Clive Steele Partners Pty. Ltd.
Consulting Structural & Civil Engineers

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Building 6, 62/195 Wellington Road Clayton, VIC 3168

CIVIL ENGINEERING DEVELOPMENT APPLICATION REPORT

RESPONSE TO DOUGLAS SHIRE COUNCIL RFI

Application no: CA 2025_5878/1

PROPOSED RESORT DEVELOPMENT

18 OASIS DRIVE, WONGA BEACH, QUEENSLAND

Date: 19th May 2026

Project No: 21342

Revised: 3rd June 2026

Clive Steele Partners Pty Ltd

Director: Ian K. Flanders, B.E. Civil (Hons), F.I.E. Aust.
Associate: Chris Vinecombe, B.E. Civil (Hons), B.Sc, M.I.E. Aust.
Associate: Selam Desta, B.E. Civil (Hons), M.I.E. Aust.

A.C.N 005 363 735
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APPENDICES

Appendix A - Electricity

Appendix B - Traffic Impact Assessment

Appendix C - Onsite Wastewater Treatment

Appendix D - Water Supply

Appendix E - Stormwater Detention Calculations

Appendix F - Geotechnical Report

Site Plan Drawing C01

Appendix A

Electricity

File: 5306L1/8
Ref: 20260516L2

16 May 2026

INFORMATION REQUEST

DOUGLAS SHIRE COUNCIL
REFERENCE NO: CA 2025_5878/1 (DOC ID 1341375)

Application Number: CA 2025_5878/1

Property Details
Street Address: 18 Oasis Drive Wonga Beach
Real Property Description: Lot 2 on SP259953
Local Government Area: Douglas Shire Council

Electricity: Information Request: Item Nos 5 to

This reports details the onsite electricity supply, on site solar power generation and battery storage.

Information Request No 5

Existing Ergon Energy overhead powerlines traversing the site and confirming the offset from the overhead power lines to the proposed development.

Response:

Existing Ergon overhead power lines are located along the site western boundary up to the Main Facilities Building at which point the power lines are located outside the property boundary and are located underground.

As part of the project all Ergon overhead will be relocated to the western side of the site boundary into the road reserve and installed underground. Final location of the underground power lines is subject to final negotiations with Ergon. In general, the underground power lines will be Approximately 1.2m from the site boundary.

Information Request No 6

Please provide details of any intended relocation of or change to the existing electricity utility service to the site and the distribution network servicing surrounding land.

Response:
The Ergon power lines are part of the 1-33 kV High Voltage power grid for the surrounding area.

The relocation of the power lines into the public reserve and underground maintains and preserves access to the power lines.

The underground of the HV cable provides protection from potentially damaging winds and cyclones.

The existing grid capacity will be retained therefore not impacting on the network servicing surrounding land.

Information Request No 7 & 8
7. Please advise whether there any intention to connect the power generated by the roof solar systems to be distributed off-site.

8. Please advise of the capacity and detail of any battery storage on the land

Response:
1. DESIGN INTENT

The electrical infrastructure for Wonga Beach Resort is based on:

- High-efficiency 6-star buildings with LED lighting within NCC 2022 LPD limits.
- A large on-site solar PV system with distributed batteries forming a private internal grid.
- Villas capable of extended autonomous operation.
- A main facility building supported by central battery storage and a standby generator for grid-outage backup only.

The objective is to minimise grid reliance, maximise on-site renewable generation, and provide high resilience during wet-season and monsoon conditions.

2. SITE MAXIMUM DEMAND AND GRID CONNECTION

- Diversified site maximum demand (MD)**:** Based on combined loads from all villas, the main facility building, pumps and common services: MD ≈ 1,000 kVA
- Solar contribution for grid sizing: Grid connection is based on site MD less solar generation at 20% output**:**
    - Installed PV capacity: ≈ 1.8 MWp
    - Solar at 20%: ≈ 360 kW
    - Grid connection capacity: $1{,}000$ kVA $-$ 360 kVA $\approx$ 640 kVA

- Recommended grid connection: ≈ 650 kVA (rounded, DNSP-friendly value)

The 350 kVA generator is provided only for grid-outage backup and is not included in grid-connection sizing.

3. SOLAR PV SYSTEM

- PV area**:** 8,854 m² Approximate
- Panel density: 200 W/m²
- Installed capacity: ≈ 1.77 MWp (≈ 1.8 MWp)

Annual and seasonal generation (based on regional capacity factors):

- Annual solar generation: **≈** 3,140 MWh/year
- Dry season (7 months): **≈** 2,020 MWh
- Wet season (5 months): **≈** 1,120 MWh

Monsoon (cloudy) conditions:

- Based on **30% of sunny-day output**:

$$1.8 \text{ MWp} \times 30\% \approx 540 \text{ kW}$$

Solar generation remains significant even during monsoon due to high diffuse irradiance.

4. BATTERY STORAGE AND AUTONOMY

4.1 Villas

- Average villa load**:** 2 kW
- Required autonomy: 48 hours
- Required usable energy: 96 kWh
- With 80% depth of discharge: 120 kWh per villa

4.2 Main facility building

- Average critical load (lights and general services**):** ≈ 80 kW
- Required autonomy: 12 hours
- Required usable energy: 960 kWh
- With 80% DoD: 1.2 MWh battery

4.3 Total storage

- Villas (60 units): 7.2 MWh
- Main building: 1.2 MWh

Total site storage: ≈ 8.4 MWh

All batteries are interconnected via an internal private network, enabling energy sharing and peak smoothing across the site.

5. SELF-SUFFICIENCY AND EXPORT

5.1 Site energy balance

Based on 8 kWh/person/day and 511 persons:

Annual site load: ≈ 1,430 MWh/year

Compared with solar generation:
Annual solar generation: ≈ 3,140 MWh/year
Annual surplus (export): $3{,}140 - 1{,}430 \approx$ 1,710 MWh/year

5.2 Frequency of power self-sufficiency

Based on solar generation exceeding site load in both seasons and the available battery storage:

- **Dry season:** solar ≈ 2,020 MWh vs load ≈ 871 MWh
  - Site is power self-sufficient on **≈ 90–95% of days**.
- **Wet season:** solar ≈ 1,120 MWh vs load ≈ 559 MWh
  - Site is power self-sufficient on **≈ 70–85% of days**.
- **Annual average:**
  - Site is power self-sufficient on **≈ 80–90% of days**, importing only during extended low-solar periods or after several consecutive monsoon days.

5.3 6. Summary table

Item	Value
Site Maximum Demand	≈ 1,000 kVA
Solar Capacity	≈ 1.8 MWp
Solar Output (Monsoon @ 30%)	≈ 540 kW
Grid Connection (MD – Solar @ 20%)	≈ 640 kVA
Recommended Grid Connection	≈ 650 kVA
Villa Battery Capacity	120 kWh each
Main Building Battery	1.2 MWh
Total Battery Storage	≈ 8.4 MWh
Annual Solar Generation	≈ 3,140 MWh
Annual Site Load	≈ 1,430 MWh
Annual Export Energy	≈ 1,710 MWh
Self-Sufficiency Frequency	≈ 80–90% of days

This concept demonstrates that the resort operates predominantly **on** on-site renewable energy, with a moderate grid connection and backup generator providing resilience and compliance with network requirements.

We trust the above address the matters raised in item 27 of the requested information,

Yours faithfully
Proactive Consulting Engineers Pty Ltd

Gino Fabris
Director
Practising Registered Professional Engineer of Queensland
REPQ: No 06041

Appendix B

Traffic Impact Assessment

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Wonga Resort

Traffic Impact Assessment

Oasis Drive, Wonga Beach, Queensland

Prepared for: 101 Ives Avenue Pty. Ltd.
Location: Oasis Drive, Wonga Beach QLD
Date: May 2026
Amended: 3rd June 2026

Table of Contents

Wonga Resort

Traffic Impact Assessment

Oasis Drive, Wonga Beach, Queensland

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1. Introduction

This preliminary traffic engineering assessment considers the likely transport and traffic impacts associated with the proposed tourist resort development at the end of Oasis Drive, Wonga Beach, Queensland.

The assessment has been prepared based on the following proposed development characteristics:

- 66 resort apartments in 33 villas
- Maximum guest capacity of 210 guests
- Conference centre
- Restaurant and bar facilities
- Day Spa and Gymnasium
- Resort shop
- Indigenous Interpretive Centre
- Staff and servicing operations
- Bus access for conference and tourism groups
- Delivery and waste collection vehicles
- Dedicated on-site guest and staff parking
- Dedicated on-site bus drop-off and turning area
- Dedicated delivery truck parking and servicing bay

The development site is at the end of Oasis Drive, Wonga Beach, with vehicular access via Oasis Drive connecting to Wonga Beach Road and the broader Mossman–Daintree road network.

2. Site Location and Context

The subject land is located at the southern end of Oasis Drive in Wonga Beach within the Douglas Shire local government area. Relevant planning references indicate substantial land holdings and ongoing development activity in the Oasis Drive precinct.

Wonga Beach is a low-density coastal settlement approximately:

- 16 km north of Mossman
- 35–40 km north of Port Douglas
- Connected primarily via Mossman-Daintree Road

The locality currently experiences relatively low traffic volumes typical of small coastal communities. The Douglas Shire economy is strongly tourism-based, with more than 426,000 overnight visitors annually across the region.

3. Existing Road Network

3.1 Oasis Drive

Oasis Drive is a sealed local access road serving residential and undeveloped land parcels. Existing traffic volumes are currently low and generally comprise:

- Two-way local traffic operation
- Low operating speeds
- Residential traffic generation
- Minimal heavy vehicle activity

3.2 Regional Access

Traffic generated by the resort would distribute through the following network:

- Wonga Beach Road (an Urban Collector Road)
- Mossman–Daintree Road
- Captain Cook Highway connections via Mossman

Road access to the local road network is via one existing state-controlled road intersection at the Mossman-Daintree Road / Wonga Beach Road intersection. This intersection is improved by a channelised right turn lane (CHR(S)) and a basic left turn treatment (BAL).

Public transport availability is limited, with infrequent regional bus services.

Consequently, the majority of resort-related travel is expected to occur via:

- Private vehicles
- Rental vehicles
- Organised tourist coaches
- Shuttle buses
- Airport transfer services

The broader regional network currently accommodates significant tourism traffic associated with the Douglas Shire and Far North Queensland tourism industry and is considered capable of accommodating additional resort-related traffic volumes.

4. Development Characteristics

4.1 Resort Population

Maximum Occupancy

Component	Number
Resort guests	210
Conference Guests – (160 max.) ….from other accommodation =	50 *
Restaurant / Bar Guests – (240 max.) ……. external guests =	120 *
Bar & restaurant staff	26
Retail staff	1
Interpretive Centre	2
Gymnasium/Day Spa Staff	12
Servicing & Housekeeping staff	33
Tourist Coach Access	Yes
Delivery Vehicles	Yes
Waste Collection Vehicles	Yes
Total persons on site	**454**

Total staffing capacity is estimated at approximately 74 persons.

The maximum theoretical on-site population is therefore approximately **454 persons**.

However, this level of occupancy would only occur during major holiday periods, conference events and peak tourism seasons.

* These figures are extremely conservative.

4.2. Realistic Occupancy Assumptions

Tourist resorts in regional Queensland typically operate below theoretical maximum capacity for much of the year.

For traffic assessment purposes, the following realistic occupancy assumptions are considered appropriate:

Season	Assumed Occupancy
Low season	45–55%
Average annual occupancy	60–70%
Peak holiday periods	85–95%
Conference peak events	75–90%

For assessment purposes, an average operational occupancy of approximately **70%** has been adopted.

This results in an average daily guest population of approximately:

$$454 \times 0.70 \approx 318$$

Approximately 320 guests on a typical operational day.

5. Traffic Generation Assessment

5.1 Resort Guest Vehicle Generation

Tourist resorts generally generate fewer vehicle movements per guest than conventional residential development because:

- Guests commonly travel together
- Visitors remain on-site for extended periods
- Shared transport usage is common
- Airport shuttle services are frequently utilised
- Conference attendees often arrive collectively by bus or charter transport
- Daily commuter travel is lower

Typical regional resort traffic generation rates are as follows:

- 4 vehicle trips per apartment per day under average occupancy conditions *

This produces estimated resort guest traffic generation of:

$$66\ x\ 4\ x\ (\ 0.6 - 0.95) = 160 - 250$$

Approximately 160 to 250 guest-related vehicle movements daily. (190 vpd is a realistic average)

5.2 Staff Traffic Generation

Assuming:

- Shift-based operations
- Some shared transport
- Multiple staffing periods throughout the day

Estimated staff-generated traffic:

- Approximately 120–180 vehicle movements daily

5.3 Conference Centre Traffic

Conference traffic characteristics differ from normal resort traffic because attendees commonly:

- Stay onsite
- Arrive collectively
- Use airport transfer coaches
- Use charter buses

Consequently, conference activity is not expected to proportionally increase private vehicle demand.

Typical conference-related transport may include:

Vehicle Type	Estimated Activity
Large coaches	2–6 per day during events
Mini-buses/shuttles	4–8 per day
Taxi/rideshare movements	Moderate
Additional private vehicles	Limited

Coach movements will produce short-duration peak operational activity but relatively low overall road loading.

5.4 Service and Delivery Vehicles

The resort will require routine commercial servicing including:

- Food and beverage deliveries
- Linen services
- Maintenance contractors
- Waste collection
- Courier vehicles

Estimated heavy/service vehicle activity:

Vehicle Type	Estimated Frequency
Medium rigid trucks	3–8 per day
Waste collection trucks	1–2 per day
Couriers/light commercial	5–15 per day

Heavy vehicle impacts are therefore expected to remain relatively minor.

5.5 Anticipated Vehicles per day

Source	Estimated Daily Vehicle Movements	Estimated average vpd
Guest vehicles	160–250	190
Staff vehicles	120–160	140
Restaurant/bar visitors	30–60	40
Deliveries/service vehicles	18–30	24
Waste collection	2–4	2
Tour buses/shuttles	6–14	12
Total estimated daily movements	336–518	408

This equates to approximately:

- **120–260 inbound trips/day**
- **120–260 outbound trips/day**

These traffic volumes are considered low to moderate within the context of regional tourist developments.

---

6. Parking and Internal Circulation

6.1 Vehicle Parking

A significant mitigating factor associated with the proposed development is the provision of adequate on-site infrastructure for vehicles and servicing operations.

The proposal includes:

- Sufficient on-site parking for guests and their guests
- Dedicated staff parking areas
- On-site bus drop-off and manoeuvring facilities

- Dedicated delivery and service vehicle loading bay
- Internal circulation areas for coaches and service vehicles

The provision of these facilities substantially removes all of the following:

- On-street parking
- Bus queuing on Oasis Drive
- Delivery vehicle obstruction of public roads
- Overflow parking impacts on neighbouring residential properties

The inclusion of dedicated internal bus and truck facilities represents an important positive design outcome from a traffic engineering perspective.

6.2 Villa Carparks

The carparks and circulation at ground level for the resort have been redesigned by a Civil Engineer in this office. They now comply with ***AS1890.1-2004 Parking facilities Part 1: Off-street Car Parking***

These changes are now shown on both the Engineering drawing C01 as well as the updated Architectural drawings.

---

7. Bus Traffic Impacts

7.1 Conference Centre Operations

The conference centre significantly influences the transport characteristics of the development.

Conference-related transport activity is expected to include:

- Full-size coaches
- Mini-buses
- Airport transfer buses
- Tour coaches
- Charter transport vehicles

Importantly, many conference attendees are expected to stay on-site within the resort accommodation. This reduces the need for large numbers of daily commuter trips that would otherwise occur if conference patrons travelled separately from off-site accommodation.

This integrated accommodation model is considered beneficial from a traffic generation perspective.

7.2 Coach Access and Operations

The inclusion of a dedicated on-site bus drop-off and turning area substantially improves operational efficiency and safety outcomes.

The on-site bus facilities will:

- Remove any need for buses to stop on Oasis Drive
- Reduce traffic interruption to local residents
- Allow safe passenger loading and unloading
- Improve manoeuvring safety for large vehicles

While bus traffic will increase compared with existing conditions, the proposed internal bus handling arrangements are expected to significantly mitigate local traffic impacts.

---

8. Heavy Vehicle and Service Traffic

The inclusion of a dedicated delivery truck parking and loading bay is a significant operational advantage.

This arrangement will:

- Prevent delivery vehicles from parking on Oasis Drive
- Improve safety for pedestrians and cyclists
- Allow servicing activities to occur fully within the site boundary

Accordingly, servicing impacts on the surrounding road network are expected to be manageable.

---

9. Peak Traffic Periods

Peak traffic activity is expected during:

Morning Peak

- Staff arrivals
- Guest departures
- Tour bus departures
- Delivery vehicle arrivals

Afternoon/Evening Peak

- Guest arrivals
- Restaurant and bar traffic
- Conference arrivals
- Airport transfer activity

Weekly Peaks

- Friday and Sunday resort turnover
- Conference changeover periods

Estimated peak hour traffic generation:

50 to 75 vehicle movements per peak hour

This traffic volume is considered modest within engineering road capacity standards.

---

10. Safety Considerations

Key traffic engineering issues that have been considered include:.

- Increased pedestrian activity – There is an existing path to the western side of the property connecting into the rest of Wonga Beach.
  Internal pedestrian circulation is at first floor level, with the only vehicles being gold buggy sized electric service vehicles. Cars and trucks are prevented from entering this upper level except in the event of an emergency or major maintenance issues.
- Coach turning movements – Catered for within the main building
- Tourist driver unfamiliarity – This is in a low speed environment with good sightlines and a very straight forward road network with only one turn after leaving the Mossman-Daintree road. Good signage makes this simple and safe.
- Interaction with cyclists and recreational users – The existing network separates this.
- Night-time vehicle activity – Limited numbers as most guests remain in the Resort.
- Wet-weather operational safety - Low speed environment
- Emergency vehicle access – This has been provided with an internal driveway providing full access to Emergency services vehicles to all Villas and the central facility building at ground level
- Cyclone evacuation considerations – The Resort guests would be evacuated well before any cyclone arrived. The entire resort has been designed to withstand a cyclone, with all services well elevated so it can continue to operate without any external services. Any remaining vehicles would be moved to the upper level to protect them from inundation.

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11. Construction Traffic

Construction activities may temporarily generate significantly higher heavy vehicle movements than operational resort traffic.

Potential impacts include:

- Temporary road wear
- Dust generation
- Noise impacts
- Construction worker parking
- Oversize vehicle access

A Construction Traffic Management Plan should therefore be prepared prior to commencement of works.

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12. Impact on Local Amenity

The resort will materially alter the traffic environment of Oasis Drive compared with existing conditions.

Expected changes include:

- Increased traffic frequency
- Increased bus movements
- Increased service vehicle activity
- Increased pedestrian movement
- Greater night-time activity levels

However, because the development incorporates comprehensive on-site parking and servicing facilities, many of the common traffic impacts associated with tourist developments are expected to be moderated.

In particular, the proposal removes the likelihood of:

- On-street parking spillover
- Bus queuing on public roads
- Service vehicle obstruction
- Informal roadside loading activity

All of these vehicular functions and requirements are adequately catered for within the site.

12.1 Traffic Impact Assessment:

12.1.1 Traffic Generation

1) Traffic generation rates for the operational resort complex at peak times (July – August)
   336 – 518 vpd (see page 5.) with an average of 408 vpd.
   Note, we believe these figures are extremely conservative due to the use of buses.

2) Estimate of existing traffic on the road network, based on the population average age, location of services and employment statistics.
   Approximately 50 % of households use Wonga Beach Road for access to their properties, using the intersection of Mossman-Daintree Road / Wonga Beach Road intersection.

   Wonga Beach Population 1301 / 595 houses – average 2.2 residents / household.
   50% (approx..) with 6 – 10 trips per day $\Rightarrow$ 595 x 9 x 50% = **2,680 vpd**
   Less than 3000 vpd is considered Low Traffic volume.
   (Austroads AGTM08-16)

3) Wonga Beach Road is largely consistent with an Urban Collector Road.
   Less than 3000 vpd is considered Low Traffic volume. As such, Wonga Beach Road currently operates well within its environmental capacity, with the short section of road between Snapper Island Drive and Mossman Daintree Road carrying the larger volume.

4) Only about 10% of trips in this section of Wonga Beach drive past Oasis Drive.
   10% of total traffic = 268 vpd. Again, this is well below it's capacity, with an adequate and safe intersection design.
   Oasis Drive 17 no. lots, with 12 no. households in the street (including Bells Reef Close).
   12 x 9 = 108 vehicle movements / day.

   Even with the addition of the maximum of 518 vpd (on an extremely rare occasion) the traffic volumes are well below the road capacity.

12.1.2 Traffic Distribution

All traffic will head north of the site along from Oasis Drive to Wonga Beach Road, then head west towards Mossman-Daintree Road (450 m. approx.. from intersection to intersection). The only section of higher volume traffic is from Snapper Island Drive to Mossman-Daintree Rd (approximately 250 m) past rural land.

Trips arriving and departing Wonga Beach would travel on Mossman-Daintree Road from the north or the south.

We would anticipate minimal local trips by vehicle within Wonga Beach as there are few services in the township, and they are within walking or cycling distance.

12.1.3 Traffic Impacts

Traffic impacts will be primarily limited to Oasis Drive and the eastern section of Wonga Beach Road. These are large increases in traffic volume compared to the existing volume, but the total volume remains well within acceptable limits for these roads. Further, the previously approved residential subdivision would have generated approximately 90% of these vehicle movements on Oasis Drive and Wonga Beach Road (40 x 9 = 360 vpd).

Wonga Beach Road is an Urban Collector Road with about 14 properties accessing this road directly. The traffic impacts of the proposal on this road will be noticeable but manageable. The increase in traffic is of the order of 12.5 % in the wet season and 19 % at peak times, well within an acceptable increase in volume, increasing to between 3016 vpd and 3198 vpd, around the level considered a low volume, and significantly less than 5000 – 6000 vpd that is considered the upper limit of urban collector roads.

We do not consider the proposed development will compromise PO1 – PO3 of State code 6: Protection of state transport networks, for the above reasons.

Accordingly, I am satisfied that the daily traffic impacts of the proposal on the nearby road network are acceptable.

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13. Conclusion

The proposed 66 apartment tourist resort at Oasis Drive, Wonga Beach, is expected to generate a moderate increase in traffic relative to the existing residential environment.

Based on realistic occupancy assumptions, the development is estimated to generate approximately:

- 340–520 vehicle movements per day
- Regular coach activity
- Moderate service and delivery vehicle traffic

The inclusion of a conference centre will increase peak transport demand; however, the integrated resort accommodation model and extensive shared transport usage are expected to reduce private vehicle dependency.

Importantly, the provision of:

- Adequate on-site guest and staff parking
- Dedicated on-site bus drop-off facilities
- Internal delivery truck loading bays

substantially mitigates many of the potential adverse traffic impacts commonly associated with large tourist developments.

Subject to appropriate detailed engineering design and operational management measures, the development is considered capable of operating safely and efficiently within the surrounding transport network.

References

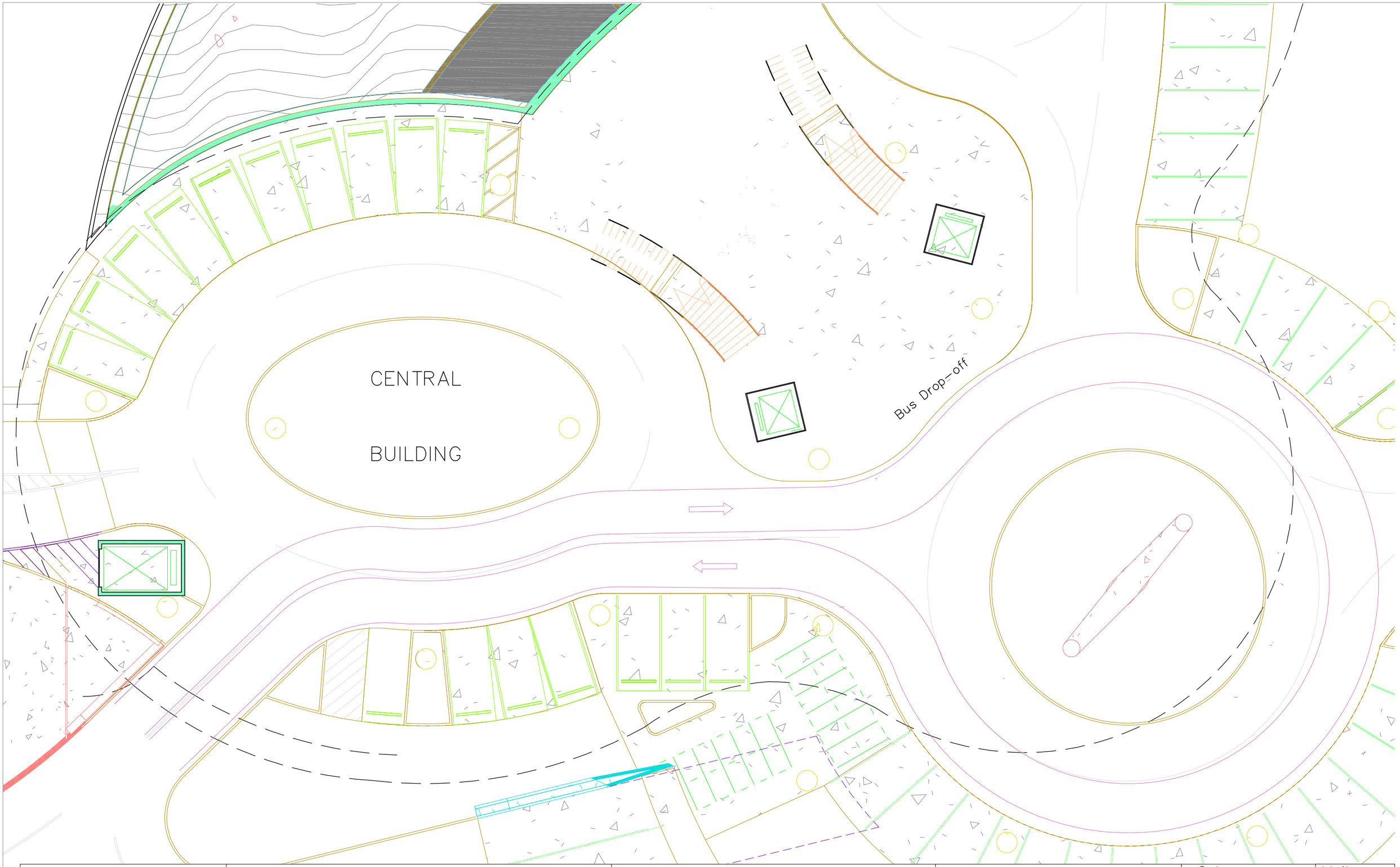
- Douglas Shire Council Planning Documentation
- Queensland Places – Wonga Beach
- Port Douglas Daintree Destination Tourism Plan 2025
- Austroads
- ABS – population analysis

Planning and locality information sourced from Douglas Shire Council planning records and regional demographic information.

* Department of Main Roads Road Planning & Design Manual Queensland Transport figures

signed:

Timothy Hall RPEQ 15280
Principal Architect, Civil & Structural Design Engineer
Clive Steele Partners Pty. Ltd.



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Building 6, 62/195 Wellington Rd
Clayton Vic. 3168 Australia

Project:
Wonga Resort
Wonga Beach QLD xxxx

Title:
Bus Turning Circles
14.5 m Rigid Bus

Scale:

Date: Mar.'26

CAD File:

Drawn: th

Checked:

Job No: 21342

Drawing: T01

Revision:

Appendix C

Onsite Wastewater Treatment

File: 5306L1/8
Ref: 20260516L2

16 May 2026

INFORMATION REQUEST

DOUGLAS SHIRE COUNCIL
REFERENCE NO: CA 2025_5878/1 (DOC ID 1341375)

Application Number: CA 2025_5878/1

Property Details
Street Address: 18 Oasis Drive Wonga Beach
Real Property Description: Lot 2 on SP259953
Local Government Area: Douglas Shire Council

Hydraulic Services: Information Request: Item No 27 – Onsite Wastewater Treatment

This reports details the onsite wastewater treatment water plant for the proposed development.

1. PURPOSE OF REPORT

This report has been prepared by a suitably qualified professional to:

- Quantify on-site wastewater **loads** (wet and dry seasons) based on 200 L/person/day**.**
- Define what is the Taylex wastewater treatment systems**,** their safety and performance.
- Quantify the treated water absorbed on site by all landscaped areas and roof-top green gardens.
- Quantify the treated water discharged to the on-site lake (hold pond) per season and per annum.
- Demonstrate that the land and systems can safely cater for full occupancy (90% wet season, 100% dry season).

2. DESIGN BASIS AND KEY INPUTS

2.1 Population and loading rate

- Unique site population: 511 persons
- Sewage loading rate (AS standard): 200 L/person/day

Daily wastewater at 100% occupancy:
$Q_{\text{daily,100\%}} = 511 \times 200 = 102.2$ kL/day

2.2 Seasonal occupancy

- Wet season: 5 months ≈ 152 days, 90% occupancy
- Dry season: 7 months ≈ 213 days, 100% occupancy

Wet season daily wastewater:
$Q_{\text{daily,wet}} = 0.9 \times 102.2 \approx 92$ kL/day

Dry season daily wastewater:
$Q_{\text{daily,dry}} = 102.2$ kL/day

2.3 Toilet flushing water (extracted)

From the earlier water-balance work. Refer to response to question 26

- Toilet flushing volume (full occupancy):

$Q_{\text{toilets}} = 11{,}188$ kL/year

This is part of the total wastewater treated and reused.

2.4 Landscaped and garden areas

From the civil/hydraulic drawings

- Roof-top green gardens + walkway bridge gardens: $A_{\text{roof+walk}} = 3{,}081$ m^2
- Apartment garden areas: $A_{\text{apt}} = 523$ m^2
- Facility building garden areas: $A_{\text{fac}} = 704$ m^2
- Deep soil gardens: $A_{\text{deep}} = 19{,}577$ m^2

Define:
$A_{\text{shallow}} = A_{\text{roof+walk}} + A_{\text{apt}} + A_{\text{fac}} = 4{,}308$ m^2
$A_{\text{total}} = A_{\text{shallow}} + A_{\text{deep}} = 23{,}885$ m^2

2.5 Irrigation depths

Adopted average irrigation depths:

- Wet season: $d_{\text{wet}} = 2$ mm/day $= 0.002$ m/day
- Dry season: $d_{\text{dry}} = 4$ mm/day $= 0.004$ m/day

These are typical for tropical resort landscaping with efficient irrigation.

3. TAYLEX WASTEWATER TREATMENT SYSTEMS

3.1 System configuration

- Each apartment building and the facility building is provided with an above-ground Taylex Advanced Secondary Wastewater Treatment System (AWTS).

- All internal wastewater streams (toilets, showers, baths, kitchen, laundry) are directed to the Taylex units.

- The final chambers of all Taylex units are interconnected via an underground pipe network, forming a shared tank-farm.

- Treated effluent is pumped to the landscape irrigation network and, when surplus exists, to the on-site lake via a controlled outlet.

3.2 Process description

Each Taylex AWTS typically comprises:

- **Primary chamber:** Settles solids and floatables; initial anaerobic breakdown of organics.

- **Aeration chamber:** Forced aeration supports aerobic bacteria that reduce BOD, COD and suspended solids.

- **Clarification chamber:** Separates treated effluent from biological solids; sludge is periodically removed.

- **Disinfection / polishing:** UV or chlorination to achieve a high level of pathogen reduction suitable for non-potable reuse.

- **Reuse storage:** Treated effluent is stored in a balance tank and pumped to irrigation zones.

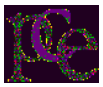
3.3 Safety and effluent quality

- Taylex systems are designed to produce Class B or Class A effluent (depending on configuration), suitable for landscape irrigation**.**

- Above-ground tanks are UV-stabilised and structurally robust under tropical sunlight.

- All non-potable pipework is colour-coded and hydraulically isolated from the potable water network.

- Disinfection ensures low pathogen lev**els**, making the reuse of treated water for gardens and landscaping safe and compliant**.**



3.4 3.4 Interconnected tank-farm benefits

- Shared storage capacity: all final chambers act as one large reservoir.
- Equalisation: inflows from different buildings are balanced across the network.
- Controlled release: surplus treated water is discharged to the on-site lake at managed flow rates, avoiding uncontrolled overflow.
- Operational resilience: redundancy and buffering during wet-season peaks.

3.5 Total wastewater flows (wet and dry seasons)

3.5.1 Wet season (90% occupancy)

Duration: 152 days - $Q_{\text{wet,total}} = 92 \times 152 \approx 13{,}984$ kL
Average daily treated flow (wet): $q_{\text{wet,total}} \approx 92$ kL/day

3.5.2 Dry season (100% occupancy)

Duration: 213 days: $Q_{\text{dry,total}} = 102.2 \times 213 \approx 21{,}769$ kL
Average daily treated flow (dry): $q_{\text{dry,total}} = 102.2$ kL/day

3.5.3 Annual total - $Q_{\text{annual,total}} = 13{,}984 + 21{,}769 \approx 35{,}753$ kL/year

This includes **toilet flushing (≈11,188 kL/year)** plus all other internal wastewater (showers, baths, kitchen, laundry).

3.6 Treated water absorbed by gardens and green roofs

3.6.1 Wet season irrigation demand

Shallow landscaping (roof + walkways + apartments + facility)
$Q_{\text{wet,shallow}} = A_{\text{shallow}} \times d_{\text{wet}} \times 152$
$Q_{\text{wet,shallow}} = 4{,}308 \times 0.002 \times 152 \approx 1{,}310$ kL

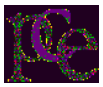
Average daily absorption (wet, shallow):
$q_{\text{wet,shallow}} = \frac{1{,}310}{152} \approx 8.6$ kL/day

3.6.2 Deep soil gardens

$Q_{\text{wet,deep}} = A_{\text{deep}} \times d_{\text{wet}} \times 152$
$Q_{\text{wet,deep}} = 19{,}577 \times 0.002 \times 152 \approx 5{,}951$ kL
Average daily absorption (wet, deep): $q_{\text{wet,deep}} = \frac{5{,}951}{152} \approx 39.1$ kL/day

3.6.3 Total wet season absorption

$Q_{\text{wet,irr,total}} = 1{,}310 + 5{,}951 \approx 7{,}261$ kL
Average daily absorption (wet, all landscaping):
$q_{\text{wet,irr,total}} = \frac{7{,}261}{152} \approx 47.7$ kL/day



3.6.4 Dry season irrigation demand

Shallow landscaping: $Q_{\text{dry,shallow}} = A_{\text{shallow}} \times d_{\text{dry}} \times 213$

$Q_{\text{dry,shallow}} = 4{,}308 \times 0.004 \times 213 \approx 3{,}670$ kL

Average daily absorption (dry, shallow): $q_{\text{dry,shallow}} = \frac{3{,}670}{213} \approx 17.2$ kL/day

3.6.5 Deep soil gardens

$Q_{\text{dry,deep}} = A_{\text{deep}} \times d_{\text{dry}} \times 213$

$Q_{\text{dry,deep}} = 19{,}577 \times 0.004 \times 213 \approx 16{,}680$ kL

Average daily absorption (dry, deep): $q_{\text{dry,deep}} = \frac{16{,}680}{213} \approx 78.3$ kL/day

3.6.6 Total dry season absorption

$Q_{\text{dry,irr,total}} = 3{,}670 + 16{,}680 \approx 20{,}350$ kL

Average daily absorption (dry, all landscaping): $q_{\text{dry,irr,total}} = \frac{20{,}350}{213} \approx 95.5$ kL/day

3.6.7 Annual absorption summary

Shallow landscaping (roof + walkways + apartments + facility):
$Q_{\text{shallow,annual}} \approx 1{,}310 + 3{,}670 = 4{,}980$ kL/year

Deep soil gardens: $Q_{\text{deep,annual}} \approx 5{,}951 + 16{,}680 = 22{,}631$ kL/year

Total landscaping absorption: $Q_{\text{irr,annual,total}} \approx 27{,}611$ kL/year

This is the total recycled water used on site for gardening and landscaping.

4. SURPLUS TREATED WATER TO ON-SITE LAKE (HOLD POND)

4.1 Wet season surplus

$Q_{\text{wet,surplus}} = Q_{\text{wet,total}} - Q_{\text{wet,irr,total}}$

$Q_{\text{wet,surplus}} = 13{,}984 - 7{,}261 \approx 6{,}723$ kL

Average daily surplus to lake (wet): $q_{\text{wet,surplus}} = \frac{6{,}723}{152} \approx 44$ kL/day

4.2 Dry season surplus

$Q_{\text{dry,surplus}} = Q_{\text{dry,total}} - Q_{\text{dry,irr,total}}$

$Q_{\text{dry,surplus}} = 21{,}769 - 20{,}350 \approx 1{,}419$ kL

Average daily surplus to lake (dry): $q_{\text{dry,surplus}} = \frac{1{,}419}{213} \approx 7$ kL/day

4.3 Annual surplus to lake

$Q_{\text{annual,surplus}} = 6{,}723 + 1{,}419 \approx 8{,}142$ kL/year

Overview Summary

- Treated water used and absorbed on site (landscaping): **≈** 27,600 kL/year
- Treated water discharged to on-site lake: **≈** 8,100 kL/year

5. BENEFITS TO INFRASTRUCTURE AND ENVIRONMENT

- **Reduced potable water demand:** All internal wastewater (including toilet flushing, showers, baths, kitchen and laundry) is recycled for irrigation, significantly reducing reliance on Council potable supply for landscaping.

- **Controlled discharge:** The interconnected Taylex tank-farm and on-site lake ensure that surplus treated water is discharged in a controlled, low-rate manner**,** avoiding peak loads on any single disposal element.

- **Environmental protection:**
  - Treated effluent is disinfected and suitable for non-potable reuse.
  - Deep soil gardens provide additional polishing and infiltration**,** improving environmental outcomes.
  - The on-site lake acts as a buffer and habitat feature**,** not a primary disposal field.

- **Infrastructure resilience:**
  - Above-ground Taylex units are UV-resistant and easily accessible for maintenance.
  - The modular system allows staged operation and future adjustment if occupancy patterns change.
  - The design comfortably accommodates 90% wet-season and 100% dry-season occupancy**.**

6. PLANNING RESPONSE SUMMARY

1. The development generates approximately 35,800 kL/year of treated wastewater at the Australian Standard loading rate of 200 L/person/day.

2. Of this, approximately 27,600 kL/year **is** beneficially reused on site for roof-top green gardens, walkway gardens, apartment and facility gardens, and deep soil landscaping.

3. Approximately 8,100 kL/year of surplus treated water is safely discharged to the on-site lake**,** at average rates of ~44 kL/day in the wet season and **~**7 kL/day in the dry season**.**

4. The Taylex systems provide safe, disinfected effluent, and the combination of landscaping absorption and lake buffering ensures that the land and infrastructure can comfortably cater for full occupancy in both wet and dry seasons.

We trust the above address the matters raised in item 27 of the requested information,

Yours faithfully
Proactive Consulting Engineers Pty Ltd

Gino Fabris
Director
Practising Registered Professional Engineer of Queensland
REPQ: No 06041

Appendix D

Water Supply

File: 5306L1/8
Ref: 20260516L1

16 May 2026

INFORMATION REQUEST

DOUGLAS SHIRE COUNCIL
REFERENCE NO: CA 2025_5878/1 (DOC ID 1341375)

Application Number: CA 2025_5878/1

Property Details
Street Address: 18 Oasis Drive Wonga Beach
Real Property Description: Lot 2 on SP259953
Local Government Area: Douglas Shire Council

Hydraulic Services: Information Request: Item No 28 – Water Supply

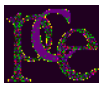
This reports details the water supply requirements for the proposed develop including water harvesting and its use.

1. EXECUTIVE SUMMARY

The Wonga Beach Resort development includes 66 villas, a two-level facility building, extensive landscaped areas, and multiple pools. The project incorporates a large, interconnected rainwater tank system designed to significantly reduce reliance on Council water supply.

1.1 Key Water Demand Summary

- Unique site population: 511 persons
- Total water demand (potable + non-potable):
  - Full occupancy: 102,450 kL/year
  - Realistic occupancy: ≈ 95,000 kL/year
- Non-potable demand (toilets + pools):
  - Full occupancy: 13,699 kL/year
  - Realistic occupancy: 12,903 kL/year
- Potable demand (showers, kitchen, laundry, drinking):
  - Full occupancy: 88,751 kL/year
  - Realistic occupancy: ≈ 82,000 kL/year
- Annual rainwater harvested: 15,937 **kL/year**
- Total storage capacity: 3,706 kL



1.2 Performance

- Rainwater fully covers **all non-potable demand** under normal rainfall.
- Surplus rainwater: **2,238–3,034 kL/year**
- Storage autonomy: **~100 days**
- Potable water demand is approximately **$32,704$ kL/yr** remains town mains supplied.

2. INTRODUCTION

2.1 Purpose

This report provides an RPEQ-level assessment of potable and non-potable water demand, rainwater harvesting capacity, and system performance for the proposed Wonga Beach Resort.

2.2 Development Summary

- 66 villas (Types V1, V2, V3)
- Two-level facility building
- Solar-panel roof catchments
- Villa pools + 815 m² facility pool
- Interconnected rainwater tank farm (3,706 kL)

3. OCCUPANCY SUMMARY

3.1 Villas (2 persons per bedroom)

Villa Type	Apts	People
V1	24	48
V2	24	72
V3	18	90
Total Villas	**66**	**210**

3.2 Facilities Building

Level	People
Level 1	215
Level 2	215
Total	**430**

4. WATER DEMAND SUMMARY

4.1 Per-Person Water Use

The water demand for the building is summarised as follows:

- **Total water use:** 200 L/person/day
- **Toilet flushing:** 60 L/person/day
- **Potable component:** 140 L/person/day
- **Flow rate:** 0.00231 L/s per person

5. NON-POTABLE WATER DEMAND (TOILETS + POOLS)

5.1 Toilets (Unique Population Basis)

Scenario	Toilets (kL/yr)
Full occupancy	11,188
Realistic occupancy	10,392

5.2 Pool Evaporation

The approximate not potable water consumption due to evaporation at all pools is:

Component	Annual Volume (kL/yr)
Villa pools	1,397
Facility pool	1,113
Total pools	**2,511**

5.3 Total Non-Potable Demand

Scenario	Toilets	Pools	Total
Full occupancy	11,188	2,511	**13,699 kL/yr**
Realistic occupancy	10,392	2,511	**12,903 kL/yr**

5.4 POTABLE WATER DEMAND (SHOWERS, KITCHEN, LAUNDRY, DRINKING)

Potable water = **140 L/person/day**.

5.5 Full Occupancy

$511 \times 140 = 71{,}540$ L/day

$71{,}540 \times 365 = 26{,}108{,}100$ L/yr $= 26{,}108$ kL/yr

But this is only the **unique population**. To match earlier villa + facility building totals, potable demand must be calculated per building:

5.5.1 Villas

$210 \times 140 = 29{,}400$ L/day $= 10{,}731$ kL/yr

5.5.2 Facility

$430 \times 140 = 60{,}200$ L/day $= 21{,}973$ kL/yr

5.5.3 Total Potable Demand

$10{,}731 + 21{,}973 = 32{,}704$ kL/yr

6. TOTAL WATER DEMAND (POTABLE + NON-POTABLE)

Scenario	Potable (kL/yr)	Non-Potable (kL/yr)	Total (kL/yr)
Full occupancy	32,704	13,699	**46,403**
Realistic occupancy	≈ 30,000	12,903	**≈ 42,900**

7. RAINWATER HARVESTING & STORAGE

7.1 Storage

Concrete tanks are provide in the under croft areas under the pools at each villa and main facilities building. The structure is also used to support eh pools above. All tanks are interconnected to form one large concealed tank farm. The various storage capacities are approximately as follows:

- Villa tanks: 2,851 kL
- Facility tank: 815 kL
- Facilities Building Under croft: 40 kL
- **Total: 3,706 kL**

7.2 Harvesting

Rainwater is harvested from the solar panel collects on the roof. The total catchment in each area is approximately as follows:

- Catchment: 8,854 m²
- Annual rainfall: 2,000 mm
- Runoff coefficient: 0.9

The estimated harvested water quantities are approximately as follows:

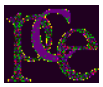
Season	Harvested Volume
Wet	12,746 kL
Dry	3,187 kL
Annual Total	**15,937 kL**

The harvested rainwater is first filters and the disinfected with UV lamps before being reticulated to toilet flushing systems and as make up water to pools where it is chloride disinfected.

8. WATER BALANCE (POTABLE + NON-POTABLE)

8.1 Non-Potable Balance

Scenario	Rainwater	Demand	Surplus
Full occupancy	15,937	13,699	**2,238 kL/yr**
Realistic occupancy	15,937	12,903	**3,034 kL/yr**



8.2 Potable Balance

Potable water is 100% Town mains supplied**.**
Potable water is used for all personal use, drinking, showering, food preparation and sue in all kitchens and laundries**.**

Scenario	Potable Demand	Rainwater Contribution
Full occupancy	**32,704 kL/yr**	**0**
Realistic occupancy	**≈ 30,000 kL/yr**	**0**

9. SYSTEM AUTONOMY

Metric	Value
Surplus non-potable days	60–86 days
Storage autonomy	99–105 days
Potable autonomy	Council-dependent

10. LOW-RAINFALL PERFORMANCE

Even with rainfall reduced by **30–40%**, annual harvesting remains **9,600–11,200 kL**, partially covering non-potable demand. Council supply supplements potable and any shortfall in non-potable demand.

11. CONCLUSION THE WONGA BEACH RESORT WATER STRATEGY:

- Meets **all non-potable water demands** under normal rainfall
- Provides **~100 days** of storage autonomy
- Reduces Council water use by **>30%**
- Requires Council supply only for **potable water** and **drought-year supplementation**
- Is f**it-for-purpose**, **sustainable**, and **RPEQ-compliant.** The development accommodates a unique site population of approximately 511 persons at full occupancy.
- Total non-potable demand for toilet flushing and pool evaporation is approximately 13,699 kL/yr (full occupancy) and 12,903 kL/yr (realistic occupancy).
- The proposed rainwater harvesting system, with 8,854 m² of catchment and 3,706 kL of storage, yields approximately 15,937 kL/yr under typical rainfall.
- Under average conditions, rainwater harvesting **fully covers** toilet flushing and pool top-up demands, with a surplus equivalent to 60–86 days of demand depending on occupancy.
- In low-rainfall years, rainwater may not fully meet non-potable demand, but the system still substantially reduces reliance on Council supply.
- Potable water for drinking and hygiene remain supplied from Council mains, with rainwater used primarily for toilets and pool top-up.

- With appropriate water quality treatment, maintenance access, and separate firefighting design, the proposed system provides a robust and sustainable water strategy for the development.

12. LIMITATION CLARIFICATION NOTE

It should be noted the various figures and quantities detail in this assessment are approximate based on the preliminary nature of Town Planning drawings. The figures represents the project intend and general quantum. However, these figures are not absolute and some variation on quantum may occur as structural and building construction details are finalised.

We trust the above address the matters raised in item 26 of the requested information,

Yours faithfully
Proactive Consulting Engineers Pty Ltd

Gino Fabris
Director
Practising Registered Professional Engineer of Queensland
REPQ: No 06041

Appendix E

Stormwater Detention Calculations

CLIVE STEELE PARTNERS
Consulting Structural & Civil Engineers
62 / 195 Wellington Road, Clayton, Victoria 3168
Telephone: (03) 9545 0223 Facsimile: (03) 9545 3022
Email: csp@clivesteele.com.au

Computation Sheet ..01..
Project Number ..21342..
Designed ..NY.. ...../...../.....
..../...../.....

- TOTAL SITE AREA = 49,882 m²

- ROOF AREA: V1 = 12 x 291
  V2 = 12 x 327
  V3 = 9 x 406
  CENTRAL BUILDING = 3,712 m²
  COVERED WALKWAYS = 5,630 m²
  ⇒ TOTAL ROOF = 20,412 m²

- PAVED AREA = 1508 + 319 = 1,827 m²

⇒ PERMEABLE AREA = 27,643 m²

CLIVE STEELE PARTNERS
Consulting Structural & Civil Engineers
62 / 195 Wellington Road, Clayton, Victoria 3168
Telephone: (03) 9545 0223 Facsimile: (03) 9545 3022
Email: csp@clivesteele.com.au

Computation Sheet 02
Project Number 21342
Designed N.Y. ... / ... / ...
... / ... / ...

POST DEVELOPMENT COEFFICIENT OF DISCHARGE

(SECTION 4.5) QUDM

$C_y = F_y \cdot C_{10}$

- WEIGHTED COEFFICEN OF RUNOFF $= \dfrac{(20412 \times 0.98 + 1827 \times 0.9) + 27643 \times 0.3}{49\,882}$

$= 0.6$

- URBAN RESIDENTIAL - LOW DENSITY (INC. ROADS) $\Rightarrow f_i = 0.6$ (Table 4.5.1)

- $F_y = 1.0$ (10% AEP) TABLE 4.5.2

- $C_{10} = 0.82$

$\Rightarrow C_y = 1.0 \times 0.82 = 0.82$

TIME OF CONCENTRATION (4.6.3)

TABLE 4.6.1 , CATCHMENT CONDITION 'C'

OVERLAND SHEET FLOW (4.6.6)

$t = (107\, n\, L^{0.333}) / S^{0.2}$, EQUATION 4.5

$L = 146m$, $S = 0.0009$, $n = 0.075 \Rightarrow t = 172$ min SOUTH RUN

$L = 87m$, $S = 0.005$, $n = 0.075 \Rightarrow t = 103$ min SOUTH RUN

CLIVE STEELE PARTNERS
Consulting Structural & Civil Engineers
62 / 195 Wellington Road, Clayton, Victoria 3168
Telephone: (03) 9545 0223 Facsimile: (03) 9545 3022
Email: csp@clivesteele.com.au

Computation Sheet 3
Project Number 21342
Designed TH 22 / 04 / 2026
..... / ..... / .....

Detention basin 3960 m³.

Roof 20,412
- walkways 5630. @ 125 = 704 m³
- villas only = 11070 @ 125 = 1384
- main pavilion = 3712 @ 125 = 464

Detention Basin 1 ≈ 407 m²
- Ground Level RL = 2.5
- water depth ≈ 700 mm 226 m³

Detention Basin 2 ≈ 278 m² @
- Ground level RL 2.80
- water depth = 700 mm => Vol. ≈ 150 m³ / 2928

Water level ≈ 1.770
=> pipe 60 m @ 1:200 0.3 m.
=> max. water depth. ≈ 700 m.
=> Volume

② Top A. = (278 m² - 152) × 0.35 = 44.1
Btm A = 152 m² × 0.7 = 106.4
150 m³

① Top A = (407 m² - 238.) @ 0.35 = 59.
Btm A = 238 m² × 0.7 = 167
226 m³

③ Exst Dam 2598 m² @ 1.82
2915 m² @ 2.0 (max. ht)
Top @ 2000 mm

Require 3960 - 2928 = 1032 m³. /2600 nom. = 400 mm.

Overspill @ 2.0 m → Dam falls to RL 1.60 m.

CLIVE STEELE PARTNERS

Consulting Structural & Civil Engineers

62 / 195 Wellington Road, Clayton, Victoria 3168
Telephone: (03) 9545 0223 Facsimile: (03)9545 3022
Email: csp@clivesteele.com.au

Computation Sheet..... C1
Project Number..... 21342
Designed..... NY
Date..... 17/04/2026

DETENTION SYSTEM

Pre Development Assumed Conditions

Total Site Area	49882 (m^2)
0.3 Runoff Coefficient	14964.6 (m^2)
ARI	10 (Years)
DURATION	172 (Mins)

Intensity Calculation

T	LN(T)	C0	C1	C2	C3	C4	C5	C6
172	5.147494477	1.521741	0.92	-0.041709471	-0.0116007	0.003063719	-0.00024	5.31E-06

LN(I)	=	4.944	
I	=	48.95	mm/hr

INTENSITY	48.9 (mm/hr)
Assumed Area Contributing	14964.60 (m^2)
Pre Dev. Discharge	203.47 (L/s)

Post Development

ARI	10 (Years)	
DURATION	331 (Mins)	CRITICAL STORM DURATION

Intensity Calculation

T	LN(T)	C0	C1	C2	C3	C4	C5	C6
330.827995	5.801598588	1.521741	0.92	-0.041709471	-0.0116007	0.003063719	-0.00024	5.31E-06

LN(I)	=	5.276	
I	=	35.47	mm/hr

INTENSITY	35.47 (mm/hr)

Name	Area	Runoff Coefficients (C)	Discharge Rate (Q)	
Roof	20412	0.82	164.90	Adopt c of 0.82 for all areas as per QUDM
Pavement	1827	0.82	14.76	
Permeable	27643	0.82	223.31	

Storage Requirements

Pre Dev. Discharge	203.47 (L/s)
Unrestricted Disch.	402.97 (L/s)
Storage Flow Rate	199.50 (L/s)
Storage Volume	3959.98 (m^3)

Appendix F

Geotechnical Report

GILBERT+SUTHERLAND
agriculture · water · environment

April 21, 2010

IPA LAW
Level 2,
4-6 Innovation Parkway
Birtinya
Q 4575

Attention: Andrew Davis

Dear Andrew,

RE: PRELIMINARY SITE ASSESSMENT, SITE AT OASIS DRIVE, WONGA BEACH

Further to your request, please find as follows our preliminary assessment of the Wonga Beach site for the purposes of determining the suitability of an 800m^2 minimum lot size for on-site effluent disposal. This incorporates a preliminary site assessment and desktop review of the information provided to date.

Desktop Review
From a review of the Golder Associates assessment, the site soils consist of predominantly 0.5 - 0.75m brown silty SAND overlying yellow brown to pale grey SAND to 3 - 3.5m overlying dark grey CLAYEY SILTS to SANDY CLAYEY SILTS.

Exceptions to this were soils encountered in the vicinity of boreholes BH05 and BH11 of the 12 boreholes drilled in total. BH05 had 0.75m of SILTY SAND FILL from near surface (0.00m) overlying approx. 0.5m of SILTY CLAY FILL overlying the natural sand horizon. BH11 had 1m of SILTY CLAY FILL from near surface (0.25m) overlying the sand.

The watertable was generally encountered from 1-1.35m NSL (BHs 01, 02, 04, 08, 10, 11, 12) but was encountered at shallow depth in boreholes 03 and 07 (0.55m and 0.3m NSL respectively). No groundwater was encountered to the maximum depth of 5.5m in boreholes 05, 06 and 09.

These soils are similar to those encountered at 'The Ives'. However, groundwater was encountered at greater depth at 'The Ives' (1.8 to 2.1m NSL). This may be a reflection of both the increased site elevation and the date of observation given the much drier rainfall average for October (39.7mm) compared to January (397mm) (source BOM Cairns Airport).

Preliminary Site Assessment
A preliminary site assessment was undertaken on 12.04.10 by Gilbert & Sutherland staff. This incorporated a general inspection of the soil surface conditions and any impediments to on-site effluent disposal and an inspection of the recent drainage works by Council.

The hotel shown on the attached 2003 Google Earth image and Drawing 7427WEY-04 has been removed, however the asphalt roads still exist (although are degraded). The existing pond shown on the image and drawing in the central section of the site exists

and is approximately 0.3-0.5m below NSL (near surface level) (See attached Plates 2, 3 and 7). On initial inspection the pond appears to be a groundwater window - this will be confirmed with an additional inspection later this week or early next week.

There are three existing stormwater drains on the site:

- The northern drain which flows east-west
- The western drain which flows north-south; and
- The southern drain which flows east-west

The northern drain had a standing water level measured at 0.57m below the headwall at the eastern end of the drain (see Plate 15) and a depth of 0.07m; and 0.94m below the headwall at the western end of the drain (Plate 1) and a depth of 0.18m.

The western drain runs adjacent to a paved bike path which forms the western boundary of the site. The standing water level (taken adjacent the proposed loop road near lots 45-49 on Drawing M2186-07) was approximately 0.6m below NSL (Plate 11) with a depth of 0.19m.

Works have recently occurred in the southern drain. Standing water level was measured at 1.15m below the headwall at the western end (Plates 4, 5 and 12) with a depth of 0.10m, and approximately 1.3m below NSL at the eastern end (Plate 13) with a depth of 0.2m. Pictures were taken along the central section of the drain (Plates 8, 10 and 16) and the far western and eastern ends (Plates 5 and 9).

There was approximately 40-60m of veg between the eastern border and HAT. The site itself is highly disturbed and has been previously cleared of vegetation, and consists mainly of grasses. The southern section adjacent to the drain has recently been stripped.

An area of reasonably poor drainage was identified in the vicinity of (i.e. between) Golder Associates borehole locations BH06 and BH07 (i.e. lot 20) (Plate 14).

Drain works
As discussed above, Plates 8, 10 and 16 show the recent drainage works along the southern drain.

Preliminary conclusions
From the preliminary site assessment and review of supplied information, there appears to be only limited impediment with regard to on-site effluent disposal in relation to the proposed minimum lot size of 800m^2. Impediments include clay fill at shallow depth in the vicinity of Golder Associates borehole BH11 and some more poorly drained areas associated with a small drainage depression in the vicinity of Golder Associates boreholes BH06 and BH07.

This will be confirmed by another site visit either this week or early next week.

We have attached for your reference the Golder borehole logs with a handrawn borehole locations map over the lot layout extrapolated from the Golder Report.

To aid in further detailed assessment it would be very helpful if we could get the contour Drawing 7427WEY-04 by Charles O'Neil in ACAD to confirm these standing

water level measurements in mAHD – particularly at the headwalls (the levels are very hard to read on the photocopied version). An ACAD version of the existing stormwater layout with Z levels would also be very helpful.

We trust this is acceptable. Please contact us if you have any queries regarding this preliminary assessment.

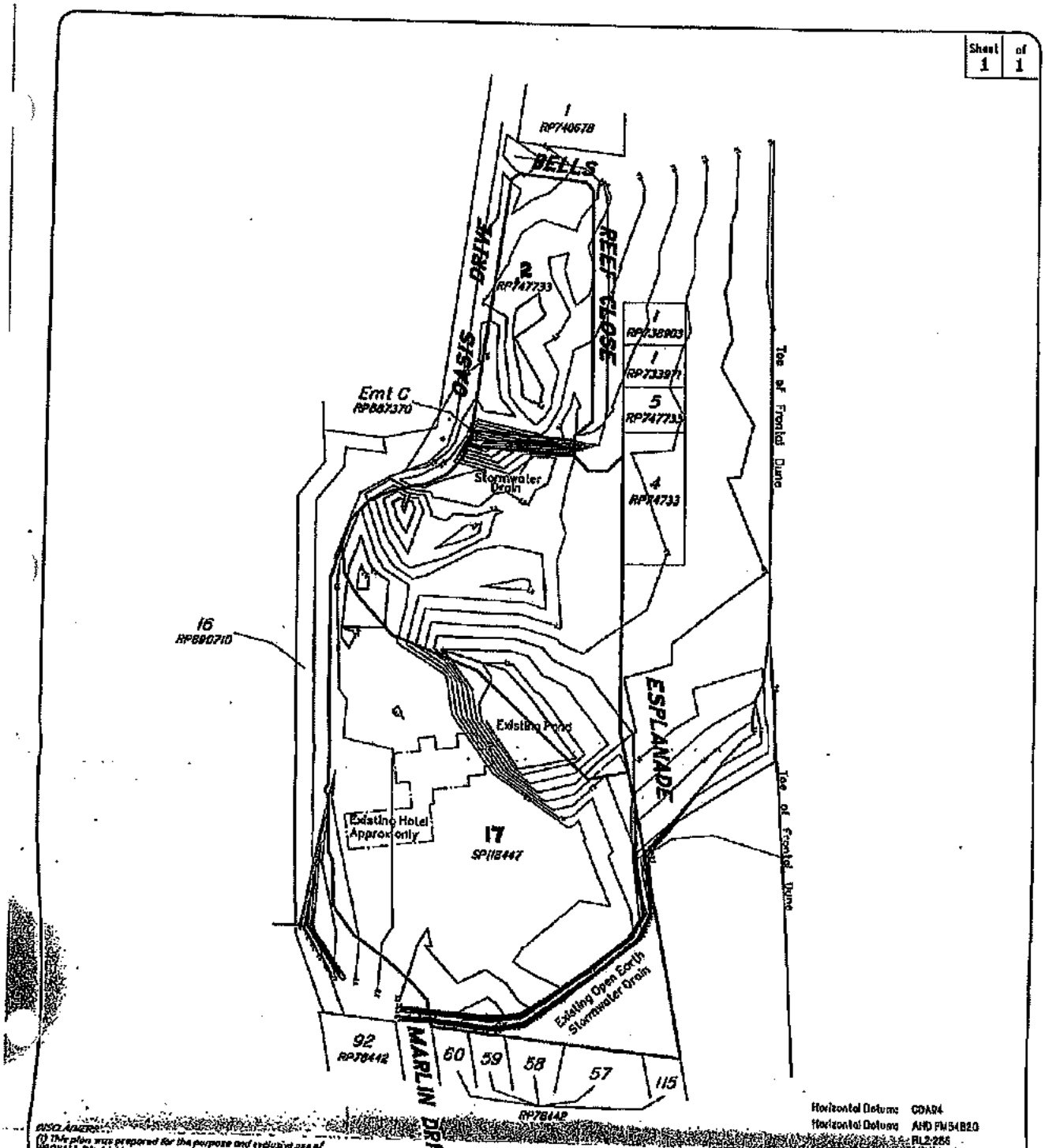
Yours faithfully,
Gilbert & Sutherland Pty Ltd

Greg Holland
Principal Environmental Scientist

Megan Hancock
Environmental Scientist

ATTACHMENT 1 – Google Earth Map 2003 and survey map Drawing 7427WEY-04 by Charles O'Neill Pty Ltd Consulting Surveyors


Jenaer Cl
Sylvia Cl
Ives Ave
Oasis Dr
Roy Cl
Julia Cl
Kalai St
Yumba Cl
Esplanade
© 2010 MapData Sciences Pty Ltd, PSMA
Image © 2010 DigitalGlobe
302 m
16°21'02.73" S 145°24'52.70" E
elev 13 m
Jun 22, 2003
Eye alt 1.06 km
©2008 Google



(i) This plan was prepared for the purpose and exclusive use of WROXALL PTY LTD to accompany an application to the DOUGLAS Shire Council for approval to subdivide the land described in the plan and is not to be used for any other purpose or by any other person or corporation. Charles O'Neill Pty. Ltd. accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this plan in contravention of the terms of this clause or clauses (ii) to (vi) hereof.

(ii) The contours shown on this plan are derived from preliminary field work, or other sources and are suitable only for the purposes of this application. The accuracy of the contours has not been verified and no reliance should be placed upon such contours for any purpose other than for the purpose of this application.

(iii) The dimensions, areas, size and location of improvements, flood information (if shown) and number of lots shown on this plan are approximate only and may vary.

(iv) Unless stated otherwise, no investigations have been carried out by Charles O'Neill Pty. Ltd. into whether or not any of the land has been filled, and it is recommended that such investigation be undertaken by a suitably qualified person.

(v) Scale shown is correct for the original plan and any copies of this plan should be verified by checking against the bar scale.

(vi) This plan may not be photocopied unless this note is included.

Charles O'Neill Pty. Ltd.
Consulting Surveyors

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ACN 010 329 174

Contour Plan of Lot 2 on RP747733 Easement C on RP887370 and Lot 17 on SP118447

PARISH: WHYANBEEL COUNTY: SOLANDER

Scale: 1:2000 – A3	
Drawn: AD	Checked: ERS
Cad Ref: 7427DT-04	Orig. Issue: 09/07
PASSED & ENDORSED: By: S. Sessions Date:	
Signed: Cadastral Surveyor	
Plan No. 7427WEY–04	

ATTACHMENT 2 – Golder Associates Borehole logs and locations overlay

REPORT OF BOREHOLE: BH01

CLIENT: Wroxall Investments
PROJECT: ASS Investigation
LOCATION: Wonga Beach
JOB NO: 077673054

POSITION: Refer to Site Plan
SURFACE RL: 2.8 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: mm HOLE DEPTH: 5.50 m

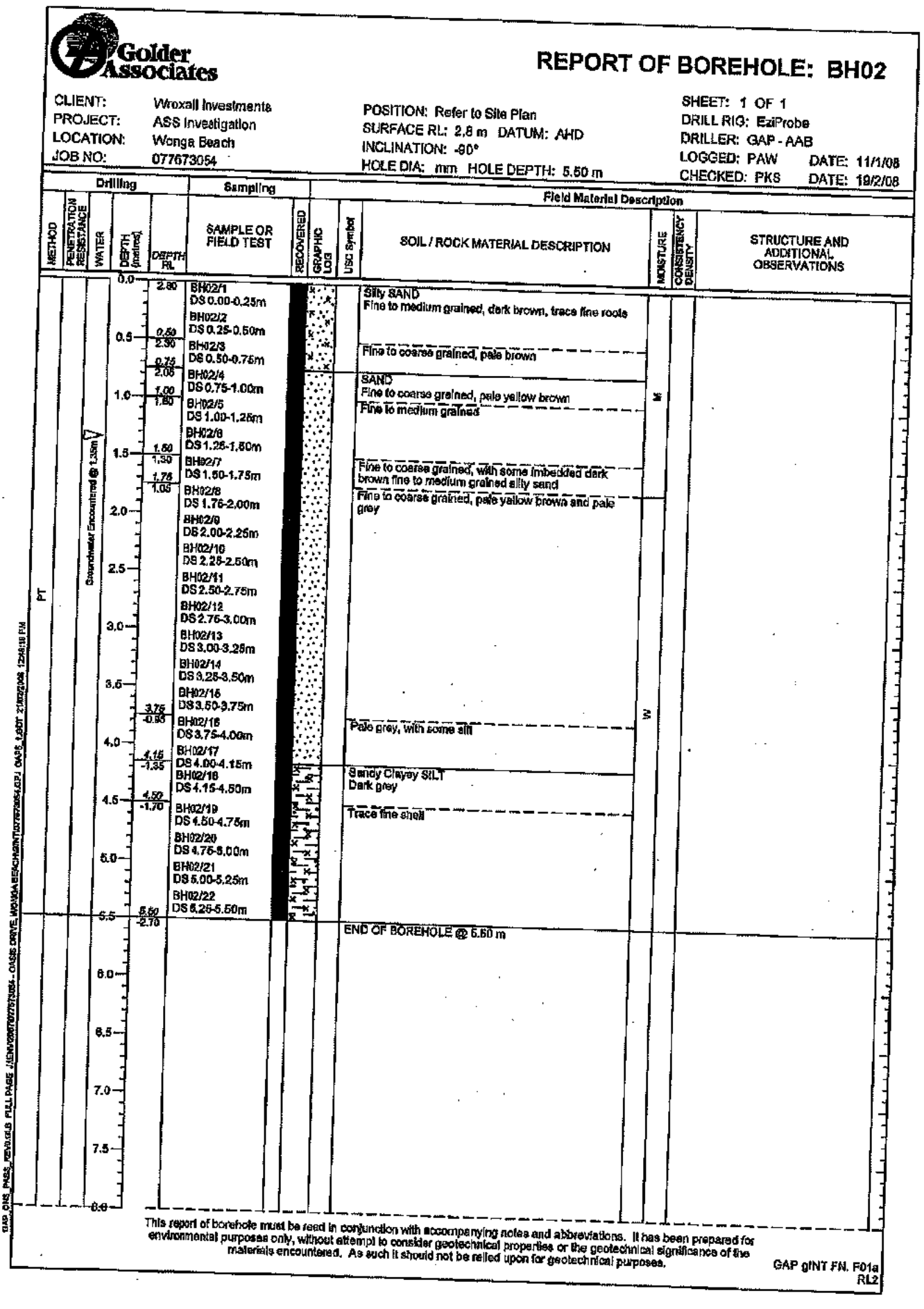
SHEET: 1 OF 1
DRILL RIG: EziProbe
DRILLER: GAP - AAB
LOGGED: PAW DATE: 11/1/08
CHECKED: PKS DATE: 19/2/08

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT		Groundwater Encountered @ 1.0m	0.0	2.80	BH01/1 DS 0.00-0.25m				Silty SAND Fine to coarse grained, brown, trace fine roots	M		
				0.25 2.55	BH01/2 DS 0.25-0.50m				Dark brown			
			0.5	0.50 2.30	BH01/3 DS 0.50-0.75m				SAND Fine to medium grained, pale yellow brown, no roots			
				0.75 2.05	BH01/4 DS 0.75-1.00m				Fine grained			
			1.0		BH01/5 DS 1.00-1.25m							
				1.25 1.55	BH01/6 DS 1.25-1.50m				Fine to coarse grained			
			1.5		BH01/7 DS 1.50-1.75m							
					BH01/8 DS 1.75-2.00m							
			2.0		BH01/9 DS 2.00-2.25m							
					BH01/10 DS 2.25-2.50m							
			2.5		BH01/11 DS 2.50-2.75m							
					BH01/12 DS 2.75-3.00m							
			3.0	3.00 -0.20	BH01/13 DS 3.00-3.25m				Pale grey			
				3.25 -0.45	BH01/14 DS 3.25-3.50m				With some small to medium shells			
			3.5	3.50 -0.70	BH01/15 DS 3.50-3.75m				Sandy Clayey SILT Pale grey, fine to medium grained sand, trace fine shells	W		
				3.75 -0.95	BH01/16 DS 3.75-4.00m				Clayey SILT Dark grey, trace fine grained sand and shell			
			4.0		BH01/17 DS 4.00-4.25m							
					BH01/18 DS 4.25-4.50m							
			4.5		BH01/19 DS 4.50-4.75m							
					BH01/20 DS 4.75-5.00m							
			5.0		BH01/21 DS 5.00-5.25m							
				5.50 -2.70	BH01/22 DS 5.25-5.50m				END OF BOREHOLE @ 5.50 m			
			5.5									
			6.0									
			6.5									
			7.0									
			7.5									
			8.0									

GAP_GINT_PKSS_REVISED FULL PAGE J:\ENVIRO\077673054 - OASIS DRIVE, WONGA BEACH\DRG\077673054.GPJ GAP5_1.GDT 21/02/2008 12:45:57 PM

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.

GAP gINT FN. F01a RL2


Golder Associates
REPORT OF BOREHOLE: BH02
CLIENT: Wroxall Investments
PROJECT: ASS Investigation
LOCATION: Wonga Beach
JOB NO: 077673054
POSITION: Refer to Site Plan
SURFACE RL: 2.8 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: mm HOLE DEPTH: 5.60 m
SHEET: 1 OF 1
DRILL RIG: EziProbe
DRILLER: GAP - AAB
LOGGED: PAW DATE: 11/1/08
CHECKED: PKS DATE: 19/2/08
Drilling
Sampling
Field Material Description
METHOD
PENETRATION RESISTANCE
WATER
DEPTH (metres)
DEPTH RL
SAMPLE OR FIELD TEST
RECOVERED
GRAPHIC LOG
USC Symbol
SOIL / ROCK MATERIAL DESCRIPTION
MOISTURE
CONSISTENCY DENSITY
STRUCTURE AND ADDITIONAL OBSERVATIONS
PT
Groundwater Encountered @ 1.35m
BH02/1 DS 0.00-0.25m
BH02/2 DS 0.25-0.50m
BH02/3 DS 0.50-0.75m
BH02/4 DS 0.75-1.00m
BH02/5 DS 1.00-1.25m
BH02/6 DS 1.25-1.50m
BH02/7 DS 1.50-1.75m
BH02/8 DS 1.76-2.00m
BH02/9 DS 2.00-2.25m
BH02/10 DS 2.25-2.50m
BH02/11 DS 2.50-2.75m
BH02/12 DS 2.76-3.00m
BH02/13 DS 3.00-3.25m
BH02/14 DS 3.25-3.50m
BH02/15 DS 3.50-3.75m
BH02/16 DS 3.75-4.00m
BH02/17 DS 4.00-4.15m
BH02/18 DS 4.15-4.50m
BH02/19 DS 4.50-4.75m
BH02/20 DS 4.75-5.00m
BH02/21 DS 5.00-5.25m
BH02/22 DS 5.25-5.50m
2.80
0.50 2.30
0.75 2.05
1.00 1.80
1.50 1.30
1.75 1.05
3.75 -0.95
4.15 -1.35
4.50 -1.70
5.50 -2.70
Silty SAND
Fine to medium grained, dark brown, trace fine roots
Fine to coarse grained, pale brown
SAND
Fine to coarse grained, pale yellow brown
Fine to medium grained
Fine to coarse grained, with some imbedded dark brown fine to medium grained silty sand
Fine to coarse grained, pale yellow brown and pale grey
Pale grey, with some silt
Sandy Clayey SILT
Dark grey
Trace fine shell
END OF BOREHOLE @ 5.60 m
M
W
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for geotechnical purposes.
GAP gINT FN. F01a RL2

Golder Associates

REPORT OF BOREHOLE: BH03

CLIENT: Wroxall Investments	POSITION: Refer to Site Plan	SHEET: 1 OF 1	
PROJECT: ASS Investigation	SURFACE RL: 2.4 m DATUM: AHD	DRILL RIG: EziProbe	
LOCATION: Wonga Beach	INCLINATION: -90°	DRILLER: GAP - AAB	
JOB NO: 077673054	HOLE DIA: mm HOLE DEPTH: 5.50 m	LOGGED: PAW	DATE: 11/1/08
		CHECKED: PKS	DATE: 19/2/08

METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT			0.0	2.40	BH03/1 DS 0.00-0.25m				Silty SAND Fine to medium grained, brown, through to pale yellow brown, trace fine roots	M		
				0.25 / 2.15	BH03/2 DS 0.25-0.50m				Pale brown			
		Groundwater Encountered @ 0.55m	0.5	0.50 / 1.90	BH03/3 DS 0.50-0.75m				SAND Fine to medium grained, pale yellow brown			
					BH03/4 DS 0.75-1.00m							
			1.0		BH03/5 DS 1.00-1.25m							
				1.25 / 1.15	BH03/6 DS 1.25-1.50m				Fine to coarse grained			
			1.5		BH03/7 DS 1.50-1.75m							
				1.75 / 0.65	BH03/8 DS 1.75-2.00m				Pale grey			
			2.0		BH03/9 DS 2.00-2.25m							
				2.25 / 0.15	BH03/10 DS 2.25-2.50m				Medium to coarse grained			
			2.5	2.50 / -0.10	BH03/11 DS 2.50-3.00m				Fine to coarse grained			
			3.0		BH03/12 DS 3.00-3.50m					W		
			3.5	3.50 / -1.10	BH03/13 DS 3.50-4.50m				With some silt			
			4.0									
			4.5	4.50 / -2.10	BH03/14 DS 4.50-5.00m				Silty Clayey SAND Fine to coarse grained, grey			
			5.0	5.00 / -2.60	BH03/15 DS 5.00-5.50m				Sandy Clayey SILT Dark grey, with trace coarse sand and shell			
			5.5	5.50 / -3.10					END OF BOREHOLE @ 5.50 m			
			6.0									
			6.5									
			7.0									
			7.5									
			8.0									

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GAP gINT FN. F01a RL2

REPORT OF BOREHOLE: BH04

Golder Associates

CLIENT: Wroxall Investments
PROJECT: ASS Investigation
LOCATION: Wonga Beach
JOB NO: 077673054

POSITION: Refer to Site Plan
SURFACE RL: 2.2 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: mm HOLE DEPTH: 5.50 m

SHEET: 1 OF 1
DRILL RIG: EziProbe
DRILLER: GAP - AAB
LOGGED: PAW DATE: 11/1/08
CHECKED: PKS DATE: 19/2/08

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT		Groundwater Encountered @ 1.1m	0.0	2.20	BH04/1 DS 0.00-0.25m				Silty SAND Fine to medium grained, brown, trace fine roots			
				0.60	BH04/2 DS 0.25-0.50m							
			0.5	1.70	BH04/3 DS 0.50-0.75m				SAND Fine to coarse grained, pale yellow brown	M		
					BH04/4 DS 0.75-1.00m							
			1.0	1.00 1.20	BH04/5 DS 1.00-1.25m				Fine to medium grained			
					BH04/6 DS 1.25-1.50m							
			1.5	1.50 0.70	BH04/7 DS 1.50-1.75m				With some imbedded dark brown fine to medium grained silty sand			
				1.75 0.45	BH04/8 DS 1.75-2.00m				Fine to coarse grained, no imbedded silty sand			
			2.0	2.00 0.20	BH04/9 DS 2.00-2.25m				Pale yellow brown and pale grey			
				2.25 -0.05	BH04/10 DS 2.25-2.50m				Pale grey, trace roots			
			2.5	2.50 -0.30	BH04/11 DS 2.50-3.00m				No roots			
			3.0		BH04/12 DS 3.00-3.50m					W		
			3.5	3.60 -1.40	BH04/13 DS 3.50-3.75m				Clayey SILT Dark grey, trace medium to coarse grained sand			
					BH04/14 DS 3.75-4.00m							
			4.0	4.00 -1.80	BH04/15 DS 4.00-4.25m				Clayey SILT Grey, trace fine shell			
					BH04/16 DS 4.25-4.50m							
			4.5		BH04/17 DS 4.50-5.00m							
			5.0		BH04/18 DS 5.00-5.50m							
			5.5	5.50 -3.30					END OF BOREHOLE @ 5.50 m			
			6.0									
			6.5									
			7.0									
			7.5									
			8.0									

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GAP gINT FN. F01a RL2

GAP_CHG_PASS_REVGLB FULL PATH: J:\ENVIRO\077673054 - CASINO DRIVE, WONGA BEACH\BOREHOLES\077673054.GPJ GAPS_1.GDT 21/2/2008 12:46:36 PM

REPORT OF BOREHOLE: BH05

Golder Associates

CLIENT: Wroxall Investments	POSITION: Refer to Site Plan	SHEET: 1 OF 1	
PROJECT: ASS Investigation	SURFACE RL: 2.9 m DATUM: AHD	DRILL RIG: EziProbe	
LOCATION: Wonga Beach	INCLINATION: -90°	DRILLER: GAP - AAB	
JOB NO: 077673054	HOLE DIA: mm HOLE DEPTH: 5.50 m	LOGGED: PAW	DATE: 11/1/08
		CHECKED: PKS	DATE: 19/2/08

Method: PT. Water: Groundwater Not Encountered.

DEPTH (metres)	DEPTH / RL	SAMPLE OR FIELD TEST	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	STRUCTURE AND ADDITIONAL OBSERVATIONS
0.0	2.90	BH05/1 DS 0.00-0.25m	FILL - Silty SAND. Fine to coarse grained, dark brown through to brown, trace fine roots	M	
		BH05/2 DS 0.25-0.50m			
0.5	0.50 / 2.40	BH05/3 DS 0.50-0.75m	Fine to medium grained, pale brown, with some fine to medium gravel, with some clay		
	0.75 / 2.15	BH05/4 DS 0.75-1.00m	FILL - Silty CLAY. Pale brown and pale red brown, trace fine to medium grained gravel, trace fine to medium grained sand		
1.0	1.00 / 1.90	BH05/5 DS 1.00-1.25m	Trace fine to coarse grained gravel		
	1.25 / 1.65	BH05/6 DS 1.25-1.50m	Silty SAND. Fine to coarse grained, pale yellow brown		
1.5	1.50 / 1.40	BH05/7 DS 1.50-1.75m	SAND. Fine grained, pale yellow brown	W	
		BH05/8 DS 1.75-2.00m			
2.0	2.00 / 0.90	BH05/9 DS 2.00-2.25m	Fine to medium grained sand		
	2.25 / 0.65	BH05/10 DS 2.25-2.50m	Fine to coarse grained sand		
2.5	2.50 / 0.40	BH05/11 DS 2.50-2.75m	Pale yellow brown and pale grey		
	2.75 / 0.15	BH05/12 DS 2.75-3.00m	Pale grey		
3.0		BH05/13 DS 3.00-3.25m			
		BH05/14 DS 3.25-3.50m			
3.5	3.50 / -0.60	BH05/15 DS 3.50-3.75m	Medium to coarse grained		
	3.75 / -0.85	BH05/16 DS 3.75-4.00m	Fine to coarse grained		
4.0	4.00 / -1.10	BH05/17 DS 4.00-4.25m	Clayey SILT. Dark grey, trace medium to coarse grained sand, trace fine to medium shells		
		BH05/18 DS 4.25-4.50m			
4.5		BH05/19 DS 4.50-4.75m			
		BH05/20 DS 4.75-5.00m			
5.0		BH05/21 DS 5.00-5.25m			
		BH05/22 DS 5.25-5.50m			
5.5	5.50 / -2.60		END OF BOREHOLE @ 5.50 m		
6.0					
6.5					
7.0					
7.5					
8.0					

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GAP gINT FN. F01a R12

GAP_CMS_PASS_REVGLB_FULL PAGE J:\ENV\2007\077673054 - OASIS DRIVE, WONGA BEACH\GINT\077673054.GPJ GAPS_1.GDT 21/02/2008 12:46:26 PM

Golder Associates

REPORT OF BOREHOLE: BH06

CLIENT: Wroxall Investments
PROJECT: ASS Investigation
LOCATION: Wonga Beach
JOB NO: 077673054

POSITION: Refer to Site Plan
SURFACE RL: 2.5 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: mm HOLE DEPTH: 5.50 m

SHEET: 1 OF 1
DRILL RIG: EziProbe
DRILLER: GAP - AAB
LOGGED: PAW DATE: 11/1/08
CHECKED: PKS DATE: 19/2/08

Drilling: METHOD: FT; WATER: Groundwater Not Encountered

DEPTH (metres)	DEPTH / RL	SAMPLE OR FIELD TEST	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	STRUCTURE AND ADDITIONAL OBSERVATIONS
0.0	2.50	BH06/1 DS 0.00-0.25m	Silty SAND Fine to coarse grained, brown, trace fine roots	W	
	0.25 / 2.25	BH06/2 DS 0.25-0.50m	Becoming pale yellow brown		
0.5	0.50 / 2.00	BH06/3 DS 0.50-0.75m	SAND Fine to medium grained, pale yellow brown		
	0.75 / 1.75	BH06/4 DS 0.75-1.00m	Fine grained		
1.0	1.00 / 1.50	BH06/5 DS 1.00-1.25m	Fine to coarse grained		
	1.25 / 1.25	BH06/6 DS 1.25-1.50m	Trace roots		
1.5		BH06/7 DS 1.50-1.75m			
		BH06/8 DS 1.75-2.00m			
2.0		BH06/9 DS 2.00-2.25m			
	2.25 / 0.25	BH06/10 DS 2.25-2.50m	Medium to coarse grained, pale grey, trace fine shell		
2.5	2.50 / 0.00	BH06/11 DS 2.50-2.75m	Fine to coarse grained		
		BH06/12 DS 2.75-3.00m			
3.0	3.00 / -0.50	BH06/13 DS 3.00-3.25m	Sandy Clayey SILT Dark grey, trace fine shells		
		BH06/14 DS 3.25-3.50m			
3.5		BH06/15 DS 3.50-3.75m			
		BH06/16 DS 3.75-4.00m			
4.0		BH06/17 DS 4.00-4.25m			
	4.25 / -1.75	BH06/18 DS 4.25-4.50m	No shells		
4.5	4.50 / -2.00	BH06/19 DS 4.50-4.75m	Trace fine shells		
		BH06/20 DS 4.75-5.00m			
5.0		BH06/21 DS 5.00-5.25m			
		BH06/22 DS 5.25-5.50m			
5.5	5.50 / -3.00		END OF BOREHOLE @ 5.50 m		
6.0					
6.5					
7.0					
7.5					
8.0					

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GAP gINT FN. F01a RL2

Golder Associates

REPORT OF BOREHOLE: BH07

CLIENT: Wroxall Investments	POSITION: Refer to Site Plan	SHEET: 1 OF 1	
PROJECT: ASS Investigation	SURFACE RL: 2.3 m DATUM: AHD	DRILL RIG: EziProbe	
LOCATION: Wonga Beach	INCLINATION: -90°	DRILLER: GAP - AAB	
JOB NO: 077673054	HOLE DIA: mm HOLE DEPTH: 5.50 m	LOGGED: PAW	DATE: 11/1/08
		CHECKED: PKS	DATE: 19/2/08

Drilling: METHOD: PT; WATER: Groundwater Encountered @ 0.3m

DEPTH RL	SAMPLE OR FIELD TEST	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
0.0 / 2.30	BH07/1 DS 0.00-0.25m	Silty SAND Fine to medium grained, brown, trace fine roots			
	BH07/2 DS 0.25-0.50m				
	BH07/3 DS 0.50-0.75m				
0.75 / 1.55	BH07/4 DS 0.75-1.00m	SAND Fine to medium grained, pale yellow brown			
	BH07/5 DS 1.00-1.25m				
	BH07/6 DS 1.25-1.50m				
1.50 / 0.80	BH07/7 DS 1.50-1.75m	With some dark brown fine to medium grained silty sand			
1.75 / 0.55	BH07/8 DS 1.75-2.00m	No silty sand			
	BH07/9 DS 2.00-2.25m				
2.25 / 0.05	BH07/10 DS 2.25-2.50m	Pale grey, medium to coarse grained			
	BH07/11 DS 2.50-2.75m		W		
	BH07/12 DS 2.75-3.00m				
	BH07/13 DS 3.00-3.25m				
3.25 / -0.95	BH07/14 DS 3.25-3.50m	Sandy Clayey SILT Fine to coarse grained, pale grey, trace fine shell			
3.50 / -1.20	BH07/15 DS 3.50-3.75m	Dark grey			
	BH07/16 DS 3.75-4.00m				
	BH07/17 DS 4.00-4.25m				
	BH07/18 DS 4.25-4.50m				
	BH07/19 DS 4.50-4.75m				
	BH07/20 DS 4.75-5.00m				
	BH07/21 DS 5.00-5.25m				
	BH07/22 DS 5.25-5.50m				
5.50 / -3.20		END OF BOREHOLE @ 5.50 m			

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GAP gINT FN. F01a RL2

Golder Associates

REPORT OF BOREHOLE: BH08

CLIENT: Wroxall Investments	POSITION: Refer to Site Plan	SHEET: 1 OF 1	
PROJECT: ASS Investigation	SURFACE RL: 2 m DATUM: AHD	DRILL RIG: EziProbe	
LOCATION: Wonga Beach	INCLINATION: -90°	DRILLER: GAP - AAB	
JOB NO: 077673054	HOLE DIA: mm HOLE DEPTH: 5.50 m	LOGGED: PAW	DATE: 12/1/08
		CHECKED: PKS	DATE: 19/2/08

Drilling: METHOD: PT; WATER: Groundwater Encountered @ 1.2m

DEPTH (metres)	DEPTH / RL	SAMPLE OR FIELD TEST
0.00	2.00	BH08/1 DS 0.00-0.25m
0.25	1.75	BH08/2 DS 0.25-0.50m
		BH08/3 DS 0.50-0.75m
0.75	1.25	BH08/4 DS 0.75-1.00m
		BH08/5 DS 1.00-1.25m
		BH08/6 DS 1.25-1.50m
		BH08/7 DS 1.50-1.75m
1.75	0.25	BH08/8 DS 1.75-2.00m
2.00	0.00	BH08/9 DS 2.00-2.25m
2.25	-0.25	BH08/10 DS 2.25-2.50m
2.50	-0.50	BH08/11 DS 2.50-2.75m
		BH08/12 DS 2.75-3.00m
		BH08/13 DS 3.00-3.25m
3.25	-1.25	BH08/14 DS 3.25-3.50m
3.50	-1.50	BH08/15 DS 3.50-3.75m
3.75	-1.75	BH08/16 DS 3.75-4.00m
		BH08/17 DS 4.00-4.25m
		BH08/18 DS 4.25-4.50m
		BH08/19 DS 4.50-5.00m
		BH08/20 DS 5.00-5.50m
5.50	-3.50	

Field Material Description

Depth (m)	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE
0.00	Silty SAND Fine to coarse grained, brown, trace fine to medium roots	
0.25	SAND Fine to medium grained, pale yellow brown, trace medium roots	M
0.75	Fine grained	
1.75	Fine to medium grained	W
2.00	Pale yellow brown and pale grey, trace roots	
2.25	Fine to coarse grained, pale grey	
2.50	No roots	
3.25	Medium to coarse grained	
3.50	Sandy Clayey SILT Pale grey, trace fine shell	W
3.75	Dark grey	
5.50	END OF BOREHOLE @ 5.50 m	

STRUCTURE AND ADDITIONAL OBSERVATIONS: (none recorded)

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GAP gINT FN. F01a RL2

REPORT OF BOREHOLE: BH09

Golder Associates

CLIENT: Wroxall Investments	POSITION: Refer to Site Plan	SHEET: 1 OF 1	
PROJECT: ASS Investigation	SURFACE RL: 2.9 m DATUM: AHD	DRILL RIG: EziProbe	
LOCATION: Wonga Beach	INCLINATION: -90°	DRILLER: GAP - AAB	
JOB NO: 077673054	HOLE DIA: mm HOLE DEPTH: 5.50 m	LOGGED: PAW	DATE: 12/1/08
		CHECKED: PKS	DATE: 19/2/08

METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT		Groundwater Not Encountered	0.0	2.90	BH09/1 DS 0.00-0.25m				SAND Fine to medium grained, pale yellow brown and pale brown, trace fine to medium roots, trace of silt	M		
			0.25	2.65	BH09/2 DS 0.25-0.50m				With some dark brown fine to medium grained silty sand			
			0.50	2.40	BH09/3 DS 0.50-0.75m				No silty sand, no roots			
			0.75	2.15	BH09/4 DS 0.75-1.00m				Pale yellow brown			
					BH09/5 DS 1.00-1.25m							
					BH09/6 DS 1.25-1.50m							
			1.50	1.40	BH09/7 DS 1.50-1.75m				Fine grained			
			1.75	1.15	BH09/8 DS 1.75-2.00m				Fine to medium grained			
			2.00	0.90	BH09/9 DS 2.00-2.25m				Pale yellow brown and pale grey			
			2.25	0.65	BH09/10 DS 2.25-2.50m				Fine to coarse grained, trace roots			
			2.50	0.40	BH09/11 DS 2.50-3.00m				No roots			
					BH09/12 DS 3.00-3.50m							
			3.50	-0.60	BH09/13 DS 3.50-3.75m				Sandy Clayey SILT Dark grey, fine to medium grained sand, trace fine shells	W		
					BH09/14 DS 3.75-4.00m							
					BH09/15 DS 4.00-4.25m							
					BH09/16 DS 4.25-4.50m							
					BH09/17 DS 4.50-5.50m							
			5.50	-2.60					END OF BOREHOLE @ 5.50 m			

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GAP gINT FN. F01a RL2

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Golder Associates

REPORT OF BOREHOLE: BH10

CLIENT:	Wroxall Investments	POSITION: Refer to Site Plan		SHEET: 1 OF 1	
PROJECT:	ASS Investigation	SURFACE RL: 2.9 m	DATUM: AHD	DRILL RIG: EziProbe	
LOCATION:	Wonga Beach	INCLINATION: -90°		DRILLER: GAP - AAB	
JOB NO:	077673054	HOLE DIA: mm	HOLE DEPTH: 5.50 m	LOGGED: PAW	DATE: 12/1/08
				CHECKED: PKS	DATE: 19/2/08

Drilling: METHOD: PT; PENETRATION RESISTANCE; WATER: Groundwater Encountered @ 1.3m ▽

DEPTH / RL	SAMPLE OR FIELD TEST	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
0.00 / 2.90 – 0.25	BH10/1 DS 0.00-0.25m	Sandy SILT Dark brown, fine to medium grained sand, with some clay, with some fine to medium grained gravel, trace fine roots	W		
0.25 / 2.65 – 0.50	BH10/2 DS 0.25-0.50m	Silty SAND Fine to medium grained, dark brown, with some clay, trace fine roots			
0.50 / 2.40 – 0.75	BH10/3 DS 0.50-0.75m	Clayey SAND Fine to coarse grained, pale grey brown and pale brown, trace fine roots			
0.75 / 2.15 – 1.00	BH10/4 DS 0.75-1.00m				
1.00 / 1.90	BH10/5 DS 1.00-1.25m	SAND Fine to medium grained, pale yellow brown			
	BH10/6 DS 1.25-1.50m	Fine grained			
	BH10/7 DS 1.50-1.75m				
2.00	BH10/8 DS 1.75-2.00m				
2.00 / 0.90 – 2.25	BH10/9 DS 2.00-2.25m	Fine to coarse grained, trace decomposing roots			
2.25 / 0.65	BH10/10 DS 2.25-2.50m	Pale yellow brown and pale grey			
2.75	BH10/11 DS 2.50-2.75m				
2.75 / 0.15 – 3.00	BH10/12 DS 2.75-3.00m	Pale grey			
3.00 / -0.10 – 3.25	BH10/13 DS 3.00-3.25m	Medium to coarse grained			
3.25 / -0.35	BH10/14 DS 3.25-3.50m	Sandy Clayey SILT Dark grey, trace fine shell			
	BH10/15 DS 3.50-4.00m				
4.00 / -1.10	BH10/16 DS 4.00-4.50m	With some medium to coarse grained gravel			
4.50 / -1.60	BH10/17 DS 4.50-5.00m	Trace medium grained gravel			
5.00 / -2.10	BH10/18 DS 5.00-5.50m	No gravel			
5.50 / -2.60		END OF BOREHOLE @ 5.50 m			

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REPORT OF BOREHOLE: BH11

CLIENT: Wroxall Investments
PROJECT: ASS Investigation
LOCATION: Wonga Beach
JOB NO: 077673054

POSITION: Refer to Site Plan
SURFACE RL: 3 m DATUM: AHD
INCLINATION: -90°
HOLE DIA: mm HOLE DEPTH: 5.50 m

SHEET: 1 OF 1
DRILL RIG: EziProbe
DRILLER: GAP - AAB
LOGGED: RG DATE: 1/2/06
CHECKED: PKS DATE: 19/2/06

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT		Groundwater Encountered @ 1.25m	0.0	0.10	BH11/1 DS 0.10-0.25m				TOPSOIL:- SAND Medium grained, dark grey brown, some clay	M	
				0.25 2.75	BH11/2 DS 0.25-0.50m				FILL:- Clayey SAND Fine to medium grained, brown, some gravel		
			0.5		BH11/3 DS 0.50-0.75m				FILL:- Silty CLAY Brown and red brown, some sand and gravel		
					BH11/4 DS 0.75-1.00m						
			1.0		BH11/5 DS 1.00-1.25m						
				1.25 1.75	BH11/6 DS 1.25-1.50m				SAND Fine to medium grained, grey brown		
			1.5		BH11/7 DS 1.50-1.75m						
					BH11/8 DS 1.75-2.00m						
			2.0	2.00 1.00	BH11/9 DS 2.00-2.25m				SAND Fine to medium grained, grey, some coarse sand and fine grained gravel		
					BH11/10 DS 2.25-2.50m						
			2.5	2.50 0.50	BH11/11 DS 2.50-2.75m				Fine to medium grained		
					BH11/12 DS 2.75-3.00m						
			3.0	3.00 0.00	BH11/13 DS 3.00-3.25m				Medium to coarse grained		
					BH11/14 DS 3.25-3.50m						
			3.5		BH11/15 DS 3.50-3.75m						
					BH11/16 DS 3.75-4.00m						
			4.0	4.00 -1.00	BH11/17 DS 4.00-4.25m				Sandy Clayey SILT Dark grey, fine grained sand, trace fine shells		
					BH11/18 DS 4.25-4.50m						
			4.5		BH11/19 DS 4.50-4.75m						
					BH11/20 DS 4.75-5.00m						
			5.0		BH11/21 DS 5.00-5.25m						
					BH11/22 DS 5.25-5.50m						
			5.5	5.50 -2.50					END OF BOREHOLE @ 5.50 m		
			6.0								
			6.5								
			7.0								
			7.5								
			8.0								

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GAP gINT FN. F01a RL2

REPORT OF BOREHOLE: BH12

Golder Associates

CLIENT:	Wroxall Investments	POSITION: Refer to Site Plan	SHEET: 1 OF 1
PROJECT:	ASS Investigation	SURFACE RL: 2.9 m DATUM: AHD	DRILL RIG: EziProbe
LOCATION:	Wonga Beach	INCLINATION: -90°	DRILLER: GAP - AAB
JOB NO:	077673054	HOLE DIA: mm HOLE DEPTH: 5.50 m	LOGGED: RG DATE: 1/2/08
			CHECKED: PKS DATE: 19/2/08

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC Symbol	SOIL / ROCK MATERIAL DESCRIPTION	MOISTURE	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
FT		Groundwater Encountered @ 1.3m	0.0	2.85	BH12/1 DS 0.05-0.25m				TOPSOIL:- Clayey Silty SAND Medium grained, dark brown, trace fine roots	M		
			0.5		BH12/2 DS 0.25-0.50m				Silty SAND Medium grained, brown, some plant fibres			
					BH12/3 DS 0.50-0.75m							
			1.0	1.00 1.90	BH12/4 DS 0.75-1.00m				Dark brown			
				1.25 1.65	BH12/5 DS 1.00-1.25m				SAND Medium grained, yellow brown			
			1.5		BH12/6 DS 1.25-1.50m							
					BH12/7 DS 1.50-1.75m							
					BH12/8 DS 1.75-2.00m							
			2.0	2.00 0.90	BH12/9 DS 2.00-2.25m				Medium to coarse grained, grey	W		
			2.5		BH12/10 DS 2.25-2.50m							
					BH12/11 DS 2.50-2.75m							
			3.0		BH12/12 DS 2.75-3.00m							
					BH12/13 DS 3.00-3.40m							
				3.40 3.50 -0.60	BH12/14 DS 3.25-3.50m				Dark grey			
			3.5		BH12/15 DS 3.50-3.75m				Sandy Clayey SILT Dark grey, fine grained sand, with some fine shells			
				3.75 -0.85	BH12/16 DS 3.75-4.00m				Trace fine shell fragments			
			4.0		BH12/17 DS 4.00-4.25m							
					BH12/18 DS 4.25-4.50m							
			4.5		BH12/19 DS 4.50-4.75m							
					BH12/20 DS 4.75-5.00m							
			5.0	5.00 -2.10	BH12/21 DS 5.00-5.25m				With some coral fragments			
					BH12/22 DS 5.25-5.50m							
			5.5	5.50 -2.60					END OF BOREHOLE @ 5.50 m			
			6.0									
			6.5									
			7.0									
			7.5									
			8.0									

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GAP gINT FN. F01a RL2

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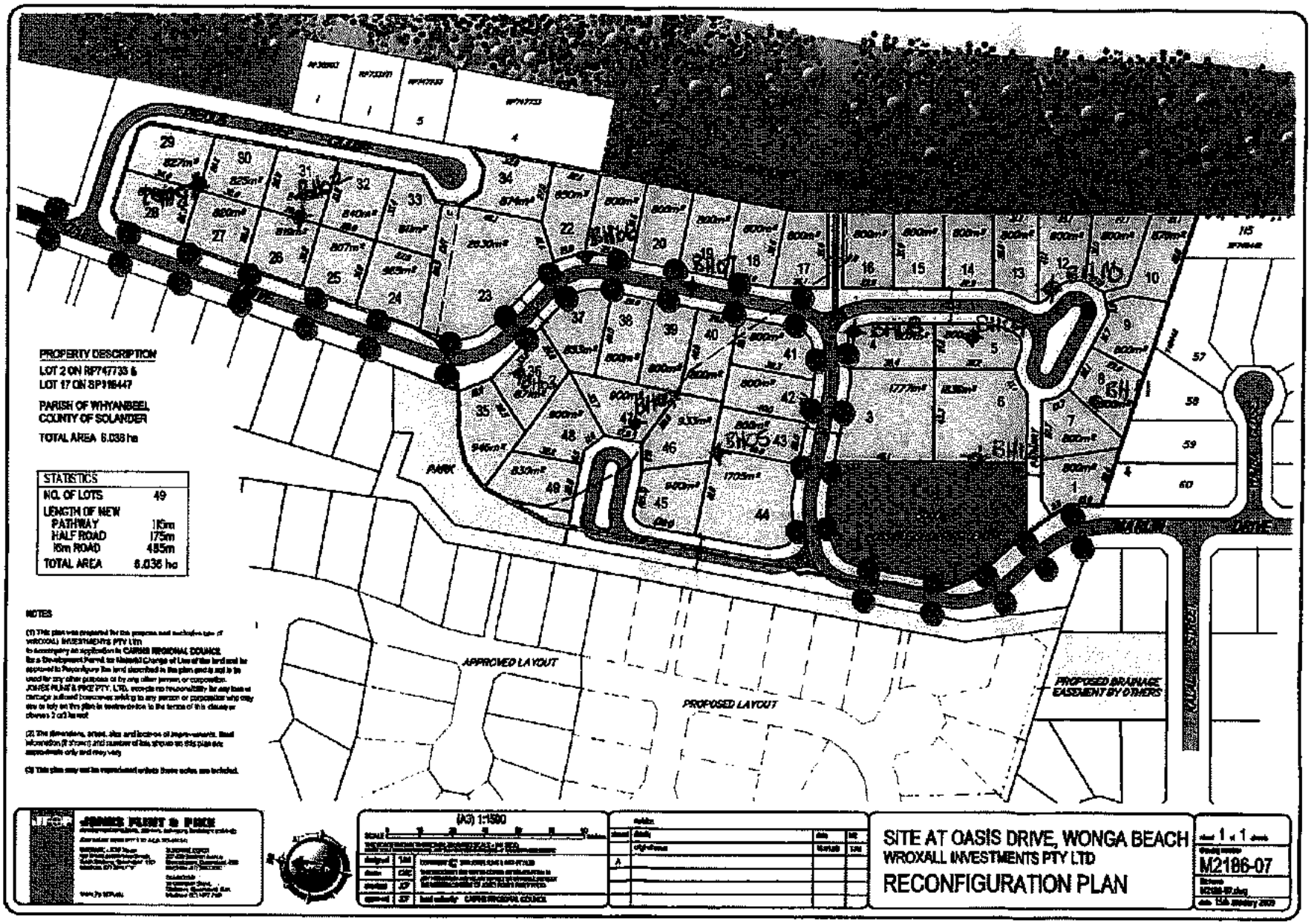
LEGEND
Borehole Locations
1:2000
0
40
80 m
20
Golder Associates
Wroxall Investments
OASIS DRIVE, WONGA BEACH
INVESTIGATION LOCATIONS
1:2000
A3
2
A


PROPERTY DESCRIPTION
LOT 2 ON RP747733 &
LOT 17 ON SP116447
PARISH OF WHYANBEEL
COUNTY OF SOLANDER
TOTAL AREA 6.038 ha
STATISTICS
NO. OF LOTS 49
LENGTH OF NEW
PATHWAY 115m
HALF ROAD 175m
15m ROAD 485m
TOTAL AREA 6.036 ha
NOTES
APPROVED LAYOUT
PROPOSED LAYOUT
PROPOSED DRAINAGE EASEMENT BY OTHERS
PARK
(A3) 1:1500
SITE AT OASIS DRIVE, WONGA BEACH
WROXALL INVESTMENTS PTY LTD
RECONFIGURATION PLAN
M2186-07

ATTACHMENT 3 – Plates

Plate 1. At northern drain culvert at Oasis drive

Plate 2. Western bank of pond looking east

Plate 3. From Plate 2 looking north

Plate 4. Southern drain looking from culvert at end of Marlin Drive looking east

Plate 5. Southern drain looking west towards culvert at end of Marlin Drive

Plate 6. From Culvert at end of Marlin Drive looking west

Plate 7. From southern bank of pond looking north

Plate 10. Mid-southern drain looking northeast

Plate 8. Central southern drain looking east at recent drain works

Plate 11. Standing water level in western drain

Plate 9. From southern drain at eastern boundary looking east

Plate 12. Standing water level southern drain at western boundary

Plate 13. Standing water level southern drain at eastern boundary

Plate 14. From Golder Associates BH06 looking SW towards area of poor drainage

Plate 15. Standing water level east drain western end

Plate 16. Southern drain near eastern boundary looking south west at recent drain works

No:	Amendment:	Date:

Clive Steele Partners Pty Ltd
Civil & Structural Engineers
Building 6, 62/195 Wellington Rd
Clayton Vic. 3168 Australia
Telephone: (613) 9545 0223
Email: csp@clivesteele.com.au

Project:
WONGA RESORT
WONGA BEACH, QUEENSLAND

Title:
VEHICLE CIRCULATION & PARKING
STRORMWATER MANAGEMENT

Scale:	1:500 @ A1
Date:	Apr.2026
CAD File:	21342 – Overall Plan_Undercroft
Drawn:	th
Checked:	

Job No: 21342
Drawing: C01
Revision: B