NORTH ONE HOTEL AND APARTMENTS

Desktop Environmental Wind Study

Prepared for:

KTT Investment Pty Ltd
459 Harris Street
ULTIMO NSW 2007

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with KTT Investment Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.30461-R01-v1.0	8 July 2021	Mark Hobday	Dr Neihad Al-Khalidy	Dr Neihad Al-Khalidy

EXECUTIVE SUMMARY

SLR Consulting Australia Pty Ltd (SLR) has been engaged by KTT Investment Pty Ltd to assess the wind impact on the immediate surrounds of a proposed Mixed-Use Development at Mindil Beach in Darwin called North One Hotel and Apartments– refer **Figure 1**.

North One Hotel and Apartments is located in Darwin, approximately 500m south of Mindil Beach Park, situated to the south of Mindil Beach Casino Resort, bounded by Burnett Place, Gilruth Avenue and Mindil Beach to the south, east and west respectively. The wider surrounding area of the site is predominantly coastal beach areas and parklands to the west and east respectively, with low rise residential areas to the northeast, southwest and southeast and 2 medium rise buildings, namely Mindil Beach Casino Resort and Myilly Point towers located north and south respectively.

This initial assessment has been made on the basis of our best engineering judgment and on the experience gained from (decades of) scale-model Wind Tunnel Testing and CFD Simulation Modelling of a range of similar scale developments.

Local Wind Climate

On the basis of long-term wind records obtained from the weather stations at Darwin Airport, SLR has determined that key prevailing wind directions of interest are the north to west quadrant for Summer/Autumn/Spring and east to southeast quadrant winds for Winter.

Existing Wind Environment

Existing street level wind conditions in the vicinity of the site could be close to or greater than 16 m/s “walking comfort” criterion for some prevailing wind directions, due to the exposed nature of the western aspect of the site.

Wind Impact on Surrounding Areas

Around the development comprises of parkland, beach areas and mostly low residential buildings in all directions. Furthermore, there are 2 medium rise buildings, namely Mindil Beach Casino Resort and Myilly Point towers located north and south respectively.

North One Hotel and Apartments is situated close to the beach and will be built on the low-lying land at an RL of approximately 6.0m and with a maximum height of 27m. The development is designed to have a large setback from surrounding areas and has a large cliff of approximately 19m to the south of the development.

Due to the recessed design of the development and the large setback from the surrounding areas it is expected that the development will have a negligible impact on the north to westerly sector winds or sea breezes that will impact the southerly buildings on top of the cliff.

Future Wind Environment

In terms of the *future* wind environment with the proposed Development, the following features are noted as being of most significance:

- The proposed Development’s blocks are set back from its two perimeter street frontages with extensive existing and planned landscaping (large trees) along both Burnett Place and Gilruth Avenue.

EXECUTIVE SUMMARY

- Areas potentially requiring wind mitigation are largely within the site, especially the elevated Communal Spaces and balcony areas.
- There is existing extensive landscaping along the north and south boundaries of the development which will be retained in the proposed development.
- Windbreak recommendations have been made to assist in ameliorating all potentially adverse winds identified in this study – refer **Section 7** and **Figures 8** for details.

The conclusions of this SLR report could be quantified using wind tunnel testing or Computational Fluid Dynamics (CFD) analysis.

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TABLES

FIGURES

1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) has been engaged by KTT Investment Pty Ltd to assess the wind impact on the immediate surrounds of a proposed Mixed-Use Development (herein the Project) in Mindil Beach in Darwin called North One Hotel and Apartments.

The present study is a qualitative (expert opinion) study of potential wind impacts. Further CFD or Wind Tunnel Environmental Test could be undertaken to reliably quantify these impacts and confirm the efficacy of recommended wind mitigation treatments.

This initial assessment has been made on the basis of our best engineering judgment and on the experience gained from (decades of) scale-model Wind Tunnel Testing and CFD Simulation Modelling of a range of similar scale developments.

Objective of the Study

This assessment will form part of the application to Northern Territory Government for the development of the Project for the purposes of a mixed-use precinct with open space, retail, and residential uses. The study is a qualitative (expert opinion) study of potential wind impacts of the new proposed development on the surrounding areas and the public and private areas within the development.

2 PROPOSED DEVELOPMENT OVERVIEW

2.1 Development Site Location

North One Hotel and Apartments is located in Darwin, approximately 500m south of Mindil Beach Park, situated to the south of Mindil Beach Casino Resort, bounded by Burnett Place, Gilruth Avenue and Mindil Beach to the south, east and west respectively. The wider surrounding area of the site is predominantly coastal beach areas and parklands to the west and east respectively, with low rise residential areas to the northeast, southwest and southeast with a 10 storey Myilly Point Towers to the south - refer **Figure 1**.

Figure 1 Proposed Development Site Location

2.2 Proposed Development Description

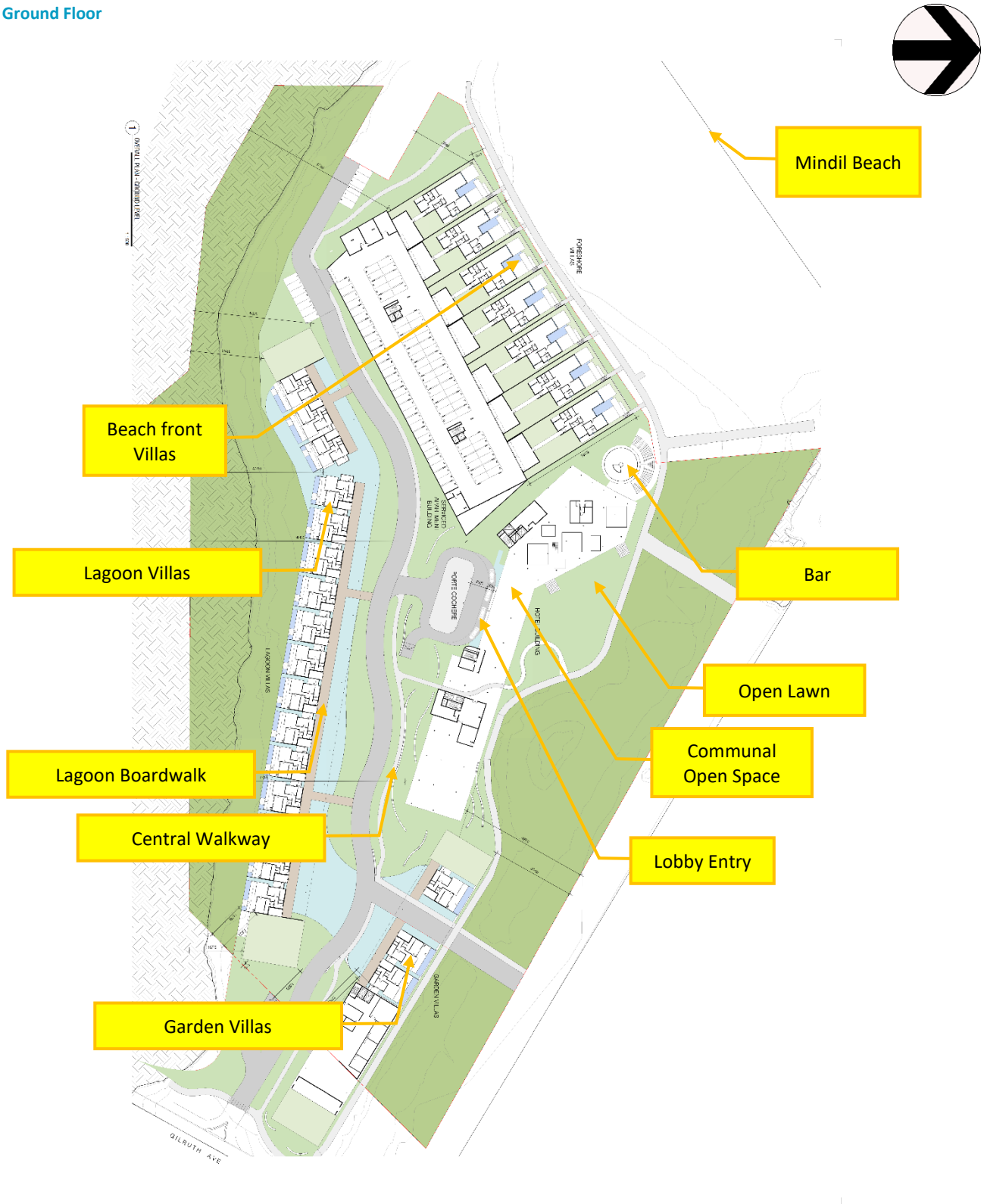
- The construction of a mixed-use development comprising:
  - 7 single storey executive beach front villas
  - A six storey Serviced Apartment Building
  - 2 six storey Hotel Buildings
  - 16 single storey Lagoon villas
  - 3 single storey Garden villas
  - Retail premises and communal open spaces.

Representative Floor Plans and Development Images are shown in **Figure 2**.

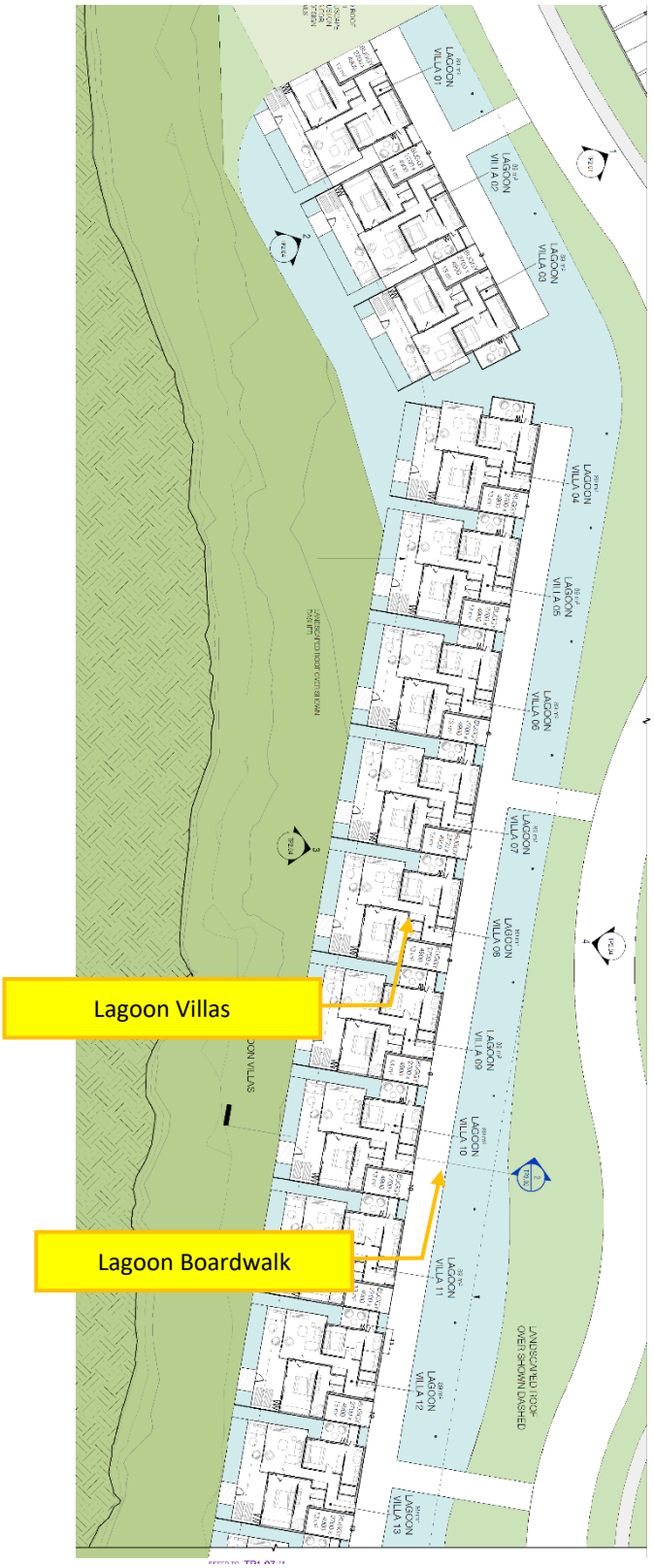
Figure 2 Representative Plans of the Proposed Development

A. Surrounding Areas of the Site

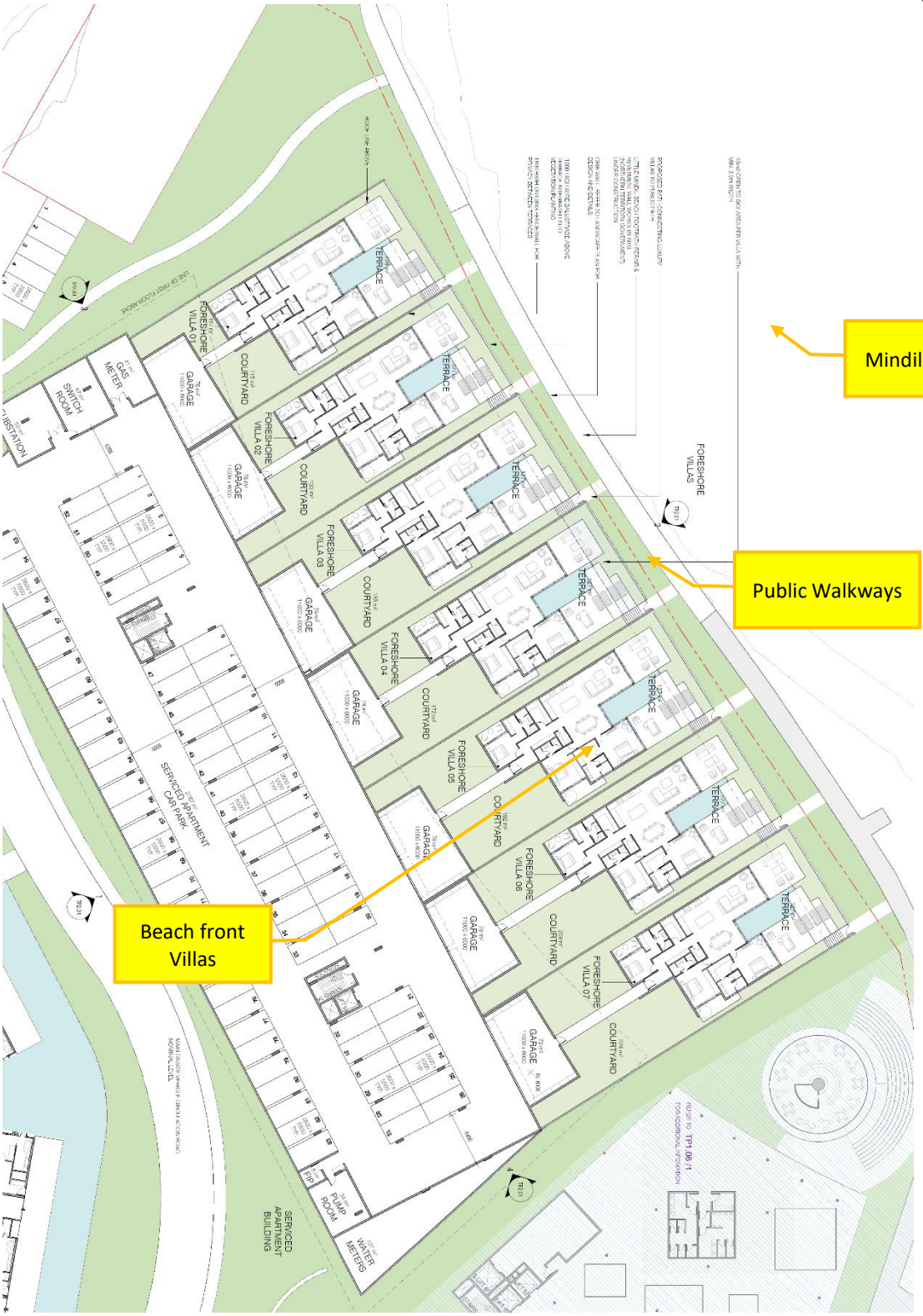
B. Ground Floor



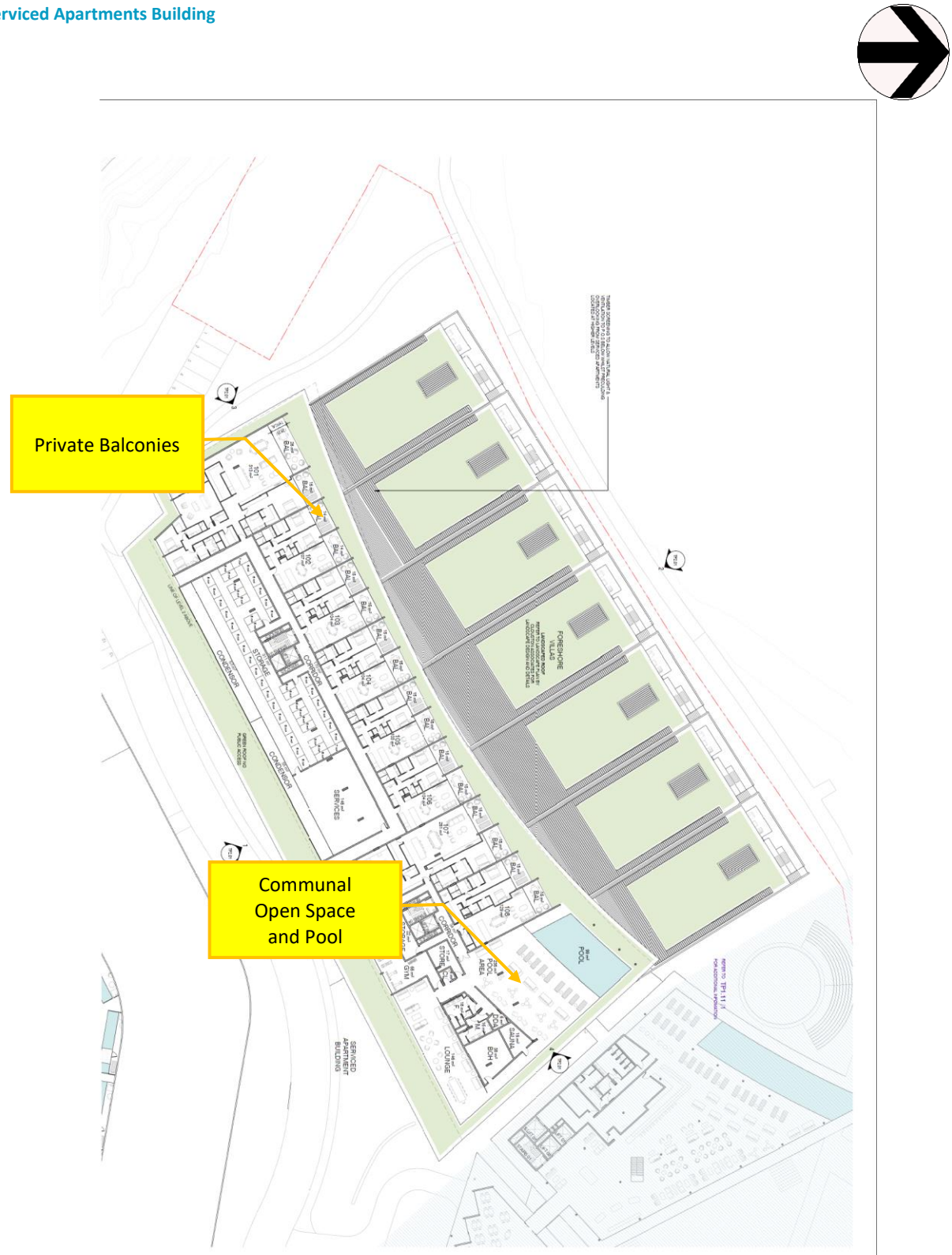
C. Ground Level Lagoon Villas



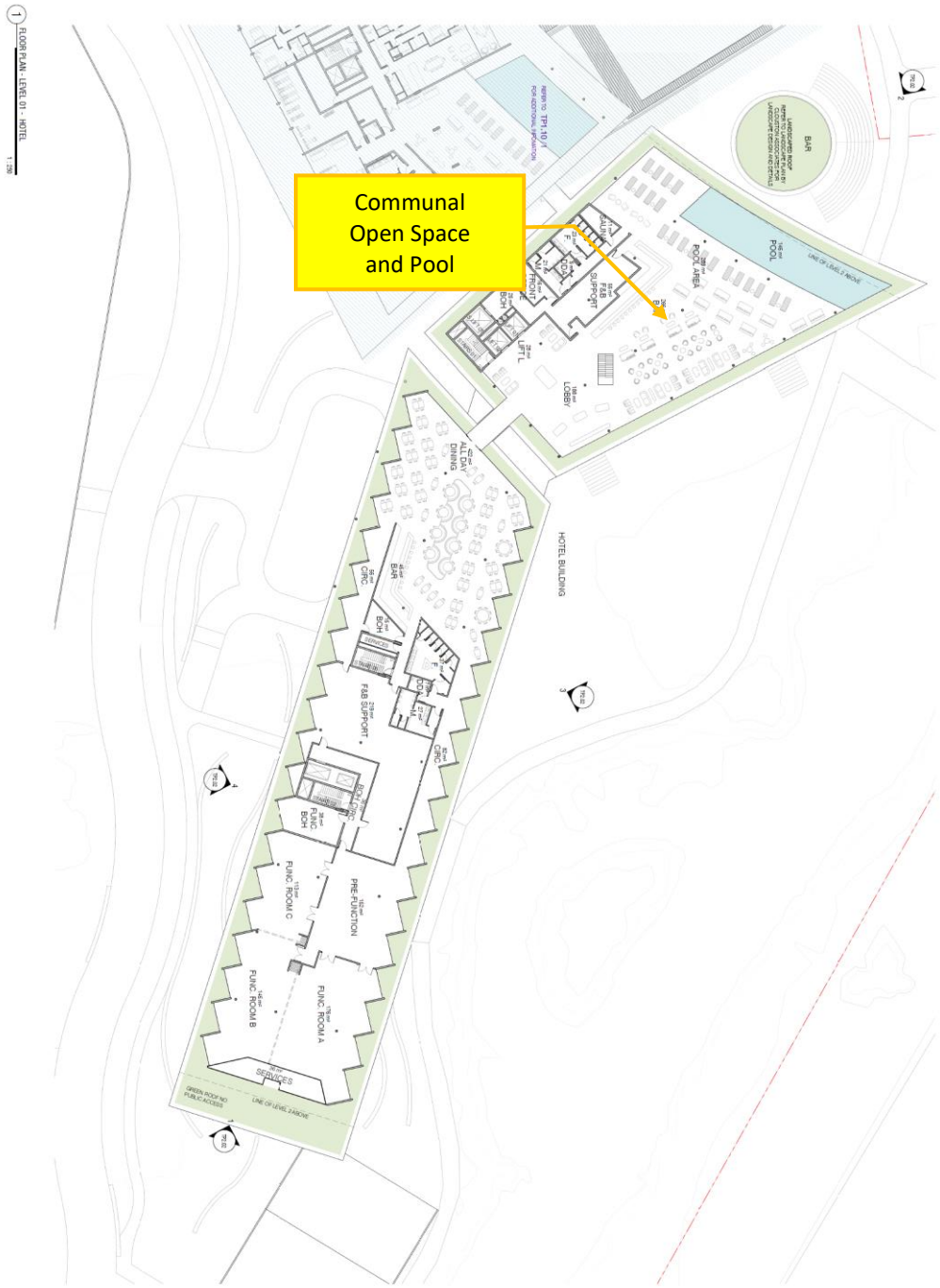
D. Ground Level Beach Front Villas



E. Level 1 Serviced Apartments Building

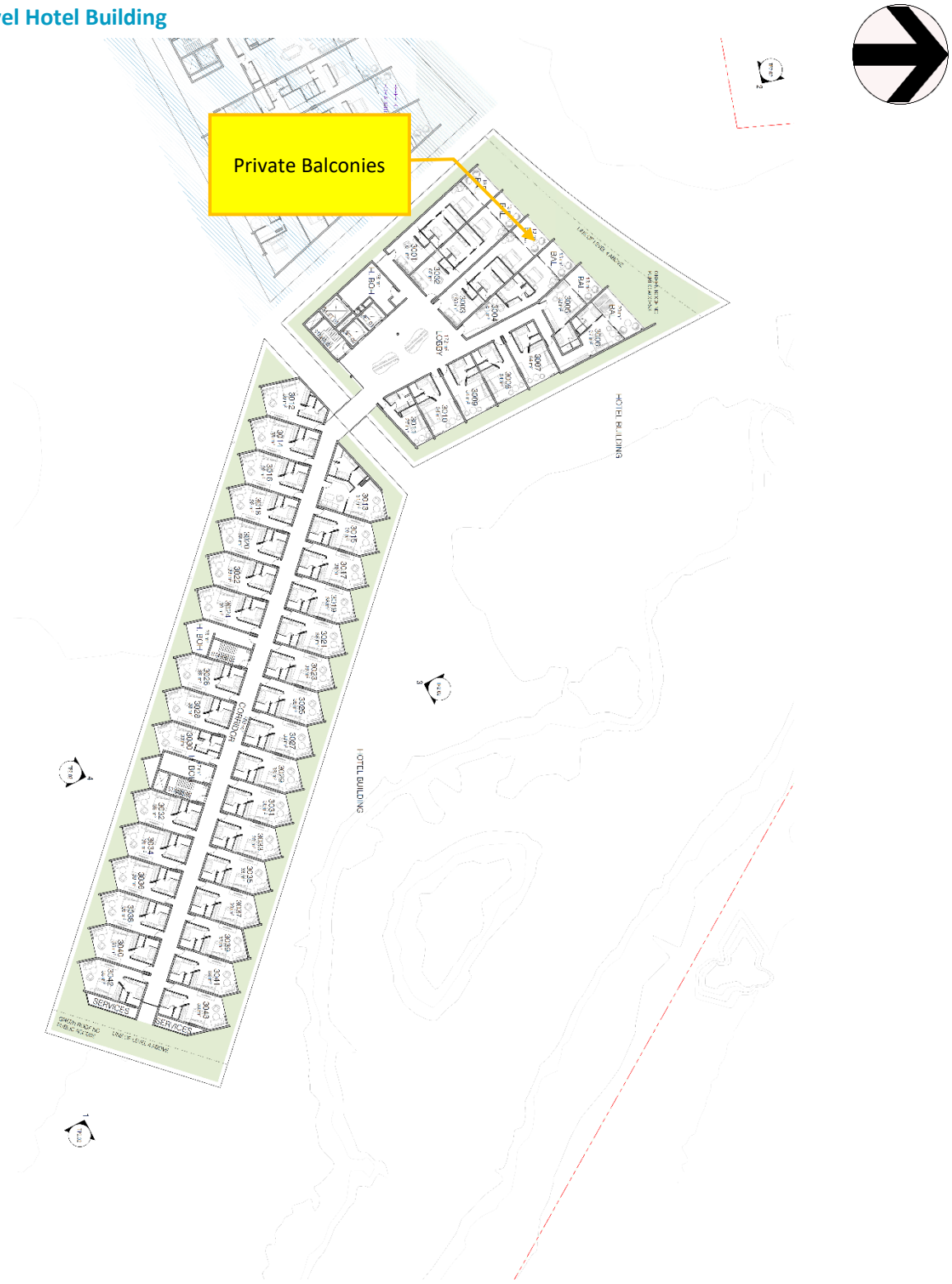


F. Level 1 Hotel Building



G. Typical Serviced Apartment Building Level

H. Typical Level Hotel Building



2.3 Surrounding Built Environment

"Near Field"

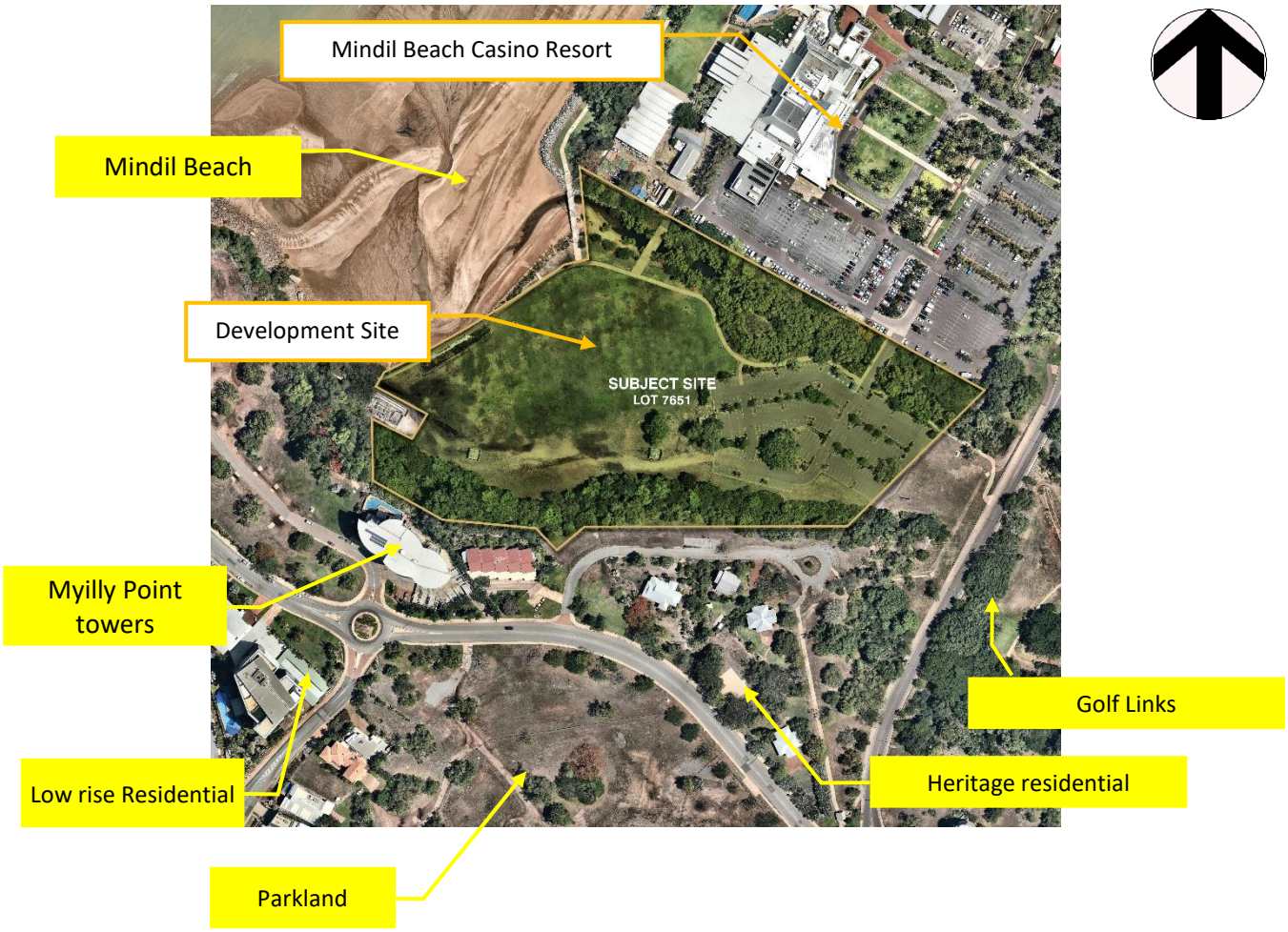
The "near-field" built environment comprises of parkland, beach areas and low residential areas in all directions. Furthermore, there is 2 medium rise buildings, namely Mindil Beach Casino Resort and Myilly Point towers located north and south respectively – refer **Figure 3**. The development to the north will impact the northerly winds impacting onto the site. Furthermore, surrounding the development there is a large amount of dense foliage which will provide heavy shielding for the development.

"Far Field"

The "far-field" built environment comprises the same mix of typically low to mid rise residential areas largely to the south and southwest with large parkland areas to the north and east of the development.

The surrounding topography has a large incline towards the south away from the site and a slight decline to the beach on the west which is expected to influence the local wind speeds.

Figure 3 Proposed Development Site Location



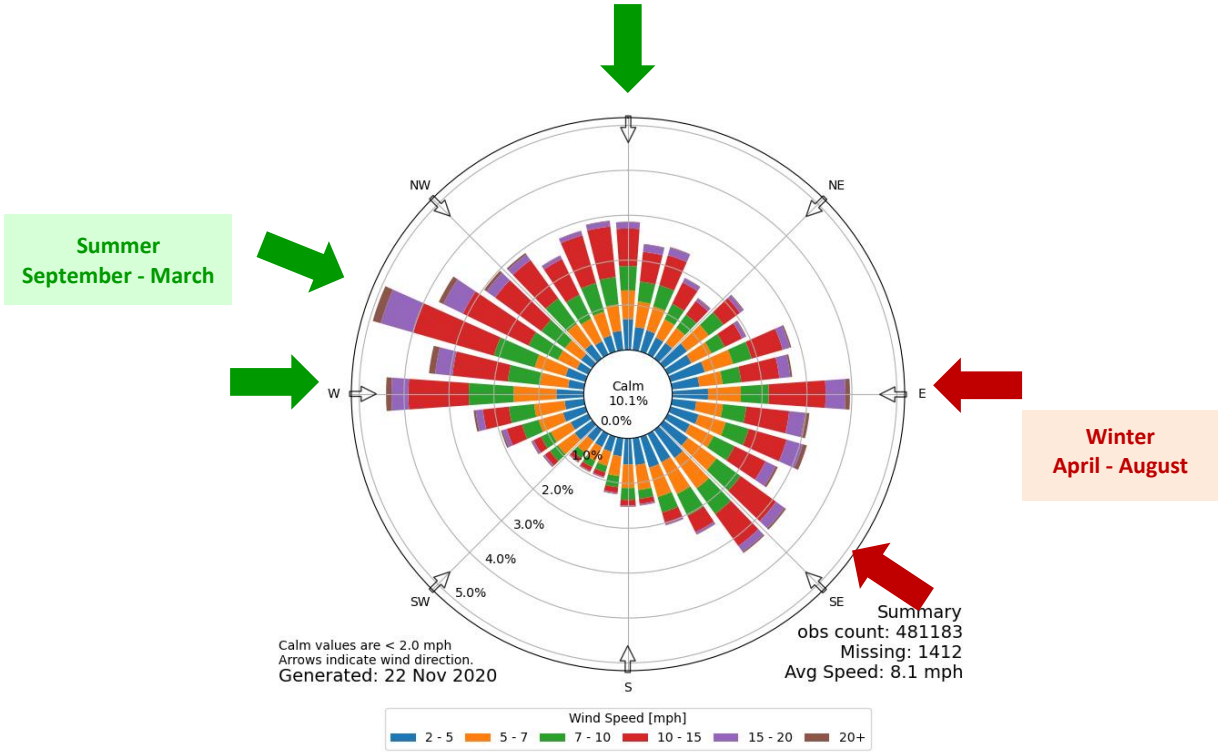
3 DARWIN'S WIND CLIMATE

3.1 Seasonal Variations of Darwin's Regional Wind Climate

Key characteristics of Darwins "regional" wind climate relevant to the development site are shown in the **Figure 4** annual wind rose, recorded at the weather station at Darwin Airport. These indicate that Darwin is affected by two primary wind seasons, with brief transition periods in between:

- Late Spring/Summer/Autumn winds occur mainly from the north, northwest, and west. The north and northwest are most common during late Spring to early summer and the westerly winds are most prominent the rest of Summer and Autumn.
- Winter/Early Spring winds occur mainly from the east-southeast: these provide the strongest winds during winter.

Figure 4 Darwin Airport Wind Roses (1970-2020)

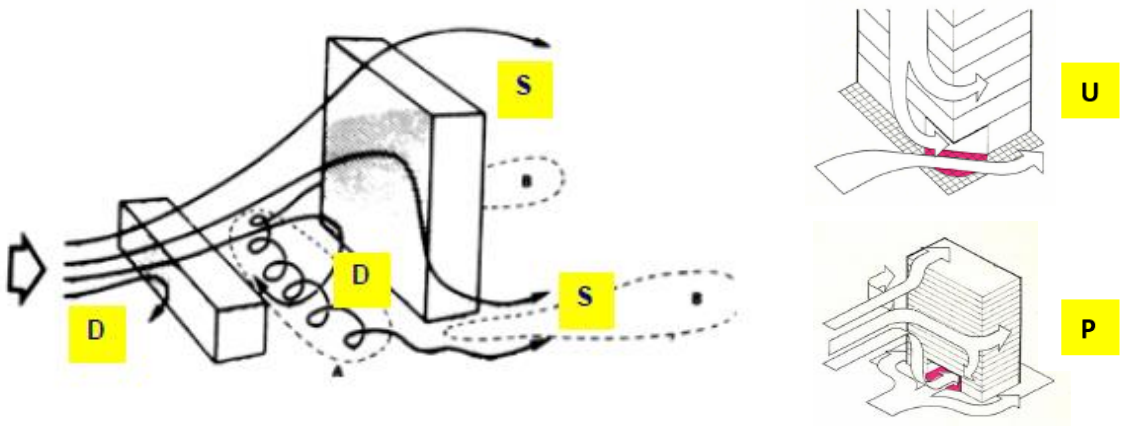


4 BUILDING-WIND INTERACTION – GENERAL OBSERVATIONS

The impact of wind flowing past buildings has well understood general impacts at ground level - refer **Figure 5**. In general, the taller the building, the more pronounced the impact on ground level winds.

- **Downwash winds "D"** are the winds which impact on the windward face of a building and are then deflected downwards to Ground Level in a vertical direction
- Accelerating **Shearflow winds "S"** are the winds which experience an acceleration as they pass by the building edges and roof as the wind flow moves around and past the building
- Concentrated adverse windflow can also be created when winds are accelerated by the negative pressure area at an undercroft (**"U"**) or through passages (**"P"**) at the base of buildings.

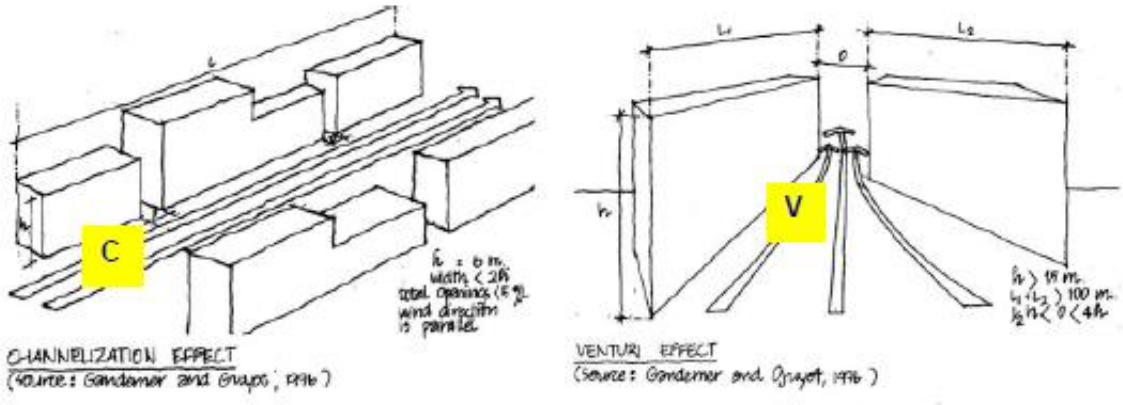
Figure 5 Wind Flow Patterns Past Regular Shaped Buildings



The grouping of buildings can also have an impact on surrounding pedestrian winds – refer **Figure 6**.

- **Channelling Effect winds "C"** result when there are rows of parallel buildings (especially taller ones) where the gaps in between the buildings line up with prevailing wind directions.
- **Venturi Effect winds "V"** result when wind flow is forced to pass between two converging buildings or groups of buildings with a resulting increase in flow.

Figure 6 Wind Flow Patterns Past Groups of Buildings



5 WIND ACCEPTABILITY CRITERIA

5.1 Standard Local Government Criteria

The choice of suitable criteria for evaluating the acceptability of particular ground level conditions has been the subject of international research over the past few decades. One of the commonly accepted set of acceptability criteria developed from this research, currently referenced by many Australian Local Government Development Control Plans, is summarised in **Table 1**. The limiting wind speed criteria in **Table 1** are based on the maximum wind gust occurring (on average) once per year.

Table 1 Standard Local Government Wind Acceptability Criteria

Type of Criteria	Limiting Gust Wind Speed Occurring Once Per Year	Activity Concerned
Safety	24 m/s	Knockdown in Isolated Areas
	23 m/s	Knockdown in Public Access Areas
Comfort	16 m/s	Comfortable Walking
	13 m/s	Standing, Waiting, Window Shopping
	10 m/s	Dining in Outdoor Restaurant

The primary objectives relating to the above wind impact criteria are as follows:

- The general objective is for annual 3-second gust wind speeds to remain at or below the so-called 16 m/s "Walking Comfort" criterion. Whilst this magnitude may appear somewhat arbitrary, its value represents a level of wind intensity above which the majority of the population would find unacceptable for comfortable walking on a regular basis at any particular location.
- In many urban locations, either because of exposure to open water conditions or because of street "canyon" effects, etc, the 16 m/s "Walking Comfort" level may already be currently exceeded. In such instances a new development should ideally not exacerbate existing adverse wind conditions and, wherever feasible and reasonable, ameliorate such conditions.
- It can be seen in **Table 1** that the recommended limiting wind speeds for spaces designed for activities such as seating, outdoor dining, etc., are lower (ie more stringent) than for "walking comfort".

5.2 Application of Wind Criteria

The criteria provided in **Table 1** (especially in relation to Comfort) should not be viewed as *"hard"* numbers as the limiting values were generally derived from subjective assessments of wind acceptability. Such assessments have been found to vary considerably with the height, strength, age, etc., of the pedestrian concerned. A further factor for consideration is the extent of windy conditions, and some relaxation of the above criteria may be acceptable for small areas under investigation provided the general site satisfies the relevant criteria.

6 WIND IMPACTS OF THE PROPOSED REDEVELOPMENT

6.1 Areas of Interest in Relation to Wind Impact

Areas of interest in relation to the expected wind impact of the proposed Development on surrounding footpaths, primary building entry points, communal open spaces, balconies, etc, are identified in **Figure 2**.

- Further Surrounding Areas — refer **Figure 2-A**
- Beach footpaths — refer **Figure 2-D**
- Open Lawn Space — refer **Figure 2-B**
- Meeting Place and Retail Areas — refer **Figure 2-B**
- Bar Area — refer **Figure 2-B**
- Lobby Entry — refer **Figure 2-B**
- Beachfront Villas — refer **Figure 2-D**
- Lagoon Villas — refer **Figure 2-C**
- Lagoon Boardwalk — refer **Figure 2-C**
- Garden Villas — refer **Figure 2-B**
- Central Walkway — refer **Figure 2-B**
- Serviced Apartment Communal Open Space and Pool — refer **Figure 2-E**
- Hotel Communal Open Space and Pool — refer **Figure 2-F**
- Serviced Apartment Private Balconies — refer **Figure 2-G**
- Hotel Communal Private Balconies — refer **Figure 2-H**

6.2 Future Wind Impact at All Areas of Interest

The wind impact of the proposed Development is described by examining the impact of key prevailing wind conditions on areas of interest within and external to the development. The key directions analysed are:

- N and NW winds for spring-summer-autumn months and
- E and SE winds for winter months.

The predicted wind environment at the site is examined in terms of both:

- Existing Winds, and
- Future Winds with the addition of the proposed development.

The above predictions are made on the basis of our best engineering judgement and (decades of) experience in carrying out Environmental Wind Tunnel Testing and CFD Simulation Studies.

The above predictions are made without necessarily assuming any benefit from the already planned landscaping for the proposed development.

Prevailing Wind Direction:
WEST to NORTH Winds

Period of Annual Cycle:
Spring to Autumn (September - March)

Location	Existing Compliance	Future Compliance	Key Factors
Burnett House Heritage residential	**Likely comply**	**Likely comply**	Due to the low-rise design and large setback from the surrounding area of the North One Hotel and Apartments and the high cliff on the southern side of the development it is expected the development should not impact the local wind breeze or create further adverse wind conditions for the Burnett House Heritage areas.
Further residential	**Likely comply**	**Likely comply**	Due to the low-rise design and large setback from the surrounding area of the North One Hotel and Apartments and the high cliff on the southern side of the development it is expected the development should not impact the local wind breeze or create further adverse wind conditions for the surrounding residential areas.
Beach Footpath	**Likely comply**	**Likely comply**	The proposed development's beachfront façades are set back from the footpath. The mix of proposed and existing trees will either be retained and are expected to shield the footpath from the winds impacting the footpath.
Open Lawn Space	Locations not relevant to "existing" built environment	**Likely comply**	Sheltering from the proposed and existing trees along the north and northwest boundary line will limit the winds impacting the Open Lawn Space.
Meeting Place and Retail Areas		**Likely comply**	Sheltering from the proposed and existing trees along the north and northwest boundary line will limit the winds impacting the ground level of the hotel building. Furthermore, the proposed setback from levels above is expected to reduce the impact of any down washed or side streaming winds.
Bar Area		**Likely comply**	Sheltering from the proposed and existing trees along the north and northwest boundary line will limit the winds impacting the Bar Area. More localised proposed planting is expected to provide further shielding from the west.
Lobby Entry		**Likely comply**	Sheltering from the proposed and existing trees along the north and northwest boundary line will limit the winds impacting the Lobby Entry. Furthermore, it is expected the proposed stalls to the west will provide further shielding for the westerly winds impacting the Lobby Entry.
Beachfront Villas		**Likely comply**	Sheltering from the proposed trees along the west and northwest boundary line is expected to limit the impact of the north to west quadrant winds around the Lagoon Villas.
Lagoon Villas		**Likely comply**	Sheltering from the proposed trees surrounding the Villas is expected to limit the impact of the north to west quadrant winds around the Lagoon Villas.
Lagoon Boardwalk		**Likely comply**	Sheltering from the proposed trees along the side of the lagoon boardwalk and the shielding provided from the Hotel and Serviced Apartment building is expected to limit the impact of the north to west quadrant winds.
Garden Villas		**Likely comply**	Sheltering from the proposed and existing trees along the north and western aspects of the Villas is expected to limit the impact of the north to west quadrant winds around the Lagoon Villas.

Location	Existing Compliance	Future Compliance	Key Factors
Central Walkway		**Likely comply**	Sheltering from the proposed trees along both sides of the Central walkway and the shielding provided from the Hotel and Serviced Apartment building is expected to limit the impact of the north to west quadrant winds.
Apartment's Communal Open Space and Pool		**May not comply without appropriate mitigation**	Sheltering from the proposed and existing trees along the north and western aspects of the Communal Open space is expected to reduce the impact of the north to west quadrant winds. The north and west quadrant winds are still expected to impact the area and could create adverse winds for stationary type activities (eg long-exposure sitting, dining, etc).
Hotel Communal Open Space and Pool		**May not comply without appropriate mitigation**	Sheltering from the proposed and existing trees along the north and western aspects of the Communal Open space is expected to reduce the impact of the north to west quadrant winds. The north and west quadrant winds are still expected to impact the area and could create adverse winds for stationary type activities (eg long-exposure sitting, dining, etc).
Serviced Apartment Private Balconies		**Likely comply**	Sheltering from the proposed trees along the west aspects of the balconies and the proposed extended wing walls are expected to create a recessed balcony area protected from the north to west quadrant winds.
Hotel Apartment Private Balconies		**Likely comply**	Sheltering from the proposed trees along the northwest aspects of the balconies and the proposed extended wing walls are expected to create a recessed balcony area protected from the north to west quadrant winds.
Mindil Beach Casino Resort	**Likely comply**	**Likely comply**	Sheltering from the proposed and existing trees along the north and northwest boundary line is expected to limit any impacts North One Hotel and Apartments will have on the existing Mindil Beach Casino Resort.

Prevailing Wind Direction:
SOUTHEAST TO EAST Winds

Period of Annual Cycle:
Winter (April - August)

Location	Existing Compliance	Future Compliance	Key Factors
Burnett House Heritage residential	**Likely comply**	**Likely comply**	Due to the low-rise design and large setback from the surrounding area of the North One Hotel and Apartments and the high cliff on the southern side of the development it is expected the development should not impact the local wind breeze or create further adverse wind conditions for the Burnett House Heritage areas.
Further residential	**Likely comply**	**Likely comply**	Due to the low-rise design and large setback from the surrounding area of the North One Hotel and Apartments and the high cliff on the southern side of the development it is expected the development should not impact the local wind breeze or create further adverse wind conditions for the surrounding residential areas.
Beach Footpath	**Likely comply**	**Likely comply**	The proposed development's beachfront façades are set back from the footpath. The mix of proposed and existing trees will either be retained and are expected to shield the footpath from the winds impacting the footpath.

Location	Existing Compliance	Future Compliance	Key Factors
Open Lawn Space	Locations not relevant to "existing" built environment	**Likely comply**	Sheltering from the proposed and existing trees along the northeast boundary line will limit the winds impacting the Open Lawn Space. Further shielding will be provided by the Hotel Building.
Meeting Place and Retail Areas		**Likely comply**	Sheltering from the proposed and existing trees along the east and south boundary line will limit the winds impacting the Meeting Place and Retail Areas. Further shielding will be provided by the proposed trees along the central walkway. Furthermore, the proposed setback from levels above is expected to reduce the impact of any down washed or side streaming winds.
Bar Area		**Likely comply**	Sheltering from the proposed and existing trees along the east and south boundary line will limit the winds impacting the Meeting Place and Retail Areas. Further shielding will be provided by the Retail store area. Furthermore, the proposed setback from levels above is expected to reduce the impact of any down washed or side streaming winds.
Lobby Entry		**Likely comply**	Sheltering from the proposed and existing trees along the east and south boundary line will limit the winds impacting the Meeting Place and Retail Areas. Further shielding will be provided by the proposed trees along the central walkway. Furthermore, the proposed setback from levels above is expected to reduce the impact of any down washed or side streaming winds.
Beachfront Villas		**Likely comply**	Sheltering from the surrounding serviced apartment building and the beachfront villas will reduce the impact of winds on the outdoor spaces of the Villas.
Lagoon Villas		**Likely comply**	Sheltering from the proposed and existing trees along the east and south boundary line will limit the winds impacting the outdoor spaces of the Villas.
Lagoon Boardwalk		**Likely comply**	Sheltering from the proposed and existing trees along the east and south boundary line will limit the winds impacting the lagoon walkway. Further shielding will be provided by the Lagoon Villas.
Garden Villas		**Likely comply**	Sheltering from the proposed and existing trees along the east and south boundary line will limit the winds impacting the outdoor spaces of the Villas.
Central Walkway		**Likely comply**	Sheltering from the proposed and existing trees along the east and south boundary line will limit the winds impacting the Meeting Place and Retail Areas. Further shielding will be provided by the proposed trees along the central walkway.
Apartments Communal Open Space and Pool		**Likely comply**	Sheltering from the surrounding hotel building and the surrounding landscaping will reduce the impact of winds on the outdoor spaces of the serviced apartment communal open space.
Hotel Communal Open Space and Pool		**May not comply without appropriate mitigation**	Sheltering from the building structure and the surrounding landscaping will reduce the impact of winds on the outdoor spaces of the Hotel communal open space. It is expected the easterly winds will still impact the communal open space and create adverse wind conditions

Location	Existing Compliance	Future Compliance	Key Factors
Serviced Apartment Private Balconies		**Likely comply**	Sheltering from the building structure and the proposed extended wing walls are expected to create a recessed balcony area protected from the north to west quadrant winds.
Hotel Apartment Private Balconies		**Likely comply**	Sheltering from the building structure and the proposed extended wing walls are expected to create a recessed balcony area protected from the north to west quadrant winds.
Mindil Beach Casino Resort	**Likely comply**	**Likely comply**	Sheltering from the proposed and existing trees is expected to limit any impacts North One Hotel and Apartments will have on the existing Mindil Beach Casino Resort.

7 WIND MITIGATION RECOMMENDATIONS

Section 6 provided guidance as to the areas where the adopted wind acceptability criteria had the potential to be exceeded and an indication as to the likely local optimum wind treatment strategy, eg whether the wind condition of interest is likely to arise from accelerating winds which require vertical windbreaks (such as landscaping) or downwash winds which require horizontal windbreaks (such as awnings, canopies).

The wind conditions of potential concern in relation to the proposed development include:

- Public Lawn Area;
- Main Lobby Entries;
- Bar and Retail Areas
- Communal Spaces
- Balconies and Garden Areas

7.1 Already Planned Wind Mitigation

The following features, already planned for the development, will have an ameliorating impact on local wind conditions:

- Extensive landscaping along the north and south boundaries of the development
- Most of the internal footpaths include extensive landscaping

Figure 7 Planned Landscaping and Existing Landscaping

7.2 Wind Mitigation Recommendations

On the basis of the expected wind impacts outlined in **Section 6**, the following recommendations for wind amelioration features are made in areas where winds have the potential, without suitable wind mitigation, to approach or exceed the relevant 10 m/s, 13 m/s or 16 m/s criterion depending on the designated use for that area.

The recommendations shown in **Figure 8** are designed to mitigate adverse wind conditions.

Further Surrounding Areas

- Retain the set back and recessed design from the southern areas to reduce the impact on the north to west winds effecting the southern residential areas.
- Retain the current proposed height of the development to reduce the impact on the north to west winds effecting the southern residential areas.

Beach Footpath

- Retain proposed trees along the beach footpaths.

Open Lawn Space

- Retain existing trees along the north and east boundary lines of the development.

Meeting Place and Retail Areas

- Retain existing trees along the north, south and east boundary lines of the development.

- Retain proposed trees along the central walkway and central road.
- Retain the windbreak provided by levels above protruding above the ground level meeting and retail areas.

Bar Area

- Retain existing trees along the north, south and east boundary lines of the development.
- Retain proposed landscaping to the west of the Bar Area.

Lobby Area

- Retain existing trees along the north, south and east boundary lines of the development.
- Retain proposed trees along the central walkway and central road.

Beachfront Villas

- Retain the proposed 1.8 m height balustrade along the perimeters indicated in Figure 8.

Lagoon Villas

- Retain existing trees along the south boundary line of the development.

Lagoon Boardwalk

- Retain existing trees along the south boundary line of the development.
- Retain proposed trees along the central walkway and central road.

Garden Villas

- Retain existing trees along the north boundary line of the development.

Central Walkway

- Retain proposed trees along the central walkway and central road.

Serviced Apartment Communal Open Space and Pool

- Provide minimum 1.8 m height balustrade along the communal space perimeters indicated in Figure 8 landscaping close to any planned seating areas.
- Retain the setback façade design of the upper levels to reduce the impact of side streaming and down washed winds.

Hotel Communal Open Space and Pool

- Provide minimum 1.8 m height balustrade along the communal space perimeters indicated in Figure 8 landscaping close to any planned seating areas.
- Retain the setback façade design of the upper levels to reduce the impact of side streaming and down washed winds.

Serviced Apartment Private Balconies

- Retain proposed wingwall vertical windbreaks on the balconies eg balustrade, planter, planter + balustrade, wind screens, etc. Windbreak is recommended to be full height.

Hotel Apartment Private Balconies

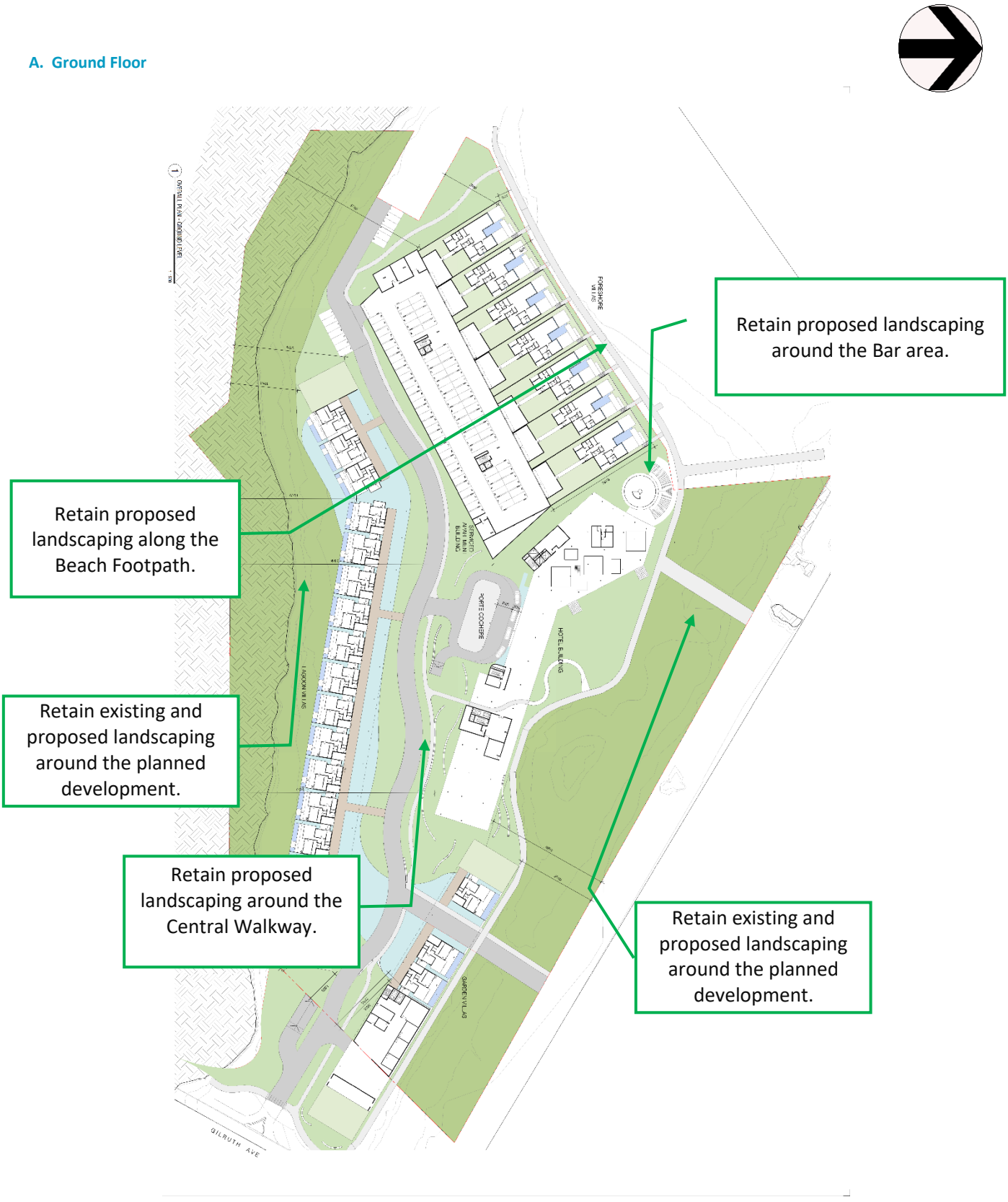
- Retain proposed wingwall vertical windbreaks on the balconies eg balustrade, planter, planter + balustrade, wind screens, etc. Windbreak is recommended to be full height.

The following is therefore recommended:

- During the Detailed Design phase of the project, once the design of the various building facades is finalised, further modelling could be carried out to confirm zones of the building, by height and by plan view location (eg which building corners), where wind mitigation (ie beyond the standard balustrade height) may be beneficial IF it is intended for balconies and terraces to be used all-year-round. Modelling and testing could be completed using computational fluid dynamics (CFD) or with scale model wind tunnel testing. This further testing can also confirm the impact of the development on the surrounding areas.

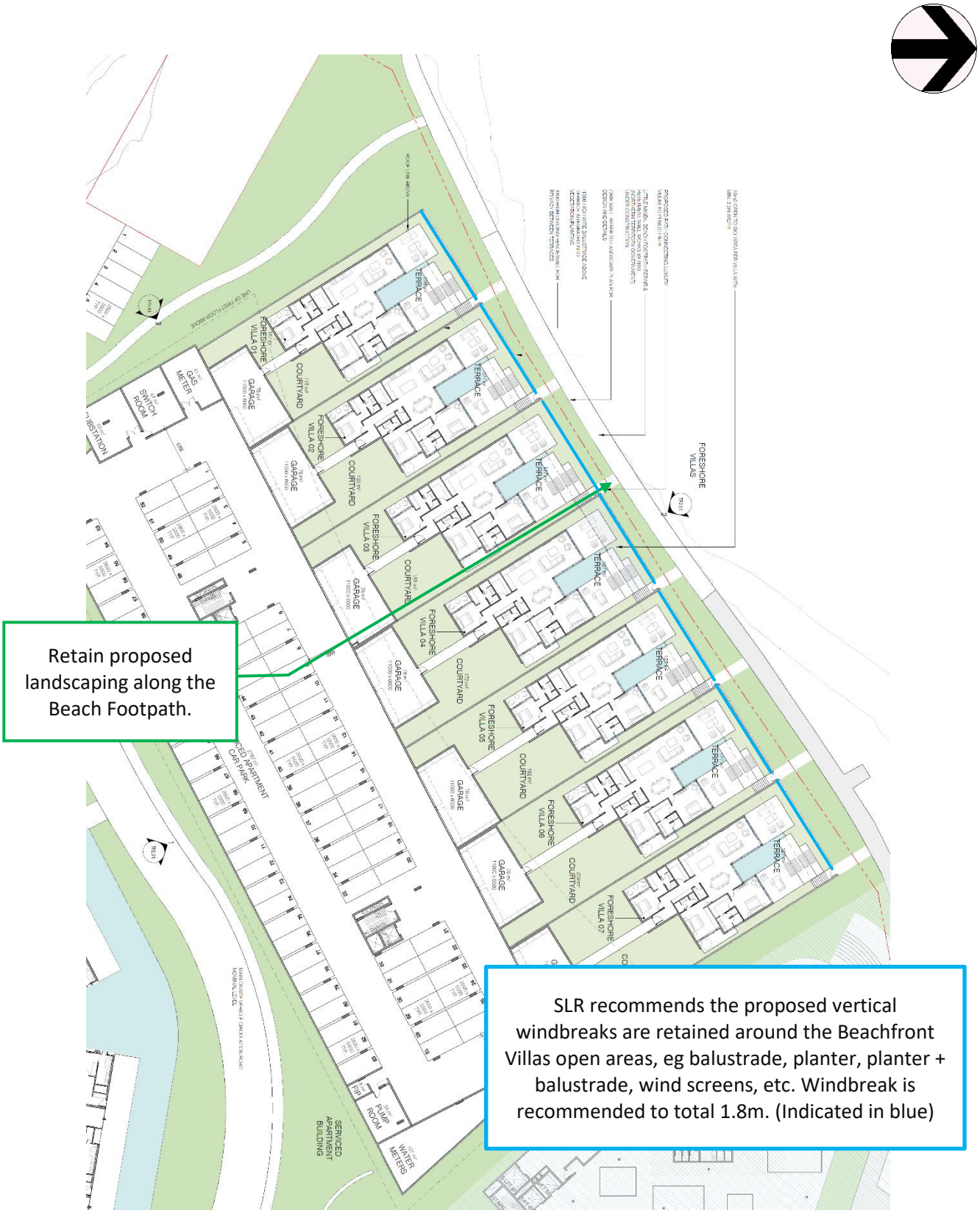
Figure 8 Wind Mitigation Recommendations

A. Ground Floor

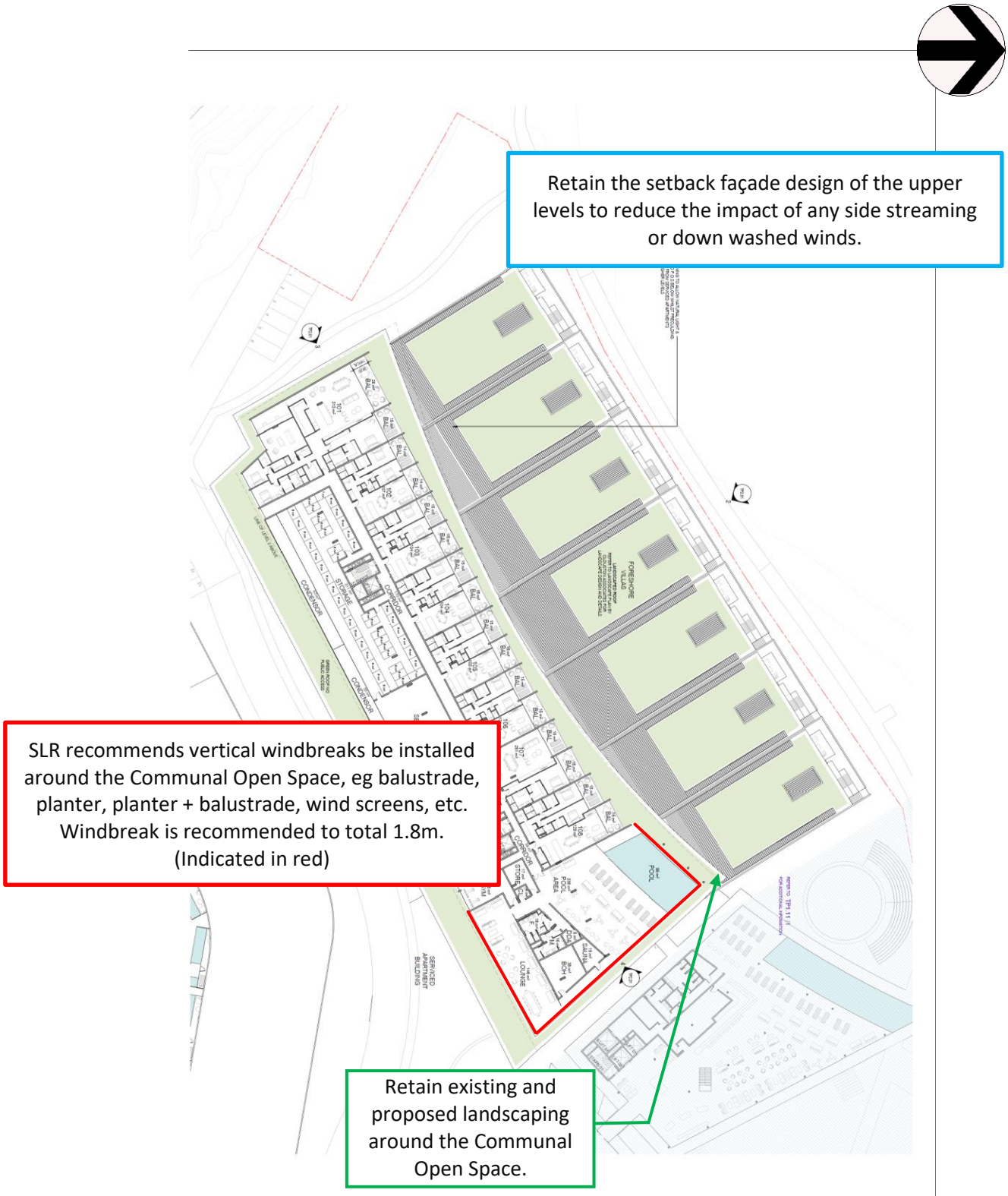


B. Ground Level Lagoon Villas

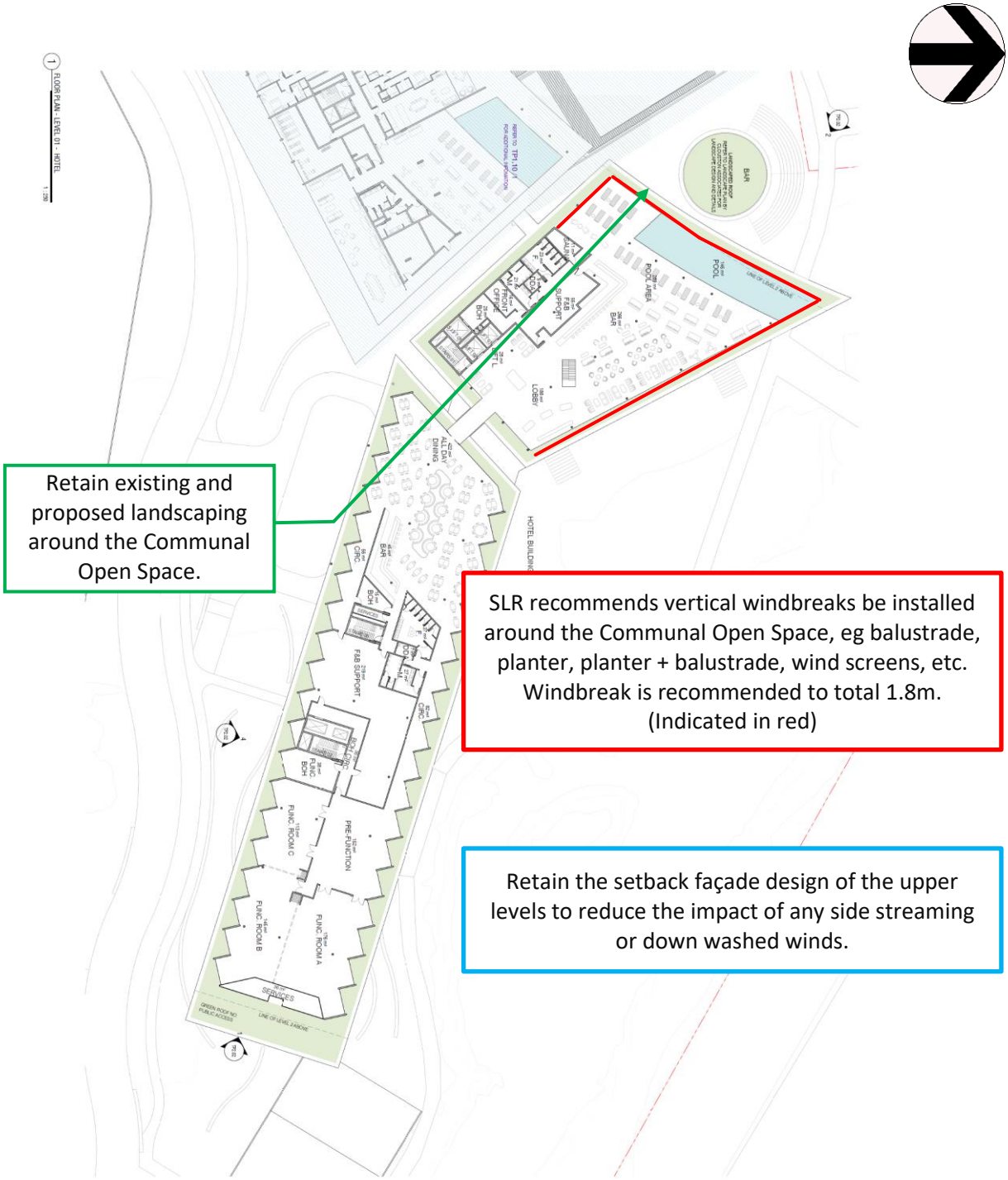
C. Ground Level Beach Front Villas



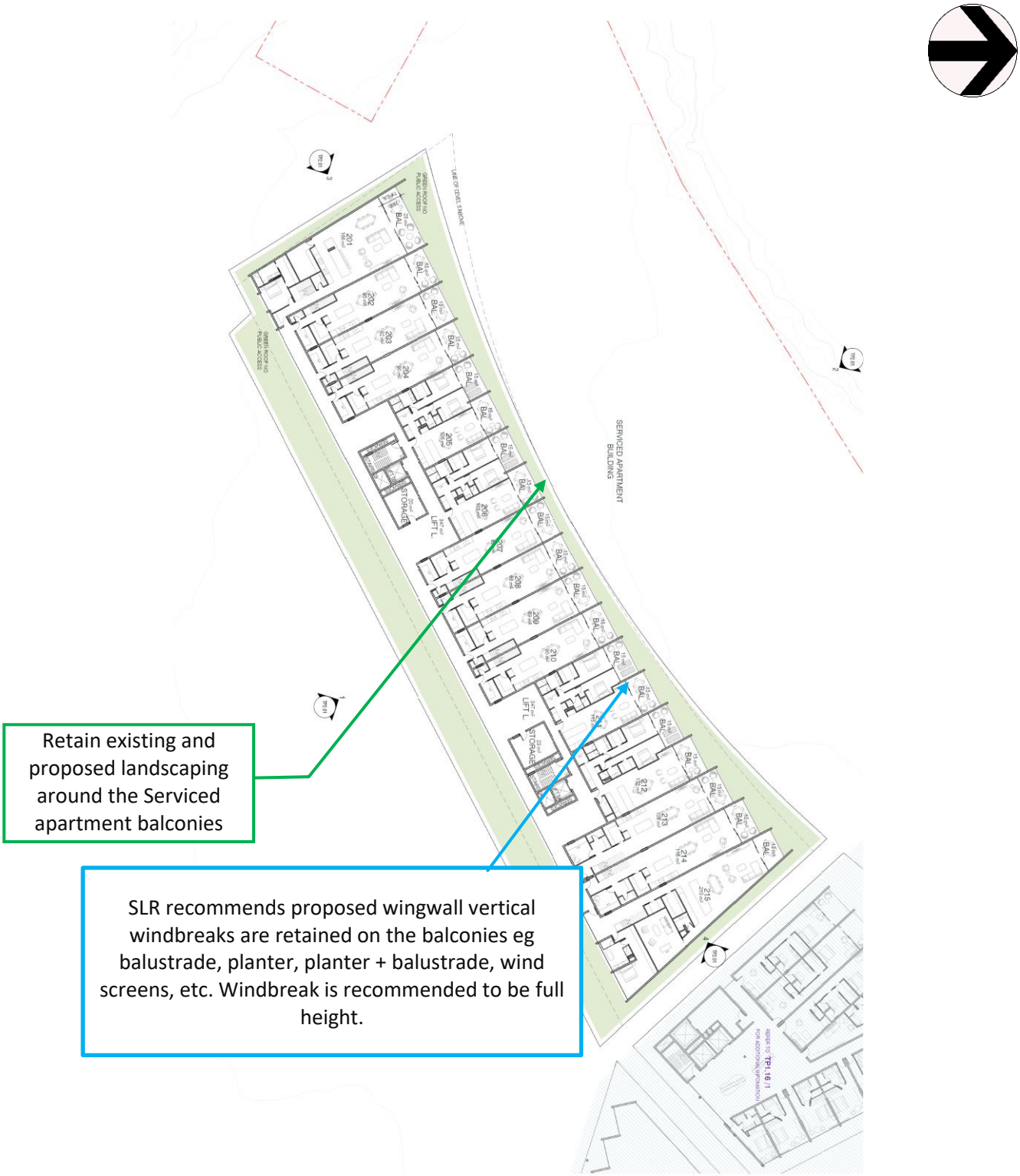
D. Level 1 Serviced Apartments Building



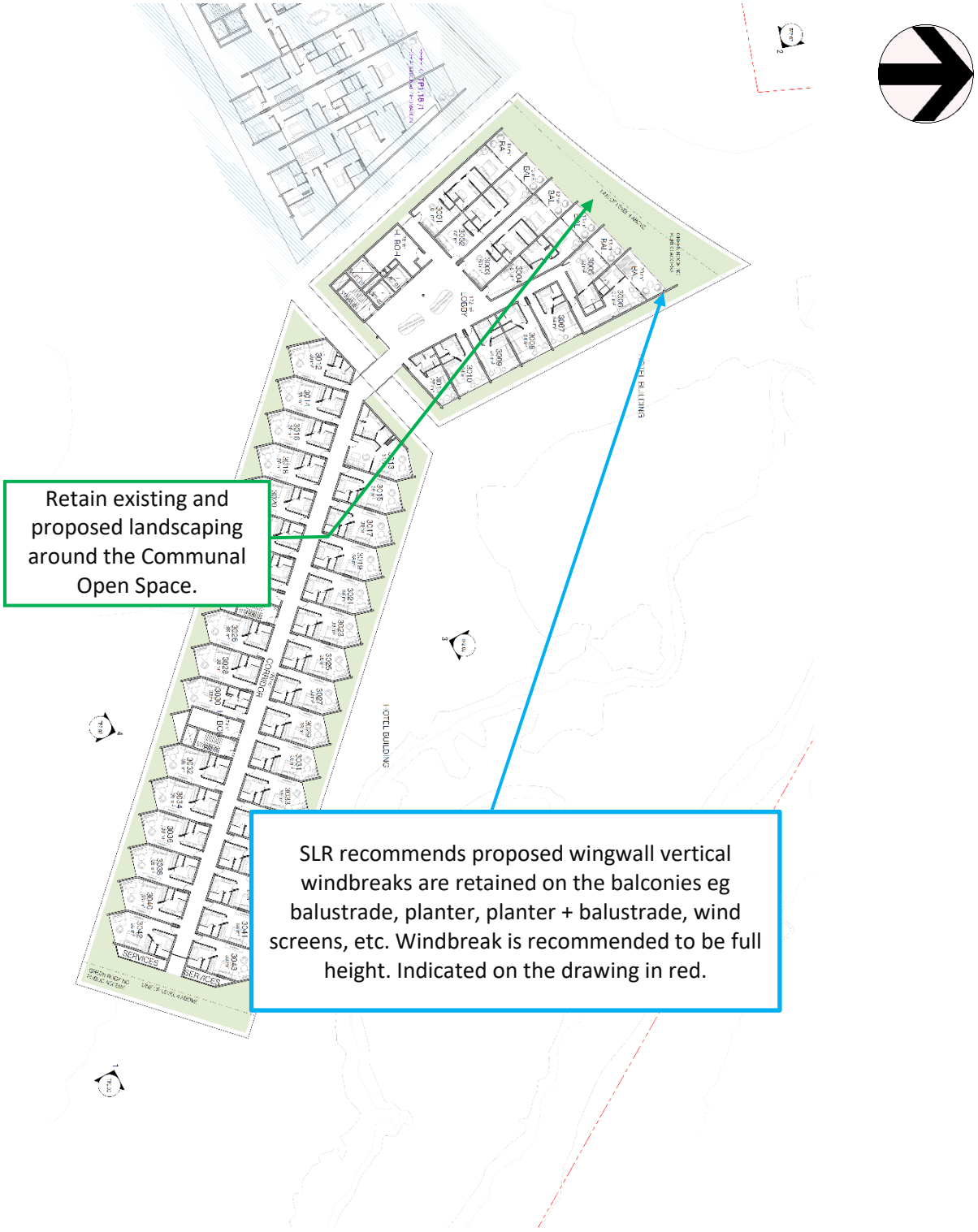
E. Level 1 Hotel Building



F. Typical Serviced Apartment Building Level



G. Typical Level Hotel Building



8 CONCLUSIONS

SLR Consulting Australia Pty Ltd (SLR) has been engaged by KTT Investment Pty Ltd to assess the wind impact on the immediate surrounds of a proposed Mixed-Use Development in Mindil Beach in Darwin called North One Hotel and Apartments– refer **Figure 1**.

North One Hotel and Apartments is located in Darwin, approximately 500m south of Mindil Beach Park, situated to the south of Mindil Beach Casino Resort, bounded by Burnett Place, Gilruth Avenue and Mindil Beach to the south, east and west respectively. The wider surrounding area of the site is predominantly coastal beach areas and parklands to the west and east respectively, with low rise residential areas to the northeast, southwest and southeast and 2 medium rise buildings, namely Mindil Beach Casino Resort and Myilly Point towers located north and south respectively.

This initial assessment has been made on the basis of our best engineering judgment and on the experience gained from (decades of) scale-model Wind Tunnel Testing and CFD Simulation Modelling of a range of similar scale developments.

Local Wind Climate

On the basis of long-term wind records obtained from the weather stations at Darwin Airport, SLR has determined that key prevailing wind directions of interest are the north to west quadrant for Summer/Autumn/Spring and east to southeast quadrant winds for Winter.

Existing Wind Environment

Existing street level wind conditions in the vicinity of the site could be close to or greater than 16 m/s “walking comfort” criterion for some prevailing wind directions, due to the exposed nature of the western aspect of the site.

Wind Impact on Surrounding Areas

Around the development comprises of parkland, beach areas and mostly low residential buildings in all directions. Furthermore, there are 2 medium rise buildings, namely Mindil Beach Casino Resort and Myilly Point towers located north and south respectively.

North One Hotel and Apartments is situated close to the beach and will be built on the low-lying land at an RL of approximately 6.0m and with a maximum height of 27m. The development is designed to have a large setback from surrounding areas and has a large cliff of approximately 19m to the south of the development.

Due to the recessed design of the development and the large setback from the surrounding areas it is expected that the development will have a negligible impact on the north to westerly sector winds or sea breezes that will impact the southerly buildings on top of the cliff.

Future Wind Environment

In terms of the *future* wind environment with the proposed Development, the following features are noted as being of most significance:

- The proposed Development’s blocks are set back from its two perimeter street frontages with extensive existing and planned landscaping (large trees) along both Burnett Place and Gilruth Avenue.

- Areas potentially requiring wind mitigation are largely within the site, especially the elevated Communal Spaces and balcony areas.
- There is existing extensive landscaping along the north and south boundaries of the development which will be retained in the proposed development.
- Windbreak recommendations have been made to assist in ameliorating all potentially adverse winds identified in this study – refer **Section 7** and **Figures 8** for details.

During the Detailed Design phase of the project, once the design of the various building facades is finalised, further modelling could be carried out to confirm zones of the building, by height and by plan view location (eg which building corners), where wind mitigation (ie beyond the standard balustrade height) may be beneficial IF it is intended for balconies and terraces to be used all-year-round. Modelling and testing could be completed using Computational Fluid Dynamics (CFD) or with scale model wind tunnel testing.

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