



- Surface Water Management Plan, to manage surface water flows and quality. The plan would include Stormwater Management Plan(s) for applicable infrastructure on site, and a Stormwater Monitoring Program for monitoring surface water runoff from the site;
- Acid Sulfate Soils Management Plan, to manage acid sulfate soil risks during construction works;
- Wastewater Management Plan, to manage wastewater collection, treatment and discharge on site. The plan would include a Groundwater Monitoring Program, to monitor groundwater levels and quality associated with the wastewater treatment system;
- Flood Risk Management Plan, to manage flood and flood-related evacuation risks. The plan would include the existing mitigation measures identified in Section 6.3.8 above;
- construct one half of the perimeter loop road in the south-eastern car park above the 1 in 100 year ARI flood level;
- minimise disturbance within the riparian area of Billinudgel Creek and Yelgun Creek as far as practicable (ie. limited to existing infrastructure crossings/roads and environmental restoration works);
- maintain the minimum 30 metre (and up to 80 metre) buffer to the SEPP 14 wetland and pre-existing vegetation in the south-eastern area of the site;
- continue regeneration of native vegetation adjacent to the SEPP 14 wetland (see Section 6.7 for further details); and
- restrict on-site effluent disposal to identified areas to the north of Jones Road.

The management plans and monitoring programs would be updated in consultation with the applicable authorities and the RWG.

6.4 Noise and Vibration

6.4.1 Background

Event noise was a key issue raised by the community and regulatory stakeholders during the assessment of the original project application. It is also the most common issue raised in calls to Parklands' Community Hotline, and is a key issue raised in the SEARs for the proposed development.

To this end, noise has been subject to significant environmental assessment and modelling both during the original project application and in subsequent modifications, in particular MOD 3 (see below). It is also the focus of significant monitoring and assessment before, during and after each event, and has been subject to assessment by the Department's Compliance Branch.

In this regard, the Department has sent a number of officers to both Splendour and Falls Festival events to undertake detailed compliance audits and to monitor noise. Overall, the audits have found that management practices employed during the events were satisfactory, although some non-compliances and areas for improvement were identified in relation to noise conditions. The Department issued two penalty infringement notices (PINs) to Parklands in relation to noise non-compliances associated with the Splendour 2014 and 2015 events (prior to MOD 3).

A key reason for these non-compliances was the way that the noise criteria in the original project approval were formulated. In this regard, the original approval included noise limits based on a 'background plus' approach, with the criteria based on the background noise level at the receiver location plus either 5 or 10 decibels depending on the time of day.

This framework is used for industrial developments regulated under the *Noise Policy for Industry* (formerly *NSW Industrial Noise Policy*), but is not particularly suited to short-term noise emissions such as those produced by events. Most events a

i.e. they couldn't comply with the original noise criteria so they created new criteria that would fit the existing noise emissions



which must be met at all off-site receivers. Such a set level provides a greater level of certainty for both the event operator and the community as to the expectations for noise performance.

And also makes it easier to comply...

The 'background plus' model was found to be problematic for a number of reasons, particularly because background noise fluctuates markedly between sites and between the winter and summer seasons, when the Splendour and Falls Festival events are held.

As a result of the non-compliances identified in Splendour in 2014 and 2015, and the resulting PINs, Parklands undertook detailed analysis of acoustic data collected during events to determine how best to manage sound emissions at future events, particularly in winter when background noise is significantly lower. The analysis found that low-frequency noise emissions from drum and bass are likely to be the cause of most of the disturbance and complaints from events. Parklands has since implemented a range of measures to mitigate these and other noise emissions during events, including:

- positioning stages to take advantage of natural topographic shielding;
- orientating stages and speakers away from sensitive receivers and Billinudgel Nature Reserve as far as practicable;
- using innovative speaker arrays, delay systems, drapes and roof sheeting to direct and contain noise spill;
- using fixed or portable barriers (eg. shipping containers or hay bales) around stages;
- using double walled tent sheets to contain noise from minor stages/venues;
- minimising use of sub-woofer speakers to minor venues;
- providing greater community liaison support on acoustic management, including a team of acoustic engineers to continually monitor noise at key off-site locations and residential receivers;
- co-locating the Noise Control Co-ordination Centre (NCCC) with the Community Hotline personnel to facilitate rapid response to complaints; and
- continuous front-of-house noise monitoring data to the NCCC, stage managers and the production team for all stages, essentially allowing the production team to 'turn down the volume' in prompt response to identified potential or actual noise exceedances.

Further, in May 2015 Parklands sought to modify the project approval conditions to move from the 'background plus' noise criteria model to absolute criteria, and to include specific criteria for low-frequency noise emissions (ie. MOD 3). Following detailed assessment by both the Department and the Commission, in April 2016 the Commission approved the proposed modification subject to the revised noise limits summarised in the following table. The noise zones³⁰ referred to in the table are shown on **Figure 6.9**.

The project approval also provides limits on hours of operation for certain activities, including amplified music from the main stages, and amplified music from bars and other venues. These hours of operation are outlined in Section 3.2.4.

Table 6.3: Revised Noise Limits

Time	Noise Criteria $dB_{LAeq}(10\ min)$	
	Inner Zone (Zone 1)	Outer Zone (Zone 2)
11 am – midnight	60 dBA	55 dBA
	70 dB(lin) ¹	65 dB(lin) ¹
Midnight – 2 am	45 dBA	45 dBA
	60 dB(lin) ¹	55 dB(lin) ¹

1 Low frequency noise in the 63 hertz 1/1 octave band

³⁰ Zone 1 refers to areas within 1 kilometre from the site, and Zone 2 refers to areas more than 1 kilometre from the site.

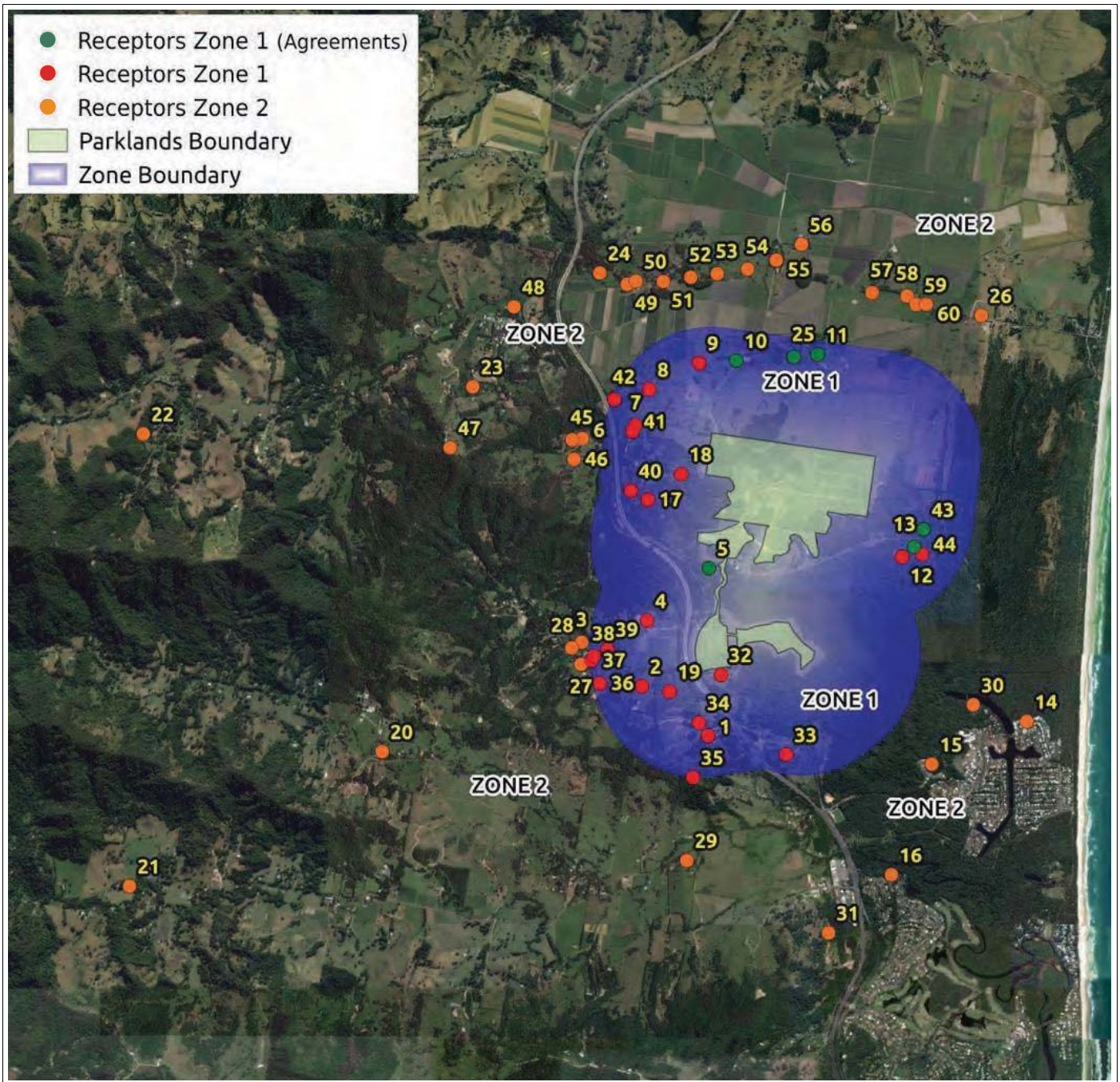


Figure | 6.9
Noise Assessment Zones & Sensitive Receivers

North Byron Parklands | Tweed Valley Way & Jones Road





The Commission's determination report for MOD 3 noted that these noise limits are consistent with, or in some cases more stringent than, noise limits for contemporary outdoor venues both in Australia and overseas. Further, the Commission noted that low-frequency noise is not regulated at all in the benchmarked Australian venues and international events such as the Glastonbury Festival. As such, it is considered that the noise regulation for the project represents best practice.

6.4.2 Performance

Since the implementation of the above mitigation measures and revised noise criteria (ie. from Splendour 2016 onwards), Parklands has achieved compliance with all of the noise-related project approval conditions and its KPIs. The adaptive management approach and the continual improvement in performance is reflected in the number of noise-related calls to Parklands' Community Hotline, which has shown a marked downward trend over the trial period (see **Figure 6.10**). It is considered that the Performance Reports demonstrate that the recent events are being managed to an acceptable standard and generally in accordance with the community's expectations.

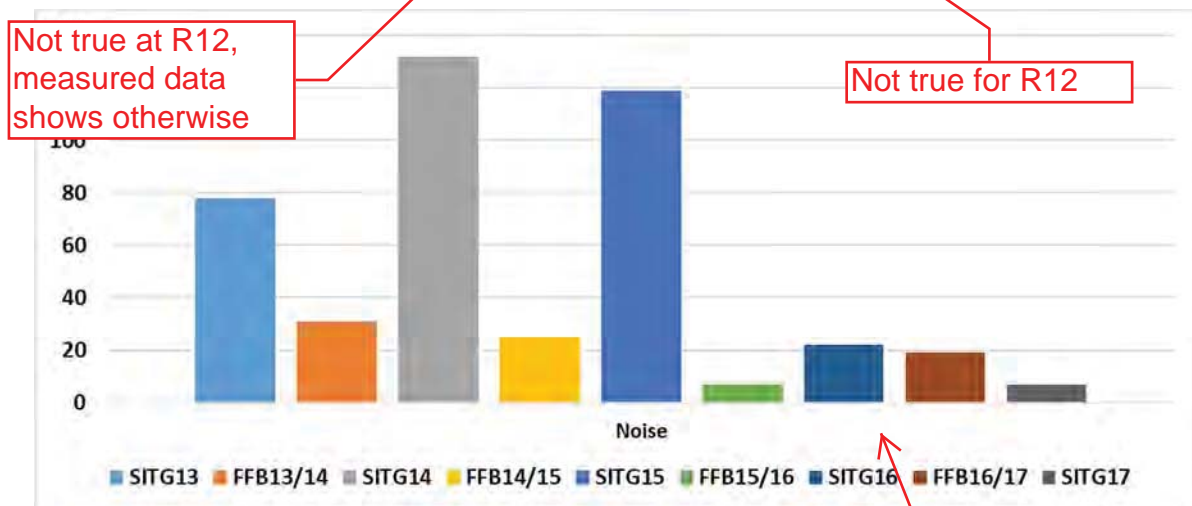


Figure 6.10: Noise Calls to the Community Hotline (Source: Parklands)

Notwithstanding, noise does continue to be the issue most raised in calls to the Community Hotline (see Section 6.2). To ensure noise is effectively managed and to promote continual improvement, Parklands implements a range of measures in accordance with the project approval and its commitment to the community, including the preparation and implementation of a comprehensive:

- Noise Management Plan, that includes a range of mitigation measures to prevent noise spill;
- Acoustic Monitoring Program, that includes amongst other things:
 - continuous unattended monitoring at sensitive receiver locations both before and after events;
 - attended monitoring at sensitive receiver locations, including in relation to the Community Hotline;
 - implementation of the NCCC which includes real-time monitoring of noise levels for all stages, monitoring of local meteorological conditions, and liaison between NCCC, Community Hotline personnel, stage managers and production personnel; and
- Noise Impact Reports for each event.

Parklands has also entered into negotiated noise agreements with some surrounding receivers³¹, and provides complimentary event tickets to a number of surrounding landowners, as outlined in Section 2.3.

³¹ Including Receivers 5, 10, 11, 13, 25 and 43.



6.4.3 Proposed Development and Noise Assessment

The proposed development involves the continuation of noise sources associated with outdoor events on the Parklands site, as well as the introduction of additional noise sources, in particular the conference centre and associated facilities.

To assess the potential noise impacts associated with the proposed development, a Noise Assessment has been undertaken by ANE, and is attached as **Appendix L**. The assessment includes consideration of construction, event and traffic related noise and vibration, and has been undertaken in accordance with applicable noise criteria and guidelines including the:

- noise criteria in the existing project approval – for event noise;
- EPA's *NSW Industrial Noise Policy* (now *Noise Policy for Industry*)³² – for plant and equipment noise and conference centre;
- EPA's *Interim Construction Noise Guideline* – for construction noise; and
- EPA's *Road Noise Policy* – for road traffic noise.

A summary of the findings of the assessment is provided below.

6.4.4 Event Noise

From a noise impact perspective, the proposed ongoing outdoor events at the Parklands site would be similar to the existing trial events. The key change would be the potential use of one additional main stage (the 'Forest' stage) for all larger events. This stage is currently only used for the Falls Festival.

A summary of the main and minor stages modelled in the noise assessment is provided in **Table 6.4** below, and an indicative layout of the stages is shown on **Figure 6.11**. The indicative stage locations have been located to take advantage of topographic shielding and to optimise stage orientation to minimise offsite impacts.

Table 6.4: *Modelled Music Stages*

Main Stages	Minor Stages/Venues
S1 – Amphitheatre	S2 – Tipi
S3 – Forest	S5 – World
S4 – McLennan	S9 – Cabaret Tent
S6 – Tiny Dancer	V1 to V10 – Minor Venues
S7 – Mix Up	

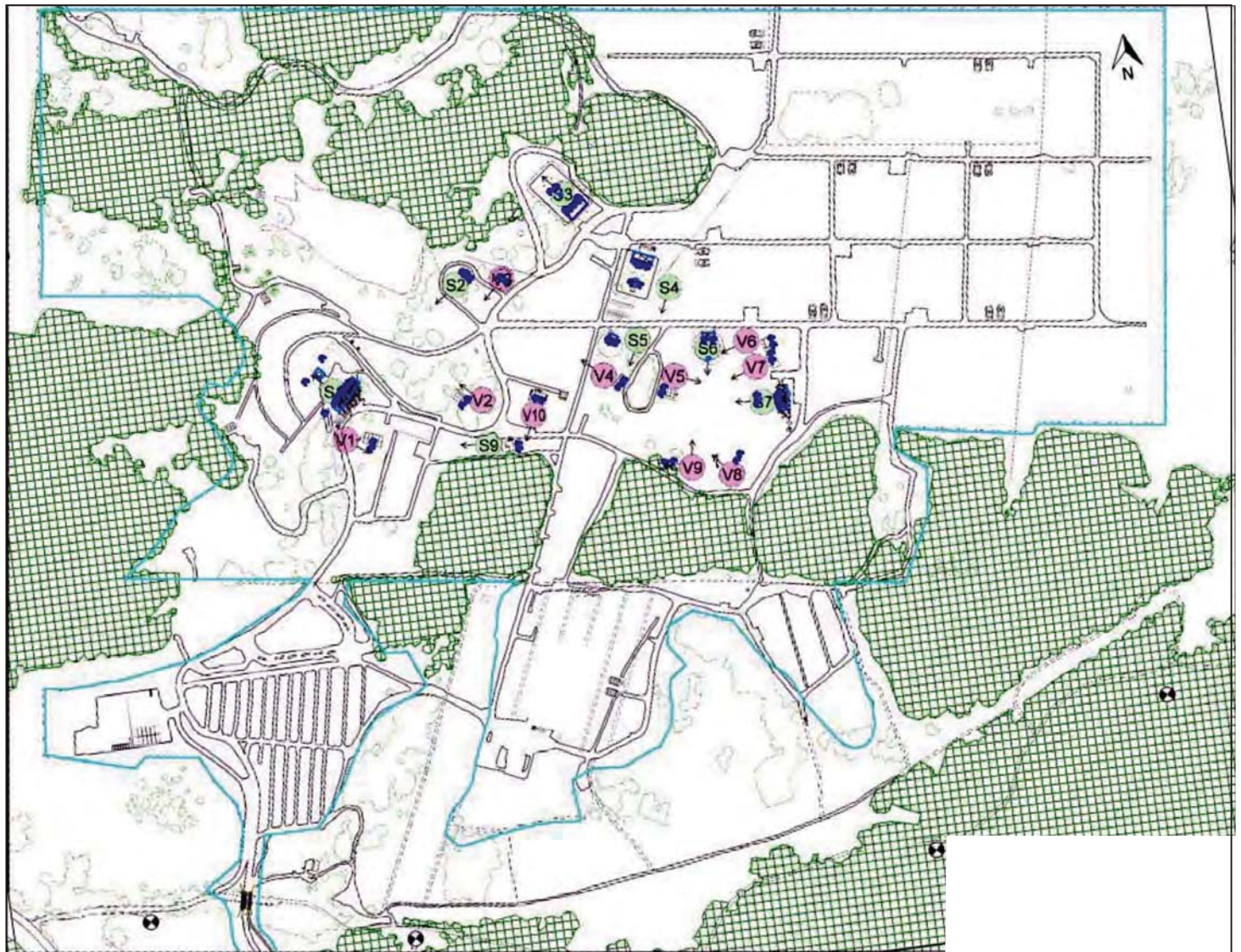
The noise assessment includes modelling of the noise levels at sensitive receiver locations associated with the proposed largest event (ie. Splendour at 50,000 patrons), with the modelling undertaken using CadnaA software.

The modelling adopts the physical mitigation measures that have been used for the existing project (as outlined in Section 6.4.1 above), and includes modelling of a number of scenarios including:

- Base case – existing Splendour layout (ie. existing operations to calibrate model);
- Future large event with all stages operating – no volume management; and
- Future large event with all stages operating – with volume management.

But only based on 11am to midnight data. No calibration between midnight and 2am with measurement data. There appears to be significant discrepancies between midnight-2am in particular

³² The *NSW Industrial Noise Policy* (INP) was replaced by the still applies to the proposed development under the savings provisions under both policies.



Legend



Foliage area



Sensitive receiver



Speaker noise source



Date	November 2017
Author	Planners North
Reference	1267.1694

Prepared by

PJEP & Planners North

Sources | ANE Acoustic Assessment

Figure | 6.11
Modelled Music Stages

North Byron Parklands | Tweed Valley Way & Jones Road



The assessment notes that the modelling provides a conservative prediction of noise impacts for a number of reasons, including:

- the assessment was undertaken assuming typical worst case meteorological conditions, including source-to-receiver winds (1 to 3 m/s), or temperature inversion under calm conditions³³. This results in predictions up to 6 dBA higher than what would occur during calm conditions;
- the assessment assumes that all stages would be operating at once. In reality, there would never be a time that all stages are operating at once;
- the model is unable to fully account for the innovative speaker arrangements that have been adopted for recent events, in particular the hanging J-curve speaker arrangements that direct sound downwards into the crowd rather than out; and
- minor music stages/venues have been assumed to radiate noise in all directions with no directivity or noise shielding from structures. In reality, all venues have some directivity and/or shielding.

Base Scenario – Existing Large Event

The modelling for the base scenario (and the future event – no volume management scenario) is based on the typical front-of-house noise levels measured for the current trial events (see **Table 6.6** below).

The modelling predicted that the existing Splendour and Falls Festival events would comply with the applicable noise limits at all off-site receivers, with the exception of a small number of receivers that were predicted to exceed the limits during the Splendour event (no exceedances were predicted for the Falls Festival event). As outlined above, these predictions are based on worst case operating levels and worst case meteorological conditions, with no active volume management.

A summary of the exceedances is provided in **Table 6.5** below.

Table 6.5: Base Scenario (Existing Splendour Event¹) – Predicted Exceedances (exceedances in bold)

Receiver ID	Location	Zone	Noise Agreement	Total Noise (dBA)		Low Frequency Noise (dB _{lin})	
				Prediction	Limit	Prediction	Limit
5	Jones Rd, Wooyung	1	Yes	65	60	73	70
10	Wooyung Rd, Wooyung	1	Yes	61	60	66	70
11	Wooyung Rd, Wooyung	1	Yes	59	60	72	70
25	Wooyung Rd, Wooyung	1	Yes	59	60	71	70
35	Billinudgel Rd, Billinudgel	1	No	52	60	71	70
43	Jones Rd, Wooyung	1	Yes	58	60	73	70
55	Hulls Rd, Crabbes Creek	2	No	53	55	66	65

1 11am to midnight time period

As indicated in the table, 2 receivers are predicted to exceed the dBA noise limits and 6 receivers are predicted to exceed the low frequency dB_{lin} limits, for a total of 7 receivers altogether. Parklands has negotiated noise agreements with 5 of these receivers.

Not true. It depends on the frequency, level and rate of change of the sound

exceedances are relatively minor (ie. 1 to 2 dB)³⁴, with the exception of Receiver 5 on Jones Rd which is subject to an agreement with Parklands, and is predicted to experience exceedances of 3 to 5 dB.

Model needs to be better calibrated for midnight to 2am before assumptions can be made

³³ In accordance with ISO 9613-2:1996 Acoustics: Attenuation of sound during propagation conditions

³⁴ Noise differences of 1 to 2 dB are not discernible by the human ear.



In practice, noise levels are managed to comply with the applicable criteria at all off-site receivers (with the exception of those with agreements) through implementation of the active noise management system described above.

Future Large Event

Modelling for the future large event (ie. Splendour at 50,000 patrons) indicates that, without volume management mitigation or other mitigation measures, exceedances of the noise limits could be experienced at a number of receivers in the surrounding area (in both Zone 1 and Zone 2).

Accordingly, the noise assessment includes consideration of additional reasonable and feasible measures that could be implemented to further mitigate noise impact to surrounding receivers. The mitigation options considered included:

- fully enclosing main stages on 3 sides;
- additional shielding behind main stages;
- tall barriers or earth turns (up to 20 metres high) to the rear of main stages;
- fully enclosing some stages with within buildings (eg. dance stages); and
- additional investigation of orientating stages away from sensitive receiver locations.

None of the enclosure/shielding options were found to provide any significant reduction in noise levels at sensitive receivers (approximately 1dB reduction). Full enclosure of some stages within buildings (eg. dance stages) was discounted for safety reasons. Further stage orientation investigation was also found to not provide any significant benefits in reducing overall off-site noise performance.

The noise assessment concludes that the existing physical mitigation measures outlined in Section 6.4.1 above represent reasonable and feasible mitigation measures available to the site. As such, source noise controls (ie. monitoring and volume management) are considered the most appropriate additional noise control strategy for the proposal.

Through iterative modelling, the assessment found that by reducing front-of-house noise levels marginally during worst case meteorological conditions, compliance would be achieved at sensitive receiver locations, with some minor exceptions as discussed below. The adjusted front-of-house noise levels for the main and minor stages are shown in **Table 6.6**.

Calibration of model between midnight and 2am appears inadequate based on measured data at R12. Needs to be improved

Table 6.6: Front-of-House Noise Levels (adjusted levels in bold)

Stage	11am – Midnight				Midnight – 2am			
	Total Noise dBA		Low Frequency Noise dBC		Total Noise dBA		Low Frequency Noise dBC	
	Non-Adjusted	Adjusted	Non-Adjusted	Adjusted	Non-Adjusted	Adjusted	Non-Adjusted	Adjusted
S1	99	98	109	108	-	-	-	-
S2	95	95	105	105	95	89	105	99
S3	99	99	109	105	-	-	-	-
S4	99	99	109	108	-	-	-	-
S5	95	95	105	105	95	92	105	104
S6	99	99	109	108	-	-	-	-
S7	99	99	109	107	-	-	-	-
S9	91	91	101	101	91	87	101	99
V1	95	95	105	105	95	94	105	104
V2	95	95	105	105	95	90	105	98
V3	95	95	105	105	95	91	105	102
V4	95	95	105	105	95	92	105	103



Stage	11am – Midnight				Midnight – 2am			
	Total Noise		Low Frequency		Total Noise		Low Frequency	
	dBA		Noise dBC		dBA		Noise dBC	
	Non-Adjusted	Adjusted	Non-Adjusted	Adjusted	Non-Adjusted	Adjusted	Non-Adjusted	Adjusted
V5	95	95	105	104	95	93	105	99
V6	95	95	105	104	95	91	105	99
V7	95	95	105	104	95	92	105	100
V8	95	95	105	105	95	91	105	98
V9	95	95	105	105	95	94	105	101
V10	95	95	105	105	95	94	105	104

As outlined in the table, the required adjustments are only 1 dBA for one stage in the 11am to midnight time period, and between 1 and 6 dBA for a number of minor stages/venues in the midnight to 2am time period. Adjustments for low-frequency noise would be 1 to 4 dBC for a number of stages in the 11am to midnight time period, and between 1 and 7 dBC in the midnight to 2am time period. The noise assessment notes that these levels would still provide acceptable sound levels for audience satisfaction.

A summary of the predicted noise exceedances at sensitive receiver locations, based on these front-of-house noise levels, is outlined in **Table 6.7** below.

Table 6.7: Future Large Event Scenario – Predicted Exceedances (exceedances in bold)

Receiver ID	Location	Zone	Noise Agreement	Total Noise (dBA)		Low Frequency Noise (dB _{lin})	
				Prediction	Limit	Prediction	Limit
11am – Midnight							
5	Jones Rd, Wooyung	1	Yes	65	60	72	70
43	Jones Rd, Wooyung	1	Yes	58	60	73	70
Midnight – 2am							
5	Jones Rd, Wooyung	1	Yes	53	45	63	60

As outlined in the table, the modelling indicates that compliance with the applicable noise criteria would be achieved during worst case conditions at all off-site receiver locations, with the exception of 2 receivers on Jones Road which are subject to noise agreements.

Based on the results of the modelling, and the historical management and event noise monitoring, the noise assessment concludes that the proposed events are able to be managed to achieve compliance with the applicable noise limits at all off-site receivers (with the possible exception of Receiver 5 and other receivers subject to agreements), and that noise can be managed to ensure an acceptable amenity in surrounding areas.

Event Plant and Equipment

The noise assessment also includes modelling of potential noise impacts associated with the operation of fixed plant and equipment during events, in particular generators for lighting during the night time period after the cessation of event performances (ie. after midnight and 2am)³⁵.

The assessment adopts a night-time noise criterion of 35 dBA for these noise sources, based on the provisions of the EPA's *Noise Policy for Industry*.

³⁵ While generators also operate during the event performance periods, they are much quieter than event noise and do not influence the noise profile at receiver locations.



The assessment found that noise levels would comply with this criterion at all off-site receivers during the sensitive night-time period. Further, noise levels at most receivers would be below the applicable rating background noise level (ie. 30 dBA), which indicates that this noise source is unlikely to be distinguishable from background noise.

The only exceptions are Receiver 5 (ie. 34 dBA) and Receiver 32 (ie. 31 dBA). The noise assessment notes that optimising the location and orientation of lighting towers and plant near these receivers would reduce noise levels further, if required.

6.4.5 Conference Centre Noise

The noise assessment includes consideration of potential noise impacts associated with the conference centre use, including:

- amplified entertainment or announcements (eg. music, presentations);
- vehicle movements;
- outdoor activities; and
- mechanical plant and equipment.

The assessment includes modelling of the combined operation of these noise sources within the conference centre and associated accommodation precinct, with reference to the minimum nighttime criterion under the *Noise Policy for Industry* (ie. 35 dBL_{Aeq}), as well as the applicable sleep disturbance criterion (ie. 45dBL_{Amax}).

The assessment found that the combined conference centre noise levels would comfortably comply with the applicable criteria at all sensitive receivers, with a maximum of 29 dBL_{Aeq} at a receiver location (Receiver 5), and a maximum of 30 dBL_{Aeq} at the boundary of the nearest property (Receiver 18).

The assessment also indicates that the operations would not result in any sleep disturbance impacts, with a maximum of 37 dBL_{Amax} at a receiver location (Receiver 5), and a maximum of 36 dBL_{Amax} at the boundary of the nearest property (Receiver 18). If consideration is given to noise attenuation through the conference centre glazing, then L_{Amax} levels would be below 30dB at all sensitive receiver locations.

6.4.6 Construction Noise and Vibration

The noise assessment includes consideration of construction noise and vibration, concluding that no impacts are likely given the distance to off-site receivers and the nature of the proposed construction works. In this regard, the nearest off-site receiver to the proposed conference centre (Receiver 18) is 450 metres from the proposed centre, and does not have a direct line of sight to the development.

To ensure that construction noise (including cumulative noise) is appropriately managed, Parklands would undertake construction activities within the hours stipulated in the EPA's *Interim Construction Noise Guideline* (as reproduced in Section 3.2), and implement standard best practice measures including:

- ensuring all plant and equipment is well maintained and appropriately operated;
- scheduling construction works near residents during the least sensitive time of the day where practicable;
- notifying residents of the construction works schedule; and
- maintaining the Community Hotline for complaints management.



6.4.7 Mitigation and Management

To manage noise related risks associated with the ongoing operation of the Parklands project, Parklands proposes to implement a range of measures that are generally consistent with the existing measures that have been implemented for the project to date. In this regard, Parklands would:

- manage the noise emissions from the project to comply with the existing noise limits at all times (as identified in **Table 6.3** above), for all receivers apart from those with negotiated noise agreements;
- update and subsequently implement the:
 - Noise Management Plan, to minimise and manage noise impacts associated with the project. The plan would include a range of noise mitigation and management measures, including:
 - at-source acoustic attenuation measures;
 - speaker array controls;
 - adaptive noise management via the Noise Control Coordination Centre (NCCC);
 - noise complaint monitoring and response via the Community Hotline;
 - noise impact reporting; and
 - Acoustic Monitoring Program, that includes amongst other things:
 - continuous unattended monitoring before, during and after all medium and large events;
 - attended monitoring at sensitive receiver locations for all medium and large events, and/or in response to calls to the Community Hotline;
 - implementation of the NCCC for all medium and large events, which includes:
 - real-time monitoring of noise levels for all stages;
 - monitoring of local meteorological conditions; and
 - liaison between the NCCC, Community Hotline personnel, stage managers and production personnel.

The management plan and monitoring program would be updated in consultation with the applicable authorities and the RWG.

6.5 Visual and Lighting

6.5.1 Background

The Parklands site, and particularly the event and camping area, is situated in a natural visual basin which assists in screening the majority of views from off-site sensitive receiver locations.

Billinudgel Nature Reserve and Marshalls Ridge screen the site to the south and east, while elevated terrain to the west and north-west screen the site in these directions. The screening ridges are shown on **Figure 6.12**.

Notwithstanding, there are views to the site from some sensitive receiver locations, and lighting associated with events can also be seen from surrounding sensitive receiver locations.

6.5.2 Performance

All trial events to date have been managed in accordance with the applicable lighting-related approval conditions and KPIs (Nb. The consent and KPIs do not include any visual amenity-related requirements given the minor visibility of event infrastructure).

Further, no calls to the Community Hotline have raised visual or lighting related issues during the trial period to date, although a small number of direct communications from neighbours have raised concerns regarding some lighting displays.