DANCE

Defqon.1 2015
Crowd Capacity Report

Contents

1. Introduction

This report has been created to show the capacity planning for the Defqon.1 2015 festival. Fruin's 'Level of Service' (LoS) guide has been used in the calculations, along with information from the previous six years of the event.

Due to the increased demand for camping tickets, the campground is moving across to the Northern Bank of the Sydney International Regatta Centre in 2015, with a temporary bridge spanning over 160m to be built, allowing patron access to the campground. The size of the Northern Bank allows for a large expansion of the campground. Approval is being sought for 5,000 campers, and as the report shows, the designated area for this will fit this comfortably.

The estimated crowd capacity for the island will assist in planning the 2015 event, as well as in subsequent years. It will also assist in determining the emergency planning requirements and crowd management processes.

1.1 Sydney International Regatta Centre (SIRC)

SIRC is the site for Defqon.1 as it provides wide, open spaces on an island, in an environment reasonably removed from high-density housing, yet close to transport and services.

The Centre in the past provided the venue for 35,000 people during the 2000 Summer Olympics, and has hosted events for over 30,000 people.

It is well equipped to support the overlay required for these events and they have become a focal point for the community.

1.2 Methodology

To establish crowd capacities, the variables that contribute to the safe and comfortable hosting of mass gatherings must be considered. Information and supporting documentation have been sought from the following accepted industry standards, and historical data:

- Dr. John Fruin's 'Level of Service' Guidelines
- The expected behaviour and profile of spectators likely to attend Defqon.1
- Green Guide – The Green Guide to Safety at Sports Grounds
- The layout of the areas not strictly covered under building codes; and
- The Defqon.1 Risk Assessment and Emergency Management plans

1.3 Results

Working Primarily with Fruin's 'Level of Service', the total capacity has been calculated as:

- Island 32,586
- Northern Bank 5,420

2. Crowd Safety Guides and Standards

2.1 Context

The context has been established based on the following event historical data:

- Age of patrons
- Tone and behavior of patrons
- Time patrons spend on site
- Environment
- Crowd Type
- Alcohol / drug intoxication
- Weather

2.2 John Fruin

Fruin's system of crowd density rating is called LoS. Each LoS is characterised by specific density values. Each density value has implications for physical characteristics of individuals within the crowd in terms of:

- Physical impact; and
- Flow Rate & Capacity for individual movement by choice. The LoS values are below:

Level of Service	Density	Flow
A	>3.24sqm/person	Flow rate less than 23 people per minute. Virtually unrestricted choice of speed, minimum manoeuvring to pass, crossing and reverse movements unrestricted
B	2.32 to 3.24sqm/person	Flow rate 23 to 33 people per metre per minute. Normal walking speeds only occasionally restricted; some occasional interference in passing; crossing & reverse movements are possible with occasional conflict.
C	2.32 to 1.39sqm/person	Flow rate 33 to 49 people per metre per minute. Walking speeds are partially restricted; passing is restricted but possible with manoeuvring; crossing and reverse movements are restricted and require significant manoeuvring to avoid conflict, flow is reasonably fluid.
D	1.39 to 0.93sqm/person	Flow rate 49 to 66 people per metre per minute. Walking speeds are restricted and reduced, passing is rarely possible without conflict; crossing and reverse movements are severely restricted with multiple conflicts; some probability of momentary flow stoppages when critical densities might be intermittently reached.
E	0.46 to 0.93sqm/person	Flow rate 66 to 82 people per metre per minute. Walking speeds are restricted and occasionally reduced to shuffling; frequent adjustment of gait is required and passing is impossible without conflict; crossing and reverse movements are severely restricted with unavoidable conflicts; flow achieves maximum capacity under pressure, but with frequent stoppages and interruptions of flow.
F	< 0.46 sqm/person	Flow rate variable. Walking speed is reduced to shuffling; passing is impossible, crossing and reverse movements are impossible; physical contact is frequent and unavoidable; flow is sporadic and on the verge of complete breakdown and stoppage.

2.3 The Guide to Safety at Sports Grounds

The 'Green Guide' (Guide to Safety at Sports Grounds) is perceived to be not just a UK guide but to provide leadership for the hosting of major events in sporting venues. The formulas and strategies identified in this document are considered suitable for outdoor events generally.

The Guide suggests a critical crowd density of 4.7people/square metre (i.e. 47 people/10 sqm or 0.21sqm/person). This value is calculated as the maximum safe level before unsafe physical and psychological effects result for individuals in the crowd. For this report generally, a value of 0.46 to 0.93 sqm/person or 2.2 to 1.1 sqm/person has been applied. This is Fruin's LoS-E, and is a desirable level for seated and standing patrons.

In this report the width of the exits off the island have not needed to be taken into consideration, as the island is large enough to contain a number of assembly areas within the site. People could then be evacuated in a safe and coordinated fashion off either end of the island.

2.3.1 The 'P and S' Formula for Crowd Capacity

In establishing safe crowd capacities and critical crowd density the following other considerations are taken into account:

- The standard of the venue's physical condition (P Factor); and
- The quality of the safety management system being implemented across the venue (S Factor).

An algorithm to estimate maximum venue holding capacity involves the terms 'P Factor', and 'S Factor'. Although they both have potential for negative impact on the event, they have both been assessed based on the previous six events, and are part of all ongoing event planning.

2.3.2 Physical Conditions (P-Factor)

According to the Green Guide, factors considered important for evaluating the P Factor include:

- Surface quality:
    - Surface material
    - Gradient
- Structures:
    - Current Fencing
    - Level of infrastructure overlay
- Sightlines:
    - Site lines to stages
    - Sound audibility for each stage
    - Site lines to screens

2.3.3 Quality of Safety Management (S-Factor)

According to the Green Guide, factors considered important for evaluating the S Factor include:

- Admission – Is it ticketed or GA admission?
- Security/Crowd Control – Is security effective?
- Keeping Thoroughfares Clear – Is there a confirmed process for keeping thoroughfares clear?
- Distribution of Participants – Will participants be evenly spread throughout the venue, or concentrated in one location?
- Migration – Viewing Distances - Is there the opportunity for crowds to migrate easily within the venue creating unsafe crowd surges?
- Provision for Spectators with Disabilities – Are there separate provisions for spectators with disabilities?
- Signage – Is there clear and adequate way-find signage?
- Crowd Behaviour:
    - Crowd size – is there a confirmed number of attendees?
    - Degree of information provided – communication with audience well in advance
    - Performance type – What type of event is it?
    - Heat/dehydration – Is there likely to be high incidence of dehydration?
    - Drugs and alcohol – Does the event have a history of drug and alcohol abuse?

2.4 Crowd Capacity Calculation

To establish the appropriate crowd capacity the following process has occurred:

1. Establish available viewing area
2. Establish appropriate density
3. Establish crowd capacity

To calculate the available viewing areas each site has been depicted on a scaled aerial plan, with the determined event parameters clearly marked. Site maps with estimated viewing areas are located in the Appendix.

3. Results

The following results relate to crowds observed by the event and venue management teams over the previous six Defqon.1 events at the SIRC.

3.1 Crowd Type

On average the crowd is made up by around 71% from NSW, 6% international and 23% inter-state.

There is a cultural diversity from all areas of Sydney, with the western suburbs the most popular.

3.1.1 Crowd Types Table

Crowd Type	Definition
Ambulatory	Walking
Cohesive spectator	Watching specific activity
Expressive/revellous	Emotional release (cheering, dancing)

3.1.2 Observations From the Previous Defqon.1 Events

Global Demographic	Approximately 85% from NSW, 15% inter-state and international
Local Demographic	There is a strong cultural diversity from all areas of Sydney, with the highest concentration of ticket sales from the western suburbs
Age	18-32 years
Gender Ratio	The crowd is approximately 63% Male / 37% Female
Behaviour	Reasonably well behaved, with large Police and Security operation in place.
Alcohol	– Full Strength, which switches to light in the evening – Minimum 2 RSA officers per bar – Detailed Alcohol Management Plan – Limits to consumption at points of sale
Period of Time on Site	Average of 9 hours on site. Gates open at 10:30 and the event finishes at 23:00
Time of the Year	Temperatures can rise to over 30 degrees during the day, and drop to 6 degrees after sunset
Seated / Standing	All standing for entertainment Seating in food and 'chill out' Expansive grassed areas, not in the way of entertainment
Ticketed / GA	Less than 1000 tickets are sold on the day, most are pre-sold
Physical Layout	Reasonably flat grassed environment, with gently undulating areas used to create natural stages One grassed hill, used as a 'chill out' zone
Security/Crowd Control	Effective, with a minimum of 1 officer to 100 patrons ratio
Thoroughfares	Are kept clear as the site is designed to provide clear walkways. Security is briefed to maintain clear thoroughfares
Distribution of Participants	Spread across the venue by utilising the seven stages, food courts, and 'chill out' areas The main stage has the largest crowd for the entire event
Signage	Clear and adequate way-find signage
Crowd Size	Crowds have ranged from 11,000 – 23,000 for the main event, and 300 – 700 for camping
Degree of information Provided	The audience has the opportunity of gaining information from the tickets, website, social media and other advertising
Water	Multiple free water stations are available around the site
Safety	There is a safety officer on site for the event

3.2 Results

The tables showing the expected capacity results for each Fruin level are below. Please see maps in the appendix.

3.2.1 Island

Fruin's Level of Service	Density	Areas/Expected populations
A	>3.24sqm/person	
B	>2.32 - 3.24sqm/person	1,465
C	2.32 - 1.39sqm/person	11,652
D	1.39 to 0.93sqm/person	2,509
E	0.46 to 0.93sqm/person	17,230
F	< 0.46 sqm/person	Density not acceptable to Q-dance
	TOTAL	32,586

3.2.2 Northern Bank – Campground Open Areas

Fruin's Level of Service	Density	Areas/Expected populations
A	>3.24sqm/person	
B	>2.32 - 3.24sqm/person	509
C	2.32 - 1.39sqm/person	1,912
D	1.39 to 0.93sqm/person	1,272
E	0.46 to 0.93sqm/person	3,517
F	< 0.46 sqm/person	Density not acceptable to Q-dance
	TOTAL	7,210

3.2.3 Northern Bank – Tent Sites

Fruin's Level of Service	Density	Areas/Expected populations
A	>3.24sqm/person	
B	>2.32 - 3.24sqm/person	
C	2.32 - 1.39sqm/person	5,420
D	1.39 to 0.93sqm/person	
E	0.46 to 0.93sqm/person	
F	< 0.46 sqm/person	Density not acceptable to Q-dance
	TOTAL	5,420

4. Considerations

The Green Guide recommends close consideration of the following factors when designing access and egress paths for outdoor areas such as the SIRC.

4.1 Movement

Stationary people caught in large crowds become agitated and can invoke undesirable psychological responses leading to crowd surge.

The site has been designed so that egress pathways allow for the continual movement of people.

4.2 Alternative and Direct Exit Routes

Areas such as the bridges can create a crowd bottleneck, and can be hazardous due to the increased risk of crowd crush, however not all emergency situations would require an evacuation of the entire island. The island itself provides enough distance to have alternate assembly areas on the island. This then allows for an orderly evacuation off the island, or a closure of just one section.

4.2.1 Island

As the event is on an island, there are only two possible egress routes – over the bridges located to the east and west of the island. The exit(s) used would be determined by the location of the emergency, and direction given by emergency services.

4.2.2 Northern Bank

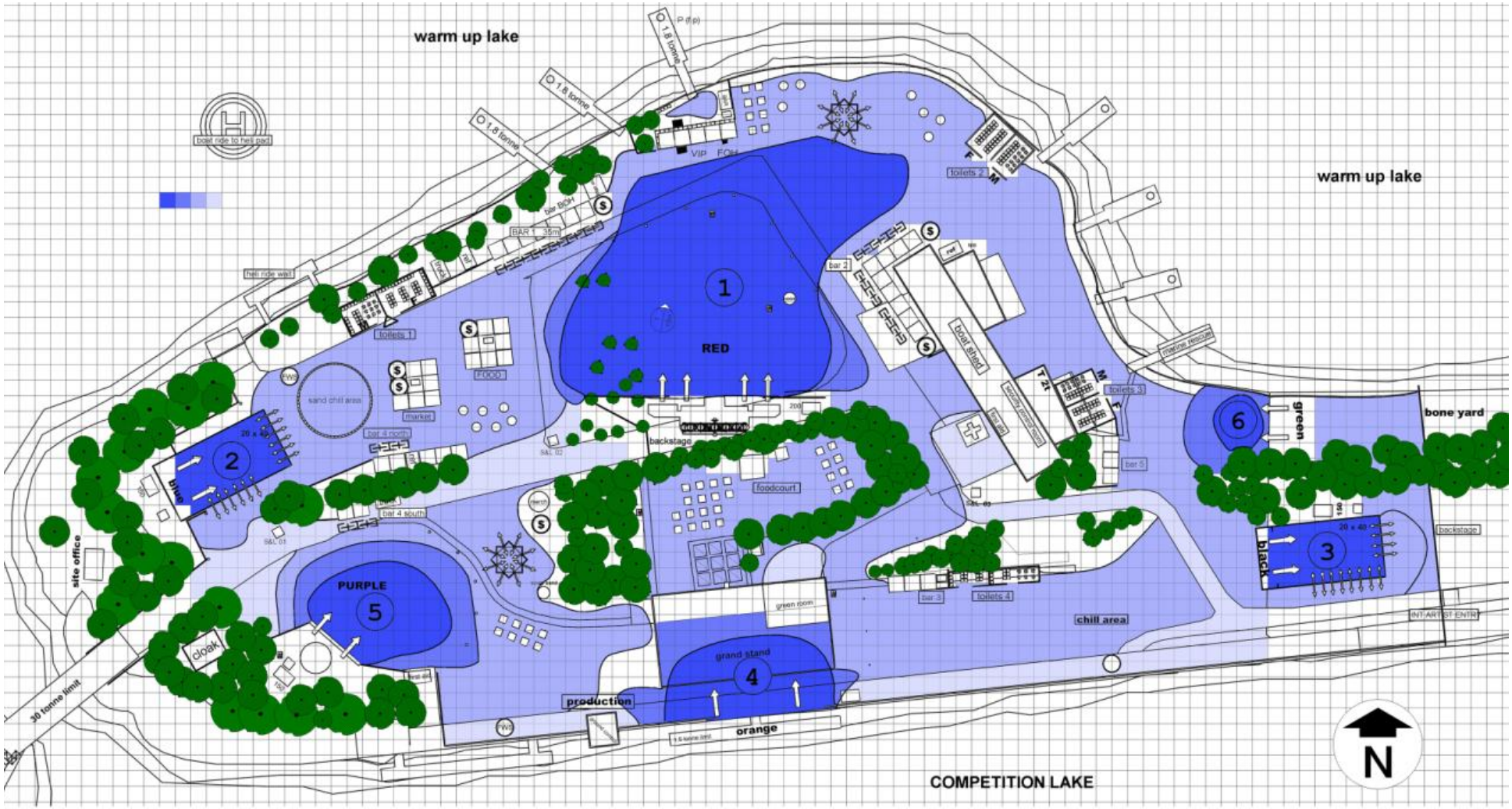
As the access to the island for campers is via a temporary bridge, it will not be used as an emergency egress route. The Western side will be excavated at the time of the event, and the northern area is fenced, with a mine site on the other side - leaving the western grassed area as the emergency egress route for the campground.

4.3 Maintaining Clearways

Outdoor areas with few defined egress routes are difficult to keep clear with the audience self-regulating their density. Security is briefed to ensure crowd movements occur in designated egress routes. They are supported by clear signage and appropriately located pedestrian barriers.

5. Appendix

5.1 Main Event Site Map with Capacity Highlighted



los . . . E = 17230 pax

los . . . D = 2509

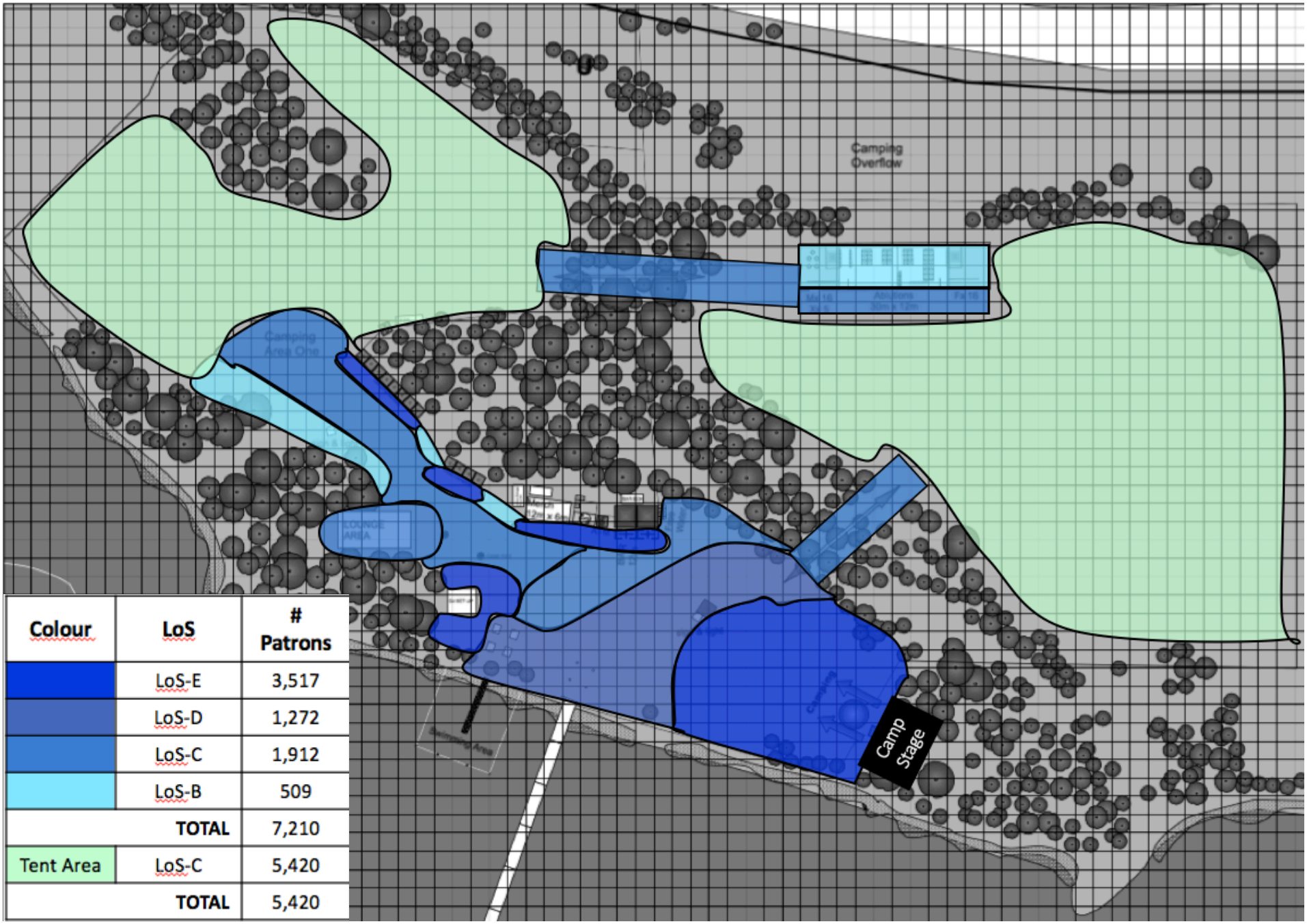
los . . . C = 11652

los . . . B = 1465

Fruins level of service (los)

Total pax = 32856

5.2 Northern Bank Campgrounds with Capacity Highlighted



Colour	LoS	# Patrons
	LoS-E	3,517
	LoS-D	1,272
	LoS-C	1,912
	LoS-B	509
	TOTAL	7,210
Tent Area	LoS-C	5,420
	TOTAL	5,420