elements work in conjunction with the vegetation management measures above:

- All accommodation buildings are constructed to the bushfire standards of the assessed BAL rating
- All other buildings are not required to be constructed to the assessed BAL rating, but are located in areas of BAL-29 or less.

4.0 Emergency Contacts

4.1 Onsite Emergency Response Team

Table 3 outline the people within the ***Emergency Response Team who are responsible for implementing the emergency procedures in the event of a bushfire***. Guidance on the responsibilities associated with each position is provided in Appendix 1.

Table 3: Emergency Response Team members

Emergency Role	Name of person	Organisational Position	Phone number
Chief Fire Warden	TBC	e.g. Site Manager	TBC
Deputy Chief Fire Warden	TBC	TBC	TBC
Fire Warden/s	TBC	TBC	TBC
First Aid Personnel	TBC	TBC	TBC
Traffic Warden	TBC	TBC	TBC
Communications Officer	TBC	TBC	TBC

4.2 Emergency Services and Other Organisations

Table 4 provides a summary of contacts for emergency services agencies and other organisations that may of useful in a bushfire emergency. Further information relating to bushfire emergency warning and status are provided in Section 5.0.

Table 4: Emergency contacts

Organisation	Office /contact	Information	Phone number / website
Local Fire Brigade	DFES Communications	Report a fire	000
Department of Fire and Emergency Services (DFES)	Communications Centre	Emergency warnings and incidents in local area	13 DFES (133 337)
Ambulance	Communications Centre	Report a medical emergency	000
Police	Communications Centre	Report other emergencies	000
Department of Fire and Emergency Services (DFES)	Website	Emergency warnings and incidents in local area	www.dfes.wa.gov.au twitter.com/dfes.wa

Organisation	Office /contact	Information	Phone number / website
EmergencyWA	Website	Emergency warnings and incidents in local area	www.emergency.wa.gov.au
Bureau of Meteorology	Website	Forecast fire danger ratings and weather	www.bom.gov.au/wa/forecasts
Parks and Wildlife Services	Website	Emergency warnings and prescribed burning in national parks	www.dpaw.wa.gov.au
Secondary contacts			
Shire of Ashburton	Ranger Services	Emergency management	(08) 9184 6001 0417 949 661
Onslow Hospital		Emergency medical	(08) 9184 3200
Onslow Volunteer Fire and Emergency		Local volunteer fire service	(08) 9184 6555 onslowvesu@bigpond.com.au
DFES State Emergency Service (SES)	Communications Centre	SES services for building damage and rescue	132 500
Main Roads WA	Office / website	Road closures	138 138 www.mainroads.wa.gov.au
Western Power		Electrical outages and damage	131 351

5.0 Bushfire Emergency Warnings and Forecast Bushfire Information

5.1 Bushfire emergency status information

In order to best understand the bushfire situation and the scale of response, information is available from the following sources:

- **Emergency WA website**: https://www.emergency.wa.gov.au/
  - the website is a map-based display with the best available emergency information across Western Australia
- **DFES website**: https://www.dfes.wa.gov.au/newsandmedia/Pages/NewsHome.aspx
  - which will redirect to Emergency WA website
- **DFES emergency information telephone:** 13 DFES (13 3337)
- **DFES Twitter:** https://twitter.com/dfes_wa
- **DFES Facebook:** https://facebook.com/dfeswa/
- **Emergency Alert national telephone warning system:** http://www.emergencyalert.gov.au/
  - one of the ways emergency services (police, fire and emergency services etc) can warn a community of a likely or actual emergency
  - Emergency Alert is not used in all circumstances. Whether emergency services decide to issue telephone warnings through Emergency Alert will depend on the nature of the incident
  - the warning system sends voice messages to landline telephones and text messages to mobile telephones within a specific area defined by the emergency service organisation issuing the warning message about likely or actual emergencies such as fire, flood, or extreme weather events
- **Emergency WA RSS and CAP AU feeds**: https://www.emergency.wa.gov.au/#cap-rss
  - RSS and CAP AU feeds allow you to receive updates of emergency information from official sources, including summaries and web content with links to any other available information
  - CAP AU is a standard web format that allows consistent and easy to understand emergency warning messages to be broadcast across a variety of communication systems. Specific feed readers are required to access these services.
  - DFES has provided further information on RSS feeds on the following website: https://www.dfes.wa.gov.au/pages/rss.aspx
- **ABC Local Radio** or local radio news bulletins
- **Main Roads Travel Map (road status):** https://travelmap.mainroads.wa.gov.au/Home/Map
  - the website is a map-based display with the road status information across WA
- **Bureau of Meteorology:** http://www.bom.gov.au/wa/index.shtml
  - Current and forecast weather
- **Bushfire IO:** https://bushfire.io/
  - This is website that integrates information from a variety of sources and provides in a single configurable map. It provides good visuals on fire locations, emergency warnings, weather and prevailing wind directions, and road hazards.
  - While this a good visual tool, it is run by a private organisation and should be used with care and corroborated with the other sources above.

- Emergency Services personnel
- local knowledge and being alert and aware of your surroundings.

5.2 Fire Danger Ratings

Department of Fire and Emergency Services (DFES) uses Fire Danger Ratings (FDR) to provide advice on the level of bushfire threat on a particular day. Anyone working or living in bushfire prone area should know the FDR is for their area, monitor local conditions and keep informed.

Information on forecast and current FDRs can be found on the Emergency WA website, with links to this also available from the DFES and Bureau of Meteorology websites.

- **Bureau of Meteorology website (4-day forecast FDR)**
  http://www.bom.gov.au/wa/forecasts/fire-danger-ratings.shtml
- **Emergency WA website (current and next day forecast FDR):**
  https://www.emergency.wa.gov.au/index.html#firedangerratings

The relevant weather district for the forecast FDR is: **WEST PILBARA COAST**

Information on the different FDR levels and what they mean is provided in Plate 1.

FIRE DANGER RATING	WHAT DOES IT MEAN?	
CATASTROPHIC 100+	• These are the worst conditions for a bush or grass fire • If a fire starts and takes hold, it will be extremely difficult to control and will take significant firefighting resources and cooler conditions to bring it under control	• Spot fires will start well ahead of the main fire and cause rapid spread of the fire. Embers will come from many directions • Homes are not designed or constructed to withstand fires in these conditions • The only safe place to be is away from bushfire risk areas.
EXTREME 75-99 SEVERE 50-74	• These are very hot, dry and windy conditions for a bush or grass fire • If a fire starts and takes hold, it will be unpredictable, move very fast and difficult for firefighters to bring under control • Spot fires will start and move quickly. Embers may come from many directions	• Homes that are prepared to the highest level, have been constructed to bushfire protection levels and are actively defended may provide safety • You must be physically and mentally prepared to defend in these conditions • The only safe place to be is away from bushfire risk areas.
VERY HIGH 32-49	• These are hot, dry and possibly windy conditions for a bush or grass fire • If a fire starts and takes hold, it may be hard for firefighters to control	• Well prepared homes that are actively defended can provide safety • You must be physically and mentally prepared to defend in these conditions.
HIGH 12-31 LOW-MODERATE 0-11	• If a fire starts, it is likely to be controlled in these conditions and homes can provide safety • Be aware of how fires can start and reduce the risk	• Controlled burning may occur in these conditions if it is safe – check to see if permits apply.

Plate 1: Fire Danger Ratings

Understanding the FDR categories and what they mean will assist personnel in making decisions about what to do if a bushfire starts. The FDR is based on forecast weather conditions and gives advice about the level of bushfire threat on a particular day. When the rating is high, the threat of a bushfire increases.

5.3 Total Fire Ban days

A Total Fire Ban (TFB) is declared on days when fires are most likely to threaten lives and property. This is because of predicted extreme fire weather or when there are already widespread fires and firefighting resources are stretched. TFB days are often aligned with days with an elevated FDR, however they may be declared outside of a fire season due to other factors such as higher temperatures and expected strong winds preceding a storm front.

To determine if a TFB has been declared for the next day (evening after 6pm and prior to 8.15am), the following resources are able to be used:

- **Emergency WA website (current and next day forecast FDR):** https://www.emergency.wa.gov.au/#totalfirebans
- **Total Fire Ban Hotline:** (1800 709 355)
- **DFES phone:** (13 3337)
- **DFES Twitter:** https://twitter.com/dfes_wa

There are restrictions on what activities can be conducted on a TFB day, such as it being illegal to light an open-air fire or conduct any activity that could start a fire. Further information is provided regarding these activities in Section 7.2.

5.4 DFES emergency warning system

During a bushfire, emergency services will provide information through the issuing of community alerts. The alert level changes to reflect the increasing risk to life and the decreasing amount of time until the fire arrives. Further information on the warnings and what they mean are provided below.

DFES issues the following warnings (see Plate 2 or further information):

- **Advice**
- **Watch and Act**
- **Emergency Warning**
- **All clear**

The best place to determine the current alert level is from the Emergency WA website, which shows the alert level as part of the Bushfire Advice note for each bushfire.

- **Emergency WA website:** https://www.emergency.wa.gov.au/

GOVERNMENT OF WESTERN AUSTRALIA

DFES Department of Fire & Emergency Services

BUSHFIRE WARNINGS: WHAT SHOULD YOU DO?

ALERT LEVEL	WHEN WILL IT BE ISSUED?	WHAT SHOULD YOU DO?
ADVICE **Be aware and keep up to date** Issued at **11am** and **4pm** unless the situation changes	▪ When a fire has started but there is no immediate danger ▪ There is no known threat to lives and homes ▪ The fire is likely to be small and may be causing smoke near homes ▪ Firefighters will be able to control the fire	**You need to be aware** ▪ Stay alert and monitor your surroundings by watching for signs of a bushfire, especially smoke and flames ▪ Check the Fire Danger Rating for your area ▪ Close all doors and windows ▪ Turn off evaporative air conditioners but leave water running through the system if possible ▪ Read through your bushfire survival plan. If you do not have one decide what you will do if the situation gets worse
WATCH AND ACT **Put your preparations into action – do not wait and see** Issued **every two hours** unless the situation changes	▪ When a fire is approaching and conditions are changing ▪ There is a possible threat to lives and homes ▪ The fire will be out of control. There may be smoke and embers around your home and roads ▪ Firefighters will be working with machines to put in containment lines to stop the fire spreading	**You need to leave or get ready to defend** ▪ Put your bushfire survival plan into action ▪ If you have decided to leave for a safer place, leave now and take your survival kit with you ▪ Leave well before roads are closed and full of smoke ▪ If you are not prepared for a bushfire the safest place is to be away from the fire ▪ If you plan to stay and actively defend make final preparations now
EMERGENCY WARNING **Take immediate action to survive – you will be impacted by fire** Issued **every hour** unless the situation changes	▪ When there is immediate danger and the fire will impact your home ▪ There is a threat to lives and homes ▪ The fire will be out of control and moving very fast. This is the highest level of warning ▪ Firefighters will find it difficult to control the fire and it will take significant firefighting resources and a change in conditions to bring it under control ▪ A siren sound called the Standard Emergency Warning Signal (SEWS) may be used to get your attention on radio and television	**You need to act immediately to survive** ▪ If the way is clear leave immediately for your safer place and take your survival kit with you ▪ If you have not prepared your home, it is too late to do it now. Your safest option is to leave for a safer place, if the way is clear ▪ Do not relocate at the last minute in a vehicle or on foot as this is deadly, leave immediately if the way is clear ▪ If you are unable to leave you need to get ready to take shelter in your home and actively defend it
ALL CLEAR **Take care to avoid any dangers and keep up to date** Issued when the threat has passed	▪ When the danger has passed and the fire is under control ▪ Firefighters will be working to put the last bits of the fire out and make the area safe ▪ It may still not be safe to return home. Emergency services will advise when you can go home	**You need to be careful** ▪ Remain vigilant in case the situation changes ▪ When driving in the fire area you should take extreme caution and drive slowly ▪ Dangers like smoke, fallen trees and downed power lines may be on roads and emergency services will still be working in the area

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Plate 2: Bushfire Warning Levels

6.0 Bushfire Preparedness

Preparation prior to, and during, the declared bushfire season is paramount to increasing the chances of occupants surviving a bushfire including the resilience of buildings to withstand bushfire impact. These actions focus on management of onsite combustible material, maintenance of buildings, access routes and fire and emergency systems and ensuring emergency management preparedness, to not only reduce the intensity of bushfire impact but also to maximise the chance for successful occupant evacuation or refuge (as per the project BMP).

Bushfire Season: **(Shire of Ashburton firebreak notice 2020/2021)**	**Compliance Dates** **1 January – 31 December each year**

Below is a summary of the bushfire preparations that should be carried out within the facility throughout the year, and specifically prior to and during the bushfire season. While this list of tasks is comprehensive, throughout the life of the facility there may be other actions that become necessary to improve bushfire resilience. It is requirement that this is reviewed as part of the annual BEMP review by the Emergency Management Team, and amended as required.

6.1 Preparation – Ongoing year round

Tasks detailed in Table 5 are to be performed throughout the year on the following basis:

- Year-round on an ongoing basis
- **Specifically prior to bushfire season**

Table 5: Preparation tasks/actions – Ongoing tasks throughout year

Task/Action	***Timing*** ***(if relevant)***
Comply with current Shire of Ashburton firebreak notice, including any approved variations and maintenance of perimeter firebreaks.	Ongoing; regularly with attention prior to, and during, bushfire season
Ensure all management actions documented within any endorsed Bushfire Management Plans (supporting planning applications) is undertaken in particular the ongoing maintenance of Asset Protection Zones and low threat vegetation	Ongoing; regularly with attention prior to, and during, bushfire season
Maintain and test any firefighting equipment present within the facility (e.g. fire hydrant system, fire hose reels, extinguishers) to ensure it is fit for purpose and is in good working order.	Ongoing; regularly with attention prior to, and during, bushfire season
Maintain and test any onsite communication equipment required for bushfire emergencies, is fit for purpose and is in good working order.	Ongoing; regularly with attention prior to, and during, bushfire season
Ensure there is sufficient first aid equipment, and that it is available and in good working order. Ensure sufficient staff are trained in Senior First Aid.	Ongoing; regularly with attention prior to, and during, bushfire season

Task/Action	*Timing (if relevant)*
Ensure all landscaping reticulation systems, especially around buildings, is in good working order and providing sufficient coverage.	Ongoing; regularly with attention prior to, and during, bushfire season
Maintain all AS 3959 bushfire construction elements for implemented on the various accommodation buildings	Ongoing; at least an annual basis with attention prior to, and during, bushfire season
Ensure nominated personnel in the Emergency Response Team are fully trained in the procedures outlined in this BEMP and conduct drills to practice evacuation procedures as outlined in Section 2.5. Ensure appropriate members of the ERT know how to use any site communication systems. Ensure sufficient staff are trained in first aid and first response firefighting (extinguishers, hose reels). Ensure all other staff are aware of the procedures outlined within this BEMP	Ongoing; regularly with attention prior to, and during, bushfire season
Update contact details of the emergency response team in the BEMP.	Ongoing; at least an annual basis with attention prior to, and during, bushfire season
Review and update this Bushfire Emergency Management Plan as outlined in Section 2.6, including any required bushfire preparedness tasks, training and exercises.	Ongoing; at least an annual basis with attention prior to, and during, bushfire season
Ensure procedures are in place to ensure visitor registers are readily available for use in an emergency.	Ongoing; regularly with attention during bushfire season
Comply with any forecast declared Total Fire Bans as outlined in Section 7.2	Total Fire Ban days

6.2 Preparation – Daily actions throughout bushfire season

Tasks detailed in Table 6 are to be performed daily throughout bushfire season, on declared Total Fire Ban Days, or when conditions may otherwise support significant bushfire behaviour

Table 6: Preparation tasks/actions – Daily throughout bushfire season

Task/Action	*Timing (if relevant)*
Ensure all vehicular access/egress routes are clear of any obstructions and have the appropriate vertical and horizontal clearances to ensure they are in good traversable condition. Ensure any gates along egress routes are in good working order, with keys available at all times to unlock any locked gates.	

Task/Action	*Timing (if relevant)*
Ensure any internal personnel egress pathways onsite and within buildings, are also clear and available. Ensure any pedestrian egress gates are in in good working order, with keys available at all times to unlock any locked gates.	
Check exterior of buildings and any decks, and remove/relocate combustible items (rubbish, wood piles, furniture etc that can ignite) that can be stored 10m from building and decks. Ensure all objects attached to the buildings are non-combustible or can be easily removed in a bushfire event Clear all roofs, roof gutters and valleys of any leaf litter, debris or other combustible material.	
Ensure nominated assembly points and onsite safer places are appropriately maintained including and are available and fit-for-purpose.	
Ensure all required communication equipment is available, in good working order and ready for use. Ensure all mobile phones and any radio communication devices are fully charged. Ensure site has access to a battery-operated radio.	
Ensure sufficient first aid kits and other emergency resources are available and fit-for-purpose.	
Record the presence of all people using or visiting the site, and when they have left	
Review forecast Fire Danger Rating, weather and for Total Fire Bans as outlined in Section 7.0, and implement pre-emptive actions as required. Advise all relevant staff, ERT and occupants of the forecast FDR or TFB status as required.	
Regularly check the monitor the Emergency WA website, DFES phone (13 3337), DFES Twitter and local ABC radio for current emergency warning status and bushfire information. Regularly visually scan local area for signs of bushfire	

6.3 Additional resources

Table 7 provides a list of publications that provide additional information relating to bushfire preparedness and awareness. It is recommended that facility management review these publications prior to and during the bushfire season.

Table 7: Preparation and awareness publications

Agency	Resource	Website
Department of Fire and Emergency Services (DFES)	5 Minute Fire Chat online resource	https://www.dfes.wa.gov.au/firechat/Pages/default.htm
	5 Minute Fire Chat publications	https://www.dfes.wa.gov.au/safetyinformation/fire/bushfire/Pages/publications.aspx
	Bushfire Preparation Toolkit	https://www.dfes.wa.gov.au/safetyinformation/fire/bushfire/BushfireManualsandGuides/DFES-Fire-Chat-Bushfire-Preparedness-Toolkit.pdf
Shire of Ashburton	Bushfire Control	https://www.ashburton.wa.gov.au/live/services/ranger-services/bush-fires.aspx
	Fire and Emergency	https://www.ashburton.wa.gov.au/live/services/fire-and-emergency.aspx

7.0 Awareness and pre-emptive procedures

This section outlines when and what monitoring actions are to be undertaken to ensure the facility maintains awareness of any forecast elevated bushfire weather days, and the associated pre-emptive procedures the facility can implement to respond to heightened risk. The ERT, or nominated staff, shall ensure they undertake the following monitoring and pre-emptive actions based on:

- the forecast Fire Danger Rating (FDR)
- declared Total Fire Ban days

Maintaining a high level of situational awareness, including forecast conditions, will also assist with the rapid assessment of any bushfire emergency as outlined in Section 8.0.

7.1 Forecast Fire Danger Rating

Monitoring the forecast FDR is to be conducted daily using the resources outlined in Section 5.2. The pre-emptive responses are detailed in Table 8.

Table 8: Forecast Fire Danger Rating Pre-Emptive Actions

FDR MONITORING TRIGGER (Refer Section 5.2 to determine FDR):

- **On all days during bushfire season, if the FDR will be Very High or above, or any declared Total Fire Ban days**
- **On days outside bushfire season with when weather is hot, dry or windy or there has been recent bushfires in the area**

Weather District: WEST PILBARA COAST

Action/Task	Fire Danger Rating					
	Low/Mod	High	Very High	Severe	Extreme	Catastrophic
Maintain situational awareness by: • having nominated staff visually monitor land in the local area around the development for signs of bushfire • monitoring the Emergency WA website, DFES phone (13 3337), DFES Twitter and local ABC radio for current emergency warning status and bushfire information.	Conduct checks if conditions are unusually warm and windy		Conduct regular checks throughout the day, at the following times as a minimum: • 8am • 11am • 2pm • 5pm If a bushfire is detected, go to Table 10.		Forecast FDR of Extreme or Catastrophic are less common in this location, and the facility should treat these days with great caution with potential for worst bushfire behaviour. Conduct hourly checks throughout the day, from sunrise to 1 hour after sunset If a bushfire is detected, go to Table 10.	
Contact DFES or local Fire Control Officer to discuss the next days operation	No specific requirements		No specific need to contact DFES or the or City of Busselton CESM for this forecast FDR unless there are specific circumstances result in high visitation to the area		Advise the Chief Fire Warden ASAP. They are to make contact with DFES or local Fire Control Officer as soon as the forecast FDR of Extreme or Catastrophic is identified (which may be several days in advance) and determine what pre-emptive actions can be undertaken including: • reduce visitation to the development (public visitors, functions etc) • rostering additional staff to handle an emergency • review whether a local brigade appliance is able to be in the local area	
Advise the ERT and relevant staff	No specific requirements		Ensure all ERT and relevant staff are notified of the elevated bushfire risk			
Update guests and visitors of the Fire Danger Rating	No specific requirements		Advise guests and visitors of the elevated bushfire risk. Post forecast bushfire weather and warnings on nominated noticeboards (see Section 2.4) Recommend they remain at the development and be ready for potential bushfire response such as offsite evacuation Recommend if they leave the development, they should go to areas with low bushfire risk areas (e.g. a town centre) during the hottest part of the day (e.g. 10 am to 4pm).			

FDR MONITORING TRIGGER (Refer Section 5.2 to determine FDR):

- **On all days during bushfire season, if the FDR will be Very High or above, or any declared Total Fire Ban days**
- **On days outside bushfire season with when weather is hot, dry or windy or there has been recent bushfires in the area**

Weather District: WEST PILBARA COAST

Action/Task	Fire Danger Rating					
	Low/Mod	High	Very High	Severe	Extreme	Catastrophic
Conduct daily preparations from Table 6	Recommended, but no specific requirements		Conduct daily preparations the day prior or in early morning			
Conduct year-round preparation from Table 5	Conduct preparations on ongoing basis, with focus on prior to bushfire season					
Open air fires/Campfires/Cooking fires	Can be conducted in accordance with Shire firebreak notice, and provided conditions are benign No open fires on declared Total Fire Ban days					

7.2 Forecast Total Fire Ban

Total Fire Ban (TFB) procedures are triggered on days when a Total Fire Ban is declared due to extreme fire weather, when widespread fires are stretching firefighting resources or even outside bushfire season due to higher temperatures or expected strong winds.

A TFD will be declared the evening before it is to take effect and the resources detailed in Section 5.3 can be used to determine the forecast and current TFB status.

There are restrictions on what activities can be conducted on a TFB day and Table 9 lists the procedures the required actions when a Total Fire Ban is declared.

Table 9: Total Fire Ban Actions

TFB MONITORING TRIGGER (Refer Section 5.3 for how to determine TFB day status): • **On all days during bushfire season** • **On days outside bushfire season with when weather is hot, dry or windy or there has been recent bushfires in the area**	
Action	**Person responsible**
If a Total Fire Ban is declared, ensure all relevant staff and occupants are notified to ensure all relevant actions are undertaken.	Chief Fire Warden (or nominated delegate)
Ensure the following actions are avoided if a Total Fire Ban is declared: • no fire or flames allowed in the open air • no open fires for the purpose of cooking or camping are not allowed • no 'hot work' such as metal work, grinding, welding, soldering, gas cutting or similar is allowed unless a formal exemption has been obtained • no use of chainsaws, plant or grass trimmers or lawn mowers in bushland areas • no other activities that may start a fire • ensure equipment or machinery is mechanically sound • ensure all reasonable precautions are taken to prevent a bushfire igniting, including postponing any activity that could result in a bushfire ignition. Further information on prohibited activities can be found on the DFES website below	Chief Fire Warden (or nominated delegate)
Maintain situational awareness by: • having nominated staff visually monitor land in the local area around the development for signs of bushfire (signs or smell of smoke etc) • monitoring the Emergency WA website, DFES phone (13 3337), DFES Twitter and local ABC radio for current emergency warning status and bushfire information. • If a bushfire is detected, either visually or via website/radio/social media, obtain information on the fire location and direction and speed of travel **If a bushfire is detected, refer to Table 10.**	Nominated Fire Warden

The Department of Fire and Emergency Services advice is that chainsaws, plant or grass trimmers or lawn mowers can be used during a total fire ban in suburban or built up areas which are cleared of flammable material, but not in bushland or other areas where their use is likely to cause fire. Further information on TFB days and the prohibited activities can be found on the following DFES website https://www.dfes.wa.gov.au/totalfirebans/#faqs

Individuals could be fined up to $25,000 or jailed for 12 months or both if the Total Fire Ban is ignored.

8.0 Bushfire Emergency Triggers and Decision making

The onsite ERT, in particular the Chief Fire Warden (or nominated delegate), must assume responsibility for assessing the bushfire situation, using the information available, and making a decision regarding the response occupants need to undertake to stay safe. While there are various sources of potential information available upon which to base decision making, in a bushfire emergency to timing and accuracy of the information is not always clear and if the bushfire is close to the development, onsite personnel may be the most aware of the current situation by being the closest. Additionally, when the bushfire is near the development or the evacuation routes, onsite personnel will need to exercise greater situational awareness, judgement and caution as the margin of safety is less.

There are two main response options for this facility to keep people safe:

- **Offsite Evacuation** – vehicular evacuation along the road network to an offsite location
- **Onsite Shelter-in-Place** – relocating occupants and public to an onsite location

Prior to the two main response actions, there will be two other actions:

- **Standby and Controlled Shutdown** – shutdown tasks where there is adequate time for controlled preparation for safe offsite evacuation or onsite shelter-in-place
- **Emergency Shutdown** - – shutdown tasks where the bushfire impact to the site or roads will occur shortly and rapid shutdown is required with the intention of getting occupants to a place of relative safety. Given the limited time to conduct these, they have been incorporated into the Offsite Evacuation procedures.

In bushfires, people often plan to remain in place and become overwhelmed by the bushfire causing them to leave for a safer place too late. The key to a safe evacuation is leaving early, this means long before the development or evacuation roads come under bushfire attack. Driving is very dangerous during a bushfire with smoke making it hard to see, fallen trees over the road and power lines down can all trap vehicles on the road, and result in fatalities. Traffic on the roads can also hamper firefighting operations, especially when the bushfire is close.

Early detection of a bushfire's existence and location, provides the best opportunity to conduct early evacuation. Warning of a bushfire is often provided by emergency authorities (e.g. EmergencyWA, radio, SMS alert etc) however this can't be relied upon in all cases. Visual or olfactory cues or information from arriving visitors may also be other sources of information.

When assessing the bushfire situation, the Chief Fire Warden, or nominated delegate, should consider the following:

- the location and behaviour of the bushfire based on the following:
    - current bushfire warnings that have been issued
    - any available local knowledge (e.g. visual signs of bushfire, relayed information from occupants/visitors etc), which if the bushfire is close, can be more relevant for decision-making than the regional bushfire warnings
- the nature of the hazard between the current fire location and the development e.g. type of vegetation and slope
- the development layout and incorporated bushfire protection measures as a measure of bushfire resilience
- the evacuation network (roads, paths etc) including potential to be impacted by bushfire
- variations in the facility operational routines that can impact the amount of time required to commence and complete the evacuation procedure

Advice may be provided by emergency authorities to self-evacuate which greatly assists because it confirms the safety of evacuation routes and makes the process relatively straight forward.

While it is highly recommended that the specific direction/advice of authorised emergency services personnel is followed if they are onsite, however they may not be familiar with the development, so one should always use their judgement and all available information to balance advice and make the most informed assessment possible regarding potential impact to the occupants, the development and evacuation routes.

Table 10 provides a summary of likely information that will be available to make decisions during a bushfire emergency, complete with actions to be considered. The main sources of information include:

- DFES Bushfire Emergency Warnings
- Decision Zones where the bushfire location is known
    - From reputable website, radio etc
    - Physical cues (visual, olfactory) of fire
    - relayed information (from occupants, arriving visitors or adjacent land uses)

Table 10: Bushfire Triggers and Response Actions

Trigger	Action/Tasks
Bushfire Emergency Warnings (see Section 5.1 for where to obtain warnings)	
Advice	• Commence Standby/Controlled Shutdown Procedures • Consider pre-emptive use of Offsite Evacuation procedures (depending on location and if bushfire is moving toward facility • Continue monitoring and re-evaluating situation
Watch and Act	• Commence or continue Offsite Evacuation procedures • Continue monitoring and re-evaluating situation
Emergency	• Urgently commence or continue Offsite Evacuation procedures • Only consider Onsite Shelter-in-Place as a last resort action only • Continue monitoring and re-evaluating situation
All Clear	• Commence Recovery Procedures (Offsite Evacuation or Shelter-in-Place) • Continue monitoring and re-evaluating situation
Decision Zones – based on distance of bushfire from development (from reputable website, visual signs of bushfire, relayed information from occupants/visitors etc). Bushfire conditions can change rapidly and evidence of a nearby fire may precede any formal bushfire warning.	
Monitoring Zone • Distance from site: >20km	• Call 000 and advise DFES of the bushfire (and obtain any information) • Consider commencing Standby/Controlled Shutdown Procedures (if bushfire is moving toward facility) • Continue monitoring and re-evaluating situation
Readiness Zone • Distance from site: 10 -20km	• Call 000 and advise DFES of the bushfire (and obtain any information) • Commence or continue Standby/Controlled Shutdown Procedures • Consider pre-emptive use of Offsite Evacuation procedures • Continue monitoring and re-evaluating situation
Response Zone • Distance from site: <10km	• Call 000 and advise DFES of the bushfire (and obtain any information) • Commence or continue Offsite Evacuation procedures • Only consider Onsite Shelter-in-Place as a last resort action only • Continue monitoring and re-evaluating situation

9.0 Standby and Controlled Shutdown Procedures

Where the bushfire is sufficiently far away that it is not clear whether it will impact the facility or vehicular access routes, but is close enough to trigger a heightened level of awareness by occupants which may also include commencing a shutdown response by the facility. There is still considered adequate time for shutdown to be conducted in a controlled way in preparation for safe offsite evacuation.

Bushfire situations can change rapidly, so where the bushfire is close enough to the facility and/or evacuation routes to require rapid shutdown of the development, with the priority to get occupants to a place of relative safety, emergency shutdown may need to be triggered during a controlled shutdown. Given the limited time to conduct emergency shutdown actions when the bushfire is close, these actions have been incorporated into the Offsite Evacuation procedures.

Table 11: Standby and Controlled Shutdown Procedures

Action	Person responsible
Chief Fire Warden to take charge and to assess the situation relating to level of bushfire threat and potential impact on the facility, occupants and the evacuation network through the following: • using latest emergency, weather and road information obtained from Section 5.0 • implementing the following procedure: ◦ obtain aerial photo ◦ plot where bushfire is located and whether it is moving toward the development. Wind direction is typically an indicator of fire direction ◦ obtain the Fire Danger Rating for the day from EmergencyWA website ◦ note temperature, wind direction and speed from live BoM observations from website.	Chief Fire Warden
Contact DFES (000) if not already undertaken: • inform that the facility is operating and has vulnerable occupants and the number of occupants • seek advice about the fire location, behaviour and likelihood of impacting the facility • seek instructions from DFES (preferably Emergency Services Incident Controller who is managing the fire) about what actions to take • determine Emergency Services Incident Controller/DFES point of contact (if any) • Determine where offsite safer locations or Welfare Centres are being designated (open). If they are not known, determine where to evacuate if possible. ◦ If this information is not possible to obtain, use the offsite safer location/s nominated in this BEMP on Table 13	Chief Fire Warden Communications Officer
Assemble entire ERT and relevant staff: • Ensure all ERT members remain contactable • Update ERT and staff of the bushfire situation and the planned emergency management strategy.	Chief Fire Warden All ERT members All staff (if possible)

Action	Person responsible
Ensure all other emergency communication equipment around the site is available and ready for use (e.g. connected, batteries charged etc)	Communications Officer Fire Wardens
Ensure all first aid equipment is available and ready for use.	First Aid Personnel
Begin arranging any guest and visitor registers and information to create a current and collated register enable accounting for all known occupants (staff, guests and visitors) as possible • Begin accounting for all occupants and staff, • Begin identifying any known vulnerable people that may require pre-emptive evacuation offsite safer location/s or hospital	Deputy Chief Fire Warden Fire Wardens
Contact all guests and visitors: • Sounding alarms, • Using communication systems outlined in Section 3.2 or • Direct occupants to gather at the onsite assembly area Inform guests and visitors of the following: • The current emergency warning and bushfire situation • The anticipated response actions (offsite evacuation or onsite shelter-in-place): • Confirm the location of the offsite safer location • Ensure occupants are able to walk to the offsite safer location or have access to a vehicle and identify those that don't • Identify any vulnerable occupants (young, elderly, impaired, sick, injured, respiratory or other illness etc) who may require pre-emptive offsite evacuation or relocation to the local hospital. Arrange any required emergency transportation to relocate any vulnerable occupants offsite (this may need to be an ambulance)	Chief Fire Warden All ERT members All staff (if possible)
Consider ceasing some or all non-essential operations Consider ceasing activities with guests, visitors and public, including functions ***NOTE: This is a consideration only and should be based on current bushfire situation, including location, discussion with local Emergency Services and DFES, and the nature of the activity. A remote offsite activity poses a greater risk than onsite indoor activities).***	Chief Fire Warden
Where appropriate, request guests commence undertaking shutdown of their accommodation including: • Begin gathering their belongings and packing to be ready for offsite evacuation or onsite sheltering and request they close any doors or doors. • Close all windows and doors including roller and sliding doors • Put away all external combustible items or put inside building/s • Turn off air-conditioners especially evaporative coolers, or keep the water running and turn off the fan if possible • Leave on adequate lighting including points of entry lighting.	Deputy Chief Fire Warden Fire Wardens
Where appropriate, commence shutting down the facility buildings	Deputy Chief Fire Warden

Action	Person responsible
including: • Close all windows and doors including roller and sliding doors • Put away all external combustible items or put inside building/s • Turn off air-conditioners especially evaporative cooler	Fire Wardens
Ensure all internal emergency vehicular access routes are unlocked, and clear and available for use by staff, guests, visitors and firefighters including: • Main entrance gate • All internal driveways • Access to the booster connection and/or firewater tanks • Perimeter firebreaks	Traffic Warden Fire Wardens
Ensure all internal emergency pedestrian access routes are unlocked, and clear and available for use by staff, guests, visitors and firefighters including: • Main entrance gate • Emergency egress gates • All internal walkways • Any secured access points	Deputy Chief Fire Warden Fire Wardens
If safe to do so, organise for regular patrols of the facility (if not easily observed through regular activities) to check for any signs of bushfire ignition. Those conducting the patrols are to wear appropriate PPE ***Strongly consider commencing offsite evacuation while evacuation routes are open and unimpacted by smoke, embers or fire or congested with traffic***	Deputy Chief Fire Warden Fire Wardens
• Continue monitoring and re-evaluating the bushfire scenario. • Maintain situational awareness by: ◦ having nominated staff visually monitor land in the local area around the development for signs of bushfire (signs or smell of smoke etc) ◦ monitoring the Emergency WA website, DFES phone (13 3337), DFES Twitter and local ABC radio for current emergency warning status and bushfire information. • If a bushfire scenario is changing, obtain information on the new warning status, fire location and direction and speed of travel • Review Table 10 with new information to determine new response actions ◦ Where possible, undertake decision making process in consultation with Emergency Services Incident Controller/DFES point of contact ◦ Initiate Offsite Evacuation or Onsite Shelter-in-Place response procedures as required.	Chief Fire Warden and Communications Officer

10.0 Offsite Evacuation Response

Where the bushfire is close enough to the facility and/or egress routes to require rapid shutdown of the development, with the intention of getting occupants to a place of relative safety. Priority shall be on ensuring occupants are evacuated offsite to safety, with a focus on egress routes, however if this unsafe to conduct, they shall be relocated to the onsite location to shelter-in-place. Site shutdown to be undertaken if safe to do so, although this may have been commenced as part of the Standby/Controlled Shutdown procedures.

Given the location and relatively direct connection to the residential part of Onslow townsite, offsite evacuation conducted early is the safest response in a bushfire event, while evacuation routes are open and unimpacted by smoke, embers, fire or blocked or congested with traffic, however these will likely still be available during bushfire impact on the site.

The decision to evacuate occupants to the off-site location will depend on the location and behaviour of the bushfire, and where possible, should always be conducted in consultation with the Emergency Services Incident Controller or authorised DFES personnel managing the bushfire emergency.

10.1 Emergency Onsite Assembly Point and Offsite Safer Locations

In the event that offsite evacuation is to be conducted, understanding where to assemble people onsite prior to evacuation, and the offsite locations available to safely send people, will be critical to ensure its success.

10.1.1 Designated on-site assembly point

An on-site assembly point is an area within the development where occupants are to meet on becoming aware that there is a bushfire in the area, to obtain further status information and be advised of response actions.

Although the communication strategy for the facility is considered to be sufficient to avoid the need for onsite assembly, there may be instances where on-site assembly is required. It is proposed that the designated on-site assembly point identified below in Table 12 and depicted in Appendix 2.

Table 12: Designated on-site assembly point

Designated assembly point
Administration, Training/Inductions, Medical/Wellness and Creche/Comms buildings area

10.1.2 Designated off-site locations

DFES and the Shire of Ashburton may provide advice on the day as to the locations of the designated off-site safer location/welfare centres.

In the event that this information is not yet available, Table 13 lists potential offsite location areas that are to be considered during an evacuation. The safer location/s have been chosen based on:

- relative proximity to the facility
- relative safety of evacuation route
- whether the refuge is located away from the effects of a bushfire

Table 13 nominates when the various offsite locations should be considered, while also providing

primary route to the location as well as estimated travel times during normal traffic. ***Allowance needs to be made for increased travel times due to bushfire conditions (e.g. smoke) and traffic congestion on the road network.***

Table 13: Designated off-site safer location

Location and address	Route to location	Travel Distance and Time (normal travel)
Onslow Sports Club (47 Third Avenue, Onslow)	***Primary Route*** Third Avenue (S) – Onslow Sports Club (R)	600 m (7 - 10 min walk) (2 - 5 min drive)

10.2 Offsite Evacuation Procedures

Once the decision has been made conduct offsite evacuation of the facility, Table 14 lists the evacuation procedures to be followed.

Table 14: Offsite Evacuation procedures

Action	Person responsible
Chief Fire Warden to take charge and to assess the situation relating to level of bushfire threat and potential impact on the facility, occupants and the evacuation network through the following: • using latest emergency, weather and road information obtained from Section 5.0 • implementing the following procedure: • obtain aerial photo • plot where bushfire is located and whether it is moving toward the development. Wind direction is typically an indicator of fire direction • obtain the Fire Danger Rating for the day from EmergencyWA website • note temperature, wind direction and speed from live BoM observations from website. Once the decision is made to evacuate offsite, use the available information to: • Determine the preferred offsite location (pending advice from DFES or Emergency Services Incident Controller) • Determine the safest route to get to the offsite location that takes occupants as far from the fire as possible.	Chief Fire Warden
Contact DFES (000) if not already undertaken: • inform that the facility is operating and has vulnerable occupants and the number of occupants • seek advice about the fire location, behaviour and likelihood of impacting the facility. Alternatively provide current bushfire observations if fire is close to facility or town. • seek instructions from DFES (preferably Emergency Services Incident Controller who is managing the fire) about what actions to take	Chief Fire Warden Communications Officer

Action	Person responsible
• determine Emergency Services Incident Controller/DFES point of contact (if any) • Determine where offsite safer locations or Welfare Centres are being designated (open). ◦ If this information is not possible to obtain, use the offsite safer location/s nominated in this BEMP on Table 13. • If decided, advise that offsite will be conducted, including the preferred offsite location and the route to be used.	
Ensure all relevant Standby and Controlled Shutdown actions are completed. The key actions are repeated below: • Assemble ERT and relevant staff • Update ERT and staff of the bushfire situation and the planned emergency management strategy. • Cease all operations including any functions and activities • Begin accounting for all occupants and staff ◦ Identify any known vulnerable people and arrange any required emergency transportation for priority evacuation to offsite safer location/s or hospital	Chief Fire Warden Deputy Chief Fire Warden All ERT members

Once decision is made to evacuate the site (following confirmation with the Emergency Services Incident Controller or authorised DFES personnel if possible), implement this broad process:
• Contact all guests and visitors (if not already undertaken):
  ◦ Sounding alarms,
  ◦ Using communication systems outlined in Section 3.2 or
  ◦ Direct occupants to gather at the onsite assembly area
• Inform guests and visitors of the following:
  ◦ The current emergency warning and bushfire situation
  ◦ The plan to evacuate offsite
  ◦ Confirm the offsite safer location
  – if the Emergency Services Incident Controller or DFES representative do not advised of an off-site location, use the one nominated in this as per Table 13
  ◦ the evacuation route to travel to the off-site location
  ◦ ensure occupants are able to walk to the offsite safer location or have access to a vehicle and identify those that don't
  ◦ Identify any vulnerable occupants (young, elderly, impaired, sick, injured, respiratory or other illness etc) who may require pre-emptive offsite evacuation or relocation to the local hospital.
• **If safe to do so (i.e. sufficient time)**, instruct guests and visitors to gather their belongings and either evacuate to the nominated offsite location by foot or meet at onsite assembly point prior to evacuation.
  ◦ Belongings are to be limited to mobile phone or other communication devices, wallets/purses, medicines and other health/mobility aids, food and water. They shall not bring bulky luggage, only a small bag.
	Chief Fire Warden
	Deputy Chief Fire Warden
	Communications Officer
	Fire Wardens

Action	Person responsible
◦ Encourage them to close all windows and doors at their accommodation where time to do so • **If there is insufficient time to collect belonging**, instruct guests and visitors to evacuate directly to the nominated offsite location by foot. • all evacuating occupants are to move in an orderly manner as a group, ideally with staff members, to ensure guests and visitors don't become lost • organise people traveling by vehicle to carpool as much as possible to reduce traffic. • **prioritise the evacuation of the following people, to evacuate those most at risk first and to minimise congestion of internal and local roads:** ◦ **any vulnerable occupant (elderly, respiratory problems, sick/injured)** ◦ **occupants along parts of the facility likely to be impacted by bushfire first**	
• Instruct ERT to conduct the following (if not already undertaken) ◦ use guest and visitor registers to monitor the evacuation as occupants leave the site and to confirm that all staff, guests and visitors are successfully relocated to the nominated offsite location ◦ ensure all internal emergency vehicular and pedestrian access routes are unlocked, clear and available including the emergency egress gates to Third Avenue ◦ conduct a thorough check of the site, doing a walk-through of all buildings and areas, to confirm all persons have evacuated ◦ Final evacuating staff are to travel in a group of no less than 2 people. • **If safe to do so**, instruct ERT and relevant staff to shut down the facility buildings including: ◦ Close all windows and doors including roller and sliding doors ◦ Put away all external combustible items or put inside building/s ◦ Turn off air-conditioners especially evaporative cooler • **If safe to do so**, organise for regular patrols by ERT of the facility to check for any signs of bushfire ignition.	Deputy Chief Fire Warden Fire Wardens
If not previously conducted, advise Emergency Services Incident Controller or DFES if the facility is being impacted by bushfire (i.e. bushfire ignites on or adjacent to the site) and that the facility is performing an evacuation and advise number of occupants and where they are going.	Chief Fire Warden Communications Officer
Upon arrival of occupants at off-site safer location: • confirm all relocated occupants are accounted for and safe • advise Emergency Services Incident Controller of relocation to off-site location and whether anyone is missing	Chief Fire Warden First Aid Personnel Communications Officer
To improve resilience of off-site safer location and ensure the safety of the occupants: • close all doors and windows	Deputy Chief Fire Warden First Aid Personnel Fire Wardens

Action	Person responsible
• turn off any evaporative air-conditioners or if possible, keep the water running and turn off the fan. • fill sinks, bath and buckets with water for putting out any fires that may start inside or soaking towels, blankets or clothes • soak towels and rugs in water and lay them along the inside of external doorways or block any other gaps for embers or smoke • soak woollen blankets and keep them available for protection against radiant heat • take down curtains and push furniture away from windows • erect ladder next to roof space manhole to enable inspection for spot fires. • obtain any firefighting equipment e.g. fire extinguishers, hose reels, garden hoses and determine area of coverage. • evenly distribute fire extinguishers throughout the building • immediately before the fire arrives, wet down decks and landscaping close to the building • where possible, turn on any garden reticulation for areas surrounding the offsite safer location • ensure occupants to get down low to limit exposure to smoke and drink plenty of water to avoid becoming dehydrated • where safe to do so, nominate teams of no less than two persons to regularly inspect building exterior and roof cavity (wearing suitable protective clothing - at a minimum long sleeves, trousers and leather boots) to inspect building exterior for embers and fire ignitions, and extinguish where possible • Monitor the condition of the building/s including regular inspection of the inside of the building, including the roof space for sparks and embers, and extinguish where possible. Stay in the offsite safer location while the fire front is passing. If the building catches fire and/or conditions inside become unbearable: • leave through the door furthest from the approaching fire • go to another unaffected building onsite or an area that has already burnt, or a large open space. Once the fire has passed, you will need to regularly inspect the inside and outside of the building for several hours. Go outside and extinguish any fires on the building or in adjacent landscaping.	
• Continue monitoring and re-evaluating the bushfire scenario. • Maintain situational awareness by: ◦ having nominated staff visually monitor land in the local area around the development for signs of bushfire (signs or smell of smoke etc) ◦ monitoring the Emergency WA website, DFES phone (13 3337), DFES Twitter and local ABC radio for current emergency warning status and bushfire information. • If a bushfire scenario is changing, obtain information on the new warning status, fire location and direction and speed of travel	Chief Fire Warden and Communications Officer

Action	Person responsible
• Review Table 10 with new information to determine new response actions ◦ Where possible, undertake decision making process in consultation with Emergency Services Incident Controller/DFES point of contact ◦ Initiate Offsite Evacuation or Onsite Shelter-in-Place response procedures as required.	

10.3 Recovery procedures following Offsite Evacuation

Recovery procedures are triggered when emergency services have advised that the bushfire threat has passed and it is safe to return to the facility (DFES 'All Clear' alert).

Table 15 lists the recovery procedures to be carried out following an evacuation of the facility,

Table 15: Recovery procedures (following offsite evacuation)

Action	Person responsible
Following a bushfire, emergency services are required to confirm conditions within facility and local area are safe for people to return to including the vehicular access network and services (electricity, water, gas etc) If the facility has been impacted by fire, ensure no one returns or re-enters until Emergency Services have declared it as being safe.	Chief Fire Warden Fire Wardens
Liaise and take directions from Emergency Services Incident Controller or DFES regarding whether safe return is possible. If safe to do so, consider conducting a preliminary review of the site for obvious damaged or destroyed buildings. Based on this information make the decision whether to reopen and return to the facility or whether it shall remain closed. The first priority is to ensure the safety of all people including staff. If the decision is made to keep the facility closed, seek alternative accommodation if required for displaced persons.	Chief Fire Warden Communications Officer
Once decision is made to either reopen or relocate: • arrange for occupants to be moved back to the facility or to alternative location (nominated by Emergency Services Incident Controller or DFES): • confirm all occupants are accounted for on their return to the facility (or have been otherwise safely relocated elsewhere) using the occupant/visitor register procedure used by the facility • advise Emergency Services Incident Controller of relocation to facility or alternative location and whether anyone is missing.	Chief Fire Warden All ERT members

10.4 Transport Arrangements for Offsite Evacuation

Given the location of the facility with respect to Onslow, that offsite evacuation will be into the town, and that many guests are unlikely to have access to a vehicle, offsite evacuation from the development will likely be by foot.

While it is not expected that alternative transport arrangements will be required to facilitate offsite evacuation, it is recommended that the ERT negotiate with a local transport company, the necessary arrangements to use their vehicles to evacuate occupants offsite, should it be required. It is recommended this alternative (see Table 16) is at least in place prior to bushfire season, to provide the Chief Fire Warden with transport options to deal with any unforeseen circumstances.

Table 16: Alternative transport arrangements

Alternative Transportation Arrangements To be used should there be enough people onsite without transportation	
Name of organisation providing transportation	TBC (arrange with local transportation company)
Contact phone number	TBC
Time required for transportation to arrive	TBC (but expect delays due to traffic, smoke etc)
Estimated travelling time to destination	TBC (but expect delays due to traffic, smoke etc)

10.4.1 Ambulances or Medical Transport

As noted in Section 3.1, there may be a need to pre-emptively relocate vulnerable occupants using ambulances or medical transport. Additionally it may be necessary to attempt to evacuate these occupants during the bushfire emergency, depending on the nature sickness or injury.

It is recommended that the ERT make contact with the relevant agencies and transport providers in the local area to discuss the access and extraction options available to them, prior to, during and following a bushfire emergency, so the Chief Fire Warden is clear on how to contact these services, and what the options are likely to be.

10.4.2 Traffic Awareness and Management

Any vehicles used for offsite evacuation should be in good working order and should have sufficient fuel to travel at least 100 km, and if they are not considered appropriate for evacuation, alternative transport should be found for the occupants.

10.4.3 Potential Traffic and Congestion

Evacuation from the development to an off-site location, my occur simultaneously with occupant egress from nearby facilities and the local residential population of the area. On this basis, there is likely to be traffic congestion on the road network, that potentially worsens at time passes. On that basis, the following shall be considered:

- Initiating early evacuation will be critical to ensure all occupants are able to relocate off-site, and minimise the potential for disruption of the local road network, which could prevent timely egress or impact firefighter access.
- The Chief Fire Warden (or nominated delegate) who is managing the evacuation of the development, shall ensure they are cognisant of the traffic conditions to the off-site conditions, and react to any disruption to the road network (bushfire, congestion). Traffic congestion may be sufficient to require a change in evacuation destination to the secondary

off-site location.

- Given the potential for traffic congestion, evacuation by foot shall be encouraged where safe to do so, to reduce vehicle traffic.

10.4.4 Safety considerations for evacuating by car:

While the intent of the Offsite Evacuation procedures is for early evacuation ahead of bushfire impact, including embers and smoke, or prior to any traffic congestion, there is always a chance the bushfire situation changes. Travel by vehicle through areas being impacted by bushfire, can present a significant risk to occupants, however occupants in this situation can improve their chances of survival through the following actions:

- **Before leaving**
    - Ensure there are fire blankets (or woollen blankets) and a water supply within the vehicle
    - Obtain a fire extinguisher if possible
    - Dress in protective clothing, preferably long-sleeved shirts and pants, and shoes.
    - Confirm there is sufficient fuel in the vehicle, and that it is roadworthy
        - If not, seek alternative transport or consider remaining onsite in well-prepared building
    - Ensure the vehicle headlights are on
- **If approaching bushfire on the road**
    - If there is considerable smoke
        - ensure headlights and hazard lights on
        - close windows and outside vents and put air-conditioning on recirculation
        - slow down as there could be people, vehicles and livestock on the road.
        - if you can't see clearly, pull over and wait until the smoke clears.
    - Carefully pull over and assess the situation.
        - It is a considerable risk to drive through smoke and flames. This is common cause of fatalities.
        - If safe, turn around and drive to safety in a different direction (if the option is available)
- **If you are trapped by bushfire**
    - Park and shelter within the vehicle.
        - Park off the road to avoid collisions with other vehicles
        - Park where there is the least vegetation (around, above and under the vehicle).
        - If possible, park behind a physical barrier (e.g. rock, earth mound) to minimise direct flame contact or radiant heat exposure
        - Face the vehicle towards the oncoming fire front as the front windscreen is generally thicker glass
        - Do not park too close to other vehicles in case a vehicle catches alight.
    - Inside the vehicle
        - As the fire front approaches, the intensity of the heat will increase along with the amount of smoke and embers. Smoke will gradually get inside the vehicle and fumes will be released from interior plastics.
        - Stay in the vehicle (unless there is a well-protected building nearby).

        - Call 000 to inform of situation (if mobile reception available)
        - Close doors, windows and outside vents, keep headlights and hazard lights on and turn the engine off.
        - stay as close to the floor as possible to minimise exposure to radiant heat, preferably in the foot wells, and shelter under the blankets.
        - Cover mouth with moist cloth to minimise inhalation of smoke and toxic fumes being released from the interior of the vehicle
        - Continue to drink water to minimise dehydration.
        - Stay in the car until the fire front has passed and do not open windows or doors.
- **As fire front passes**
    - Parts of the car may be extremely hot. Tyres and external plastic body parts may catch alight and in more extreme cases the interior may catch on fire. Fuel tanks are unlikely to explode.
    - Stay in the vehicle, with windows and doors closed, until the fire front has passed, and the outside temperature has dropped sufficiently.
    - Stay covered by blankets, continue to drink water.
    - Once the fire front has passed cautiously exit the vehicle, move to a safe area such as an area of land already burnt or rocky outcrop.
    - Call 000 to inform of situation (if mobile reception available)
    - Wait for assistance

11.0 Onsite Shelter-in-Place Response (Last Resort Action Only)

The alternative to offsite evacuation is for occupants to shelter-in-place within the facility. This would typically be expected to occur if there is insufficient time to conduct a safe offsite evacuation or the risk associated with offsite evacuation otherwise considered to be greater than sheltering in place on-site.

Given the facility is directly connected to the existing built-up residential portion of Onslow townsite, remaining on-site is not considered the safest option. Whilst pre-emptive and early off-site evacuation is always considered the best approach to avoid any bushfire impact on the evacuation route, the location is such that evacuation should be available even during bushfire impact on the development.

Onsite shelter-in-place is only to be conducted as a last resort action only.

The facility has no building specifically constructed for onsite refuge, and if required, should be undertaken as far from the approaching bushfire as possible. This is expected to be on the eastern side of the facility, either within a building or in open space.

If onsite shelter is being conducted within a building, the following actions should be implemented to improve building resilience:

- close all doors and windows
- turn off any evaporative air-conditioners or if possible, keep the water running and turn off the fan.
- fill sinks, bath and buckets with water for putting out any fires that may start inside or soaking towels, blankets or clothes
- soak towels and rugs in water and lay them along the inside of external doorways or block any other gaps for embers or smoke
- soak woollen blankets and keep them available for protection against radiant heat
- take down curtains and push furniture away from windows
- erect ladder next to roof space manhole to enable inspection for spot fires.
- obtain any firefighting equipment e.g. fire extinguishers, hose reels, garden hoses and determine area of coverage.
- Immediately before the fire arrives, wet down decks and landscaping close to the building
- where possible, turn on any garden reticulation for areas surrounding the building
- ensure occupants to get down low to limit exposure to smoke and drink plenty of water to avoid becoming dehydrated
- where safe to do so, nominate teams of no less than two persons to regularly inspect building exterior and roof cavity (wearing suitable protective clothing - at a minimum long sleeves, trousers and leather boots) to inspect building exterior for embers and fire ignitions, and extinguish where possible
- monitor the condition of the building/s including regular inspection of the inside of the building, including the roof space for sparks and embers, and extinguish where possible.

Stay inside while the fire front is passing. If the building catches fire and/or conditions inside become unbearable:

- leave through the door furthest from the approaching fire
- go to another unaffected building onsite or an area that has already burnt, or a large open space.

Once the fire has passed, you will need to regularly inspect the inside and outside of the building for several hours. Go outside and extinguish any fires on the building or in adjacent landscaping.

Appendix 1: Responsibilities for emergency roles

Chief Fire Warden

The Chief Fire Warden is responsible for:

- Reviewing the forecast FDR and ensuring the pre-emptive actions are undertaken based on the FDR.
- Evaluating the available information to assess the bushfire emergency
- Initiating, coordinating and supervising shutdown, offsite evacuation or onsite shelter-in-place actions.
- Supervising the emergency response from the command centre.
- Liaising with emergency authorities including advising when offsite evacuation or onsite shelter-in-place is underway
- Re-evaluating the emergency response actions during the emergency based on situational updates during the emergency.
- Supervising the recovery response and debriefing
- Documenting the circumstances of the emergency, processes and outcome.

Deputy Chief Fire Warden

The Deputy Chief Fire Warden is responsible for:

- Taking direction from and carrying out tasks allocated by the Chief Fire Warden.
- Assume the Chief Fire Warden responsibilities if not available.
- Ensuring all staff, guests, residents and visitors have been alerted of the bushfire emergency
- Once initiated, ensuring the shutdown, offsite evacuation or onsite shelter-in-place actions are being conducted correctly
- Monitoring the bushfire emergency to provide situation reports of fire location or impact on buildings and potential danger to people.
- Monitoring the response actions (shutdown, evacuation or shelter-in-place) and location of people to provide situation reports on any potential danger to people.
- Maintaining communication with, and updating the Chief Fire Warden with situation reports.
- Assisting oversee and contribute to the recovery response, debriefing and reporting.

Fire Wardens

Fire Wardens are responsible for:

- Taking direction from and carrying out tasks allocated by the Chief Fire Warden and/or Deputy Chief Fire Warden.
- Assisting in alerting all staff, guests, residents and visitors of the bushfire emergency
- Assisting the initiation and implementation of shutdown, offsite evacuation or onsite shelter-in-place actions as directed by the Chief Fire Warden and/or Deputy Chief Fire Warden.
- Monitoring the bushfire emergency to provide situation reports of fire location or impact on buildings and potential danger to people.
- Monitoring the response actions (shutdown, evacuation or shelter-in-place) and location of people to provide situation reports on any potential danger to people.

- Maintaining communication with, and updating the Chief Fire Warden, Deputy Chief Fire Warden and other relevant ERT members to provide situation reports.
- Contribute to the recovery response, debriefing and reporting.
- All permanent staff are to be trained in the role of Fire Warden.

First Aid Personnel

First Aid Personnel, under the direction of the Chief Fire Warden, Deputy Chief Fire Warden or Fire Warden are responsible for:

- Evaluating the extent of any injuries.
- Administer first aid (only where safe to do so).
- Assess if injured personnel can be evacuated safely.

Traffic Warden

The Traffic Warden is responsible for:

- In collaboration with the Chief Fire Warden, arranging and coordinating additional offsite transport to come to the development to assist with offsite evacuation, if safe to do so.
- Ensuring all onsite access control measures (gates, bollards etc) are unlocked and removed to enable full use of the onsite access network.
- Coordinating and supervising the placement of Fire Wardens to nominated locations to coordinate vehicle movement and traffic flow oversee the orderly evacuation to offsite location, if the decision is made to evacuate the development.
- Ensuring any Fire Wardens conducting traffic management have communication devices to enable them to provide and receive situation reports

Communications Officer

The Communications Officer is responsible for:

- Taking direction from and carrying out tasks allocated by the Chief Fire Warden.
- Maintaining communication with, and updating the Chief Fire Warden and/or Deputy Chief Fire Warden with situation reports.
- Providing situation updates (bushfire characteristics, emergency response update) to the Traffic Warden to enable them to update the Fire Warden conducting traffic management.
- Receive traffic situation updates from the Traffic Warden and relay to the Chief Fire Warden and/or Deputy Chief Fire Warden
- Liaise with external adjacent accommodation and residential properties to provide situation updates and receive information to relay to the Chief Fire Warden and/or Deputy Chief Fire Warden
- Liaise with emergency agencies under the direction of the Chief Fire Warden
- Assist the Chief Fire Warden collect any available information about the bushfire emergency

Appendix 2: Bushfire Emergency Management Map

BUSHFIRE EMERGENCY MANAGEMENT MAP

Lot 300 Back Beach Road, Onslow

Emergency Response Team Contacts

Chief Fire Warden:	Joe Bloggs (0400 000 000)
Deputy Chief Fire Warden:	Joe Bloggs (0400 000 000)
First Aid Personnel:	Joe Bloggs (0400 000 000)

Emergency Services Contacts

DFES/Ambulance/Police:	000
DFES:	13 DFES (13 3337)

Bushfire Information and Updates:

EmergencyWA	www.emergency.wa.gov.au
DFES:	13 DFES (13 3337)
Radio Updates:	1188 AM (ABC Pilbara
Fire Danger Ratings:	www.emergency.wa.gov.au
	www.bom.gov.au

Bushfire Awareness Actions (using forecast FDR)

ERT	Guests/Visitors
• Rare event with potential for worst bushfire behaviour. • Contact DFES • Update guests and visitors • Monitor for bushfires hourly • Prepare all staff, systems procedures and the refuge for bushfire emergency	• Know where onsite assembly point and offsite safer location is located • Be prepared for rapid offsite evacuation • Listen to ERT instructions
• Update guests and visitors • Monitor for bushfires (every few hours) • Prepare all staff, systems procedures and the refuge for bushfire emergency	
• Monitor for bushfires (if conditions are unusually warm and windy)	• Be aware of bushfires • Listen to ERT instructions

ERT are to refer to facility Bushfire Emergency Management Plan for further detail on pre-emptive action

Bushfire Response Actions

- Offsite evacuation into Onslow townsite is considered the safest response action given the development is adjacent to a residential area.
- Evacuation will be safest when conducted early, prior to bushfire impact.
- This facility has an Emergency Response Team (ERT) who are trained to deal with bushfire emergencies. Listen to their instructions
- Take a copy of map with you if evacuating offsite
- Refer to response table on other side of sheet for further actions

Bushfire Triggers and Response Actions

Trigger	ERT	Guests/Visitors
Bushfire Emergency Warnings		
Advice	• Controlled Shutdown • Consider pre-emptive Offsite Evacuation • Monitor & re-evaluate	• Listen to ERT instructions • Know where offsite safer location is located • Be prepared for offsite evacuation
Watch and Act	• Commence Offsite Evacuation • Monitor & re-evaluate	
Emergency Warning	• Commence Offsite Evacuation • Monitor & re-evaluate	• Relocate to offsite safer location • Listen to ERT instructions
All Clear	• Recovery Procedures • Monitor & re-evaluate	• Listen to ERT instructions
Bushfire Location (Decision Zones based on distance from site – use if no emergency services guidance)		
Monitoring Zone: >30km away	• Consider Controlled Shutdown • Monitor & re-evaluate	• Listen to ERT instructions • Monitor bushfire
Readiness Zone: 20km - 30km	• Start Controlled Shutdown • Consider pre-emptive Offsite Evacuation • Monitor & re-evaluate	• Listen to ERT instructions • Know where onsite bushfire refuge is located • Be prepared for offsite evacuation or relocation to bushfire refuge
Response Zone: **Offsite Evacuation** 7.5km - 20km	• Emergency Shutdown • Offsite Evacuation if safe. If not, Onsite Shelter-in-Place • Monitor & re-evaluate	
Response Zone: **Onsite Shelter-in-Place** <7.5km	• Emergency Shutdown • Onsite Shelter-in-Place • Monitor & re-evaluate	• Relocate to onsite bushfire refuge • Listen to ERT instructions

ERT are to refer to facility Bushfire Emergency Management Plan for detail on response actions

Onsite Assembly Point

- **Administration, Training/Inductions, Medical/Wellness and Creche/Comms buildings area**

Offsite Safer Location/s

- Use the designated welfare centres or nominated locations as advised by DFES or Emergency Incident Controller
- ***If this information is not available, the offsite safer location is to be***

  Onslow Sports Club (47 Third Avenue, Onslow)

Driving in Bushfire

Before leaving

- Is car roadworthy and have sufficient fuel?
- Take fire blanket, extinguisher, maps, PPE, plenty of water

Approaching bushfire

- Headlights on; close windows; air-con on recirculation; slow down
- Pull over; assess situation; can you go to a safe place in other direction?

If trapped in car in bushfire

- Park off road in least vegetation or behind non-combustible barrier
- Face vehicle toward fire; don't park too close to other cars
- Close up car (windows; doors; vents); engine off; lights/hazards on
- Stay close to floor; shelter under blankets and wet cloth on mouth
- Drink water
- Stay in car until outside temperature has dropped; exit cautiously
- Call 000; wait for assistance

Appendix E
Urban Water Management Plan for Lot 300 Back Beach Road, Onslow

360 environmental

Lot 300 Back Beach Rd, Onslow

Urban Water Management Plan

Prepared for

Mineral Resources Limited

August 2021

people planet professional

1638

Document Reference	Revision	Prepared by	Reviewed by	Admin Review	Submitted to Client	
					Copies	Date
4757AA_Rev0	Internal Draft	LSC	PD			
4757AA_Rev1	Client Draft	PD	DT	LI	1x electronic	06/08/2021
4757AA_Rev2	Client Draft	PD, NC	DT	LI	1x electronic	27/08/2021

Disclaimer

Executive Summary

Rowe Group, on behalf of Mineral Resources Limited (the proponent), commissioned 360 Environmental Pty Ltd (360 Environmental) to produce an Urban Water Management Plan (UWMP) to support the development of Lot 300 Back Beach Rd, Onslow (the site) into a transient workers resort.

The site covers an area of 20.45 ha and is located in the Shire of Ashburton. Back Beach Road bounds the site to the south and the Indian Ocean coast to the west. Residential development borders the site to the east and the Onslow Memorial Park to the north.

This UWMP has been prepared in accordance with the Better Urban Water Management guidelines (WAPC 2008) to secure approval (via the Regional Joint Development Assessment Panel and State Development Assessment Unit) for the development of a high-quality 500-person permanent resort-style 'Transient Workforce Accommodation Resort' to cater for the Client's operations workforce associated with its Onslow Iron Project.

Table 1 provides an overview of the site description and summary of the water management strategies to implement.

Table 1: Key UWMP Design Elements

Site Overview	Description
Proposed Development Section 1.2	The site is proposed to be developed into a transient workforce accommodation resort. It comprises 500 independent accommodation pods and a communal space including the main entry gatehouse, car parks, a medical centre, restaurants, tavern with dedicated alfresco area, gymnasium, outdoor pools, recreation room, driving range, oval and outdoor cricket. The site will be developed, ensuring minimal on-site works are carried out, minimising the development footprint. The development will contain drainage infrastructure, roads, gardens, and water services infrastructure. Mineral Resources Limited (MRL) will lease the site for approximately 30 years. It will be returned to the landowner with the intent of continuing as a public resort.
Existing Land use Section 3.1	The site is Unallocated Crown vacant land owned by Western Australia's Government. The land will be ceded to the Aboriginal Corporation, and MRL will hold a lease over the land for approximately 30 years.
Topography Section 3.2	The site elevation is approximately 16 m AHD to the north and slopes down to the southwest to approximately 12 m AHD. The site has three natural depressions around the centre of the land, and steep slopes are found from the site to the west towards Back Beach. The eastern portion of the land gently slopes towards Simpson Street.
Soil Type Section 3.3	The regional soil mapping indicates the site is located on the Dune System, characterised by dune fields and deep red sand. The geological unit within the site comprises light grey sand and unconsolidated and poorly consolidated quartzose calcarenite. The desktop study also concluded a substantial likelihood of limestone units being encountered at shallow depths.

Site Overview	Description
Surface Water Section 3.5	There are no surface water features, including drains or waterways within site. The closest surface waters are Beadon Creek (2.5 km east) and a Salt Lake (0.5 km south), located outside of the site.
Groundwater Section 3.7	The site lies within the Pilbara groundwater area and Ashburton sub-area. Carnarvon superficial aquifer and the Carnarvon Birdrong artesian aquifer are present within site. Water drawn from the Birdrong Aquifer is the primary local bore water source. It is the principal artesian aquifer for the Carnarvon Artesian Basin. The Groundwater Resource Allocation Plan developed by DWER in October 2013 indicated that 1,000,000 kL/year of water were available for allocation and licencing from Ashburton – lower Cane Alluvial. Water level monitoring has been recorded at bores 3/97 and 4/97, located approximately 300 m to the site's southeast. The AAMGL ranged from 0.08 m AHD to 0.81 m AHD. The LWMS reported groundwater salinity to be less than 3,000 mg/L on average, which is considered moderately salty and suggests groundwater is unsuitable for garden bores.
Water Servicing Section 4.0	The Water Corporation has provided support for the site to supply potable water and wastewater disposal. Groundwater for irrigation has not been considered because it has been identified as an unfeasible source in the LWMS (hyd2o, 2012). Alternative sources were assessed, and scheme water is a reliable source for POS irrigation compared to other sources. Other sources can ease the demand but will not suffice the irrigation requirements for the site.
Water Conservation Strategy Section 5.0	Water use within the development will be consistent with the Water Corporation’s waterwise land development criteria and Australia's urban water-saving scheme (WELS), including: • Use of high-density accommodation pods to reduce the use of water outside of these • Promotion of waterwise practices, including water-efficient fixtures and fittings (taps, showerheads, toilets, waterwise landscaping) within the accommodation pods and administration buildings • Non-structural controls implemented to minimise water evaporation from pools • Use of native plants and natural mosquito repellent trees and vegetation in landscaped areas and hydro zoning as much as possible, including along the edges of the accommodation pods' boardwalks • Maximising on-site retention of stormwater by decreasing the development footprint including protecting the current cultural significance site.
Stormwater Management Strategy Section 6.1	A stormwater management strategy has been developed, which demonstrates that the site can effectively manage stormwater generated during the small, minor, and major rainfall events: • All runoff from the roads and car park will be treated at source or as close to the source as possible. • All other runoff from impervious areas within Catchment C (Figure 7) will be directed, via overland flow paths, to Storage C (Figure 9). There will be

Site Overview	Description
	no runoff from pervious areas of Catchment A and B (Figure 7) during the small rainfall event. • Minor (20% AEP) and major (1% AEP) rainfall events will be managed via safe overland flow to the natural depressions. Three natural depressions will be used for storage and infiltration.
Groundwater Management Strategy Section 6.2	Imported fill will not be required to raise the site to a minimum elevation of 6.4 m AHD as the development will use elevated boardwalks and accommodation pods. These will be built to provide a minimum clearance to the AAMGL plus sea-level rise of approximately 2.7 m. Therefore, subsoil drainage is not required. The proposed stormwater management practices will ensure that groundwater quality is maintained. The site has been identified as having a moderate to low risk of acid sulfate soils (ASS). Since the natural landform will be used, i.e. no excavation or earthworks will be required around the ASS identified area (Figure 5), an ASS management plan will not be required.
Implementation Plan Section 7.0	A construction and post-development maintenance program has been provided. The operation and maintenance of the stormwater management infrastructure will be the responsibility of the site managers during construction. Post-development, the following measures will be undertaken to ensure the system functions correctly: • Ongoing removal of debris and liter from the swales and the natural depressions to guarantee their designed life cycle • Maintaining the landscape feature to ensure effective infiltration and protect the site from erosion.

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1 Introduction

Mineral Resources Limited proposes to develop Lot 300 Back Beach Rd, Onslow (the site). This UWMP has been prepared in accordance with the Better Urban Water Management guidelines (WAPC, 2008) to secure approval for the development of a high-quality 500-person permanent resort-style 'Transient Workforce Accommodation Resort' to cater for the proponent's operations workforce associated with its Onslow Iron Project. The site is set to include recreational facilities, a restaurant and the village operations and administration buildings.

The site is approximately 20.45 hectares (ha) and is located in the Shire of Ashburton, in Onslow. Back Beach Road bounds the site to the south and the Indian Ocean coast to the west. Residential development borders the site to the east and the Onslow Memorial Park to the north (Figure 1).

1.1 Planning Background

The site falls within Unallocated Crown land zoned 'Conservation, Recreation and Nature Landscape' in the Shire of Ashburton Town Planning Scheme No. 7 (TPS7). However, the Onslow Townsite Structure Plan, developed in 2016, identified the area for further development investigation. This plan has been prepared to support the site's development application to be approved via the Regional Joint Development Assessment Panel and the State Development Assessment Unit.

The Residential Design Codes of WA (R-Codes) and Clause 4.1.1 of the Structure Plan apply where the area is found suitable for residential development subject to the approval of the Shire of Ashburton and WAPC.

A Local Water Management Strategy (LWMS) (hyd2o, 2012) was prepared to support the Onslow Townsite Structure Plan.

1.2 Proposed Development

The site's Masterplan is provided in Figure 2 and comprises 500 accommodation pods and communal spaces, including:

- Main Entry gatehouse and car parks
- Administration blocks including a medical centre, restaurants, tavern, and their dedicated alfresco area
- Wellness facilities including gymnasium, outdoor pools, recreation room, driving range, oval and outdoor cricket.

The site will be developed by retaining the current landform. The development footprint will be minimised by providing elevated boardwalks and connecting with, also elevated accommodation pods. The southern portion of the site, ending at Back Beah Road (approximately 6.5Ha), has been preserved for cultural heritage values and will not be developed.

The site will be serviced with roads, carparks, landscape and water and drainage services. The site will be leased to Mineral Resources Limited (MRL) over a period of more than 30 years.

The development proposes to house up to 500 transit workers. However, only around 60% of the site is expected to be occupied in the future due to MRL operations.

1.3 Guiding Documents

This UWMP has been prepared in accordance with the following guidelines, policy documents and previous site investigations:

- Stormwater Management Manual for Western Australia (DoW, 2004-2007)
- State Planning Policy 2.9 Water Resources (WAPC a, 2006)
- Better Urban Water Management (WAPC, 2008)
- State Planning Policy 2.6 State Coastal Planning Policy (WAPC b, 2006)
- Onslow Townsite Development Local Water Management Strategy (hyd2o, 2012)
- Onslow Townsite Development – Development Plan – Engineering Servicing Report (WGE, 2012)
- Decision Process for Stormwater Management in Western Australia (DWER, 2017)
- Desktop Geotechnical Study (Golder Associates, 2011)
- Onslow Townsite Planning Coastal Setbacks and Development Levels (MP Rogers & Associates Pl, 2011).

2 Design Criteria

The site design criteria were adopted from the LWMS (hyd2o, 2012). This plan shows compliance with these criteria as described in sections 4 to 7.

Table 2: Design Criteria

Criteria	Strategy Elements	Criteria
Water Use Sustainability		
CW1	Water Efficiency	Reduce consumptive use through adoption of waterwise practices.
CW2	Water Supply	Develop 'fit for purpose' water supply strategy and minimise potable water use where drinking quality water is not essential.
CW3	Wastewater	Provide a wastewater system that meets agency requirements.
Stormwater		
CS1	Ecological Protection	Maximise the retention of stormwater generated from the site during frequently occurring events. Establishment of storage invert levels no lower than seasonal maximum groundwater levels. Use of infiltration systems for frequently occurring events to minimise mosquito breeding opportunities. Implement non-structural controls.
CS2	Serviceability	Road drainage system to be designed so that roads are passable in the 20% Average Exceedance Probability (AEP) storm event.
CS3	Flood protection	Provide safe conveyance during the 1% AEP storm event from the site. Habitable building floor levels are set at 1% AEP storm surge levels allowing for 1% climate change (or suitable building restrictions where not feasible). Habitable building floor levels are set at 0.5 m above 1% AEP flood levels.
Groundwater		
CG1	Fill Requirement and Subsoil Drainage	Establish development levels with acceptable clearance above post-development groundwater levels. If required, provide subsoil drainage to control any post-development groundwater rise.
CG2	ASS and Contamination	If required, criteria and management of ASS to be handled as a separate process consistent with the Department of Water and Environmental Regulation (DWER) requirements.

3 Existing Environment

3.1 Existing Land use

The site is Unallocated Crown vacant land owned by Western Australia's Government. The land will be ceded to the Aboriginal Corporation, with MRL holding a lease over the land for approximately 30 years. Land negotiations are progressing between MRL, the State Government and the Aboriginal Corporation.

3.2 Current climate

Weather data from 2011 – 2020 were collected from the Onslow Airport weather station (Ref 005017), located approximately 4.1 km south of the site. The annual mean maximum temperature is 32.84 °C, and the annual mean minimum temperature is 21.22 °C. The recorded mean yearly rainfall was 240.92 mm (BoM, 2021).

3.3 Topography

The site gently slopes from the north to the south. The contours indicate that the site elevation is approximately 16 m to the north and 12 m AHD to the south. The site has a steep slope from the northeast to the middle of the site, featuring a low portion (4 m AHD), and then gently slopes towards the southwest of the site (Figure 3) to Back Beach Road, with the lowest ground elevation being 2 m AHD close to Back Beach Road

The site has three natural depressions around its centre:

- A small depression is located to the east
- A medium-size depression around the middle (Storage B in Figure 9)
- A larger depression to the west (Storage C in Figure 9).

Steep slopes are found to the west towards Back Beach. The site features views towards the beach. The eastern portion of the land gently slopes towards exiting housing located on Simpson Street.

The main area to be developed within site has been planned to be at and above 4 m AHD.

3.4 Geology and Soils

3.4.1 Regional Geology

The regional soil mapping indicates the site is located within the Dune System, characterised by dune fields supporting soft and minor hard spinifex grassland and red deep sand (Figure 4).

3.4.2 Soils

Based on the Western Australia Soil Landscape Mapping (DPIRD, 2019), the soils are characterised predominantly by deep red sands. In addition, tidal soils are found to the south and outside the site, within Salt Lake.

3.4.3 Topsoil Condition

Golder Associates Pty Ltd conducted a desktop geotechnical investigation of the site and surrounding region in September 2011 (Golder Associates, 2011).

The geotechnical investigation suggested the beach and coastal dunes (Qs) – light grey sand and unconsolidated and poorly consolidated quartzose calcarenite geological units are present within the site. This unit occurs over the site and may comprise a variable cover of sand over limestone.

The areas are likely to be underlain predominantly by beach and coastal dune deposits. However, the desktop study also concluded a substantial likelihood of limestone units being encountered at shallow depths from the ground level.

3.4.3.1 Infiltration Testing

Hyd2o undertook seven permeability tests on 8 March 2012 to investigate the saturated hydraulic conductivity of the soil across Onslow's townsite area, and the infiltration rates recorded were found to be between 5 m/day and 20 m/day. PM4, a test point, was located on the site's eastern boundary, and a high hydraulic conductivity was observed at this location (16 m/day) (**Table 3**).

Higher rates were observed within Onslow's townsite in lower elevation areas than those conducted within elevated areas. It has been assumed that these rates apply to the site as the site shares the same surface geology as for the LWMS investigation area (hyd2o, 2012).

Stormwater disposal by infiltration is considered suitable for the site, subject to any lower permeability materials such as caprock limestone. Lower infiltration rates may be expected for the elevated area that extends northeast to southwest.

Table 3: Infiltration Test Result Adjacent to the Site

Test Location	Stratigraphy	Average Unsaturated Permeability1 k (m/day)		
		Test 1	Test 2	Test 3
PM4	Sand	15.5	18.57	15.2

3.5 Acid Sulfate Soils

Pilbara Coastline ASS mapping (DWER, 2021) indicates the site is mapped as having a moderate to low risk of ASS occurring within 3 m of the natural soil surface from the site centre to Back Beach Road (Figure 5). The rest of the site is classified as no known ASS disturbance risk less than 3 m from the surface.

3.6 Surface Water

The site is located within the Ashburton River surface water area. The Ashburton River is 20 km southwest of the site. The closest surface water features are located approximately 2.5 km east (Beadon Creek) and 0.5 km south (Salt Lake) of the site. There are no surface water features, including drains or waterways within site.

3.7 Wetland Mapping

The Department of Biodiversity Conservation and Attractions (DBCA, 2021) wetland mapping indicates no wetlands on-site.

3.8 Groundwater

3.8.1 Groundwater Resources

The Water Register (DWER a, 2021) indicates that the site lies within the Pilbara groundwater area and Ashburton subarea. Carnarvon superficial aquifer and the Carnarvon Birdrong artesian aquifer are present within site. Water drawn from the Birdrong Aquifers is the principal artesian aquifer for the Carnarvon Artesian Basin, and therefore the primary local water source. The geological units above the Birdrong Aquifer consist of interbedded claystone, siltstones, sandstones, limestones, and dolomite with wide variability in permeability characteristics. The varying permeability characteristics of the interbedded geological units within the overlying layer have most likely resulted in an alternating sequence of aquifers and confining units.

The Onslow townsite is supplied with groundwater from a bore field that draws water from the lower Cane Alluvial. The bore field is owned and operated by Water Corporation and is approximately 40 km to the east of the Onslow townsite. The latest Groundwater Resource Allocation Plan (DWER, 2013) indicated 1,000,000 kL/year of water was available for allocation and licencing from the lower Cane Alluvial. Of this, 550,000 kL/year had been allocated for public water supply and 92,500 kl/year for general licensing (WGE, 2012). Additionally, the DWER has reserved approximately 2,000,000 kL from the Lower Robe Alluvial aquifer for future public water supply. This source is located approximately 70 km east of Onslow.

3.8.2 Groundwater Levels

3.8.2.1 Regional Groundwater Mapping

The historical maximum groundwater levels provided in the Perth Groundwater Map (DWER b, 2021) do not extend to the site.

3.8.2.2 Local Groundwater Monitoring

A search of the Water Information Reporting Database (DWER c, 2021) indicates three WIN groundwater monitoring bores in the vicinity of the site with no valid groundwater readings available.

3.8.2.3 On-site Groundwater Monitoring

Onslow Salt and Water Corporation own five bores, of which two bores are near the site (3/97 and 4/97) (Figure 6). The water levels are monitored bi-monthly within the Onslow area since 1999. The bore records indicated groundwater flowing from south to north, towards the shoreline.

Bore 3/97 and 4/97 are located in the townsite, less than 300 m to the site's southeast. These bores are considered representative of the site groundwater characteristics.

Based on LWMS (hyd2O, 2012), groundwater in the Onslow townsite area ranges from fresh to saline. Freshwater is contained in the Carnarvon superficial aquifer that floats above hyper-saline groundwater. The superficial aquifer relies on surface recharge during rainfall events and experiences increases in salinity during periods of low rainfall.

3.8.2.4 Design Groundwater Level

Bore 3/97 and 4/97 were recorded and reported an average annual maximum groundwater level (AAMGL) ranging from 0.08 m AHD to 0.81 m AHD. The bores were drilled at a ground elevation of 5 m AHD (Golder Associates, 2011).

The site's developable area will be located at or above 6.4 m AHD. Therefore, enough clearance to groundwater from the ground surface is expected on site. Additionally, no excavation has been proposed as the development will be built on the pre-development landform.

The lowest ground elevation at the site (2 m AHD) is located within the heritage area, to the south and near Back Beach Road. This area will not be developed.

No groundwater controls (i.e. subsoil drainage) are proposed to be used at the site, satisfying design criteria CG1.

3.8.3 Groundwater Quality

The LWMS (hyd2o, 2012) suggests that the historical salinity within the Onslow townsite reported an annual mean of less than 3,000 mg/L within the existing townsite at bore 3/97, which is considered of low quality to use for POS irrigation.

4 Water Servicing

4.1 Potable Water Supply and Wastewater Disposal

An Engineering Servicing Report was prepared in May 2012 by Wood & Grieve Engineers (WGE, 2012) to support the Onslow townsite development. The investigation extension area covered the site. The report indicated that the Water Corporation supplies the potable water sourced from the Cane River alluvial aquifer located approximately 30 km east of Onslow.

The Onslow Water Supply Scheme is operating close to full capacity with an annual drawing of 0.55 GL/year. Discussions were undertaken between MRL, the project team and Water Corporation on 22 July 2021, suggesting that their current Water Supply Scheme can supply the expected occupancy rate (around 300 workers at one time).

Water Corporation will build a desalination plant to serve the local population growth. The desalination plant has been estimated to provide 1.5 ML/day to cater to population increase for the next 20 years (Water Corporation, 2021). The Water Corporation is currently seeking environmental approvals from the Environmental Protection Authority. It is expected that the desalination plant will be operating in 2024. Therefore, the site will benefit from this source within the next three to five years.

Water Corporation has also provided support to connect to their reticulated sewerage system for an increase of about 125 kL/day of wastewater. This is based on 300 people residing on-site at any one time, satisfying design criteria CW3.

In the coming months, ongoing negotiations will continue between MRL and Water Corporation to finalise approvals for water supply and sewerage connections.

4.2 Irrigation Water

Table 4 highlights the irrigation schedule and worst-case water use scenario. It shows the total was demand during the plants' establishment phase (first 2 years). During this phase more water will be used per day. The water demand decreases by 50% post establishment for garden beds and dune planting.

Groundwater for irrigation has not been considered because it has been identified as an unfeasible source in the LWMS (hyd2o, 2012). Additionally, water quality is poor. The DWER manages allocations from the Carnarvon superficial aquifer and the Carnarvon Birdrong artesian aquifer on a case-by-case basis. This strategy was adopted as actual storage volume within the aquifers are unknown.

An analysis of alternative sources is provided below. It suggests that the only reliable and cost-effective source of irrigation for the site is scheme water.

Greywater and blackwater have been considered as potential sources. Calculated volumes, however, do not significantly reduce the scheme water use demand. When compared to capital costs associated with the systems construction and maintenance and operational costs, these systems become non-cost-effective (compared to scheme water) and unfeasible at this time.

The irrigation costs, if water is sourced from scheme water, is around $735,000 per year.

Table 4: Proposed irrigation schedule

Landscape	Area (m^2)	Irrigation schedule	Application rate during establishment (mm/day)	Irrigation volume (kL/year)
Managed Native Garden Bed	18,260	5 days a week	5	28,486
Managed Native Dune Planting (Sparse)	31,647	5 days a week	5	41,141
Turf	5,750	5 days a week	8	11,960
Total	**55,657**			**81,587**

4.2.1 Estimation of alternative water supplies

4.2.1.1 Groundwater

The licensed aquifers in the Onslow townsite area are the Carnarvon Birdrong artesian and Carnarvon superficial aquifers. The groundwater is described in the LWMS as being of limited and insufficient quantity and marginal quality.

DWER adopts licensing on a case-by-case basis for both aquifers. This is because actual volumes within the aquifers are unknown and the impacts to the aquifers.

Groundwater availability, quantity and quality on-site cannot be ascertained at this time without further investigations, as required by DWER. However, the site is approximately 150 m from the Indian Ocean. Therefore, with a very high likelihood of seawater intrusion occurring.

Additionally, the Birdrong aquifer's water quality is primarily brackish (3,000-10,000 mg/L). It is found over 300 m below ground level in the area. The known presence of gas in the area would also entail additional studies and costs to ensure safe abstraction from this resource.

As groundwater quality is moderately brackish and groundwater volumes from the superficial and the confined aquifer are unknown and unreliable at this time, groundwater has not been further investigated as a source for public open space (POS) irrigation. This is in accordance with the LWMS, suggesting other water sources should be explored.

4.2.1.2 Stormwater/rainwater

Based on the LWMS (hyd2O, 2012), Onslow's limited annual rainfall (240.92 mm) at the same time with episodic cyclonic events makes stormwater and rainwater harvesting schemes problematic and expensive. This is in line with the LWMS recommendations. Furthermore, the use of gutters in cyclonic areas also raises issues concerning potential over-topping, which can be a function of sizing and lack of maintenance/cleaning of gutters. Consequently, stormwater harvesting is not considered a sustainable and steady water source for irrigation.

4.2.1.3 Greywater

Greywater is wastewater from washing machines, showers, baths, washbasins, spa baths, laundry, tubes, and kitchen. Greywater reuse has been considered as a source, and a feasibility analysis has been undertaken. Bathroom's greywater and laundry greywater are the two primary greywater sources at the site, primarily coming from the accommodation pods.

The amount of greywater was calculated based on the Portable Water Calculator for Green Star projects. The water demand from each potable water use is identified to estimate the greywater generated on-site. The calculations assume the maximum number of people at the site (500 people) and accommodation pods and buildings are installed with water efficiency fixtures and fittings, including: Taps – WELS 6 Stars, Toilets – WELS 4 Star (3.5L/min), Urinals – WELS 5 Star (0.8L/flush or water less) and showers – 3 Star (<=7.5 L/min). Washing machines, dishwashers, heat rejection, washdown water, swimming pools and fire system water are excluded from the greywater calculations. The total greywater available for reuse is summarised in **Table 5**.. The recycled greywater can only fulfil 13% of the irrigation demand. Other resources will be needed to meet the requirement.

Table 5: Greywater and blackwater calculations

Proposed Building	Water demand (kL/year)	Greywater (kL/year)	Blackwater (kL/year)
Toilets	2,546.9	-	2,546.9
Urinals	138.3	-	138.3
Taps	635.4	635.4	-
Showers – occupants	11,634.4	11,634.4	-
Showers – Sports	3,421.9	3,421.9	-
TOTAL	**18,376.9**	**15,691.6**	**2,685.2**

The kitchen's greywater from the site restaurant has not been considered in the estimation, but this amount is not expected to change the above calculations significantly, and most definitely, will not suffice for irrigation. Additionally, the greywater treatment system will need to be conditioned to receive a more organically loaded wastewater source if this source is used.

In conclusion, the use of greywater minimally reduces the scheme water demand. However, when the small volumes are compared to the high capital costs associated with a greywater system's construction and its associated and stringent maintenance and operational requirements, the source becomes a non-cost-effective solution. Therefore, it has been considered unfeasible for use at this time.

4.2.1.4 Wastewater (Blackwater)

Blackwater is produced from toilets and urinals. The amount of blackwater was calculated based on the Potable Water Calculator developed by Green Building Council of Australia. **Table 5** estimates the blackwater generated on-site. As with greywater, the calculations have been assumed the maximum number of people at the site (500 people), and the use of WELS star rated fittings and fixtures. Again, the estimation of blackwater is lower than greywater, and therefore less water is available to be recycled for POS irrigation.

The Shire of Ashburton has expressed interest in developing a recycled water scheme to irrigate Onslow's existing and proposed future POS areas, thus removing these demands from the drinking water supply. This scheme offers to assist the future growth of the town sustainably and cost-effectively. Water demand and wastewater volumes are expected to increase over a period of 15 years. When the Shire warrants the development of the recycling scheme, this source may assist in reducing or eliminating the use of scheme for POS irrigation at the site in the future. MRL is to initiate discussions with the Shire about the use of this source in the future.

5 Water Conservation Strategy

5.1 Proposed Strategy

Development of the site will lead to an increased demand for potable water use and irrigation of landscaped areas. Water conservation measures will be implemented to reduce the scheme water consumption and satisfy design criteria CW1 and CW2.

Water use within the development will be consistent with the Water Corporation's waterwise land development criteria and Australia's urban water-saving scheme (WELS), including:

- Use of high-density accommodation pods to reduce the use of water outside of these
- Promotion of waterwise practices, including water-efficient fixtures and fittings (taps, showerheads, toilets, waterwise landscaping) within the accommodation pods and administration buildings
- Non-structural controls implemented to minimise water evaporation from pools
- Use of native plants and natural mosquito repellent trees and vegetation in landscaped areas and hydro zoning as much as possible, including along the edges of the accommodation pods and boardwalks
- Minimising turfed areas as much as possible and using eco-zoning
- Maximising on-site stormwater retention by decreasing the development footprint, including not developing the cultural significance area to the south.

5.2 Water Efficiency and Conservation

5.2.1 Buildings

To achieve water efficiency targets, it is envisaged that all accommodation pods and buildings on-site will be built consistent with the current Building Codes Australia energy and water efficiency standards. WELS 3-star (and above) fitting and fixtures are recommended for use. The development footprint will be reduced by building infrastructure that is easily removable such as elevated boardwalks along and connecting the accommodation pods and the accommodation pods.

5.2.2 Landscaped Areas

The Landscape Plan is provided in Appendix A. The following will be implemented to improve water efficiency within landscaped areas. These have been based on benchmarked landscape industry best practices with an emphasis on water efficiency:

- Appropriate species selection and planting of drought-tolerant, dunal and native garden beds plant species and mosquito repellant plant species. Hydro zoning will be implemented.
- Retention of existing vegetation where possible to provide amenity, shade, and landscaping features.

- Mulching to improve moisture and nutrient retention.
- Provide optimal irrigation rates during plant establishment, with irrigation reduced or eliminated at plant maturity.
- Staged irrigation in line with the project's anticipated rate of development.
- The use of a water-efficient sprinkler system and controlled water application rates to suit the water requirement of plants, climate, and rainfall patterns.

The landscape architects estimated the amount of water required for best practice irrigation across the development for garden beds, dunal vegetation, and turfed areas. **Table 4** summarises the water demands for each vegetation type. During the establishment phase, the water requirements can be as much as treble. The application rate in Table 4 is a typical establishment period of up to 2 years. The water demand for native dune planting will be reduced by up to 50% after establishment. Therefore, the approximate establishment rates for garden beds and dunal planting will be 6 mm/day and 5 mm/day, respectively.

Based on the irrigation schedule, approximately 81,587 kL/year of water demand would be required for irrigation. This demand would need to be met entirely through a scheme water supply with the possibility of other sources alleviating the demand. These have been described in Section 4.2 above.

5.2.2.1 Water Efficient Irrigation System

A water-efficient irrigation system will irrigate trees and plants. The irrigation water demand volumes will maintain a constant and uninterrupted supply, especially during dry and hot periods. However, water demand will be minimised as much as possible by, for example, hydro zoning according to water requirements. This allows the reticulation to the endemic plantings to be separately controlled and significantly reduce following their establishment period.

The automated irrigation system will be designed to include monitors to detect malfunctions so that rapid response rectification can be programmed before the planting is detrimentally affected by a disruption of water supply.

6 Water Management Strategy

Stormwater management is proposed to be undertaken consistent with DWER's recommended water sensitive design practices for the northwest of Western Australia and the Onslow Local Water Management Strategy.

The main aim for stormwater management for the site is to mimic, as closely as possible, the pre-development environment post-development. This will be achieved by maintaining, where possible, the natural topography of the site. Runoff throughout the site will be conveyed via overland flow, using the natural topography, to depression storage within site.

6.1 Stormwater Management

A stormwater management strategy has been developed, which demonstrates that the site can effectively manage stormwater generated during minor and major rainfall events and meet design criteria CS1 to CS3.

The drainage design will aim to achieve the following objectives:

- Maximise retention of stormwater generated from the site during frequently occurring events
- Ensure serviceability of the site during the 20% AEP event
- Provide safe conveyance of stormwater during the 1% AEP storm event from the site.

The site will provide permanent resort-style FIFO accommodation with an oval located in the site's northwest corner. The natural landforms of the site will be retained where possible. An engineering design plan has been provided in Appendix B.

The first 10 mm of runoff from roads and car parks will be treated and infiltrated at the source. All other runoff from the site will be conveyed via the natural landforms as overland flow to natural depression storage within site.

6.1.1 Post-development modelling

Post-development stormwater catchments are shown in Figure 7, with the land use breakdown within each catchment summarised in **Table 6**.

For the post-development modelling, only areas of the site that the development has altered have been modelled. The cultural heritage area (to the south of the site) and some of the boundaries of the site where no development is proposed, no runoff from site will be conveyed, or the natural landforms have been maintained, have not been modelled.

Three catchments were developed for the post-development model, each with a natural storage depression. The total area of the catchments is 12.45 ha. The eastern portion of the site drains to a depression (Storage A) with an invert of 7 m AHD. A southern, eastern portion of the site drains to two connected depressions (Storage B) with an invert of 5 m AHD. The remainder of the site, and the total developed area to the north, drains to the largest of the three depressions

(Storage C) to the south, and during major storm events will overflow downstream to further depression storage located within the cultural heritage area.

Australian Rainfall and Runoff Guidelines (ARR) (Geoscience Australia 2019) guide the choice of loss parameters across Australia. There are no recommendations for design losses for arid areas with mean annual rainfalls less than 350 mm.

Infiltration testing, conducted by part of the LWMS (hyd20 2012), indicated infiltration rates across the entire structure plan area ranged from 5 m/day to 20 m/day, with higher rates observed in the lower elevation areas. Infiltration rates on the edge of the site (hyd2o 2021) were recorded as 16.4 m/day.

GHD used a constant rate of 72 mm/hr for modelling in the *Shire of Ashburton Report for Onslow Drainage Assessment, Review of Stormwater Drainage System in Onslow* (GHD 2010).

For consistency with the previous modelling undertaken for the area, a constant rate of 73 mm/hr has been adopted for the natural landforms. In addition, following the recommendation made in the LWMS, a rate of 10 m/day (hyd2o 2012) was adopted for the depression storage.

In accordance with ARR guidelines, all building and hardstand areas were modelled with an initial loss of 1 mm and no continuing losses.

Table 6: Post-development Catchments

Catchment	Land use				Total area (ha)
	Buildings and Hardstand (ha)	Roads (ha)	POS (ha)	Natural ground (ha)	
Catchment A	0.1	na	na	2.9	3
Catchment B	0.1	na	na	2.0	2.1
Catchment C	1.65	0.8	0.8	4.1	7.35

6.1.2 Small Event (63.2% AEP)

The LWMS recommends that the first 10 mm from roads are to be retained and treated. All runoff from the roads and car park will be treated at the source or as close as possible.

All other runoff from impervious areas within Catchment C will be directed, via overland flow paths, to Storage C. The modelling results indicate that there will be 0.14 m of ponding in Storage C during the small event.

Due to the high infiltration rates of the native soils, there will be no runoff from pervious areas of Catchment A and B during the small rainfall event.

6.1.3 Minor Event (20% AEP) and Major Event (1% AEP)

Minor (20% AEP) and major (1% AEP) rainfall events will be managed via safe overland flow to the natural depressions. Three natural depressions will be used for storage and infiltration. Modelling for the site indicates that all Catchments will produce ponding during the 1% AEP event. Catchment C will produce ponding during the 1%, 20%, 63.2% AEP events. Results from the modelling suggest Storage C will overflow during the 1% AEP event to depression storage located downstream in the cultural heritage area.

The extents of inundation in the 20% and 1% AEP events are shown in Figures 8 and 9. The maximum flood depths, storage volumes, topwater levels (TWL), overflow rates and volumes, for the 20% AEP and 1% AEP events are shown in **Table 7.**

Table 7: Rainfall runoff storage

Storage	Depth (m)	Volume (m^3)	TWL (m AHD)	Overflow (m^3/s)	Overflow Volume (m^3)
20% AEP					
Storage C	1.5	3,172	5.5	na	na
1% AEP					
Storage A	0.3	467	8	na	na
Storage B	0.9	1156	5.9	na	na
Storage C	1.9	4,974	5.9	0.9	8,510

Elevated accommodation pods and boardwalks will be used throughout the site to ensure a minimum 0.5 m clearance from maximum TWLs of flood storage.

Roads have been designed to be passable in the minor events with water flowing to vegetated swales and downstream depressions storage.

6.2 Groundwater Management

6.2.1 Groundwater Levels

Use of fill or excavation will not be undertaken at the site. The site's floor levels will be required to be raised to a minimum elevation of 6.4 m AHD, which will provide enough clearance to the AAMGL plus sea-level rise (approximately 2.7 m). Therefore, subsoil drainage is not proposed.

6.2.2 Groundwater Quality

The proposed stormwater management practices will ensure that groundwater quality will be maintained.

The two key strategies include infiltrating the first flush of rainfall at the source and minimising the development footprint to replicate current (pre-development) conditions and natural groundwater recharge. Other critical strategies for managing groundwater quality at the site include:

- Maximising native and waterwise vegetation within landscaped areas
- Fertiliser and pesticide use on-site to be minimised through waterwise and or native landscaping, minimal community open space and private gardens due to development style.

6.2.3 Acid Sulphate Soil Management

ASS investigations are commonly required as part of the conditions of subdivision application. As moderate to low risk of ASS (Figure 5) have been identified at the site's southern portion, and the natural landform is to be used (i.e. no excavation or earthworks will be required) an ASS management plan will not be required.

6.3 Flood Management

The overland flow will be safely conveyed to the natural depressions, and the site will use natural flow paths.

Figure 9 shows the maximum flood depth for the Storage A, B and C depressions in the 1% AEP storm event. A clearance of 0.5 m to habitable floor levels from the 1% AEP will need to be accounted for to provide the minimum clearance requirement under DWER flood management policy.

Hence, the site's development floor level has been designed to be at a minimum of 8.5 m AHD (at Storage A) and 6.4 m AHD (at Storage B and C). These provide an adequate freeboard to the 1% AEP return period cyclonic storm surge allowing for climate change as specified in the coastal strategy (MP Rogers & Associates Pl, 2011).

7 Implementation Plan

The success of the water management strategy relies on the implementation throughout all stages of development, including construction and post-development.

The commencement of the project construction phase is expected to be in November 2021. The site is scheduled to be completed and ready for use as early as August 2022. Approximately nine months of construction has been proposed, and high-water demand is expected during this phase. However, it has been anticipated that water demand would drop and reach an equilibrium in 2023 when the site's residential condition enters into a steady state. MRL will provide a monthly forecast of water demand to the Water Corporation when construction phasing details, scheduling and implementation are determined. However, the following sections detail implementation practices to be followed during construction and after development completion.

7.1 Construction Phase

During the project's construction phase, water management requires considering direct impacts from any construction activities and maintaining the pre-development hydrological regime at post-development.

7.1.1 Management of Construction Activities

Potential impacts from construction activities related to the water cycle include:

- Dust generation during bulk earthworks and building construction
- Erosion of exposed surfaces.

All of these potential impacts are manageable through appropriate engineering design and site management practices.

Contractors and staff will be notified of the requirement to implement management practices to limit any potential impacts resulting from these activities.

The timing of the construction activities will be dependent on several factors not related to water management. Where possible, the construction schedule should allow for work to be undertaken when impacts on the water cycle are minimised. These include completing civil works during summer or autumn. MRL intends to initiate works in November 2021.

7.2 Post-Development

After completing construction activities, maintenance of any stormwater management infrastructure and assessment of their performance will be required. As there is no drainage pipes and pits system constructed on-site, swales near roads and car parks would be the critical maintenance features.

7.2.1 Maintenance

The operation and maintenance of the stormwater management infrastructure will be the responsibility of the site managers. The stormwater management infrastructure will remain private and will not be ceded to the Shire for management or maintenance. The following measures will be undertaken to ensure the infrastructure functions correctly:

- Street sweeping to reduce the particulate build up on road surfaces
- The ongoing removal of debris and liter from the swales and the natural depressions to guarantee their designed life cycle
- Maintaining the landscape feature to ensure effective infiltration and protect the site from surface erosion.

7.2.2 Roles and Responsibilities

Table 8 details the roles and responsibilities for water management during the construction phase of the development and post-development.

Table 8: Roles and Responsibilities

Role	Responsibility	Description
Construction		
Dust suppression	Site managers	Scheduled water uses for dust suppression with effective watering technique.
Street Sweeping	Site managers	Carry out street sweeping of roads, car parks, and hard surfaces during construction to prevent sediment and other pollutants mobilisation. This is to be carried out as required throughout the construction phase.
Post Construction		
Stormwater infrastructure	MRL	Manage and repair/replace infrastructure as required.
Maintenance	MRL	Undertake maintenance of the stormwater infrastructure (swales), oval and landscaping. Activities include removing sediment build-up, frequent maintenance during the established period of plants. Inspections are to be completed every six months during the first year of operation.

8 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data, and analyses ('client's information') provided by the Client and other individuals and entities. In most cases where the Client's information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the Client's information is accurate, exhaustive, or current, and the validity and accuracy of any aspect of the report including, or based upon, any part of the Client's information is contingent upon the accuracy, exhaustiveness, and currency of the Client's information. 360 Environmental shall not be liable to the Client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the Client's information was not accurate, exhaustive, and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions, and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions, and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

9 References

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Figures

Legend

- Survey Area Boundary
- Cadastral Lines

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2020
- OTHER DATA SOURCED LANDGATE 2020
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2020
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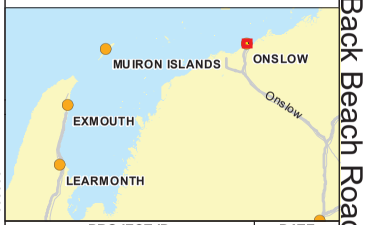
LOCALITY MAP



PROJECT ID	DATE
4757	16/07/2021

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

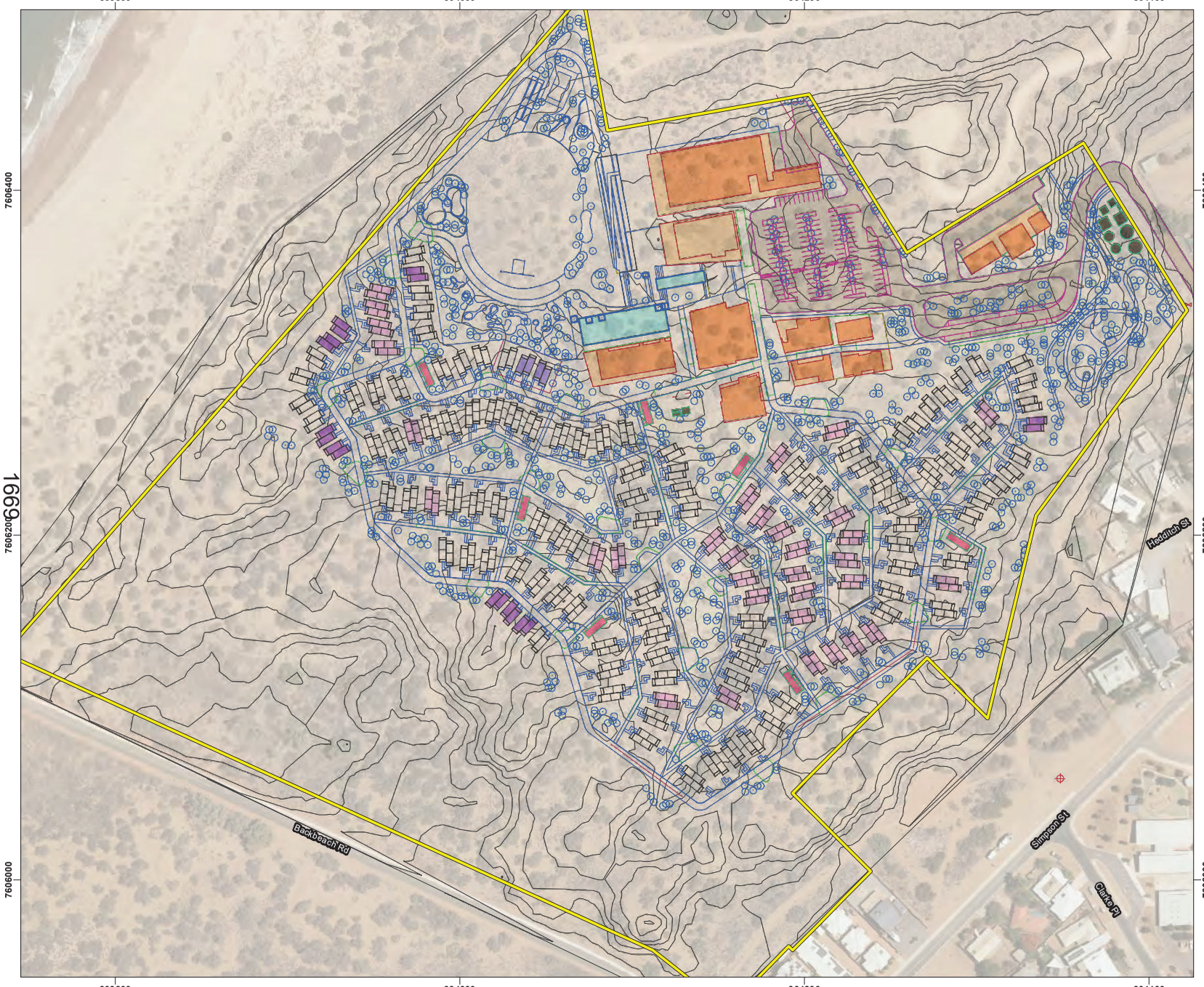
CREATED	CHECKED	APPROVED	REVISION
LF	PD	PD	0

Rowe Group c/o Mineral Resources Limited
Lot 300 Back Beach Road, Onslow

Urban Water Management Plan

Figure 1
Survey Area

K:\Projects\10. WAM\4757 Lot 300 Back Beach Rd, Onslow\4757 F01 Survey Area.mxd



Legend

- Survey Area
- BUILDING
- COVERED OUTDOOR SPACE
- SERVICES
- WATER BODY
- ROAD/CAR PARK
- FIELD STORE (WITH LAUNDRY)
- ACCOMMODATION PODS (SLEEPS 4)
- ACCOMMODATION PODS (SLEEPS 2)
- ACCESSIBLE ACCOMMODATION PODS (SLEEPS 2)

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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Lot 300 Back Beach Road, Onslow

Urban Water Management Plan

Figure 2
Conceptual Master Plan

K:\Projects\10.WAM\4757 Lot 300 Back Beach Rd, Onslow\4757 F02 Master Plan.mxd

Legend

- Survey Area Boundary
- Cadastral Lines
- Topographic Contour (mAHD - 2m Interval)

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LF	PD	PD	0

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Lot 300 Back Beach Road, Onslow

Urban Water Management Plan

Figure 3
Topography

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Attachment 13.2G - DAP/21/02078 -DA 21-67 | L300 Back Beach Road, Onslow

Legend

- Survey Area Boundary
- Cadastral Lines

Soil Land System

- 201Du: Dune fields supporting soft spinifex and minor hard spinifex grasslands.

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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LOCALITY MAP

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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

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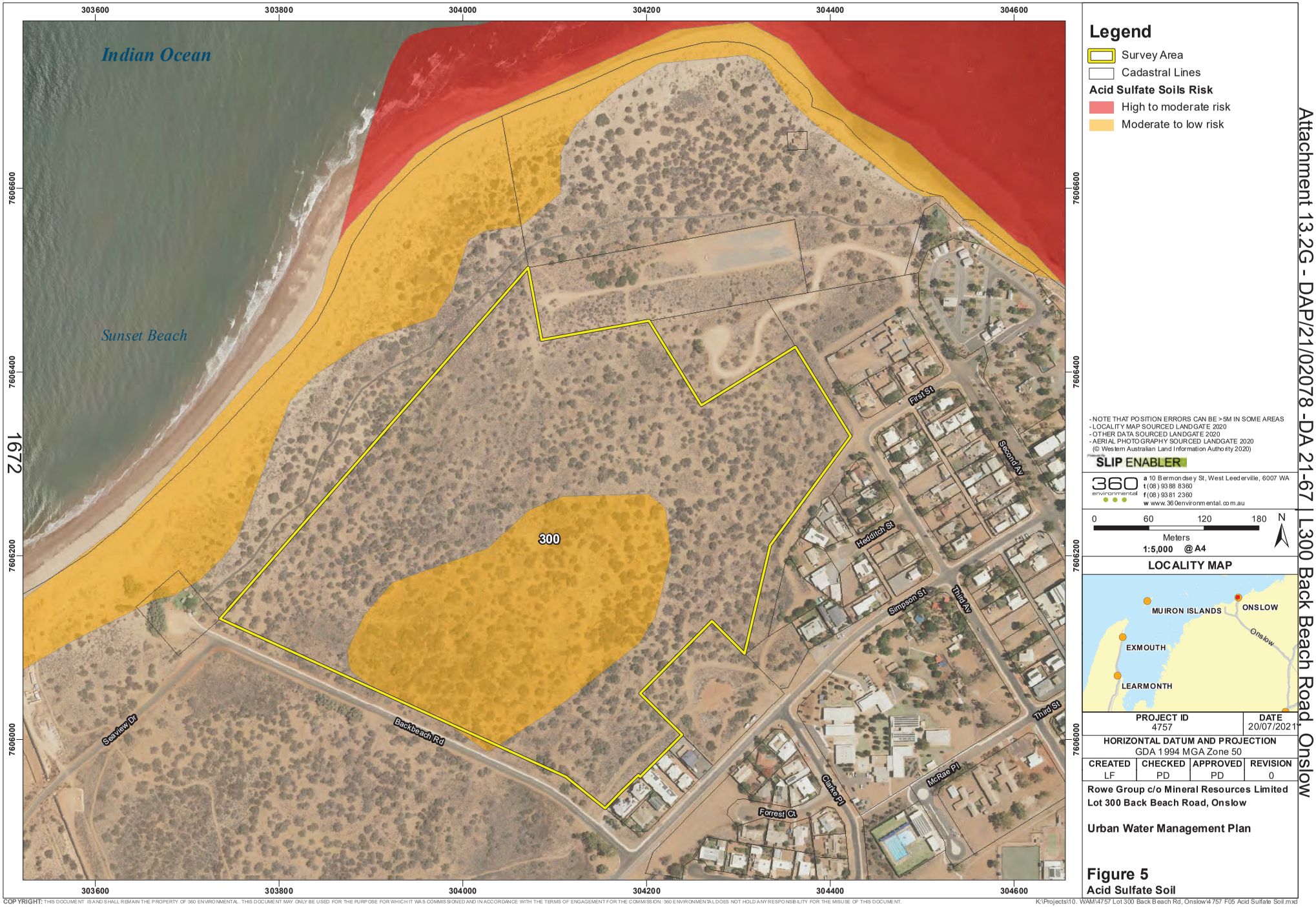
Lot 300 Back Beach Road, Onslow

Urban Water Management Plan

Figure 4
Geology

K:\Projects\10. WAM\4757 Lot 300 Back Beach Rd, Onslow\4757 F04 Geology.mxd



1672

Legend

- Survey Area
- Cadastral Lines

Acid Sulfate Soils Risk

- High to moderate risk
- Moderate to low risk

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LOCALITY MAP

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Lot 300 Back Beach Road, Onslow

Urban Water Management Plan

Figure 5
Acid Sulfate Soil

K:\Projects\10. WAM\4757 Lot 300 Back Beach Rd, Onslow\4757 F05 Acid Sulfate Soil.mxd

Legend

- Survey Area Boundary
- Cadastral Lines

WIN Bores

- Groundwater Bore
- Surface Water Bore

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Urban Water Management Plan

Figure 6
Groundwater

K:\Projects\10. WAM\4757 Lot 300 Back Beach Rd, Onslow\4757 F06 Groundwater.mxd

Legend

- Survey Area Boundary
- Catchment A
- Catchment B
- Catchment C

Sub Catchments

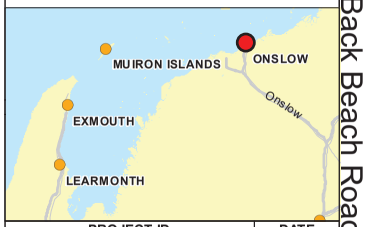
- Access Track
- Building
- Oval
- Road
- Road A
- Road B
- Road C
- Swimming Pool

360 environmental
a 10 Bermondsey St, West Leederville, 6007 WA
t (08) 9388 8360
f (08) 9381 2360
w www.360environmental.com.au

0 40 80 120 Meters
1:3,500 @ A4

N

LOCALITY MAP



PROJECT ID	DATE
4757	27/08/2021

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

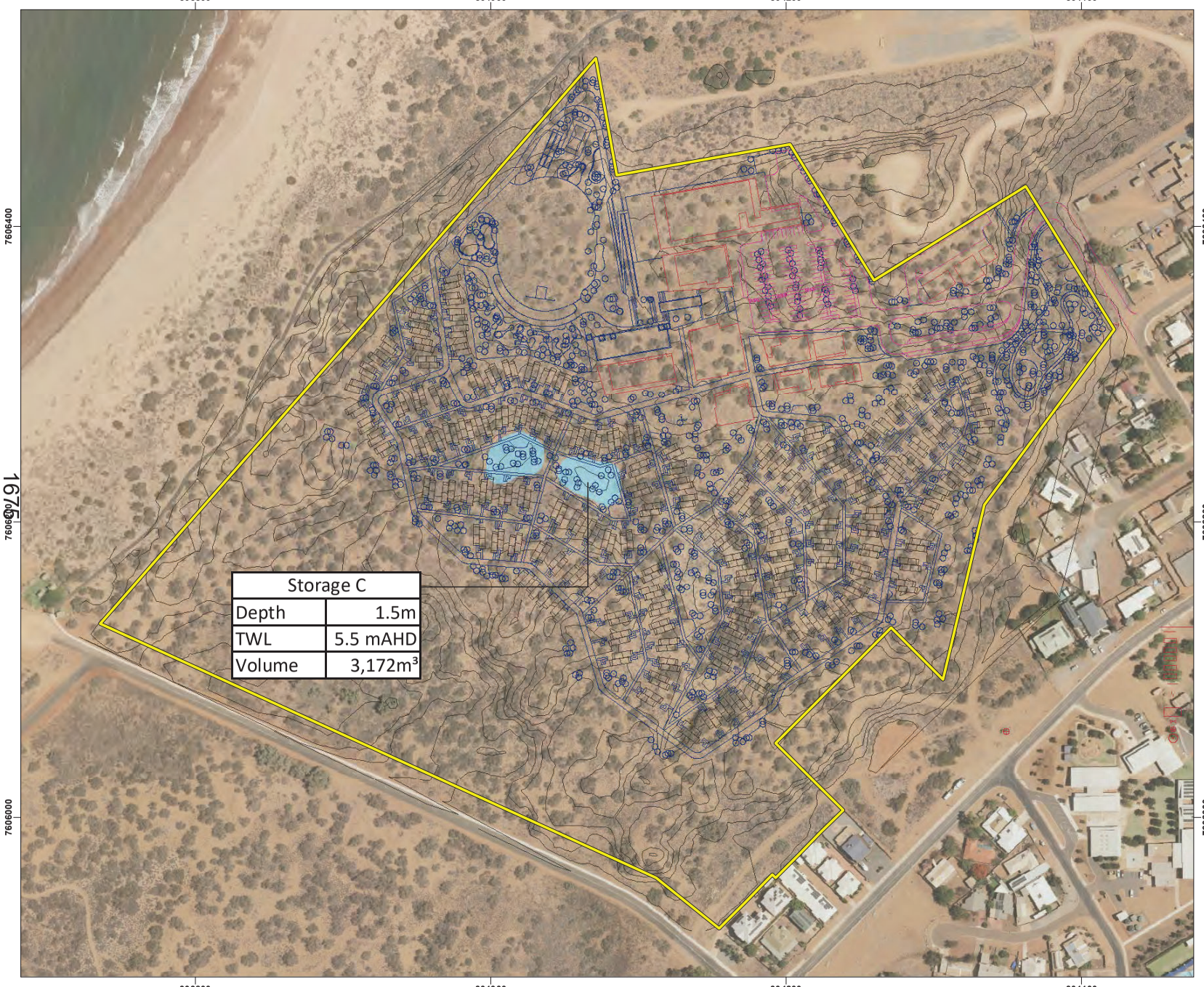
CREATED	CHECKED	APPROVED	REVISION
LF	NC	NC	0

Rowe Group c/o Mineral Resources Limited
Lot 300 Back Beach Road, Onslow

Urban Water Management Plan

Figure 7
Modelled Catchments

K:\Projects\10. WAM\4757 Lot 300 Back Beach Rd, Onslow\4757 F07 Modelled Catchments.mxd



Legend

- Survey Area Boundary
- Storage C 20% AEP Inundation Extent

Indicative Site Master Plan

- Access and Parking
- Landscaping
- Accomodation Pods
- Buildings
- Topographic Contour

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N

LOCALITY MAP

PROJECT ID	DATE
4757	27/08/2021

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

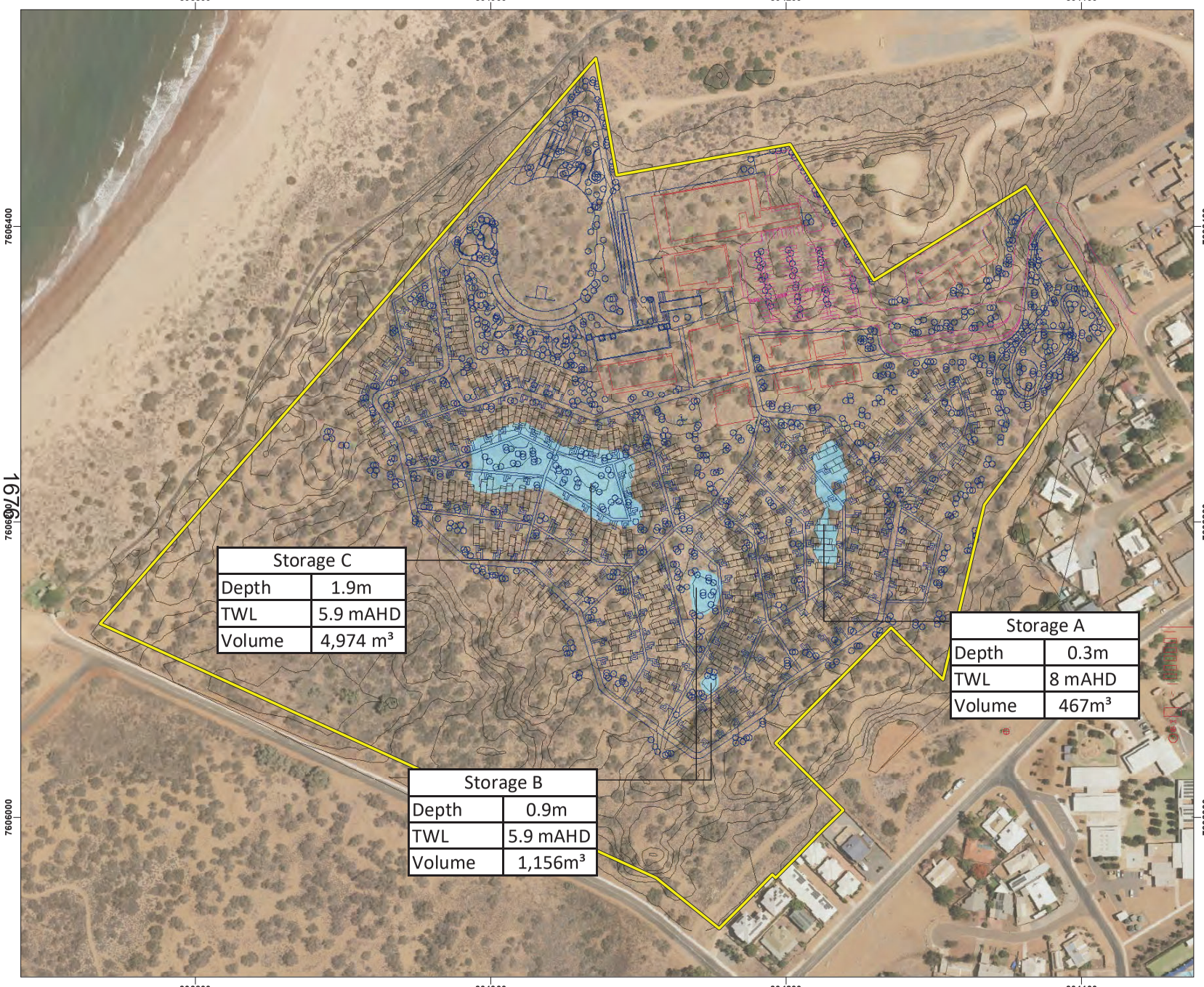
CREATED	CHECKED	APPROVED	REVISION
LF	NC	NC	0

Rowe Group c/o Mineral Resources Limited
Lot 300 Back Beach Road, Onslow

Urban Water Management Plan

Figure 8
20% AEP Inundation Extent

K:\Projects\10. WAM\4757 Lot 300 Back Beach Rd, Onslow\4757 F08 20% AEP Inundation Extent.mxd



Legend

- Survey Area Boundary
- 1%AEP Inundation Extent

Indicative Site Master Plan

- Access and Parking
- Landscaping
- Accomodation Pods
- Buildings
- Major Topographic Contour

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0 40 80 120 Meters
1:3,500 @ A4

N

LOCALITY MAP

PROJECT ID	DATE
4757	27/08/2021

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
LF	PD	PD	0

Rowe Group c/o Mineral Resources Limited
Lot 300 Back Beach Road, Onslow

Urban Water Management Plan

Figure 9
1% AEP Inundaton Extent

K:\Projects\10. WAM\4757 Lot 300 Back Beach Rd, Onslow\4757 F09 1%AEP Inundation Extent.mxd

Appendices

Appendix A
Landscape Plan

ONSLOW TOWNSHIP VILLAGE LANDSCAPE

Mineral Resources Limited
PER21030.00

1679

ASPECT Studios

ONSLOW TOWNSHIP VILLAGE

Prepared by:

ASPECT Studios

L1 / 191 St Georges Tce
Perth, WA, 6000

Prepared with:

Millieu Creative

L1 / 488 Stirling Highway
Peppermint Grove, WA, 6011

Prepared for:

Mineral Resources Limited

1 Sleat Rd,
Applecross WA 6153

Document Control

Job Number:	PER21030.00
Report Title:	Onslow Iron Ore Project
Revision:	B
Date Issued:	24.08.2021

ASPECT Team

Nicola Marunczyn
Tom Lucey
Jonathon Marshall
Tom Griffiths
Michael Rowlands

1681

Contents

1.0 Introduction

The landscape design for the Onslow Township Village, has been prepared by ASPECT Studios in collaboration with Milieu Creative. The design responds to the scale, form and function of the architecture and local context in order to create a dynamic and engaging sequence of landscape spaces.

With the striking Pilbara landscape as a backdrop, the landscape design will showcase a mix of natives, exotic, and sensory plant species to support the proposed accommodation, sports fields, play, recreation and amenity spaces.

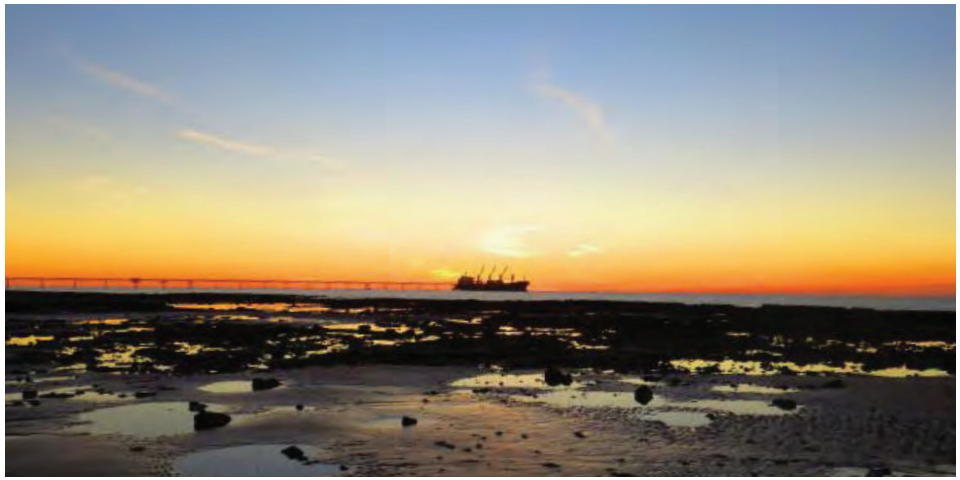
The landscape concept responds to the site's larger contextual relationship to the coastal landscape situated adjacent to Onslow Township , celebrating the vibrant, textured tones and layered vegetation.

The public landscape spaces have been designed to provide a place where the community can gather for play and recreation catering for the needs of residents, visitors and the broader community.

The following general principles form the landscape approach to the site:

- Use high quality landscape design to integrate the proposed sporting development with broader active and passive recreational offerings;
- Develop a legible network of spaces that fully integrate with and connect to the surrounding context;
- Create spaces with varying characters and identities.
- Design spaces that will become activated and vital.
- Maximise opportunities for social interaction through arrangement of seating and views.
- Create a robust landscape made from proven materials and planting species, integrating bold forms that can be managed and maintained.
- Selection of local and native plant species that benefit surrounding ecologies.
- Ensure structural elements read as an extension of the architectural material palette and are integrated with the planting compositions.

The design of landscape considers the architectural design by Milieu Creative in both concept and materiality, with the intention of creating a cohesive transition from internal to external spaces.



1.1 Vision

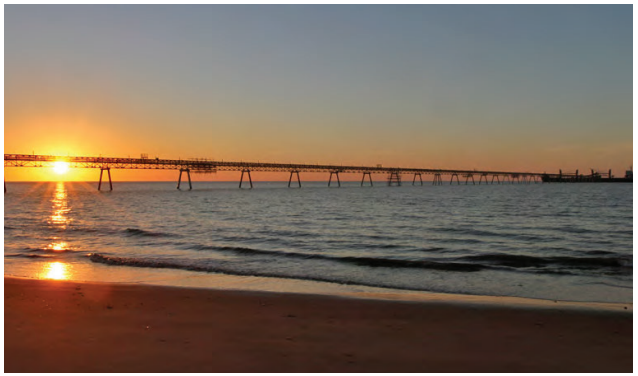
Set on the western edge of Australia, Onslow Township Village will be a world class accommodation facility that contributes to the community and economic growth of the region.

The village will be designed as a high quality facility that sets a new benchmark for accommodation that promotes a healthy, active and sustainable lifestyle for workers and the local community.

Inspired by the unique coastal landscape and sense of place the village will be designed to respond to the future vision of Onslow Town Centre and leave a lasting legacy for future generations.








1.3 Landscape Principles

The following design principles have been developed to guide the design of the village and surrounding landscape. Throughout the design process these principles will continue to inform and develop the landscape repsonse.

Celebrate the Site

- Celebrate the unique character of the site.
- Maximise visual, physical and symbolic connectivity to the local context.
- Touch the ground lightly

Connecting Community

- Create strong connections to community and the environment.
- Design to support social interaction and relationship building.

Healthy Active by Design

- Design comfortable and safe connections to promote incidental physical activity and access to nature.
- Provide formal or informal, natural and man-made landscape areas to support recreational, sporting and social activities.

Leave a Legacy

- Contribute to the "... Community vision that Onslow be a vibrant, sustainable and prosperous place for work, living and leisure - for both residents and visitors."
- Future proof the site for the next generation of users.

1.4 Landscape Approach

The landscape approach responds to the immediate context of the development area. A series of strategies have been developed that focus the development of the landscape design around key views, local character, the existing topography and integrating the architecture into the landscape.

Celebrate the Views

- Maximise the sites existing topography to retain the best views out to the horizon.
- Develop a strategy to ensure the accommodation and the common-use amenity retain views to significant vistas

Respond to the Local Character

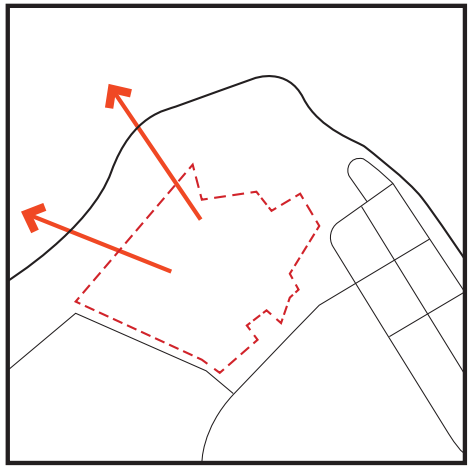
- Respond to the immediate social and environmental influences surrounding the site. Including the beach, Onslow townsite and cultural histories.

Touch the ground lightly

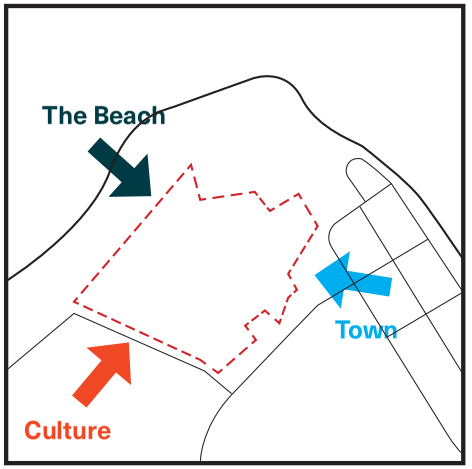
- Develop a strategy for pedestrian networks, accommodation pods and built amenity to minimize disturbance to the existing natural topography and ecologies of the site.

Integrate Landscape and Architecture

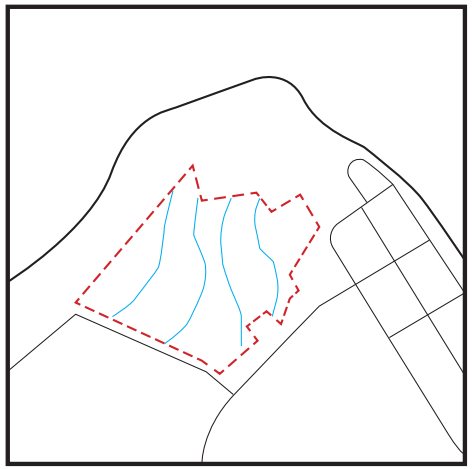
- Create a landscape-driven site response that informs the siting and location of proposed built infrastructure within the site.



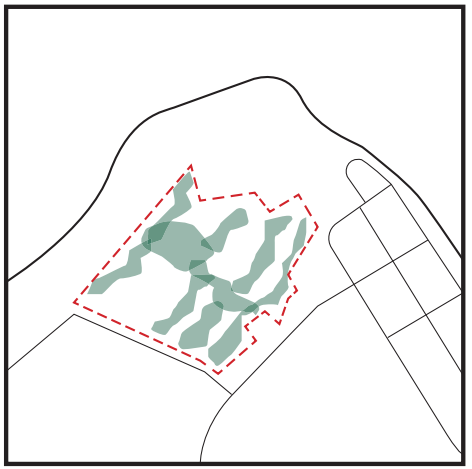
Celebrate the views



Respond to local character



Touch the ground lightly



Integrate landscape and Architecture

2.0 Landscape Plan

PROGRAM

1	Bus Stand (Pickup/Dropoff)
2	Sheltered Community Playground
3	Dedicated Dropoff (Small Vehicle, Short Term)
4	Terraced Entry Plaza
5	Water Feature
6	Recreation Turf
7	Outdoor Gym
8	Cricket Nets & Beach Volley Ball
9	Relax Zone (BBQ, Hammocks, Furniture, Shade Structure)
10	Mini Golf
11	Alfresco Deck With Terraced Embankment
11	Pedestrian / Maintenance Vehicle Access (with shade structures and comfort nodes)
12	Pedestrian Access (Boardwalk with shade structures and comfort nodes)
13	Security Fence
14	Entry Statement Wall

GENERAL

	Site Boundary

SURFACES

	Pedestrian Access Paving
	Plaza Paving
	Asphalt (Carppark)
	Asphalt (Maintenance Access)
	Composite Timber Boardwalk
	Fibre Reinforced Plastic Boardwalk
	Stabilised Gravel
	Pool

PLANTING

	Lawn
	Native Dune Mix Planting - Managed Sparse
	Native Swale Mix - Managed Sparse
	Native Shrub Mix - Managed
	Proposed Native Tree

- Refer to Civil Engineers drawings for grading plan

2.1 Community Playground & Entry

The entry road to the Onslow Township Village provides staff and guests with a high quality landscaped experience as they enter through a tree lined road. Water Sensitive Urban Design (WSUD) principles are incorporated into the design of the entry landscape, capturing water runnoff into the filtration garden beds and surrounding landscape.

South of the entry road and interfacing with the Onslow Townsite is the Community Playground. This space provides a publicly accessible parkland within the Onslow townsite. The park provides shaded recreation and play opportunities for locals and visitors to enjoy.

LEGEND

1	Treed Arrival Plaza With Furniture
2	Universal Access Ramp
3	Footpath
4	Play Area
5	Entry Statement
6	Security fence / Entry Wall

2.2 Amenity and Recreation Areas

The Amenity and Recreation Areas are characterised by a mix of high quality landscape surface treatments and softscape palette that lead guests and staff through the main amenities areas. Key vistas out to the ocean are celebrated through elevated landscape terracing, alfresco areas and the entry plaza. The design of the carpark incorporates WSUD principles to ensure large planted areas with tree planting occurs.

LEGEND

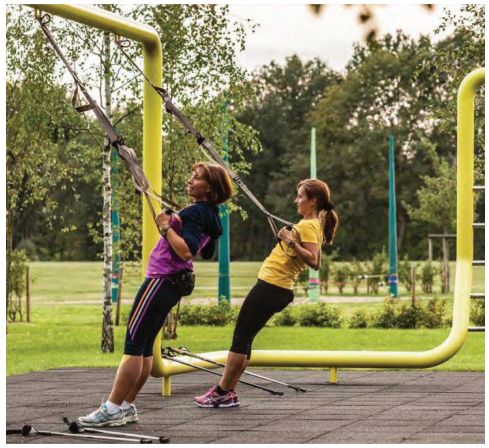
1	Carpark (Designed to Water Sensitive Urban Design principles)
2	Dropoff/Pickup Bays
3	Entry Plaza With Water Feature
4	Pool
5	Terraced Embankment With Universal Access
6	Alfresco Dinning
7	Access To Accommodation

2.3 Outdoor Amenity Areas

The outdoor amenities area provides guests and staff with a range of health and fitness opportunities in an outdoor setting. Universal access is provided through a network of high quality paved surfaces that link to the accommodation and administration areas.

The landscape design provides the following list of outdoor amenity;

LEGEND	
1	Outdoor Gym
2	Beach Volley Ball
3	Relax Zone (including hammocks and furniture in a garden setting)
4	BBQ and Shade Structures
5	Turf Kick-About Area
6	Cricket Nets
7	Mini-Golf
8	Pool

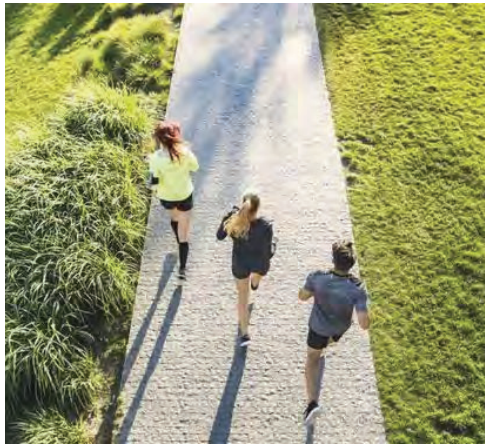


2.4 Accommodation Areas

The accommodation area has been designed to respond to the existing topography and ecology of the site. Minimising disturbance to the existing levels through a considered architectural and landscape response. An elevated boardwalk system extends through the area forming pedestrian circulation route that touches the ground lightly. Along the boardwalk network a series of comfort nodes are included to provide social spaces to experience the raw landscape in comfort. A hierarchy of boardwalks are achieved through primary access routes that provide direct linkages to the key extents of the accommodation, Secondary boardwalks provide more intimate linkages to guests accommodation.

A service and maintenance track doubles as a fitness and well-being loop for guests and staff to exercise by running or walking through the landscape.

LEGEND	
1	Pod Accommodation
2	Primary Boardwalk With Shade Structures (3m wide)
3	Secondary Boardwalk With Shade Structures (2.5m wide)
4	Comfort Node with Furniture and Shade Structure
5	Laundry Service dropoff/pickup
6	Maintenance / Exercise Loop



3.1 Landscape Materials

Materials Strategy

A refined palette of robust and low maintenance materials are proposed that are in keeping with the project context and Architecture. The proposed landscape scheme will use a palette of high quality materials, selected to reinforce the identity of the spaces.

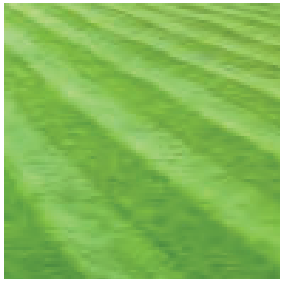
Materials have been selected that are sympathetic to the local context and are appropriate to their location and use. The materials detailed here form a structured palette that are coordinated to create visual unity and integrity within the landscape and the surrounding the Onslow neighbourhood.

The Material strategy will:

— Use materials that are sympathetic to the local context and are appropriate to their location and use.
— Create visual unity and integrity within the landscape but allow for variations in texture and colour that can be used to define function and character.
— Give consideration to long-term performance, durability and maintenance requirements.
— Consider impact on the environment and sourcing, cost and project sustainability.


Large format stone paver

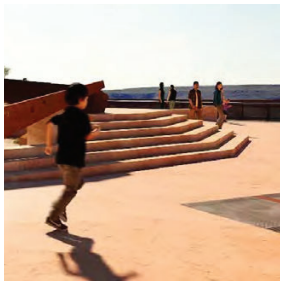

Concrete paving


Turf

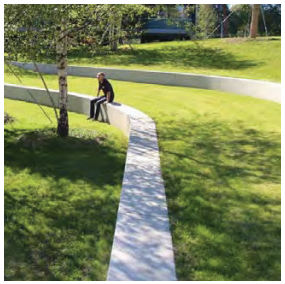

Stabilised pindan gravel


Composite timber


Stone boulders


Concrete steps


Asphalt


Concrete walls


RFP mesh boardwalk


Concrete inlay


Informal Seating

3.2 Planting Strategy

Planting Strategy

The planting scheme for the project is designed to add a strong well-vegetated character to the site and present a response that interfaces with neighbouring frontages and contributes to greater site ecologies. Landscape will be used to create identity through a series of contextually appropriate planting palettes. Guests and Staff will be able to experience the harshness and fragility of the Pilbara Coastal landscape through considered planting design.

Endemic plants will feature throughout the village which will help to restore and improve the health of degraded landscape areas within the development.

Entry and Recreation Areas

As guests enter the village they will be greeted with a tree lined access route that leads them to the arrival point at the administration and recreation area. Water Sensitive Urban Design principles are used throughout the entry and Recreation Areas and will feature low water demanding irrigated landscape areas. Bush fire Asset Protection Zones are strategical placed around the perimeter of the site with densities of trees, shrubs and ground covers in the locations designed to reduces the effect of bush-fires.

Accommodation Areas

The Accommodation areas are characterised by a mix of dunal vegetation that is characteristic of the immediate ecologies of the site. The planting intent is to restore the local vegetation complexes that exist within the dunal systems surrounding Onslow. This area will be irrigated with a mix of drip and spray irrigation. Other incentives within the accommodation areas include sswale planting within the low points of the site to maximise the filtration of overland water-flows

Low to mid-level planting to the perimeter of the site within the bush fire Asset Protection Zone will be designed to reduce the effect of bushfires while also blending the visual appearance between the development and the surrounding vegetation.

Water Efficient Irrigation System

Trees and plants will be irrigated by a water efficient irrigation system. The irrigation water demand volumes will not be excessive, however, a constant and uninterrupted supply must be maintained especially during dry and hot periods.

Where possible, plants will be hydro- zoned according to water requirements. This allows the reticulation to the endemic plantings to be separately controlled and greatly reduced following their establishment period. The automated irrigation system can be designed to include monitors to detect malfunctions so that rapid response rectification can be programmed before the planting is detrimentally affected by a disruption to water supply.

A holistic irrigation strategy will be prepared for the project that aims to include the following initiatives:

- Aqua monitoring to record and display water usage
- Hydro-zoning of plants
- Waterwise planting and use of local species
- High quality and improved soils with good moisture and nutrient holding capacity

3.3 Planting

Indicative Species List

Endemic		
Key	**Botanical Name**	**Common Name**
TREES Taller than 10m		
	Acacia coriacea	Wirewood
	Adansonia gregorii	Boab
	Brachychiton obtusifolia	
	Eucalyptus camaldulensis	River Gum
	Eucalyptus vitrix	Smooth Bark Coolibah
	Eucalyptus xerothermica	
TREES Up to 10m		
	Acacia ampliceps	Salt Wattle
	Acacia citrinoviridis	Mulga Tree
	Bauhinia cunninghamii	Jigal Native Bauhinia
	Grevillea wickhamii	Wickham's Holly Grevillea
	Pittosporum phylliraeoides	Native Olive
LARGE SHRUBS Up to 4m		
	Acacia ancistrocarpa	Fitzroy Wattle
	Acacia bivenosa	Two Vein Wattle
	Acacia dictyophleba	Sandpaper Wattle
	Acacia trachycarpa	Minni Ritchi
	Capparis lasiantha	Spit Jack
	Capparis spinosa	Caper Bush
	Crotalaria cunninghamii	Green Bird Flower
	Eremophila fraseri	Varnish Bush
	Eremophila maculata	Spotted Emu Bush
SMALL SHRUBS Less than 2m		
	Acacia hilliana	Tabletop Wattle
	Acacia gregorii	Gregory's Acacia
	Eremophila cuneifolia	Pinyuru
	Eremophila microtheca	Heath-like Eremophila
	Indigofera monophylla	Indigo Plant
	Ipomoea yardiensis	Yardie Morning Glory
	Ptilotus exaltatus	Tall Mulla Mulla
	Ptilotus obovatus	Cotton Bush
	Scaevola crassifolia	Thick leaved Fan Flower
	Solanum lasiophyllum	Bush Tomato/ Flannel Bush
	Senna notabilis	Cockroach Bush
GROUND COVERS Less than 600mm		
	Gomphrena canescens	Bachelors' Buttons
	Ipomoea pes-caprae	Coastal Morning Glory
	Enchylaena tomentosa	Barrier Saltbush
	Ptilotus clementii	Tassel Top
	Solanum horridum	Wild Gooseberry
	Swainsona formosa	Sturt Desert Pea
	Swainsona maccullochiana	Ashburton Pea
Climbers		
	Canavalia rosa	Wild Jack Bean
	Ipomoea costata	Bush Potato
	Ipomoea pes-caprae brasiliensis	Goat's Foot Morning Glory
	Ipomoea muelleri	Poison Morning Glory
Grasses		
	Aristida contorta	Wind Grass
	Panicum decompositum	Native Millet







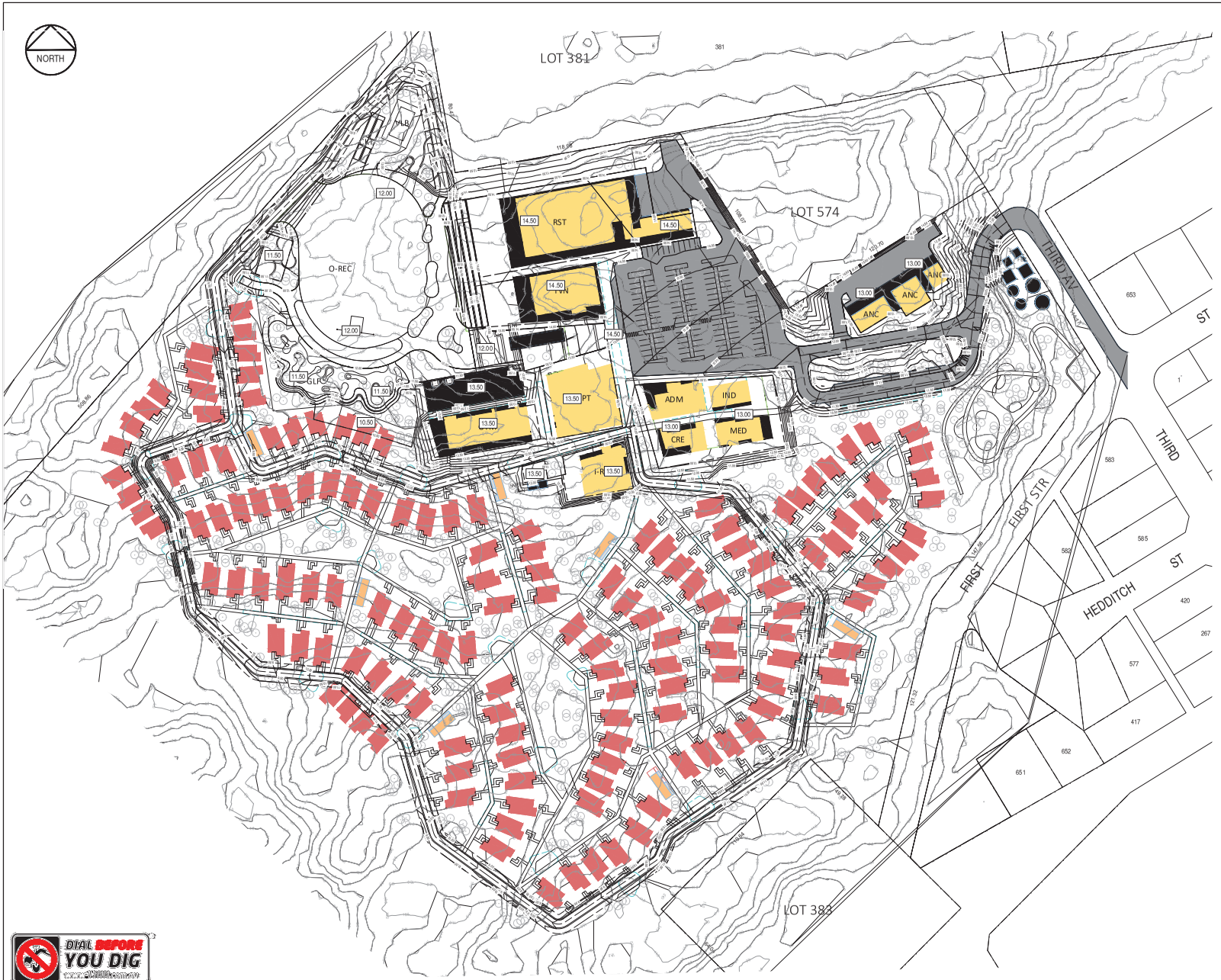









Appendix B
Engineering Design Plan



NOTES

1. ALL DIMENSIONS SHOWN ARE IN METRES U.S.O.
2. ALL CO-ORDINATES AND LEVELS SHOWN ON THIS DRAWING SHALL BE VERIFIED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT WITH IN SEVEN DAYS.
3. SURVEY INFORMATION SUPPLIED BY BENCHMARK SURVEYS W.A..
4. ALL HEIGHTS ARE TO AUSTRALIAN HEIGHT DATUM (AHD) AND ALL LEVELS SHALL BE DERIVED FROM ESTABLISHED BENCHMARKS.
5. ALL BENCHMARKS ARE TO BE PROTECTED AND PRESERVED UNLESS NOTED ON PLANS.
6. FINISHED CONTOURS AND VOLUMES ARE TO ROAD BOXOUT.
7. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE SPECIFICATION AND ALSO THE REQUIREMENTS OF THE SHIRE OF ASHBURTON.
8. THE CONTRACTOR SHALL LIAISE WITH ALL RELEVANT AUTHORITIES TO LOCATE ALL EXISTING SERVICES WITHIN THE CONTRACT AREA PRIOR TO THE COMMENCEMENT OF WORK. SERVICES INFORMATION SHOWN ON THE DRAWINGS IS INDICATIVE ONLY AND MAY NOT BE COMPLETE. WHERE EXISTING AND PROPOSED WORKS CONFLICT, LEVELS ARE TO BE TAKEN AND SUPPLIED TO THE SUPERINTENDENT IMMEDIATELY.
9. CONTRACTOR SHALL OBTAIN COUNCIL APPROVAL AND PAY ALL FEES/BONDS PRIOR TO COMMENCEMENT OF WORKS.
10. CONTRACTOR SHALL NOTE THAT NON-TRAFFICABLE SUBTERRANEAN STRUCTURES (SOAKWELLS ETC.) MAY EXIST ON SITE. PRIOR TO EARTHWORKS COMMENCING, CONTRACTOR SHALL LOCATE ANY SOAKWELLS, SEPTIC TANKS, DELETERIOUS MATERIALS AND OTHER SUBTERRANEAN STRUCTURES. THESE MATERIALS AND STRUCTURES ARE TO BE REMOVED AND THE LOCATION BACKFILLED IN ACCORDANCE WITH PROCEDURES SET OUT IN SPECIFICATION (IF APPLICABLE). THE SUPERINTENDENT IS TO BE ADVISED OF ANY UNUSED PIPE WORK ENCOUNTERED.
11. THE CONTRACTOR SHALL PROVIDE TEMPORARY FENCING TO EXISTING LOTS AS REQUIRED.
12. THE CONTRACTOR SHALL PREPARE A DUST MANAGEMENT PLAN IN ACCORDANCE WITH THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION (D.E.C.) GUIDELINES SITE CLASSIFICATION 3 AND OBTAIN APPROVAL FROM THE LOCAL AUTHORITY FOR THE DUST MANAGEMENT PLAN.
    DUST SUPPRESSION METHODS SHALL BE APPLIED BY THE CONTRACTOR DURING EARTHWORKS OPERATIONS IN ACCORDANCE WITH THE APPROVED MANAGEMENT PLAN.
13. NO CLEARING TO OCCUR UNTIL SUPERINTENDENT HAS IDENTIFIED TREES TO BE RETAINED.
    13a. ALL TREES TO BE RETAINED SHALL BE FENCED OFF FOR THE DURATION OF THE WORKS.
    13b. ALL TREES AND VEGETATION NOT FOR RETENTION SHALL BE MULCHED AND STOCKPILED FOR REUSE OR REMOVAL AS NOTED.
14. THE CONTRACTOR SHALL MAINTAIN PROPER SITE DRAINAGE TO ALL AREAS THROUGHOUT THE CONSTRUCTION PERIOD AND SHALL BE RESPONSIBLE FOR MAINTAINING EXCAVATIONS IN A SAFE AND STABLE CONDITION AT ALL TIMES.
15. TOPSOIL IS TO BE STRIPPED AND MANAGED IN ACCORDANCE WITH THE SPECIFICATION OR AS NOTED ON THE DRAWINGS.
16. ALL ROOTS, BOULDERS AND ANY OTHER DELETERIOUS MATERIAL SHALL BE TOTALLY REMOVED TO A DEPTH OF 600mm BELOW THE LOWER OF THE NATURAL/CUT SURFACE.
17. MINOR AMENDMENTS TO THE EXTENT OF EARTHWORKS MAY OCCUR TO PRESERVE IDENTIFIED TREES.
18. ALL BATTERS TO BE NOMINALLY 1 IN 6, OR FLATTER, UNLESS SHOWN OTHERWISE (U.S.O.).
19. ALL FILL SHALL BE CLEAN AND BE FREE FROM DELETERIOUS AND/OR ORGANIC MATERIAL.
20. FILL MATERIAL TO BE TESTED BY A REGISTERED MATERIALS TESTING LAB AND RESULTS PROVIDED TO THE SUPERINTENDENT PRIOR TO THE IMPORTATION AND PLACEMENT OF MATERIAL.
21. PENETROMETERS USED FOR TESTING MUST BE CALIBRATED FOR SITE AND RECALIBRATED FOR IMPORTED FILL AS REQUIRED.
22. ALL FILL SHALL BE PLACED IN UNIFORM LAYER NOT EXCEEDING 300mm THICKNESS AND COMPACTED TO A DENSITY NOT LESS THAN 95% M.M.D.D. REFER TO SPECIFICATION FOR DETAILED INFORMATION.
23. CONTRACTOR TO COMPLETE ALL BACKFILLING AND EARTHWORKS REQUIRED TO ACHIEVE LEVELS SHOWN.
24. THE SITE IS TO BE LEFT CLEAN AND FREE OF RUBBISH/DEBRIS UPON COMPLETION OF WORKS.
25. TIE INTO ADJACENT BOUNDARIES AND FEATURES TO BE SEAMLESS.
26. 'AS CONSTRUCTED' DRAWINGS ARE TO BE PREPARED IN ACCORDANCE WITH THE SPECIFICATION AND PROVIDED TO THE SUPERINTENDENT PRIOR TO PROCEEDING TO THE NEXT STAGE OF WORKS.

LEGEND

- 15.00 — PROPOSED EARTHWORKS CONTOUR (1.0m)
- 15.50 — PROPOSED EARTHWORKS CONTOUR (0.50m)
- EXISTING SURFACE CONTOUR
- 6.80 — FINISHED PAD LEVEL

DIAL BEFORE YOU DIG 1100 www.1100.com.au
Time, Essential Work Stage

R/V	DATE	DESCRIPTION	BY	CHKR
C	24/08/21	MINOR UPDATE	DL	AT
B	09/08/21	CONTOURS REVISED TO SUIT ARCHITECT COMMENTS	JS	AT
A	04/08/21	INITIAL ISSUE	JS	AT

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DRAWING STATUS: NOT FOR CONSTRUCTION
DATE: AUGUST 2021 | GRID: MGA | DATUM: AHD
DESIGNED: JS | DRAWN: JS | CHECKED: AT | APPROVED: AT
M.A.P. C.: N/A | SCALE/ U.NO.: 1:1000 @ A1

CLIENT & JOB: MINERAL RESOURCES ONSLOW VILLAGE
TITLE: EARTHWORKS CONCEPT OPTION 2
SHEET SIZE: A1 | DRG No.: 21195-C9-SK-05 | REVISION: C

1695

Attachment 13.2C - DAP/21/02078 -DA 21-67 | L300 Back Beach Road, Onslow

Appendix F
Likelihood of Occurrence – Marine Species

Scientific Name	Common Name	Conservation Status	Migratory Status	Migratory Category	Likelihood Occurrence	Marine Status
Birds						
Rostratula australis	Australian Painted Snipe	Endangered	-	-	May	Listed - overfly marine area (as Rostratula benghalensis (sensu lato))
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Critically Endangered	Migratory	Migratory Wetlands Species	Known	Listed
Fregata ariel	Lesser Frigatebird, Least Frigatebird	-	Migratory	Migratory Marine Birds	May	Listed
Glareola maldivarum	Oriental Pratincole	-	Migratory	Migratory Wetlands Species	Likely	Listed - overfly marine area
Limosa lapponica	Bar-tailed Godwit	-	Migratory	Migratory Wetlands Species	May	Listed
Limnodromus semipalmatus	Asian Dowitcher	-	Migratory	Migratory Wetlands Species	Known	Listed - overfly marine area
Anous stolidus	Common Noddy	-	Migratory	Migratory Marine Birds	May	Listed
Hirundo rustica	Barn Swallow	-	Migratory	Migratory Terrestrial Species	May	Listed - overfly marine area
Pandion haliaetus	Osprey	-	Migratory	Migratory Wetlands Species	May	Listed
Actitis hypoleucos	Common Sandpiper	-	Migratory	Migratory Wetlands Species	May	Listed

Calonectris leucomelas	Streaked Shearwater	-	Migratory	Migratory Marine Birds	May	Listed
Chalcites osculans	Black-eared Cuckoo	-	-	-	May	Listed - overfly marine area (as Chrysococcyx osculans)
Macronectes giganteus	Southern Giant-Petrel, Southern Giant Petrel	Endangered	Migratory	Migratory Marine Birds	May	Listed
Merops ornatus	Rainbow Bee-eater	-	--		May	Listed - overfly marine area
Apus pacificus	Fork-tailed Swift	-	Migratory	Migratory Marine Birds	Likely	Listed - overfly marine area
Thalassarche carteri	Indian Yellow-nosed Albatross	Vulnerable	Migratory	Migratory Marine Birds	May	Listed
Charadrius leschenaultii	Greater Sand Plover, Large Sand Plover	Vulnerable	Migratory	Migratory Wetlands Species	May	Listed
Calidris acuminata	Sharp-tailed Sandpiper	-	Migratory	Migratory Wetlands Species	Known	Listed
Bubulcus ibis	Cattle Egret	-	-		Known	Listed - overfly marine area (as Ardea ibis)
Charadrius veredus	Oriental Plover, Oriental Dotterel	--	Migratory	Migratory Wetlands Species	May	Listed - overfly marine area