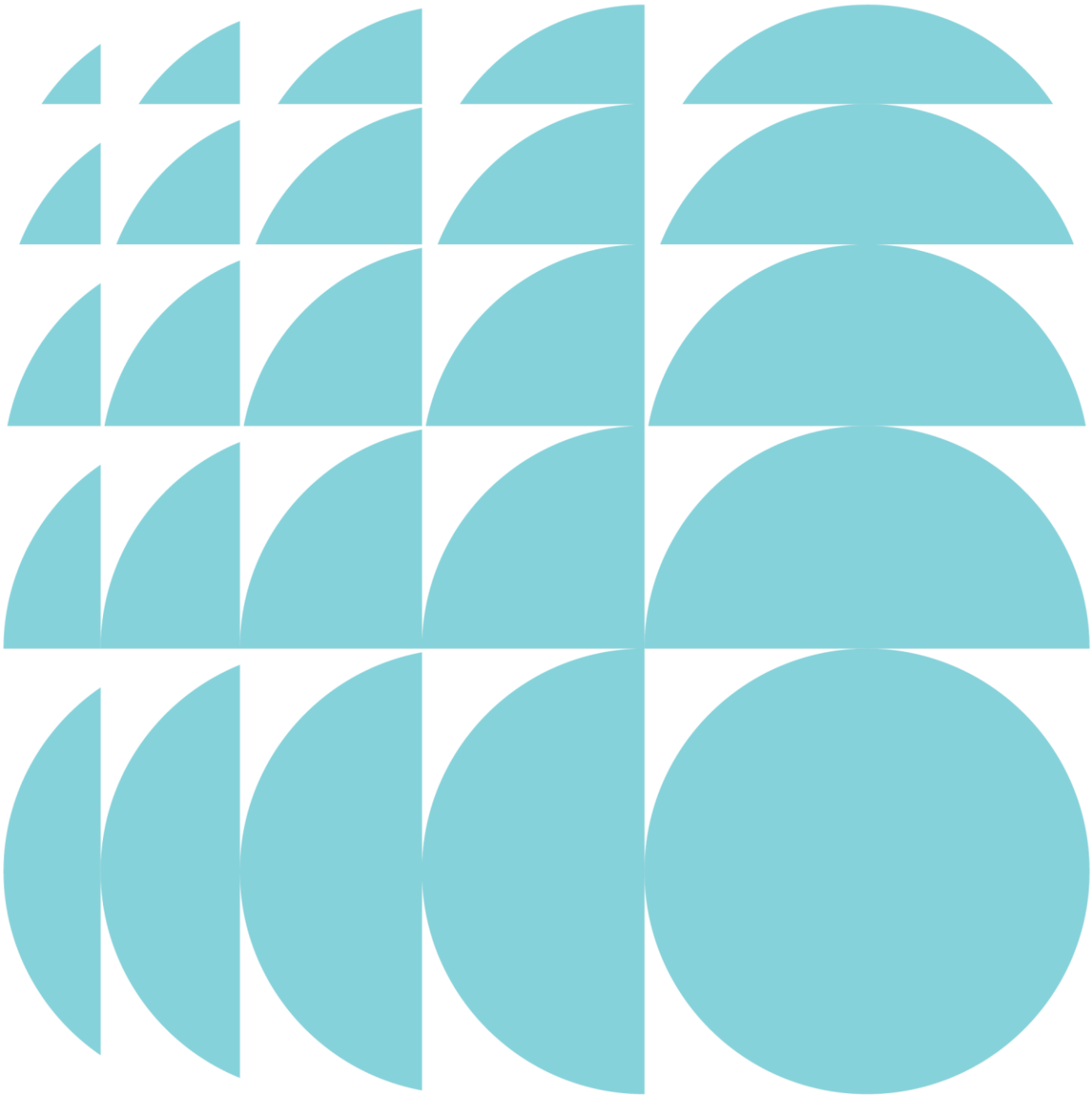
ETHOS URBAN

SSD 7388 – The Ribbon, MOD 7
Section 4.55(1A) Modification Application

The Ribbon
31 Wheat Road, Sydney

Submitted to Department of Planning and Environment
On behalf of Grocon (Darling Harbour) Developments Pty Ltd

13 December 2018 | 12255



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1.0 Introduction

On behalf of Grocon (Darling Harbour) Developments Pty Ltd, we hereby submit an application pursuant to Section 4.55(1A) of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) to modify SSD 15_7388 which relates to The Ribbon development (former IMAX site) in Darling Harbour. This modification application seeks to provide for an open roof above the hotel pool deck at the site.

In order to enable this, the following specific changes have been proposed:

- design work above the hotel pool area in order to allow for the provision of an 'open roof';
- provision of a new electronic warning system in the building, comprising sensors, an alarm and associated plant; and
- provision of a dedicated Plan of Management, which will be followed by the future operator to ensure that patrons vacate the pool area if an adverse air quality outcome were to arise.

This application is submitted to the Department of Planning and Environment (DPE), and identifies the consent, describes the proposed modifications and provides a planning assessment of the relevant matters for consideration contained in Sections 4.55(1A) and 4.15(1) of the EP&A Act. It should be read in conjunction with the Environmental Impact Statement (EIS) prepared by JBA dated December 2015 and Response to Submissions (submitted with the original SSD), as well as the previously approved modification applications, which have been further discussed at **Section 2.0**.

2.0 Background

2.1 SSD 15_7388

Development consent SSD 15_7388 was granted by the Planning Assessment Commission on 28 July 2016 for the redevelopment of the IMAX building, including:

- demolition of the existing IMAX building, tourist office and amenities block;
- construction of a new 25 storey building and separate 2 storey building;
- hotel, serviced apartments, retail and entertainment uses;
- 170 car parking spaces within the podium and 239 bicycle spaces at the ground level;
- Realignment of Wheat Road;
- Upgrade to the surrounding public domain including a new playground and relocation of heritage items; and
- Installation of a City Screen and signage zones.

Six modification applications have been lodged regarding this application to date. The first two modifications (MODs 1 and 2) related to the staging of the conditions of consent and were both withdrawn prior to determination.

The third modification application (MOD 3) comprised a range of design changes to the development below the tower, within the building podium. This application was approved by the DPE on 2 November 2017.

A fourth modification application (MOD 4) was approved by the DPE on 10 November 2017, seeking an extension of construction hours at the site. MOD 4 sought the provision of extended construction hours broadly comprising 6.00am to midnight, Monday to Saturday, and was approved by the DPE on 10 November 2017.

A fifth modification application (MOD 5) was also approved by the DPE on 10 November 2017, seeking to reflect an updated room no. configuration, and layout between the serviced apartment and hotel components of the development. The subject modification application has been designed so as to be consistent with the layout proposed under MOD 5, for consistency of assessment.

A sixth modification application (MOD 6) was submitted to the DPE on 6 April 2018, and is currently under assessment (discussed below).

2.2 SSD 7388 – MOD 6

As part of the program of changes to The Ribbon, a modification application (known as MOD 6) is currently under assessment with the DPE, which includes the following changes to the development:

- rationalisation of the geometry of the tower envelope;
- reconfiguration of the hotel pool, in order to enable the provision of an open air roof;
- minor changes to the hotel / serviced apartment room dimensions in order to reflect the revised envelope;
- minor changes to the configuration of the internal building layout;
- provision of inclined louvres into the eastern and western elevations;
- minor modifications to the northern façade of the approved development;
- provision of external facade lighting;
- incorporation of a BMU rail system;
- amendments to the approved signage strategy; and
- an extension of approved construction hours at the site to the period of between midnight and 6am, six nights per week (not including Sundays).

Of this original proposal, the façade lighting, construction hours and hotel open air roof components of the development were withdrawn from this application during the assessment process.

This modification application specifically comprises a revised and updated proposal to enable the open air roof. The modifications now propose additional safeguards and systems to provide assurance (to the maximum possible extent) that there will be a strong framework in place to minimise the impacts arising from future operation of the open air pool area and safeguard patrons in the area.

2.3 SSD 8837

Secretary's Environmental Assessment Requirements (SEARs) have been issued ahead of a State Significant Development Application (SSDA) 8837, which pertains to the fit out and operation of the IMAX cinema component of the development at the site. This application will be submitted to the DPE shortly, and pertains to different components of the development than this application.

2.4 SSD 8838

SSDA 8388 is a separate SSDA which is currently under assessment with the DPE. This application seeks the fit out of the hotel and serviced apartment components of the approved development, which is currently under assessment with the DPE. This application does not affect SSD 7388 MOD 7 (the subject application).

2.5 Interim Consultation

In addition to the above background, Grocon has also extensively consulted in the development of this scheme, including on 27 June 2018 (with RMS, Transurban and DPE), 27 September 2018 (with RMS and Transurban) and 9 October 2018 (with DPE).

The purpose of these meetings was to ensure that the application addressed and reflected the relevant issues which would need to be considered as part of such a modification application. Comments raised at these meetings have accordingly been incorporated into and reflected in this modification application, wherever possible.

3.0 Proposed Modifications to Consent

3.1 Proposed Modifications to Development

The application seeks approval for the following amendments to the approved development.

3.1.1 Physical changes

The proposed physical modifications comprise:

- the provision of the 'open roof' above the pool area at Level 22; and
- the installation of sensors at the pool level, which will work to ensure that the pool operates at safe air quality standards at all times.

The proposed changes will occur at the plan and roof components of the development only, meaning that the changes will not be visible from the surrounding public domain. In order to ensure that the development operates as intended, a number of additional systems and parameters have also been proposed as part of this application, which have been further discussed below and include:

- nitrogen oxide sensor tubes;
- strobe / flashing light with audible alarm; and
- nitrogen oxide analyser equipment.

Where relevant, these have been demonstrated on the Architectural Plans at Appendix A. The proposed amendments to Level 22 are identified at **Figure 1** below, while the open roof arrangement is identified at **Figure 2**. Some reports (i.e. the ERM assessment) refer to Level 29, however this is the commercial identification for the hotel pool level and should be treated as referring to Level 22 in the Architectural Plans prepared by Hassell.

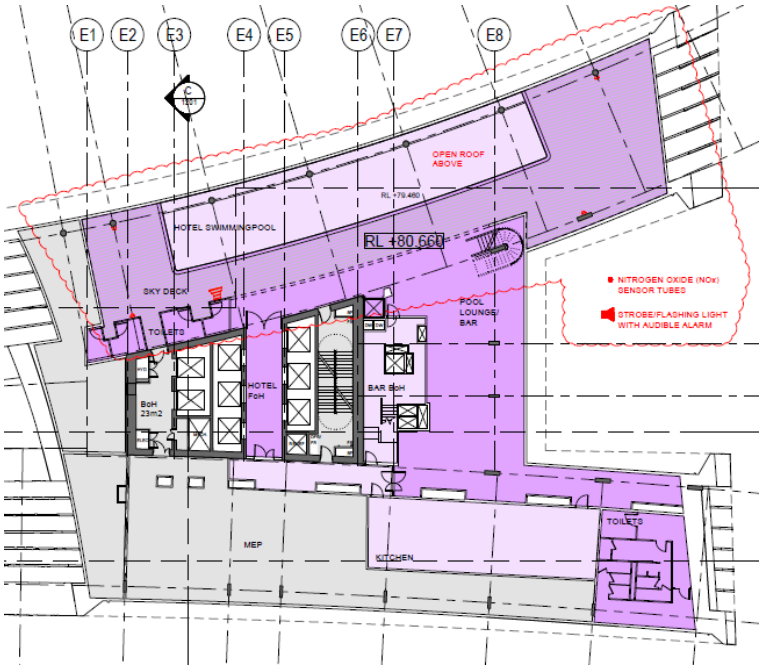

Figure 1 Excerpt of plans from Level 22

Source: Hassell

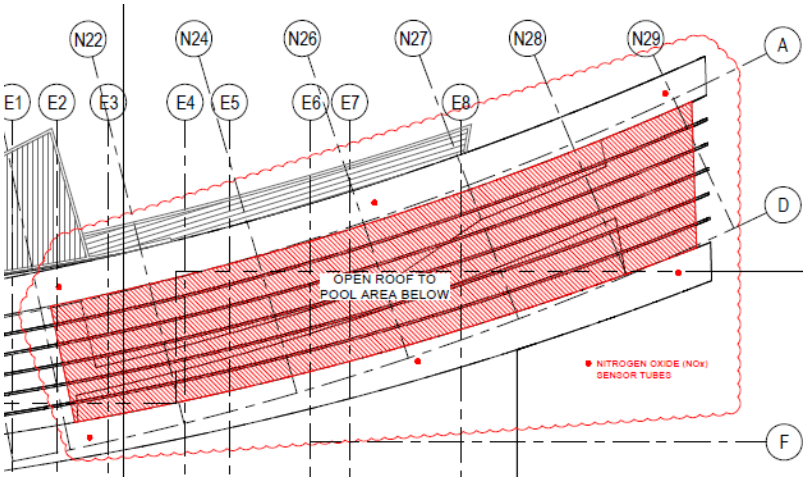

Figure 2 Proposed roof level plan, demonstrating open roof area above pool

Source: Hassell

3.1.2 Proposed additional parameters

To accompany the proposed open roof above the pool area, a system of measures has been proposed as part of this modification application. These measures have been detailed in the Architectural Drawings at Appendix A, and have been further discussed in the Plan of Management at **Appendix B**.

The proposed measures include the following:

- **Nitrogen oxide sensor tubes and analyser –** Principally, air quality of the pool deck will be monitored through the provision of four sensors which will be installed around the pool area. These sensors have been specifically selected to detect Nitrogen Oxide in the air.

  The specific model selected for this system is the Model 405 nm NO_2 / NO / NO_x Monitor, which has been selected at the advice of the system monitor by Lear Siegler Australia (the environmental monitoring company). A letter has been provided by Lear Siegler Australia which demonstrates the subject model as being appropriate for this purpose, which is provided at **Appendix D**. This letter states that *"the Model 405 nm* (the subject model) *has been approved by NSW Department of Planning and NSW Office of Environment and Heritage and will be used in the three (3) continuous Emissions Monitoring Systems (CEMS) for Stage 1 of Westconnex at Parramatta Road and Underwood locations"*. Accordingly, this sensor is fit for purpose.

  Additional specifications regarding the proposed sensor tubes have been provided at **Appendix C**. These detail the operational parameters of the specific sensor proposed for this application.

- **Escalating system of emissions monitoring / alarm system –** In conjunction with the above, a strobe / flashing light with audible alarm has been proposed within the pool area. Should the above sensors detect a level of nitrogen oxide above pre-determined acceptable limits, then progressively steps to ensure appropriate evacuation of the pool area will be progressively undertaken comprising:
  - Identification of NOx concentrations above 50 ug/m^3 raise a warning text/email to pool area supervisory management
  - Identification of NOx concentrations above 100 ug/m^3 raise a warning alarm (strobe) and text/email to pool area supervisory management – to advise patrons to be ready to vacate
  - Identification of NOx concentrations above 200 ug/m^3 raise a warning alarm (strobe + audible) advising patrons to evacuate the pool wet deck immediately.
  - Identification of NOx concentrations above 250 ug/m3 raise a warning (strobe + audible), patrons are refused access and the pool access locked and the pool area is fully vacated of any occupants.

  The impact of this is to ensure that guests are not in the pool area, at the time when an evacuation of the roof and wet deck levels is required. Through the above system, staff will be aware of the air quality issue from early in the process, and will be prepared to action any required evacuation at the appropriate time.

- **Additional management provisions –** In order to reinforce and ensure the ongoing management of the system is provided for, measures to manage the system have been included in the amended Plan of Management at **Appendix B**. Within the plan, it is delineated that the nitrogen oxide monitors are to operate in the pool area on a continuous basis, with an alarm being sounded should the levels exceed pre-determined acceptable levels. The proposed system in the plan of management includes measures to ensure that the system will be maintained over time.

  Additional supporting provisions for the system have also been detailed, including:

  - ensuring that the wet deck pool areas have clearly displayed evacuation signs and plans, such that guests will be aware of the required actions should an alarm sound;
  - education of the hotel operator in the evacuation procedures to ensure safe egress of patrons, should an alarm sound; and
  - regular and ongoing checking of the nitrogen oxide detection system to ensure that the system is correctly calibrated and is operating as intended.

Given the air quality assessment undertaken, these measures would be required on an extremely infrequent basis (further discussed at **Section 5.2**). It would be the likes of an extreme emergency which would trigger such a response. Irrespective of this, the monitors would operate on an ongoing continuous basis to ensure that should such a situation eventuate, then the response action would be promptly put into place independent of any communications directly with RMS or CCT.

The proposed modified development will ensure that Roads and Maritime Services (RMS) or Cross City Tunnel (CCT) are in no way responsible for evacuation procedures of the pool area in the case of an air quality event.

3.2 Proposed Modifications to Conditions

The proposed modifications described above necessitate amendments to the consent conditions which are identified below:

A2. The Applicant shall carry out the project generally in accordance with the:
a) Environmental Impact Statement (EIS) prepared by JBA Urban Planning Consultants dated December 2015;
b) Response to Submissions (RtS) and Amendments to Proposed Development prepared by JBA Urban Planning Consultants Pty Ltd, dated March 2016;
c) Additional information submitted subsequent to the RtS;
d) Plan of Management dated ~~***26 April 2016***~~ ***November 2018****;*
e) The following drawings, except for:
i) any modifications which are Exempt or Complying Development;
ii) otherwise provided by the conditions of consent;
e) Section 96 (2) modification application (SSD 7388 MOD 3), prepared by JBA Urban Planning and dated 8 June 2016, as amended by the Response to Submissions prepared by Ethos Urban dated 24 August 2017.
g) Section 96 (1A) modification application (SSD 7388 MOD 4), prepared by JBA Urban Planning and dated 28 June 2017, as amended by Response to Submissions prepared by Ethos Urban and dated 28 August 2017.
h) Section 96(1A) modification application (SSD 7388 MOD 5), prepared by JBA Urban Planning and dated 31 August 2017, as amended by email and attachments from Ethos Urban and dated 26 October 2017.
i) Section 4.55(2) modification application (SSD 7388 MOD 6), prepared by Ethos Urban and dated 6 April 2018, as amended by Response to Submissions prepared by Ethos Urban and dated 23 August 2018.
j) Section 4.55(1A) modification application (SSD 7388 MOD 7), prepared by Ethos Urban and dated 3 December 2018.

Architectural (or Design) Drawings prepared by Hassell			
Drawing No.	***Revision***	***Name of Plan***	***Date***
ARC-HSL-DD-1112.1	~~***F1***~~ ***G***	*GA Plans – Hotel and Serviced Apartments L21 and 22*	~~***12.06.18***~~ ***23.11.2018***
ARC-HSL-DD-1112.2	~~***G***~~ ***H***	*GA Plans – Hotel and Serviced Apartments L23 and 24*	~~***10.08.18***~~ ***23.11.2018***
ARC-HSL-DD-1113	~~***L***~~ ***M***	*GA Plans - Roof*	~~***10.08.18***~~ ***23.11.2018***
ARC-HSL-DD-1151	~~***J1***~~ ***K***	*GA Elevations – Sheet 2*	~~***12.06.18***~~ ***23.11.2018***
ARC-HSL-DD-1152	~~***L***~~ ***M***	*GA Elevations – Sheet 3*	~~***12.06.18***~~ ***23.11.2018***
ARC-HSL-DD-1153	~~***L***~~ ***M***	*GA Elevations – Sheet 4*	~~***12.06.18***~~ ***23.11.2018***
ARC-HSL-DD-1201	~~***M***~~ ***N***	*GA Sections – Sheet 2*	~~***10.08.18***~~ ***23.11.2018***
ARC-HSL-DD-1201	~~***M1***~~ ***N***	*GA Sections – Sheet 5*	~~***12.06.18***~~ ***23.11.2018***

Reason: To allow for the approved development to reflect the proposed management parameters and updated roof design.

~~**B30 No balconies, terraces or operable windows shall be incorporated within the building above a height of 60 metres above ground level.**~~

Reason: To enable the development to reflect the findings of the further air quality studies which have been undertaken since the imposition of the above condition.

~~**F3 The operable roof louvres are to remain closed at all times with the exception of when building maintenance units are required to access the building for maintenance and repairs.**~~

Reason: To enable the open roof operations sought under this application.

4.0 Substantially the Same Development

Section 4.55(1A) of the EP&A Act states that a consent authority may modify a development consent if *"it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which the consent was originally granted and before that consent as originally granted was modified (if at all)".*

The proposed development remains substantially the same as that originally approved by way of the following:

- The proposed modification to the development comprises only a minor physical change, which will be imperceptible from the public domain.
- The purpose of the proposed modification is to provide for an improved customer experience by future hotel guests, in what will be one of Australia's leading hotels. The proposed open pool area will directly contribute to the provision of a high amenity space for the future enjoyment of guests.
- No changes in use composition or building layout have been proposed under this modification application, meaning that the previously assessed and determined impacts of the building will be generally consistent with that previously considered. Where there have been differences in impacts, these have been assessed at **Section 5.0** below.
- A number of protection systems have also been proposed, with the intention of ensuring that the ultimate development at the site will continue to not result in any adverse impacts on the surrounding environment.
- This modification application does not change the key design features of the proposal, maintaining the 'ribbon' motif that runs through the architectural design.

5.0 Assessment of Environmental Impacts

Section 4.55(1A) of the EP&A Act states that a consent authority may modify a development consent if *"it is satisfied that the proposed modification is of minimal environmental impact"*. Under Section 4.55(3), the consent

authority must also take into consideration the relevant matters to the application referred to in Section 4.15(1) of the EP&A Act and the reasons given by the consent authority for the granting of the original consent.

The SEE submitted with the original DA, as well as the Environmental Assessments submitted with the modification applications submitted since collectively addressed a variety of environmental impacts. The planning assessment of the proposed modified development remains unchanged with respect to the majority of environmental impacts previously assessed.

The proposal is considered to be of minimal environmental impact, by way of the following:

- The proposed development does not comprise any substantial or perceptible changes to the building envelope or design, with the only physical change sought comprising the substitution of the existing roof arrangement for an open roof. This will positively impact the guest experience at The Ribbon, and will be appropriately managed to result in minimal, if any environmental impacts.

- The proposed development has been assessed substantially for potential environmental impacts of the roof area, which has confirmed that:
    - during normal CCT operations, there will be no impacts from use of the pool area on use of the tunnel (and associated emissions);
    - during normal CCT operations, there will be no impacts from use of the CCT on future visitors or guests of the pool area; and
    - during tunnel incidents of an extreme nature, a robust framework has been detailed with the sole intention of ensuring the safe removal of guests from the pool area whilst ensuring that CCT operations are unaffected by the open roof component of the Ribbon.

- The proposed modified development includes a suite of different systems and parameters which work together with the purpose of providing the maximum possible degree of assurance that there will be no adverse environmental impacts from the proposed modification. This is particularly relevant to operation of the surrounding road network, which the proposal has been designed to ensure the maximum possible degree of assurance that the proposed modified development will not impact operations of.

- The proposed modification will not result in any change in the intended use of the site, which will continue to provide a mixed use tourist accommodation and cinema facility at the site.

On the basis of the above, the proposal falls under the category of Section 4.55(1A) of the EP&A Act. Additional assessment of the proposed modification where relevant is undertaken below.

5.1 Environmental Planning Instruments

The Environmental Impact Statement (EIS) submitted with the original SSDA addressed the development's level of compliance against the relevant environmental planning instruments, which include:

- *State Environmental Planning Policy (State and Regional Development) 2011*;
- *State Environmental Planning Policy (Infrastructure) 2007*;
- *State Environmental Planning Policy No. 55 – Remediation of Land*;
- *State Environmental Planning Policy No. 64 (Advertising and Signage)*;
- *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*; and
- Darling Harbour Development Plan No. 1.

This application seeks approval only for very minor modifications to the roof of the approved building. The proposed modifications will not change the relationship of the development with the surrounding area, and does not result in any change in assessment with the relevant environmental planning instruments.

Also relevant to this application is Clause 7.24 of the *Sydney Local Environmental Plan 2012* (SLEP 2012). This clause specifically relates to air quality in the vicinity of the CCT emissions stack. However, the SLEP 2012 does not apply to the site, and on this basis Clause 7.24 of the SLEP 2012 is not a relevant consideration to the proposal.

Rather, the relevant consideration is prescribed by Condition 274 of the approval for the Cross City Tunnel. On this basis, the protocol for assessment against Condition 274 has been provided at **Appendix E** of this application. This protocol has been developed with the intention of addressing the following:

- *buildings potentially affected by the plume from the ventilation stack, being those buildings where, at any air intake on the building, the predicted total concentration, due to the ventilation stack emissions plus the background pollutant level, is above the air quality goal; and*
- *buildings which affect the dispersion of the plume and expand the plume footprint so that the plume potential affects an existing building or ground level receptor, being those existing buildings or ground level receptors where, at any air intake point, the predicted total concentration, due to the ventilation stack emissions plus the background pollutant level, is above the air quality goal.*

The Condition 274 protocol is the basis for the 'Level 1' and 'Level 2' air quality assessments detailed at **Table 1** below.

5.2 Air Quality

Throughout the approvals process of The Ribbon, air quality due to the proximity of the CCT exhaust stack has consistently been a matter for consideration throughout design development of the building at the site. To accurately assess air quality at the site, a chronology of the various air quality studies undertaken has been provided, which demonstrates a consistent finding that the proposed air quality is generally acceptable under normal operating conditions for the use of the Level 29 pool area.

The studies undertaken over the life of the project are detailed at **Appendix F** and have been summarised at **Table 1**.

Table 1 Summary of air quality reports prepared for the site

Year	Report	Author	Appendix	Comment
2013	Air Quality Assessment (Office Building Original DA)	Pacific Environment Limited	Appendix G	The original air quality report prepared for the development, on the basis of an office building scheme at the site. A Level 1 assessment was undertaken for this application, which comprised a high level assessment only. As the office development outcome at the site was not envisaged to require any external openings above 60m, this report was adopted and ultimately approved by DPE. This is the origin of Conditions B29 and B30.
2015	Air Quality Assessment (SSD 7388)	Pacific Environment Limited	Appendix H	This air quality assessment was prepared to support SSD7388, which sought a mixed use serviced apartment / hotel development outcome at the site. This assessment reiterates that *"while it is not possible, using this approach, to determine the frequency at which this risk of impact* (above 60m) *might occur, it is not expected that this would occur on a frequent basis (i.e. for many hours of the year)*. Irrespective of the above, given the high level nature of this assessment (Level 1) the findings of the previous assessment are retained for the mixed use development outcome.
2016a	Final Report – The Ribbon Air Quality Assessment	Pacific Environment Limited and Node Engineers	Appendix I	This air quality assessment comprised a more detailed Level 2 assessment, which used Computation Fluid Dynamics (CFD) modelling in order to confirm the conclusions of the initial air quality assessments previously undertaken. Steady state fluid low CFD analysis of the CCT ventilation outlet exhaust plume determined exhaust gas concentration levels in the vicinity of the Ribbon development under three worst-cast meteorological scenarios at 0 (ground), 30, 60, 70, 80 and 90m heights above ground level. The results concluded that the exhaust gas concentrations for scenarios 1 and 2 are expected to be negligible in the vicinity of the Ribbon development air intake zones. Under scenario 3 (negative buoyancy scenario) a maximum mass fraction of 3.6% of the original exhaust gas concentration is predicted under the worst-case hour of meteorological conditions. This would be equivalent to a maximum 1-hour NO2 concentration of 57 ug/m3 in the vicinity of the Ribbon

Year	Report	Author	Appendix	Comment
				development air intake zones. This is well below the 1 hour assessment goal of 150ug/m3 for the development. Further analysis of the PM10 impacts associated with the CCT ventilation outlet indicates that even under worst case emissions and meteorology assumptions, it is anticipated that PM10 concentrations in the vicinity of the Ribbon development air intake zones will be below the NSW EPA 24 hour criterion of 50ug/m3. Overall, the results indicated that even under the worst case dispersion / emissions conditions, the dilution between stack and receiver (i.e. the Ribbon outdoor air intake zones) is anticipated to be sufficient to ensure that air quality in these regions is not significantly impacted. The above findings were submitted to DPE for assessment, including a proposed relaxation on the 60m control for the use of mechanical ventilation. This was objected to by Transurban, on the basis of a lack of real world emissions data, however was approved by DPE (see **Appendix E**).
2016b	Grocon Internal Pool Area Assessment	Pacific Environment Limited	Appendix K	In response to the above CFD Assessment (2016a), Grocon sought advice as to the implications of such CFD analysis specifically in relation to the potential for an open roof at the site. This assessment concluded that at 80 and 90 mAGL, the CFD model predictions for Scenario 1 and 2 are below the CCT vent impact assessment criterion for NO2, whilst predictions for Scenario 3 are approaching the criterion. Additionally, the application of 'negative buoyancy' emission parameters in Scenario 3 are considered to provide a conservative representation of worst-case CCT vent plume impacts, given that in the case of peak vehicle emissions there would also be a significant quantity of waste heat from vehicles within the tunnel, which would act to increase the buoyancy of CCT vent emissions. The emissions adopted for this report were developed in 2007, and have not been reviewed in the context of modern vehicle emission performance or action CCT vent emission concentrations. As part of this assessment, Pacific Environment Limited stated that they expected that current levels within the CCT vent stack would be significantly lower than is reflected in the conservative assumptions used within the modelling to date (possibly by an order of magnitude). This report concluded that it is considered unlikely that NO2 levels at the L29 rooftop area would generate exceedances of the NO2 criterion, however recommended that a more comprehensive analysis be undertaken.
2017	Refined Assessment of level 29 Pool Area (SSD 7388 MOD 6)	Pacific Environment Limited	Appendix L	The report submitted with SSD7388 MOD 6, which provides further analysis and assessment from the report above (2016b). This assessment determined that the proposed condition could be removed, and provided a refined assessment on the above.
2018	Assessment of Level 29 Pool Area with Operational CCT Ventilation Data	ERM (formerly Pacific Environment Limited)	Appendix M	Report provided below, which builds upon the 2017 submitted report by making use of the real world CCT emissions data provided by Transurban. This report is further discussed below.

Air Quality Assessment – CCT Ventilation Data

The most recent assessment undertaken by ERM (formerly Pacific Environment Limited) is the first Air Quality Assessment which has reflected the real world CCT emissions data provided by CCT. This assessment builds upon the previous air quality assessments detailed above. This assessment has been provided in full at **Appendix M**, and included:

- review of the operational data provided by CCT;
- comparison of the additional data with the previous assumptions; and
- dispersion modelling results.

With the benefit of the additional data, ERM have been able to draw the conclusion that *"concentrations are below the 1 hour average ambient air quality criterion (246 µg/m^3) within the vent for 79% of the time, and approximately three times higher than the ambient air quality criterion in the maximum of 7,599 valid hourly records reviewed*. The 99.9th percentile concentration (the concentration exceeded approximately one in a thousand hours) is approximately twice the ambient air quality criterion.

Exhaust velocities varied between 1.4m/s and 25.1m/s, with 98% of readings falling between 4.6m/s and 11.3m/s. Exhaust temperatures varied between 11^{0}C and 33^{0}C, and are more broadly distributed with 80% of readings falling between 16^{0}C and 27^{0}C.

When this operational data is compared to previous estimates, the NO_2 emissions rates (g/s) is substantially lower. This includes comparisons to the EIS emissions estimates for the CCT, the COA 274 Protocol estimates and the 2016 operations independent estimate. **Figure 3** demonstrates this comparison visually.

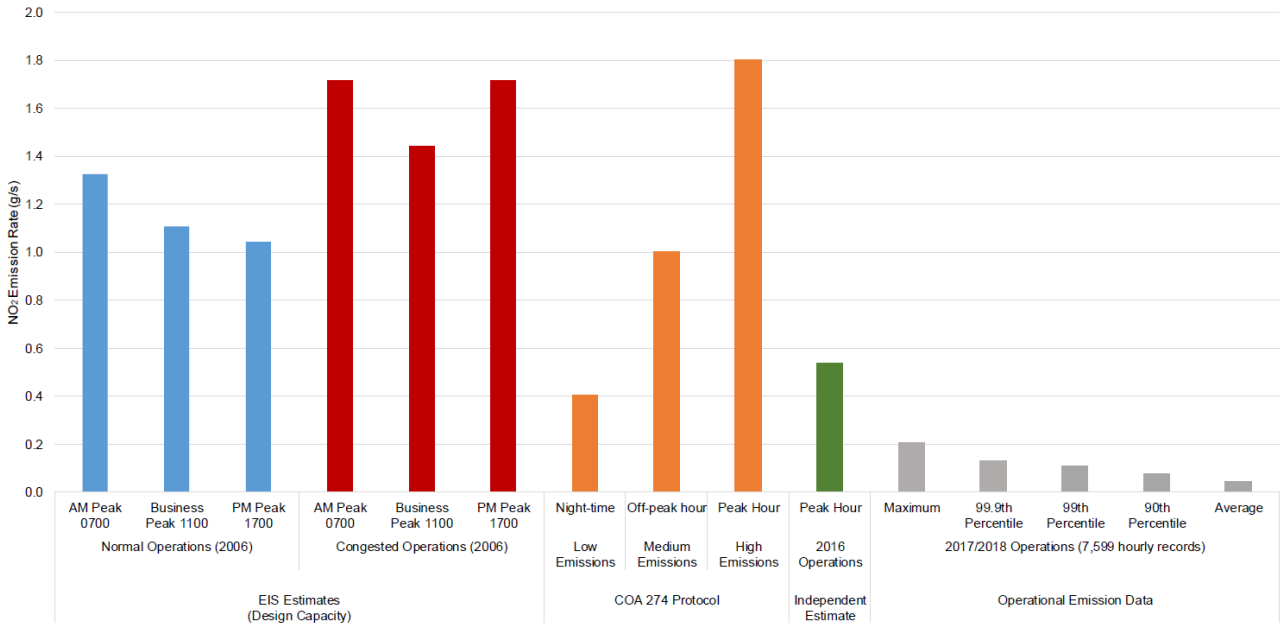

Figure 3 Comparison of CCT EIS estimates, COA 274 Protocol, ERM's 2016 Independent Estimate and the Operational Emission Data provided by CCT

Source: ERM

The above data demonstrates that the operational emission data is substantially lower than all previous estimates, including the independent estimate undertaken by ERM (then Pacific Environment Limited) referenced at **Table 1** above. This dataset demonstrates that the operational emission data (7,599 hourly records) is between five and nine times lower than the Protocol estimates, which have been applied in previous modelling analyses. It is noted that despite the most recent independent assessment modelling including an operational estimate of 0.54 µg/m^3, the higher Protocol estimates were applied in the quantitative element of the analysis.

GRAL dispersion modelling has also been undertaken as part of this assessment, given that the above data is measured at the vent, rather than the rooftop pool area of The Ribbon which is subject to this application. ERM considers that GRAL modelling is fit for the purpose under this application due to its ability to simulate flows around near-field structures. This can be applied to the context of simulating the interaction of the CCT ventilation plume with The Ribbon. This model also has an established precedence of application in the modelling of air emissions dispersion from motorway tunnel ventilation outlets in NSW. As part of this model, a number of scenarios were run

based on operational emissions data (Scenarios 1, 2, 3) and previous analysis in the 2017 analysis (Scenarios 4, 5, 6).

Detailed quantitative results of the dispersion modelling are provided below at **Table 2**. The below table demonstrates that all results are within the Protocol assessment criterion of 150 µg/m^3. Based on peak operational emission rates, the maximum downwind concentrations at the pool area are predicted to be approximately 2 µg/m^3, which is approximately two orders of magnitude below the impact assessment criterion of 150 µg/m^3.

Table 2 Summary of GRAL modelling results at discrete receptor locations

	Maximum predicted 1-hour NO_2 concentration (µg/m^3) at 95m				
Receptors	**R1**	**R2**	**R3**	**R4**	**R5**
Scenario 4	0.0	0.0	0.0	0.0	0.0
Scenario 4a	0.0	0.0	0.0	0.0	0.0
Scenario 4b	0.0	0.0	0.0	0.0	0.0
Scenario 5	0.0	0.0	0.0	0.0	0.0
Scenario 5a	0.0	0.0	0.0	0.0	0.1
Scenario 5b	0.0	0.0	0.0	0.0	0.0
Scenario 6	0.0	0.0	0.0	0.0	0.0
Scenario 6a	0.2	0.2	0.2	0.2	0.2
Scenario 6b	0.0	0.0	0.0	0.0	0.0
Scenario 6c	2.4	2.7	1.3	1.3	1.2

Source: ERM

Concluding Remarks

In light of the above assessment, the following can be concluded:

- The initial assessments of the Ribbon (2013 and 2015) comprised a simple and conservative Level 1 assessment, which lacked real world data and accordingly comprised a conservative finding that any openings above 60m should be avoided.
- The 2016a air quality assessment which made use of the CFD analysis determined that the previous assessments undertaken were conservative in nature, even in a worst case scenario.
- The refined assessment now submitted using real world data from the CCT confirms that this is true, meaning that the use of an open air roof would be safe and appropriate under normal operating conditions. The real world operating data demonstrates that in-stack concentrations are below the one hour average ambient air quality criterion (246 µg/m^3) within the vent for 79% of the time, and approximately three times higher than the ambient air quality criterion in the maximum of 7,599 valid hourly records reviewed.
- The 99.9th percentile in-stack concentration (i.e. the concentration exceeded in one in one thousand hours) is approximately twice the ambient air quality criterion. ERM notes that this is indicative of a low risk of potential NO_2 exceedances at locations away from the CCT ventilation stack, whereby significant dilation will occur.
- ERM's review of the modelled emission rates against overall operational emission data indicates that the modelling assumptions previously applied to data are conservative against operational data. ERM have determined that peak operational NO_2 emissions would be in the order of between five and ten times lower than those previously applied.
- Based on peak operational emission rates, maximum downwind concentrations at the pool area are predicted to be approximately 2 µg/m^3, which is approximately two orders of magnitude below the impact assessment criterion of 150 µg/m^3.
- The operational data reflects the current level of tunnel usage. Whilst an increase in traffic may occur in future years, fleet emissions performance improvements would likely produce significant reductions in emissions per vehicle movement.

ERM have concluded that *"the risk of exceedances of the NSW EPA ambient air quality criteria (using NO_2 as a market) associated with the operation of the pool area is minor".* Real world data has assisted in demonstrating the rare occurrence of such an event, should approval be granted. Further information supporting this has been provided at **Appendix M**.

5.3 Emergency Response

Given the above air quality findings, it is important to reiterate the improbability of an event occurring which would trigger an emergency response in the pool area. Given the much lower than anticipated air quality results experienced at the site when using CCT actual emissions data (as seen in **Section 5.2**), it would take an extreme and potentially catastrophic event to trigger this response. The impact of this is that the emergency response system would be required on a very infrequent basis.

In the rare situation that an emergency should arise in the CCT or Western Distributor that triggers the air quality of the Ribbon pool area, then the emergency management system would initiate at the site. In this system, the Nitrogen Oxide detectors would determine any exceedance of a number of pre-set levels, which would automatically action increasing levels of action including:

1. Identification of NOx concentrations above 50 ug/m^3 raise a warning text/email to pool area supervisory management
2. Identification of NOx concentrations above 100 ug/m^3 raise a warning alarm (strobe) and text/email to pool area supervisory management – to advise patrons to be ready to vacate
3. Identification of NOx concentrations above 200 ug/m^3 raise a warning alarm (strobe + audible) advising patrons to evacuate the pool wet deck immediately.
4. Identification of NOx concentrations above 250 ug/m3 raise a warning (strobe + audible), patrons are refused access and the pool access locked and the pool area is fully vacated of any occupants.

Should the system be approved, the following actions would be undertaken on a regular basis:

- *Staff will be trained (internally) in the response actions to alarms as activated above.*
- *Staff will carry out periodic simulated evacuation procedures to ensure patrons are aware of the arrangement for occupation*

In the case of an response being triggered by the system, then the following actions would be undertaken:

- *Staff will direct patrons within the pool area to vacate immediately and the doors accessing the area will be locked*
- *Patrons could remain in the adjoining bar area or return to their rooms*
- *After alarm activation and initial evacuation of area, staff would re-enter the pool area and undertake a detailed inspection of all contained areas within the pool area to ensure all patrons have been accounted for*
- *In the case of emergency evacuation, staff will enter the pool area and direct patrons to enter the fire stairwells within the core and walk down to evacuate the building*

Where relevant, components of the system have been detailed on the Architectural Plans at **Appendix A**, and have been detailed in the Plan of Management at **Appendix B**.

Ongoing maintenance of the system would be assured through the requirement for regular inspection of the system to ensure operation and calibration is correct, in conjunction with the other maintenance requirements contained within the Plan of Management. Provisions related to the pool area have also been detailed in the building design and safety procedures at **Appendix B**.

To ensure that the above is implemented, the Plan of Management includes a requirement that these provisions (related to the open roof pool) would be developed with the hotel operator prior to the granting of the Occupational Certificate. This can be conditioned as required by DPE, should approval be granted.

This would be independent of any requirement to communicate with CCT or RMS, given that the system would be based off the internal emissions readings and would not be reliant on other bodies in any way.

5.4 Ongoing Management Framework

To ensure that the emergency response system is maintained, provisions have been included as part of the Plan of Management at **Appendix B**. Specifically, this includes the following additional provision:

> *"ensuring correct maintenance procedures are adhered to for the Air Quality Monitoring system, including calibration and testing procedures undertaken by staff or specialist contractors to mitigate any potential errors"*

The above provision will be fulfilled with the hotel operator prior to granting of the Occupation Certificate.

5.5 Bulk and Scale Impacts

The proposed changes are limited to the roof above the eastern portion of the building, and will not be noticeable from the surrounding ground plane. As demonstrated at **Figure 4**, the changes are very minor in nature and will effectively comprise only the provision of 'slots' to allow for the traversing of air into and out of the pool area.

The proposed modified development will also not result in any change to Gross Floor Area (GFA) or maximum height of the building.

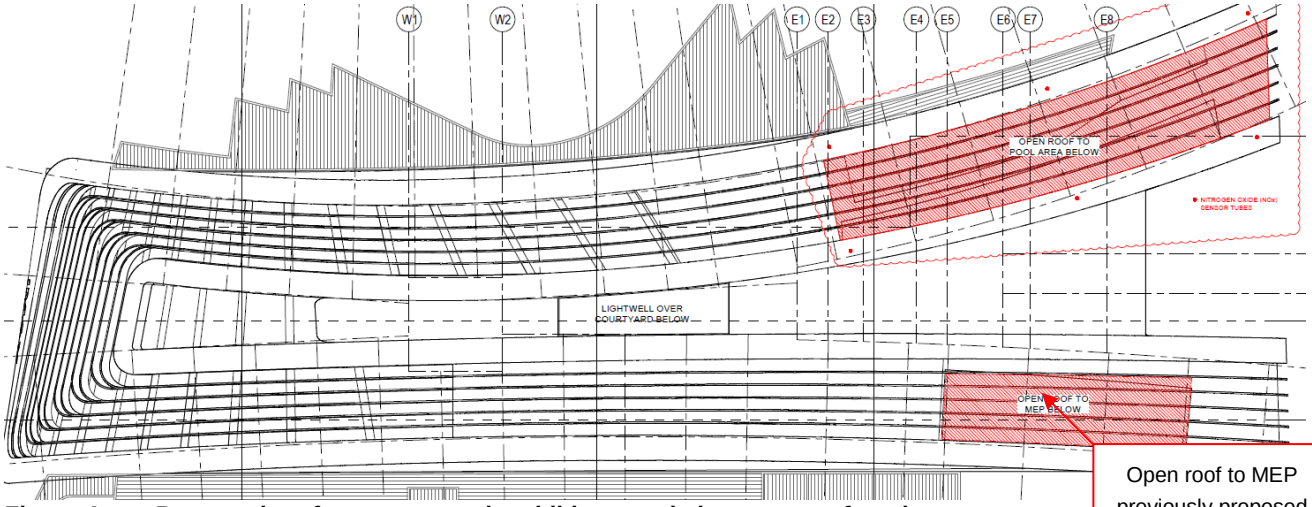

Figure 4 Proposed roof arrangement, in addition to existing open roof to plant area

Source: HASSELL

5.6 Social and Economic Impacts

The proposed modification will result in a direct positive economic impact of contributing to the provision of an amenable hotel experience at the site, which includes the provision of an open roof pool facility. This will contribute to the overall success of the future hotel at the site, and contribute to the provision of a very high quality guest experience at the site.

The proposed modification will also provide for outdoor space for the use of guests, in what is otherwise a fairly constrained site. By comparison to a fully enclosed facility, this provides a social benefit of allowing guests access to an open air environment within the hotel.

The proposal will not result in any adverse social or economic impacts, including any impacts on operations to the Cross City Tunnel, Western Distributor or any other road surrounding the site. A full program to deal with incidents has been outlined in this application to ensure that any future incidents will not result in an adverse outcome.

5.7 Site Suitability and Public Interest

The proposed development is suitable in the context of the site, given the following:

- The site has been long associated with tourism uses, and the proposed roof modification will assist in contributing to the provision of a high amenity hotel facility at the site. Specifically, this modification will

positively impact future patrons by ensuring that the development will be able to access open air guest facilities during their stay.

- This modification will not result in any changes to the bulk and scale of the building, and will result in a building form at the site which presents the same as the existing approved building at the site.
- Given that the proposal has been demonstrated as being appropriate through the provision of previous consents, and that the additional economic impacts from this proposal do not change the suitability of the site, then the proposal will continue to be suitable for the site.

The proposal is consistent with the public interest, given that it works to contribute to the future experience of The Ribbon for the enjoyment of future guests and visitors.

Additionally, given that the proposal has been extensively designed to ensure that there are no adverse impacts from the proposal on the surrounding public domain or assets. This includes the provision of a robust framework to ensure that operation of the open roof component will not adversely affect operations of either the Western Distributor or the Cross City Tunnel.

6.0 Conclusion

This Section 4.55(1A) modification application comprises the physical changes to enable an open roof pool area at the hotel component of the site. Alongside this, a number of additional systems have been incorporated which will ensure that an open air roof can be safely implemented at the site. This includes the provision of commitment by the future operator of the hotel that such a system will be adhered to, maintained and managed into the future.

In accordance with Section 4.55(1A) of the EP&A Act, the Minister or their delegate may modify the consent, given that:

- the proposed modification is of minimal environmental impact;
- the consent, as proposed to be modified, is substantially the same development as that originally approved; and
- the building's compliance with the key statutory plans and controls remains consistent with the originally approved SSD.

In light of the merits of the proposed development and in the absence of any significant environmental impacts, it is without hesitation that we respectfully recommend this application for development consent.

We trust that this information is sufficient to enable assessment of the proposed modification application. Should you have any queries regarding this matter, please do not hesitate to contact tsmith@ethosurban.com or jbuchanan@ethosurban.com as well as 9956 6962.