North Byron Parklands

jed civil
engineering design & drafting

NORTH BYRON PARKLANDS DRINKING WATER SUPPLY

Final 2

November 2017

Contents

Executive Summary

Billinudgel Property Pty Ltd is seeking Permanent Approval for the North Byron cultural events site hosting events of up to 50,000 patrons (Splendour In The Grass) as well as a number of smaller events and a conference centre and treatment facility.

The projected total annual water demand, based on data from historic events, and conservatively assuming full patronage of the proposed events and a 100% occupancy rate of the conference centre, is 15.6ML.

Parklands currently sources much of its water by collecting rainfall from roofs, augmented with water from the Byron Bay or Rous Water systems brought in by tanker truck. Parklands intends to continue with this approach into the future, albeit with less demand on external water supplies.

Based on median monthly and annual rainfall data from nearby weather stations and the roof area of the fully developed site, it is estimated that the potential annual yield is between 15.7ML and 18.1ML of rainwater.

These estimated volumes of collected rainwater are more than the estimated annual demand of 15.6ML. However, they are based on median historic values and therefore it is likely that water will have to be supplied from an alternative source in drier years.

The alternative on-site water sources, a large dam and two bores, would require significant additional treatment to improve the water quality and make it suitable for drinking. Additionally, neither source can be relied upon as the large dam is also affected by rainfall and the extraction from the bores may have a detrimental effect on the aquifer. Consequently, additional water when required will continue to be sourced from the Byron Bay or Rous Water systems and brought to site using tanker trucks.

As the demand for water will be concentrated during the larger cultural events a 4.3ML reservoir is proposed. This will provide sufficient storage volume over a year assuming it is replenished with rainwater based on median monthly rainfall, with only a minimal alternative supply of 200kL required in June, July and September to fully replenish the reservoir.

The rainwater will be collected and pumped to the storage reservoir then redistributed by a network of water pipes shown in drawing 17009-010 contained in Appendix A. The drawing also shows the site for the 4.3ML storage reservoir near the top of the hill on the western boundary at an elevation of approximately 60m AHD. At this elevation the storage will comfortably supply all camping amenity pods, the proposed conference centre and associated accommodation units.

Water sourced from rainfall on roofs can be considered the least vulnerable to contamination by pathogens and therefore minimal treatment will be necessary. However, it is recommended that for the proposed development additional barriers to the contamination of the rain water are introduced, in particular screened down pipe headers and first flush systems. These will help prevent solids entering the drinking water storage and reduce risk of contamination.

This same basic philosophy for the current water quality assurance program employed by Parklands of monitoring the water for pathogens and dosing with disinfectant will work for the proposed development. However, considering the substantial increase in the size of events a more comprehensive program to demonstrate compliance with the *Australian Drinking Water Guidelines* will be required. This program will include Critical Control Points in the water supply system for the monitoring of water quality, more frequent water quality monitoring, procedures to identify and isolate the source of any contamination and emergency action plans in the event of detection of high concentration of pathogens during an event.

After considering the available options for the supply of water to the proposed Parklands development the following recommendations are made:

- Construct a 4.3ML reservoir near the top of the high hill on the western boundary.
- The concept distribution system as shown in drawing 17009-010 will provide sufficient flow and pressure to the camping amenity buildings during an event.
- Rain water collected from roofs will not be sufficient to supply the proposed development during drier years and augmentation of the water supply with imported water from the Byron Bay or Rous Water systems is proposed.
- Screened down pipe headers and first flush systems should be installed on all roof rainwater collection systems.
- The current quality assurance program will have to be enhanced due to the increase in patrons attending events and the consequence of an outbreak of gastro intestinal disease.

1 Introduction

North Byron Parklands (Parklands) is a 229ha cultural arts and music events venue situated in Yelgun, 9km north east of Mullumbimby, in northern Byron Shire. Parklands is currently home to two of Australia's most respected music events, Splendour In The Grass and The Falls Festival.

The Project Approval was granted a trial approval by the NSW Planning and Assessment Commission in April 2012. The trial approval allows for the following events each year:

- A large event up to 35,000 patrons
- A medium event up to 25,000 patrons; and
- A small event up to 15,000 patrons

The total event days per calendar year is 10. Currently Splendour in the Grass (large event) uses 4 event days and the Falls Festival Byron Bay (medium event) also uses 4 event days. A third event has not been booked during the trial approval period.

Parklands proposes Permanent Approval for:

- Splendour in the Grass and Falls Festival Byron up to 35,000 patrons & a maximum of 5 days each;
- 3 event days up to 25,000 patrons (cumulative or separate); and
- 5 community event days up to 5,000 patrons (cumulative or separate).

With a further component being:

- subject to meeting KPIs for the 35,000 event Splendour in the Grass increasing to 42,500 patrons; and
- subject to meeting KPIs for the 42,500 event Splendour in the Grass ultimately reaching 50,000 patrons.

There are also plans to construct a conference facility, treatment centre and administration building. The conference facility and treatment centre will have 30 cabins capable of accommodating up to 120 people.

This report presents an investigation into options for the safe and sustainable supply of drinking water during the events and to the conference centre in the future.

1 Demand and Supply

1.1 Demand

Water demands for the proposed future events is presented in Table 1 below. The demands for the future events are based on the Splendour in the Grass 2017 water usage volumes prorated on ultimate maximum total patronage-days and camping/overnight - days.

Water demand from the future conference centre has been estimated based on a 100% maximum occupancy of the 180-person centre and the 120 person accommodation units over a year and a water usage of 50L/person/day and 50L/person/night.

Table 1 - Water Demand Proposed Events

Event	Total Patrons	Campers/ Overnight	No of Event Days	Event and Catering Water Usage (ML)	Camping/ Overnight Water Usage (ML)	Total Annual Water Usage (ML)
Splendour in the Grass (2017 base)	32,500	19,250	4	0.52	1.82	2.34
Splendour in the Grass (Future)	50,000	25,000	5	1.00	2.96	3.96
The Falls Festival Byron Bay (Future)	35,000	25,000	5	0.70	2.96	3.66
Moderate Events (Future)	25,000	25,000	3	0.30	1.78	2.08
Community Events (Future)	5,000	5,000	5	0.10	0.60	0.70
Conference Centre (Future)	180	120	347	3.13	1.1	5.23
Total (Future)						**15.63**

Consequently, the projected total annual water demand assuming full patronage of the proposed cultural events and an occupancy rate of the conference centre is 15.6ML.

It should be noted that the demands are based on a very conservative assumption that all the events and the conference centre will be fully attended or occupied to their maximum capacity. It is likely that actual attendance and occupancy rates for the events and conference centre, especially the smaller events and conference centre, will be lower and therefore the annual demand will be less.

1.2 Supply

The following four sources of water are available on-site:

- Rainwater collected from roofs;
- A large dam; and
- Two existing bores.

Currently Parklands use rainwater and augment the supply with town water brought to site by large tanker trucks.

The ongoing preferred source of water is rainwater from roofs as it is arguably the best on-site source of water in terms of quality, requiring minimal treatment,

and is easily collected. However, the annual yield is limited to the roof area and rainfall. Furthermore, as the water demand is concentrated during the two main events a large amount of storage is required to capture and retain the water between events.

The total current roof area has been estimated at 3,500m^2, which includes 16 camping amenity buildings (8 camping pods) each with a roof area of 132m^2 and the large storage building near the transport hub, which has a roof area of 1,400m^2. The roof area of the proposed conference centre and accommodation units has been estimated at 5,140m^2. There will also be 22 additional camping amenity buildings (11 camping pods) and a 500m^2 bus shelter at the transport hub. Therefore, a total of 12,040m2 of roof area will exist once the proposed development is complete.

According to data available from the three nearest weather stations available on the Bureau of Meteorology's website (Cape Byron Lighthouse, Cape Byron AWS and Murwillumbah) the median annual rainfall is in the order of 1,500mm per year. However, if a year of median monthly rainfall is used then the annual total is 1,300mm. This equates to a potential yield of between 15.7ML and 18.1ML of rainwater per year from the future roof area in a median rainfall year.

Those estimated volumes of collected rainwater are more than the estimated annual demand of 14.6ML. However, as the volumes are based on historic median values, in the past 50% of the years would have produced less rainfall and 50% of the years produced more rainfall. Additionally, historic performance does not guarantee future performance will be similar, especially with the current uncertainty around climate change. Consequently, an alternative source of water will be required to make up the shortfall of rainwater.

Sources of water on site include the two bores and the large dam. An investigation by Gilbert and Sutherland estimated the total volume of the dam to be 15.9ML. However, due to environmental constraints to protect the habitat of a vulnerable species of bird the volume of extraction from the dam was limited to 5.9ML. The annual yield of the dam will depend on the catchment area, soil type and vegetation cover and rainfall. Furthermore, as will be discussed in the following section on treatment, water sourced from the dam will likely require significant treatment due to the vulnerability of the catchment to contamination with pathogens. Consequently, the large dam is not a preferred source of water.

Of the two bores located on site, the one on Lot 10 DP 875112, just north of Jones Rd, is approved for basic rights only and could not be used to extract the volume of water required. Parklands would have to apply to NSW Department of Primary Industries Water for a Water Access License in the next controlled allocation order if they wanted to pursue this as an option for an alternative water source.

The bore located on Lot 102 DP 1001878, south of Jones Road in the parking area, is approved for irrigation and farming and has a Water Access Licence attached, which allows extraction of 40ML per year. Advice from Water NSW is that if the proposed development is approved then water from this bore could be used as a supply without the need to change to the water supply works and water use approval.

Unfortunately, anecdotal evidence suggests that the water is brackish and will require treatment to remove the salts. Furthermore, the bores are not a preferred source as extraction of water may have a detrimental effect on the aquifer. Consequently, the bores are not considered a suitable source of water.

Town water supply from the Byron Bay of Rous Water system is relatively costly and inefficient to transport water by tanker and has a relatively high carbon footprint compared to the other sources, therefore its use should be limited.

It has been suggested by Byron Shire Council that a pipeline is constructed to allow the development to be supplied with water from the existing network in Billinudgel or South Golden Beach some 4km south of the Parklands. However, the capital cost of the pipeline and likely booster pump station is estimated to be in the order of $1 million, plus there will be developer contribution costs, currently $10,000 per Equivalent Tenement (ET). Additionally, Parklands is keen to be self-sustaining and relying on town water is not part of the overall philosophy.

In summary, the table below presents the sources of water and the available volumes.

Table 2 - Available Water Volumes

Source	Volume (ML)
Town water	Unlimited
Rainwater form future roof area (median rainfall values)	15.7ML – 18.1ML/yr
Bore on Lot 10 DP 875112 north of Jones Rd	None. Requires application for Water Access License in the next controlled allocation order
Bore on Lot 102 DP 1001878 south of Jones Road in the parking area	40ML/yr
Large Dam	5.9ML storage capacity. Annual yield will depend on rainfall, catchment area, soil type and vegetation cover

The volumes from the roofs are based on historic median rainfall depths and will vary from year to year, with approximately 50% of the years providing more rainfall and 50% providing less rainfall.

2 Storage and Distribution

2.1 Supply, Usage and Storage Volume

Figure 1 below presents the supply, usage and fluctuation in storage volumes over one year assuming a year of median monthly rainfall and ultimate maximum patronage of the events and occupation levels of the conference centre previously described.

The major events, Splendour In The Grass (SITG) and Falls Festival Byron (FFB), occur in August and January respectively. The moderate and community events do not have a significant impact on the fluctuation of the storage volume and have been randomly nominated to occur during the year, although never two events in one month and the moderate events in February, June and November. The conference centre and accommodation unit usage is assumed to be evenly distributed over the year.

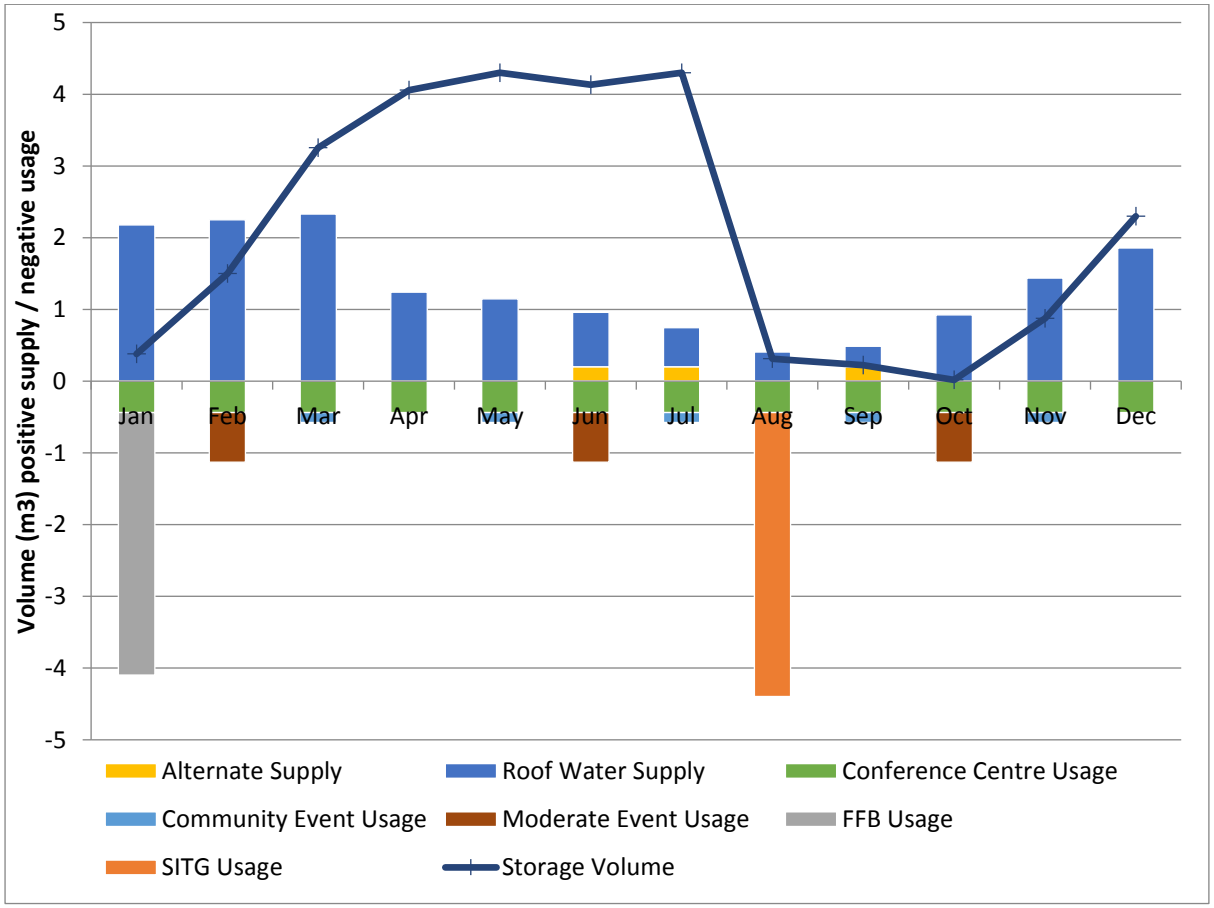


Figure 1 - Rainfall and Storage Volumes through the Year

As can been seen form Figure 1 if 4.3ML is held in storage by the end of July for Splendour In The Grass in August and 200kL is provided from an alternative source in September then the reservoir replenishes sufficiently to accommodate the Fall Festival Byron event at the end of December beginning of January. Furthermore, the storage will then replenish to supply the next years Splendour In The Grass festival, with only minimal alternative supply of 200kL required in June and July.

It should be noted that the above storage models are based on median or 50%ile historic data. Therefore, in the past there would have been a 50% probability that there would be insufficient rainfall and the supply from the alternative source would have to be increased. Conversely 50% of the time the supply from the alternative source could have been decreased as there would have been more rainfall.

Furthermore, as previously mentioned, the demands are based on very conservative assumptions that the events and the conference centre will be fully attended and occupied throughout the year. Consequently, a storage of 4.3ML is likely to provide more water than necessary during the year and therefore augmenting the rainwater supply from an alternative source may not be required as often.

Consequently, it is recommended that a 4.3ML storage reservoir is constructed and all rainfall from roofs is stored. The dimensions of the reservoir will be dependent on the area available but could be in the order of 20m diameter and 14m high or 30m diameter and 6m high.

2.2 Storage Location and Distribution System

The preferred location for the storage reservoir is near the top of the hill on the western boundary of the site at an elevation of approximately 60m AHD. This elevated location will be able to supply the entire site with water at an acceptable pressure even during peak demands.

The distribution network is shown in the drawing 17009-010, contained in Appendix A, along with the location of the storage reservoir.

A hydraulic model of the distribution system was developed for the worst-case scenario, which is the morning "shower-rush" during an event. The model assumed all 456 showers and all 342 taps in the 38 camping amenity buildings (16 current and an additional 22 in the future) were operating simultaneously at the following flow rates, which assume water efficiency features have been installed[1]:

- Showers 7L/min or 0.12L/s
- Taps 2 L/min or 0.03L/s

The target pressure at each of the amenity buildings is 230kPa or 23m, which is the minimum pressure required by the Bosch Professional Plus hot water systems installed in the camping pods to maintain maximum through flow. A target minimum water velocity in the pipes of 0.7m/s was generally achieved.

The model found that if storage reservoir is near the top of the hill on the western boundary it will comfortably supply all camping amenity pods, the proposed conference centre and associated accommodation units without the need for any pressure boosting pumps.

The distribution pipe network will also be used to transfer bore water and collected rainwater from the site to the storage. Each camping amenity pod will have rainwater tanks and small solar powered pumps, which will trickle feed

[1] Obtained from www.waterrating.gov.au/consumers/water-efficiency

collected rainwater into the main storage reservoir. Battery back-up of the pump may be necessary to ensure all rainwater is collected and transferred to the storage.

3 Treatment

As a business that provides drinking water, including water for bathing due to risk of ingestion, Parklands has a responsibility to ensure that the water is safe to use. If the safety of the water supply cannot be guaranteed, then consumers should be warned. The relevant legislation which applies to the provision of drinking water includes:

- *NSW Public Health Act 2010* and *Public Health Regulation 2012*
- *NSW Local Government Act 1993*
- *NSW Food Act 2003*
- *NSW Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005*

Consequently, Parklands must implement a drinking water quality assurance program. The *Australian Drinking Water Guidelines*, published by the National Health and Medical Research council, contain detailed advice and requirements for all drinking water supplies. The *Private Water Supply Guidelines* published by NSW Health aim to summarise and provide advice on applying the Australian Drinking Water Guidelines to private water supplies. Additionally, the Water Services Association of Australia has produced the *Manual for the Application of Health-based Treatment Targets*, which provides guidance on water treatment based on vulnerability of the water catchment to contamination with pathogens.

Generally, water treatment seeks to create tasteless, odourless and visibly clear water entirely free of pathogens. To achieve these objectives traditional water treatment plants employ a variety of treatment processes including coagulation, flocculation, sedimentation and filtration to remove suspended and dissolved solids followed by disinfection to kill any remaining pathogens.

Water sourced from rainfall on roofs can be considered the least vulnerable catchment category and therefore minimal treatment is necessary. As long as no pathogens are present in the water supply it will be safe and pleasant to drink. However, it is recommended that for the proposed development additional barriers to the contamination of the rain water are introduced, in particular screened down pipe headers and first flush systems. These will help prevent solids entering the drinking water storage and reduce risk of pathogen contamination.

As previously discussed an alternative source of water will be required during dry years. Water sourced from the Byron Bay or Rous Water supply systems will already have been treated and will be safe for consumption and is therefore considered the preferred alternative source. Parklands currently import most of their water from this source using large tanker trucks with 12kL to 18kL capacities. Considering that the conservatively estimated amount of water imported during a year of median monthly rainfall is only 200kL in June, July and September then this would equate to only 11 to 17 tanker deliveries during those months.

Based on anecdotal evidence water from the bores is brackish and not suitable for drinking without treatment. Furthermore, Parklands do not hold sufficient

water right for the bore nearest to the proposed location of the storage reservoirs and would prefer not to use the bore water in case it impacted on the acquifer.

Water from the large dam would require extensive treatment requiring significant capital and operational expenditure as the catchment is most vulnerable to contamination by pathogens, especially as the conference centre and accommodation units are to be located within its catchment. Furthermore, during dry years the volume of water available from the dam is likely to be less. Consequently, the large dam is not considered a suitable alternative source of water.

Quality Assurance Program

Parklands has an existing drinking water quality assurance program as the organisation currently collects rainwater from the roofs of the camping amenity buildings and store it in small polyethylene tanks adjacent to the buildings or in two large reservoirs constructed of steel with polyethylene liners. The water is then used for showers and taps or distributed around the site to other small polyethylene tanks. The program simply monitors for the presence of pathogens by testing for *E. coli*, generally considered a good indicator of the presence of pathogens, and if found the tank or reservoir is dosed with the disinfectant sodium-hypochlorite.

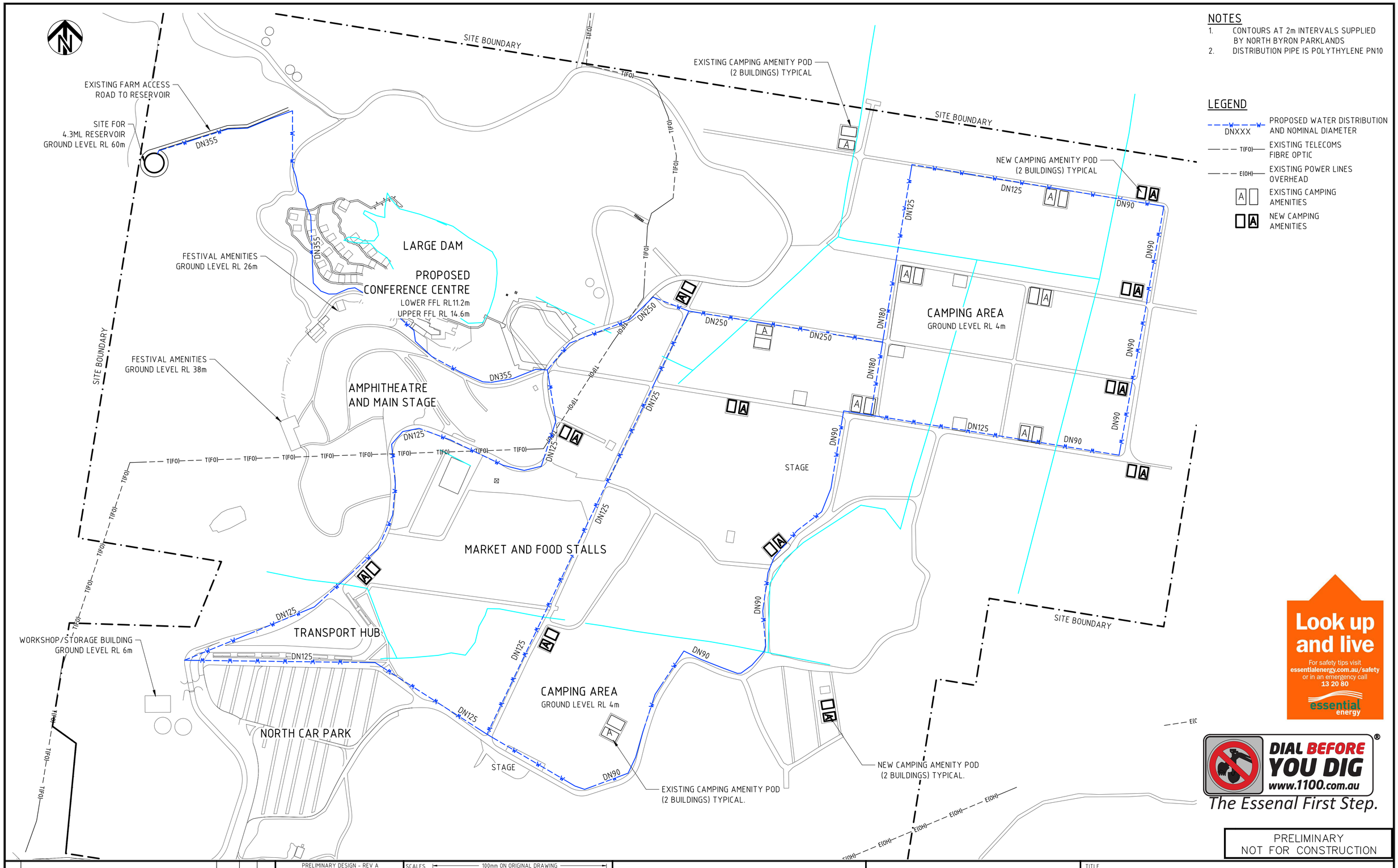
This general philosophy will work for the proposed development. However, considering the substantial increase in the size of the events a more comprehensive program to demonstrate compliance with the *Australian Drinking Water Guidelines* will be required. This program will include Critical Control Points in the water supply system for the monitoring of water quality, more frequent water quality monitoring, procedures to identify and isolate the source of any contamination and emergency action plans in the event of detection of high concentration of pathogens during an event eg how will patrons be informed.

4 Conclusions and Recommendations

After considering the available options for the supply of water to the proposed North Byron Parklands development the following recommendations are made:

- Construct a 4.3ML reservoir, preferably near the top of the high hill on the western boundary.
- The concept distribution system as shown in drawing 17009-010 will provide sufficient flow and pressure to the camping amenity buildings during an event.
- Rain water collected from roofs will not be sufficient to supply the proposed development during drier years and augmentation of the water supply with imported water from the Byron Bay or Rous Water systems is proposed.
- Screened down pipe headers and first flush systems should be installed on all roof rainwater collection systems.
- The current quality assurance program will have to be enhanced due to the increase in patrons attending events and the consequence of an outbreak of gastro intestinal disease.

APPENDIX A Water Distribution System Drawing



NOTES

1. CONTOURS AT 2m INTERVALS SUPPLIED BY NORTH BYRON PARKLANDS
2. DISTRIBUTION PIPE IS POLYTHYLENE PN10

LEGEND

- DNXXX — PROPOSED WATER DISTRIBUTION AND NOMINAL DIAMETER
- T(FO) — EXISTING TELECOMS FIBRE OPTIC
- E(OH) — EXISTING POWER LINES OVERHEAD
- A — EXISTING CAMPING AMENITIES
- A — NEW CAMPING AMENITIES

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DWN	DGN
	REVISIONS			
C	REVISED AND ISSUED WITH FINAL REPORT	19.10.17		
B	REVISED AND ISSUED WITH DRAFT REPORT	19.07.17	BJ	BJ
A	PRELIMINARY CONCEPT FOR REVIEW	06.07.17	BJ	BJ

PRELIMINARY DESIGN - REV A	
DATE:	06.07.2017
DRAWN:	B. JEDREJ
DESIGNED:	B. JEDREJ
CPENG No.	2823641
FINAL DESIGN - REV 0	
DATE:	
DRAWN:	
DESIGNED:	
CPENG No.	

SCALES — 100mm ON ORIGINAL DRAWING
SCALE 1:2500 — 25 0 50 100
ORIG. SIZE A1

North Byron Parklands

jed civil
engineering design & drafting
Ben Jedrej CPEng RPEQ
645 Gleniffer Road, Gleniffer, NSW 2454
E: ben.jedrej@gmail.com
M: 0416 843 764

TITLE
NORTH BYRON PARKLANDS
STATE SIGNIFICANT DEVELOPMENT
WATER SUPPLY
COLLECTION AND DISTRIBUTION SYSTEM LAYOUT

DRAWING NUMBER 17009-010
REVISION C

$IGE(VAR,??)

jed civil

engineering design & drafting

Ben Jedrej CPEng RPEQ
645 Gleniffer Road, Gleniffer, NSW 2454
E: ben.jedrej@gmail.com
M: 0416 843 764