SUMMARY EXPERT OPINION (REVISED)

SEPP 65 AMENITY COMPLIANCE

SOLAR ACCESS

DEVELOPMENT APPLICATION
MIXED USE DEVELOPMENT
311 Hume Highway Liverpool

Revised and updated 22 July 2015

Signed,

.....

Steve King

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1.0 PRELIMINARIES/SUMMARY

1.1 I provide this expert opinion, relating to **solar access** compliance with relevant local controls, and with the Residential Flat Design Code (RFDC)/Apartment Design Guide (ADG) as it gives effect to the Amenity provisions of SEPP65, for the proposed **mixed use residential flat buildings** at **311 Hume Highway, Liverpool.**

This report is a revision of my earlier report of 19 December 2014 (revised 2 July 2015). The further revisions relate to changes in the design incorporated in the amended DA documents set out in *3.0 Documents*.

1.2 My qualifications and experience are included at *2.0 Credentials*.

1.3 **Solar access**. The RFDC *Rules of Thumb* require 70%of apartments to achieve a minimum mandated period of direct sun on June 21, with allowance for the control to be satisfied by minimum 2 hours in a closely built up context. The development is located in the Liverpool City Centre within an area zoned R4 and B4. The '2 hour standard' is therefore applicable in this dense urban setting. This 2-hour standard' is now confirmed to apply more generally in the recently issue Apartment Design Guide.

Analysis by use of a full 3D digital model takes into account overshadowing by known future development – in particular at the proposed twin towers at 420 Macquarie Street to the north-east of the subject site. The number of apartments projected to receive over 2 hours of sun to Living areas and private open space between 9am and 3pm on June 21 is 184 units (60%) from a total of 307. If I then take into account sun from 8am till 3pm which is known from the 3D model to be unobstructed, an additional 67 apartments (22%) may be considered to receive at least two hours of effective sun on June 21. This approach to quantifying effective solar access has consistently had the support of the Land and Environment Court, most clearly set out by Brown, C. in *Botany Development Pty Ltd v Council of the City of Botany Bay NSWLEC 10360 of 2013.*

The total number of apartments which will receive over two hours of effective direct sun on June 21 is 255 from a total of 307 (83%). *The RFDC Rules of Thumb and the ADG Design criteria recommend 70%.* ***In my considered opinion, the RFDC or ADG controls for solar access are fully satisfied.***

1.4 **Natural ventilation**

A total of **249 apartments out of a total of 315 (81%) may be regarded as cross ventilated** *or because of their height likely to achieve ventilation rates equivalent to cross ventilation.* The proportion required by the RFDC and the ADG is a minimum of 60%.

The proposed development fully complies with the relevant control for natural ventilation.

2.0 CREDENTIALS

I taught architectural design, thermal comfort and building services at the Universities of Sydney, Canberra and New South Wales since 1971. From 1992, I was a Research Project Leader in SOLARCH, the National Solar Architecture Research Unit at the University of NSW. Until its disestablishment in December 2006 I was the Associate Director, Centre for Sustainable Built Environments (SOLARCH), UNSW.

My research and consultancy includes work in solar access, energy simulation and assessment for houses and multi-dwelling developments. I am the principal author of *SITE PLANNING IN AUSTRALIA: Strategies for energy efficient residential planning*, published by AGPS, and of the BDP Environment Design Guides on the same topic. Through NEERG Seminars, I conduct training in solar access and overshadowing assessment for Local Councils. I have delivered professional development courses on topics relating to energy efficient design both in Australia and internationally.

I taught the wind and ventilation components of environmental control in the architecture program at UNSW, and am the author of internationally referenced, web accessed coursework materials on the subject. I have supervised PhD research specifically on the problem of single sided ventilation of multi-storey apartments.

Of particular relevance, I have delivered the key papers in the general area of assessment of *ventilation and solar access performance and compliance* at the NEERG Seminars and other professional development settings. Senior Commissioner Moore cited my assistance in reframing of the Land and Environment Court Planning Principle related to solar access (formerly known as the Parsonage Principle) in *The Benevolent Society v Waverley Council [2010] NSWLEC 1082.* I am a Registered Architect and maintain a specialist consultancy practice in Sydney and Canberra. I regularly assist the Land and Environment Court as an expert witness in related matters.

3.0 DOCUMENTS

3.1 I base my report on

- DA architectural drawings issued to me 23 June 2015 by by DWA Architects:
    - PN1086 - 02 - SITE SURVEY.pdf
    - PN1086 01 - SITE ANAYLSIS.pdf
    - PN1086 02 - SITE SURVEY.pdf
    - PN1086 03 - SITE PLAN.pdf
    - PN1086 04 - B1.pdf
    - PN1086 05 - B2.pdf
    - PN1086 06 - B3.pdf
    - PN1086 07 - B4.pdf
    - PN1086 08 - GROUND FLOOR PLAN.pdf
    - PN1086 09 - LEVEL 1.pdf
    - PN1086 10 - LEVEL 2.pdf
    - PN1086 11 - LEVEL 3.pdf
    - PN1086 12 - LEVEL 4.pdf
    - PN1086 13 - LEVEL 5.pdf
    - PN1086 14 - LEVEL 6.pdf
    - PN1086 15 - LEVEL 7.pdf
    - PN1086 16 - LEVEL 8.pdf
    - PN1086 17 - TYPICAL FLOOR PLAN.pdf
    - PN1086 18 - TYPICAL FLOOR PLAN.pdf
    - PN1086 19 - TYPICAL FLOOR PLAN.pdf
    - PN1086 20 - EAST ELEVATION.pdf
    - PN1086 21 -NORTH ELEVATION.pdf
    - PN1086 22 - WEST ELEVATION.pdf
    - PN1086 23 - SOUTH ELEVATION.pdf
    - PN1086 24 - INTERNAL ELEVATION.pdf
    - PN1086 25 - INTERNAL ELEVATION.pdf
    - PN1086 26 - SECTION.pdf
    - PN1086 27 - SECTION.pdf

- 3D digital model prepared in Revit CAD software and exported as a .DWG digital model file.

The model file is for the scheme before amendment – but the addition of 2/3 stories to the town does not make a difference to the analysis.

3.2 I have visited the site.

4.0 SITE CONSTRAINTS AND BUILDING MASSING

4.1 The site

The site is an irregular shape, the joining of two square portions connected at a narrow overlap, as seen in Figure 1. The main portion is bounded on the north by Hoxton Park Road, the east by Hume Hwy., the south by the historic Collingwood Hotel, and to the east currently by a single storey industrial building. The same industrial site forms the northern boundary of the smaller portion of the site, which fronts Gillespie Street to the west. A single dwelling forms the south boundary and the east borders the carpark of the Collingwood Hotel.

The most relevant constraint on solar access is the alignment of the Hume Highway, which results in a nominal east elevation of any orthographically aligned building not receiving any direct winter sun at a

useful angle after approximately 10:30am. Coupled with that limitation is the likely overshadowing early in the morning by the known future development of the large amalgamated site known as 420 Macquarie St Liverpool. That development is to be twin multi-storey towers of similar height to that proposed on the subject site. See location view and site plan in Figures 1 & 2.

Figure 1: Aerial view of site location

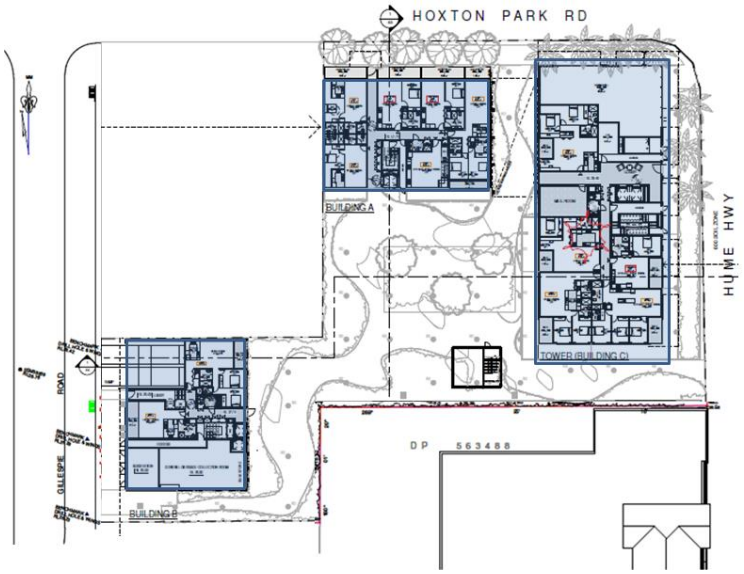


Figure 2: Site Plan

4.2 The proposal

The proposal is for one tall residential tower and two eight storey buildings, over basement car parking. The Hume Hwy and Hoxton Park Road corner frontage at ground level is partly given over to commercial uses. The size and positioning of the tower appears to respond directly to the desired future character of the major intersection of these roads.

The exact orientation of the boundaries is a key consideration in assessing solar access for apartments. True North relates to the site boundaries such that while winter sun exposure of the westerly facades is marginally enhanced, that of the easterly facades is reduced. This arises from the street grid established in the original subdivision, being surveyed to magnetic north. The proposed wintergarden treatment of the

east facing apartments on Hume Highway has the benefit that in comparison with recessed open balconies, it significantly extends the period of direct sun access to glazing at midwinter.

However, no glazing in the nominally east façade will receive effective winter sun after approximately 10.30am, but the façade is ideally oriented for earlier morning sun to more effectively penetrate deeper into the dwellings.

Overall, the proposed orientation of the long axis of the tower component of the scheme in a north-south direction results in units predominantly facing north, east and west, and therefore maximises the number of dwellings with available winter solar access.

5.0 SOLAR ACCESS

5.1 Methodology

5.1.1 Quantification of solar access for compliance with the requirements of the Residential Flat Design Code and the local controls has been carried out by use of a 3D digital model in the *Trimble SketchUp* software package.

5.1.2 The 3D digital model was prepared by the architects in their Revit CAD documentation software, and exported in .DWG format for import into SketchUp. Because the 2D architectural drawings are produced from the same 3D project file, the model can by definition be assumed to be an accurate representation of those drawings.

I independently geolocated the SketchUp digital model, and checked the orientation of True North by reference to cadastral grid north. I summarily checked sufficient of the critical building dimensions to satisfy myself that the model will accurately represent mutual overshadowing by the various three discrete buildings in the scheme, and in particular by the proposed twin towers to the north-east of the site. I feel confident to rely on the general accuracy of the modelling.

Figure 3: View from the sun 9am June 21
The model incorporates relevant adjacent development.

5.1.3 The SketchUp software prepares the shadow projections by reference to accurate solar geometry. The model has been used to examine the projected solar access for the glazing and private open space for each individual apartment, including the overshadowing impacts and self-shading.

My detailed analysis is performed primarily by using projections known as *'View from the Sun'*. A view from the sun shows all sunlit surfaces at a given time and date. It therefore allows a very precise count of sunlight hours on any glazing or horizontal surface, with little or no requirement for secondary calculations or interpolation. The technique is illustrated in Figure 3.

Note that the views from the sun do not show any shadows. Shadows are those areas exactly coinciding with objects in the foreground which cast them.

5.2 Relevant solar access standards

5.2.1 Residential Flat Design Code

The Residential Flat Design Code gives the following quantified recommendations:

- Living rooms and private open spaces for at least 70 percent of apartments in a development should receive a minimum of three hours direct sunlight between 9am and 3pm in mid winter. In dense urban areas a minimum of two hours may be acceptable.
- Limit the number of single-aspect apartments with a southerly aspect (SW-SE) to a maximum of 10 percent of the total units proposed.
- Developments which seek to vary from the minimum standards must demonstrate how site constraints and orientation prohibit the achievement of these standards and how energy efficiency is addressed (see Orientation and Energy Efficiency).
  (Rules of Thumb: Daylight Access p. 84)

5.2.2 Local controls

The applicable local control appears to be Liverpool Development Control Plan 2008 Part 3.7 Daylight Access. Notwithstanding extensive reference to daylight quality, the DCP makes little mention of direct sunlight, and contains no numerical controls. Compliance with the RFDC is therefore taken as complying with the local control.

5.3 Characterisation of solar access compliance

5.3.1 Sun patches

For the purpose of calculating the compliance with the control, I have examined sun patches on the relevant glazing line and for the private open space of each apartment. I refer specifically to the relevant *L+EC Planning Principle (The Benevolent Society v Waverley Council [2010] NSWLEC 1082)* for characterisation of compliance*:*

- I ignore very large angles of incidence to the glazing surface, and unusably small areas of sunlit glazing;
- I quantify as complying all sun patches on glazing of 'reasonable size'. There is no accepted standard for the absolute limit of acceptable area of the sunpatch on partly shaded glazing. In accordance with the Court's *Planning Principle*, I regard an area of sunlit glazing to be of 'reasonable size' to be approximately $1m^2$ – on the basis that it exceeds 50% of the area of a standard window 1500 x 1200 high, which would normally be accepted as complying.

5.3.2 Duration of sun access

The RFDC suggests that a minimum of two hours solar access can be applied in high density areas. Given the development is located in the Liverpool City Centre and will relate to buildings ranging in height from 45m to 80m, the '2 hour standard' is clearly applicable.

The recently published apartment design guide giving effect to the amended SEPP65 confirms the more general requirement of only two hours of direct sun throughout the Sydney metropolitan area.

5.3.3 Applicable times of day for effective sun

The 9am and 3pm limits are a legacy from early controls for single dwellings in arcadian suburban settings. In my considered opinion, to apply those limits without reference to the availability of earlier and later sun is inappropriate. This opinion has consistently had the support of the Land and Environment Court., most recently by Brown, C. in *Botany Development Pty Ltd v Council of the City of Botany Bay NSWLEC 10360 of 2013.*

Given the comprehensive 3-D modelling of the subject site in its context, and anticipating taller developments to the north-east, there is relative certainty that some apartments will receive additional effective direct winter sun earlier or later than the arbitrary 9am and 3pm limits. In relation to such apartments I have recorded solar access from 8am and until 4.00pm. I note that in general, these earlier and later periods of winter sun are actually the most effective for the relevant east and west glazing.

5.3.5 Wintergardens

As noted previously, a number of apartments employ a wintergarden style private open space. The judicious use of wintergardens optimises winter performance as 'attached sunspaces' with extended sunlit glazing. This contributes to significant improvement in the heating energy efficiency of those dwellings, while retaining the flexibility for well ventilated summer use.

If the operable glass louvers proposed to enclose the relevant balconies are of appropriate quality (typically 'tropical' standard), the proposed wintergardens have the additional benefit of significantly improving the acoustic privacy of the internal living areas.

In this proposal, wintergardens as POS are associated with single aspect apartments on both east and west elevations, where the potential of direct sun on the main glazing line is limited by self-shading from the deep privacy walls. For these apartments, I qualify the outer line of glazing as the relevant surface for the acceptable sun patch and duration.

5.4 Projected solar access

5.4.1 I have independently generated my own quantification and compliance table. Table 1 summarises the projected levels of compliance.

Table 1: Summary of solar access compliance

	No. of units	>3hrs (9-3)	>2hrs (9-3)	>2hrs (8-3)	Complying units	%
Building A	37	32	0	0	32	86%
Building B	30	14	0	7	21	70%
Tower	240	138	4	60	202	84.2%
Total:	307	184	4	67	**255**	**83%**
		60%	1%	22%		

5.4.2 The RFDC *Rules of Thumb* and the ADG *Design criteria* require a minimum of 70%. In considering this level of compliance, I pay regard to the following factors:

- The RFDC suggests that the less onerous '2-hour standard' can be applied in a high density urban area. In the given context, my view is that apartments meeting the '2-hour standard' should be considered compliant;
- The ADG has confirmed the '2-hour standard' to be generally applicable in the metropolitan area;
- Brown, C. in *Botany Development Pty Ltd v Council of the City of Botany Bay LEC 10360 of 2013* confirmed that effective sun before 9am and after 3pm is legitimately considered where adverse overshadowing limits the solar access potential of a site; and the 70% nominated in the controls is not a Development Standard

The total number of apartments which will receive over two hours of effective direct sun on June 21 is 240 from a total of 304 (79%). In my considered opinion, this level of compliance can be safely taken to satisfy the controls for solar access.

6.0 NATURAL VENTILATION

6.1 Performance Objectives

SEPP65 itself does not refer to prescribed quantitative standards. The Residential Flat Design Code gives a quantified recommendation for interpreting SEPP65 with respect to natural ventilation:

- Building depths, which support natural ventilation typically range from 10 to 18 metres.
- Sixty percent (60%) of residential units should be naturally cross ventilated.
- Twenty five percent (25%) of kitchens within a development should have access to natural ventilation.
- Developments, which seek to vary from the minimum standards, must demonstrate how natural ventilation can be satisfactorily achieved, particularly in relation to habitable rooms.

(Rules of Thumb: *Natural Ventilation* p.87)

The Apartment Design Guide effectively confirms these criteria, ***with the additional relief that apartments above Level 10 may be considered to have sufficient ventilation due to higher wind speeds to be considered complying for natural ventilation performance.***

6.2 Natural ventilation compliance

In Table 1, I summarise the compliance for natural ventilation performance.

Table 2: Natural ventilation compliance

Conventionally cross ventilated apartments	161	
Additional apartments at Level 10 and above deemed *equivalent* to cross ventilation due to elevated exposure	88	
Total number of apartments	307	
Total deemed to comply	**249**	**81%**

7.0 CONCLUSIONS

7.1 Solar access

The RFDC *Rules of Thumb* recommend a minimum of 70% of the apartments to comply with the applicable standard, and nominate 2 hours of sun in densely built up urban settings. The newly introduced Apartment Design Guide *Design criteria* require 2 hours in the metropolitan areas of Sydney, Wollongong and Newcastle.

The number of apartments projected to receive over 2 hours of sun to Living areas and private open space between 9am and 3pm on June 21 is 188 units from a total of 307 being 61%. When we consider sun available before 9am to the apartments facing east across Hume Highway, a further 67 apartments (22%) may be safely considered to receive at least two hours of effective sun on June 21.

The total number of apartments which will receive over two hours of effective direct sun on June 21 is 255 from a total of 307 (83%). In my considered opinion, this level of compliance can be safely taken to satisfy the controls for solar access.

7.2 Natural ventilation

At a certain height, suitable single sided apartments can also be treated as subject to winds of so much greater velocity, that the distinction between single sided ventilation and cross ventilation is no longer relevant. I would normally apply this characterisation of blanket compliance at and above Level 10 of both tower blocks proposed in this development. This criterion has been adopted in the newly published Apartment Design Guide.

A total of **249 apartments out of a total of 307 (81%) may be regarded as cross ventilated** *or likely to achieve ventilation rates equivalent to cross ventilation.* The proportion required by the RFDC and the ADG is a minimum of 60%.

The proposed development fully complies with the relevant control for natural ventilation.

A.0 APPENDIX: DETAILED COMPLIANCE TABLE

Table 3: Solar access and cross ventilation for individual dwellings

	TOWER																						
	Solar access																						
	8	830	9	930	10	1030	11	1130	12	1230	13	1330	14	1430	15	1530	16	>3 hrs	>2hrs	>2hrs (8-16)	Cross vent	Vent comply due to height	
201	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0						
202	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES		
203	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1				YES		
204	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0						
205	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0						
206	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
207	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
208	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES			
301	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0						
302	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES		
303	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1		YES		YES		
304	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0						
305	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0						
306	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
307	B	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	YES			YES		
308	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES			
401	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0						
402	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES		
403	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	YES			YES		
404	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0						
405	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0						
406	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
407	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
408	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES			
501	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0						
502	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES		
503	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
504	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1	0		YES				
505	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0						
506	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
507	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
508	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES			
601	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0						
602	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES		
603	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
604	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					

605	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0		YES					
606	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			
607	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES			
608	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES				
701	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0							
702	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES			
703	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES			
704	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
705	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
706	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			
707	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES			
708	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES				
801	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0							
802	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES			
803	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES			
804	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
805	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
806	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			
807	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES			
808	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES				
901	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0							
902	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES			
903	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES			
904	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
905	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
906	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			
907	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES			
908	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES				
1001	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0							
1002	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES			
1003	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES			
1004	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
1005	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
1006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			
1007	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES			
1008	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES				
1101	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0					YES		
1102	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES			
1103	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES			
1104	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
1105	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
1106	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			
1107	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES			
1108	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
1201	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0					YES		
1202	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES			

1203	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
1204	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1205	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1206	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
1207	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
1208	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
1301	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0					YES	
1302	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES		
1303	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
1304	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1305	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1306	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
1307	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
1308	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
1401	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0					YES	
1402	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES		
1403	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
1404	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1405	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1406	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
1407	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
1408	0	1	1	1	1	1		0	0	0	0	0	0	0	0	0	0			YES		YES	
1501	0	0	1	1	1	1		0	0	0	0	0	0	0	0	0	0					YES	
1502	0	0	1	1	1	1		0	0	0	0	0	0	0	0	0	0				YES		
1503	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
1504	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1505	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1506	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
1507	B	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	YES			YES		
1508	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
1601	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0					YES	
1602	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0				YES		
1603	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
1604	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1605	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1606	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
1607	B	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	YES			YES		
1608	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
1701	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
1702	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES		
1703	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
1704	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1705	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
1706	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
1707	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
1708	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	

1801	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
1802	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES			
1803	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES			
1804	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
1805	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
1806	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			
1807	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES			
1808	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
1901	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
1902	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES			
1903	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES			
1904	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
1905	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
1906	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			
1907	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES			
1908	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
2001	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
2002	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES			
2003	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES			
2004	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
2005	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			
2007	B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES			
2008	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
2101	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
2102	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES			
2103	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES			
2104	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
2105	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
2106	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			
2107	B	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES			
2108	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
2201	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
2202	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES			
2203	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES			
2204	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
2205	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
2206	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			
2207	B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES			
2208	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
2301	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES		
2302	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES			
2303	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES			
2304	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
2305	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES						
2306	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES			

2307	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
2308	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2401	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2402	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES		
2403	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
2404	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
2405	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
2406	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
2407	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
2408	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2501	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2502	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES		
2503	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
2504	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
2505	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1		YES				
2506	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
2507	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	YES			YES		
2508	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2601	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2602	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES		
2603	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
2604	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
2605	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
2606	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
2607	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
2608	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2701	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2702	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES		
2703	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
2704	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
2705	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
2706	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
2707	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
2708	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2801	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2802	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES		
2803	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
2804	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
2805	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
2806	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
2807	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	YES			YES		
2808	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2901	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
2902	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES		
2903	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
2904	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					

2905	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
2906	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
2907	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	YES			YES		
2908	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
3001	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
3002	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES		
3003	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
3004	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
3005	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
3006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
3007	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	YES			YES		
3008	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
3101	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
3102	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES	YES		
3103	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES			YES		
3104	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
3105	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	YES					
3106	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		
3107	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	YES			YES		
3108	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0			YES		YES	
240																		138	4	60	120	88	
																		57.5%	1.7%	25.0%	50.0%	36.7%	
																						208	
																			59.2%	**84.2%**		**86.7%**	

BUILDING A

	Solar access																	**Solar access compliance**					
	8	830	9	930	10	1030	11	1130	12	1230	13	1330	14	1430	15	1530	16	>3 hrs	>2hrs	>2hrs (8-16)	Cross vent	Vertical shafts	
G01	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
G02	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
G03	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
G04	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
G05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
G06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				YES		double height
101	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
102	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
103	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
104	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
201	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
202	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
203	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
204	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				YES		double height
301	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
302	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
303	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					

304	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
401	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
402	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
403	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
404	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
405	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				YES		double height
501	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
502	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
503	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
504	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
601	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
602	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
603	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
604	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
605	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				YES		double height
701	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
702	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
703	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
704	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	YES			YES		
37																		32	0	0	19		
																		86.5%	0.0%	0.0%	51.4%		
																			86.5%	86.5%		51.4%	

BUILDING B

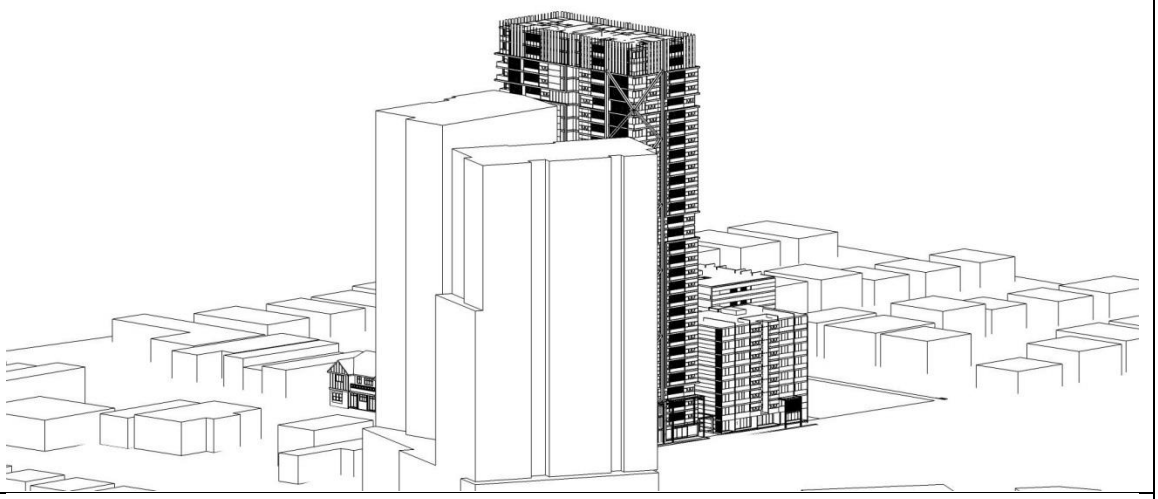
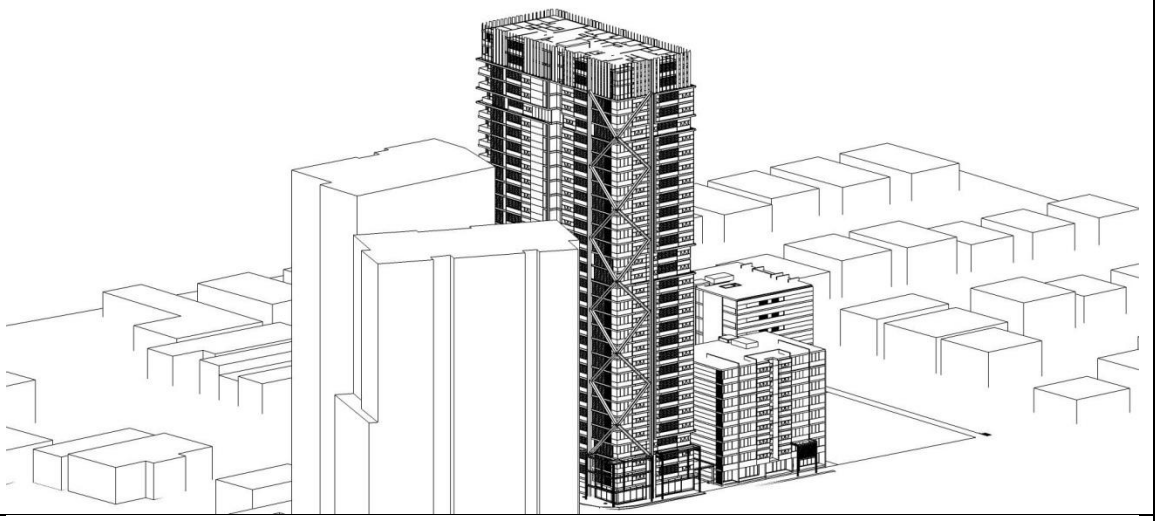
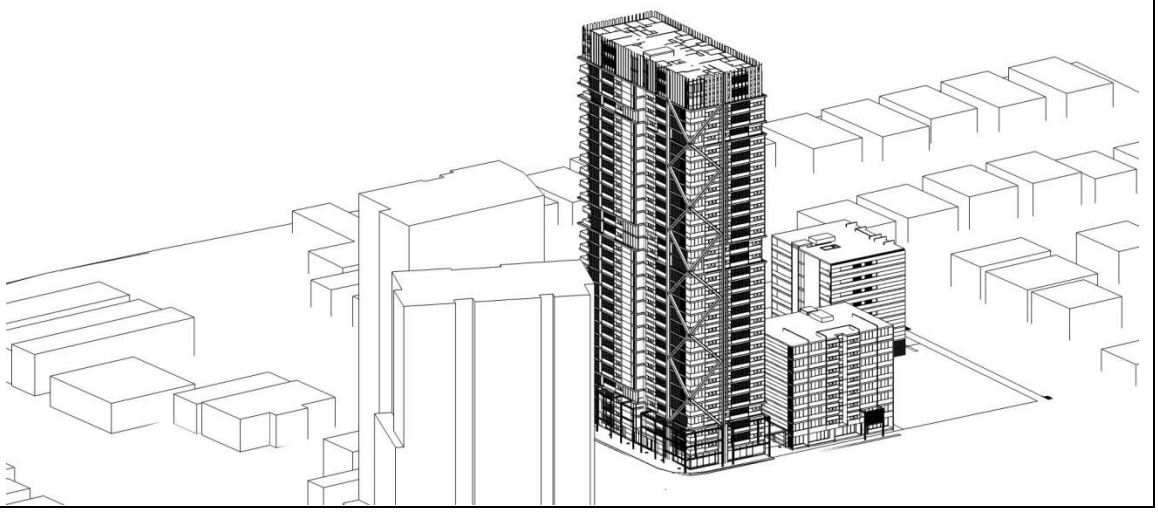
	Solar access																						
	8	830	9	930	10	1030	11	1130	12	1230	13	1330	14	1430	15	1530	16	>3 hrs	>2hrs	>2hrs (8-16)	Cross vent	Vertical shafts	
BG01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
BG02	0	0	0	0	0	B	B	0	0	0	0	0	0	0	0	0	0						
101	0	0	0	B	B	0	0	0	0	0	0	0	1	1	1	1	1			YES	YES		
102	0	0	0	0	0	0	0	0	B	B	B	B	B	1	1	1	1						
103	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
104	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
201	0	0	B	B	B	0	0	0	0	0	0	0	1	1	1	1	1			YES	YES		
202	0	0	0	0	0	0	0	0	B	B	B	B	B	1	1	1	1						
203	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
204	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
301	0	0	B	B	B	0	0	0	0	0	0	0	1	1	1	1	1			YES	YES		
302	0	0	0	0	0	0	0	0	B	B	B	B	B	1	1	1	1						
303	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
304	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
401	0	0	B	B	B	0	0	0	0	0	0	0	1	1	1	1	1			YES	YES		
402	0	0	0	0	0	0	0	0	B	B	B	B	B	1	1	1	1						
403	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
404	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
501	0	0	B	B	B	0	0	0	0	0	0	0	1	1	1	1	1			YES	YES		
502	0	0	0	0	0	0	0	0	B	B	B	B	B	1	1	1	1						

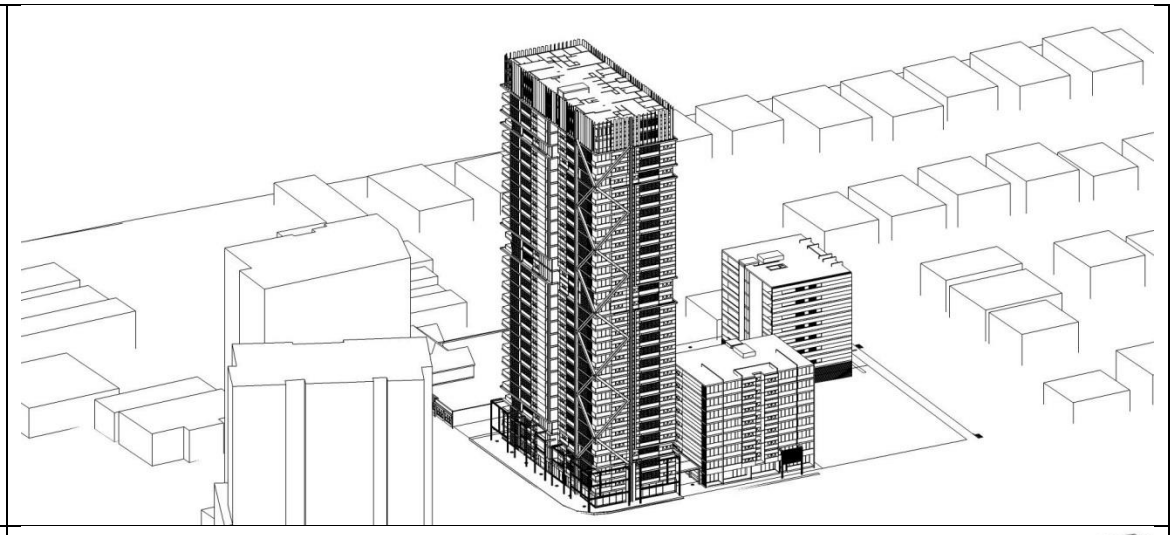
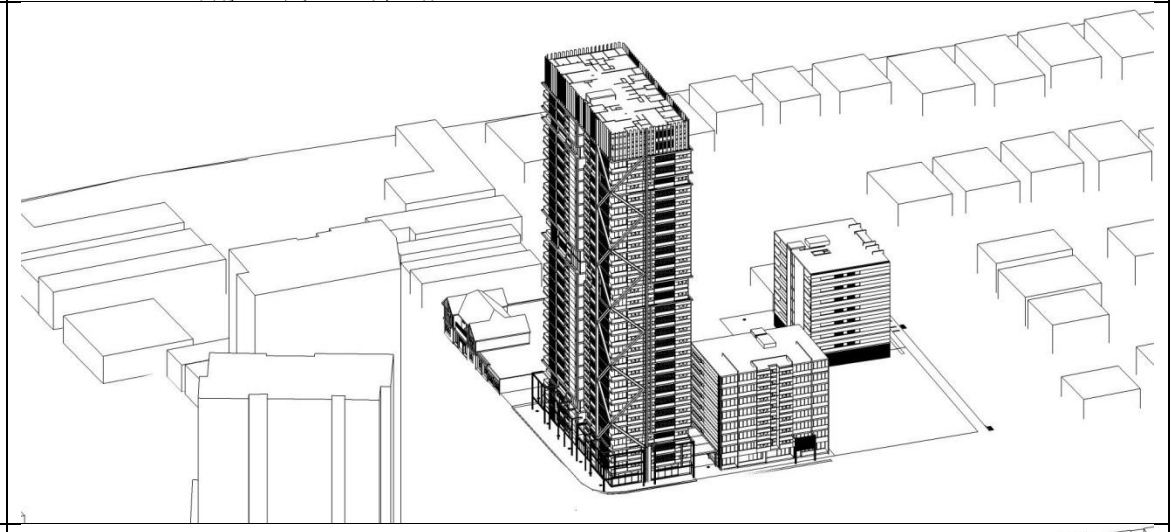
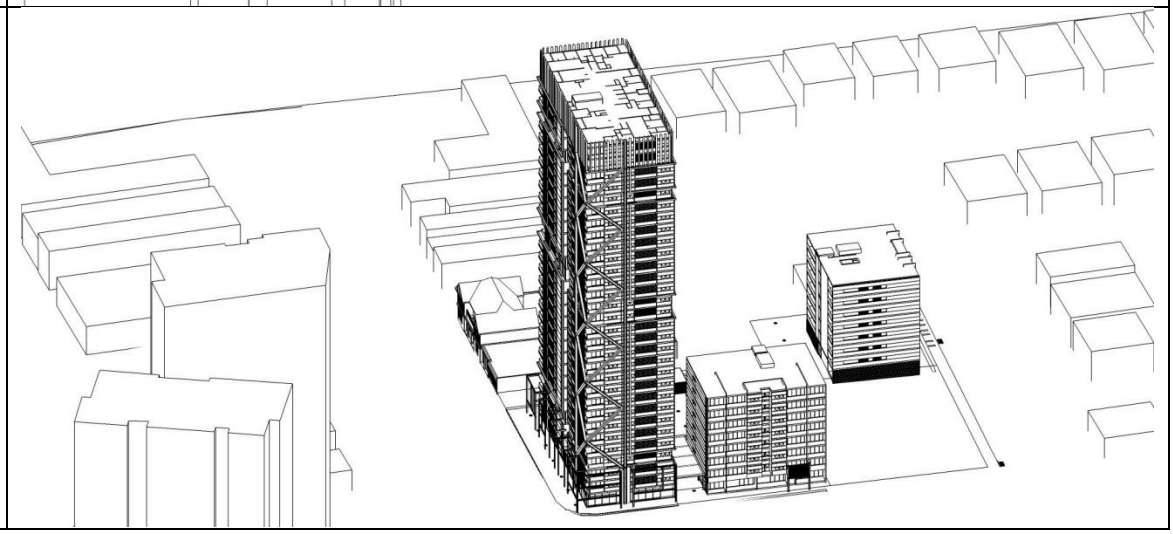
503	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
504	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
601	0	0	B	B	B	0	0	0	0	0	0	0	1	1	1	1	1			YES	YES		
602	0	0	0	0	0	0	0	0	B	B	B	B	B	1	1	1	1						
603	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
604	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES					
701	0	0	B	B	B	0	0	0	0	0	0	0	1	1	1	1	1			YES	YES		
702	0	0	0	0	0	0	0	0	B	B	B	B	B	1	1	1	1				YES		vent skylight
703	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		vent skylight
704	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	YES			YES		vent skylight
30																		14	0	7	22		
																		46.7%	0.0%	23.3%	73.3%		
																			46.7%	70.0%		73.3%	

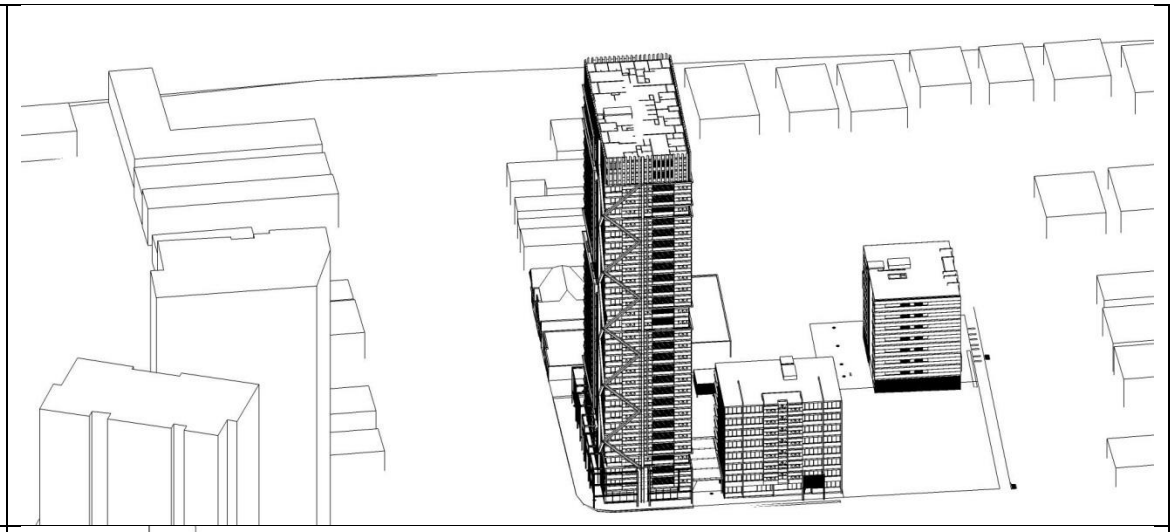
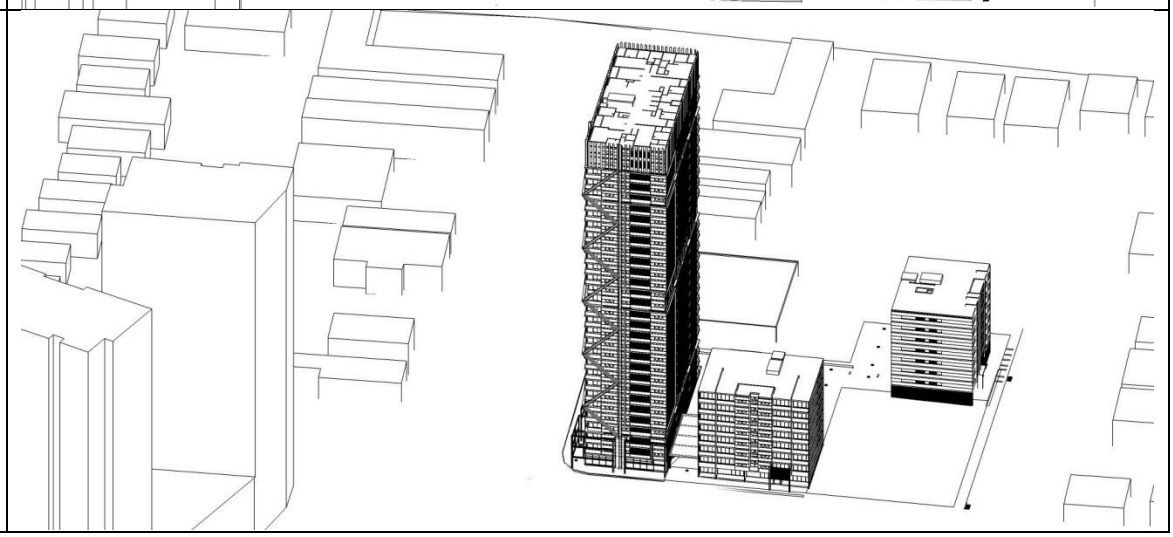
A.1 APPENDIX: VIEWS FROM THE SUN

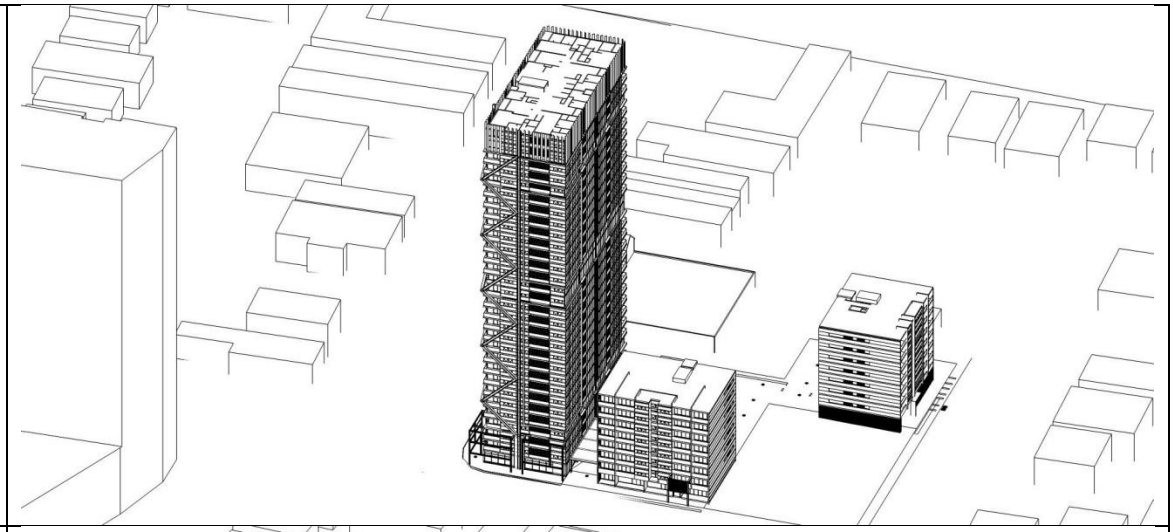
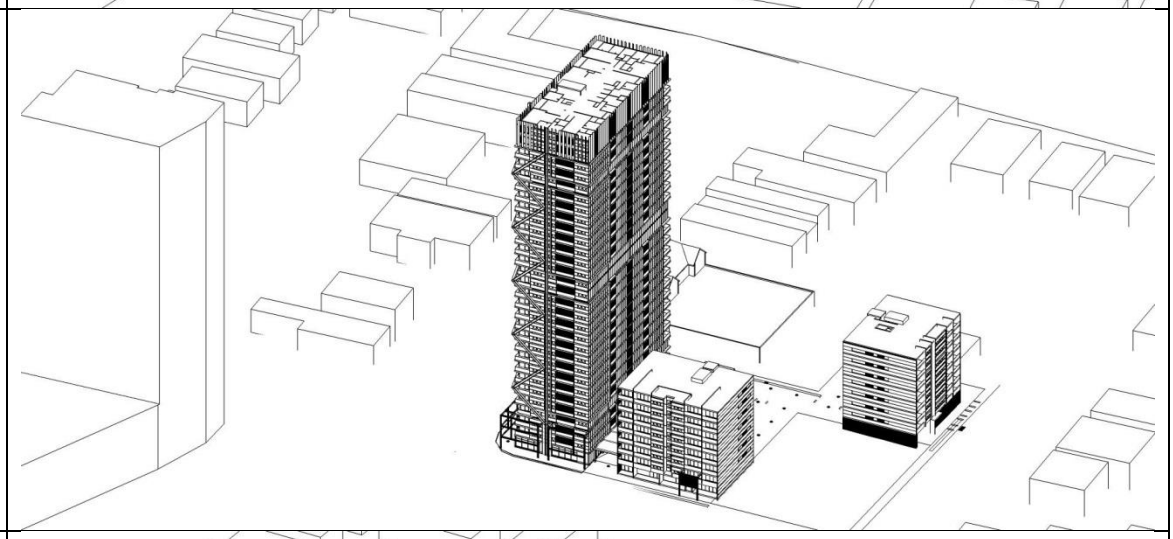
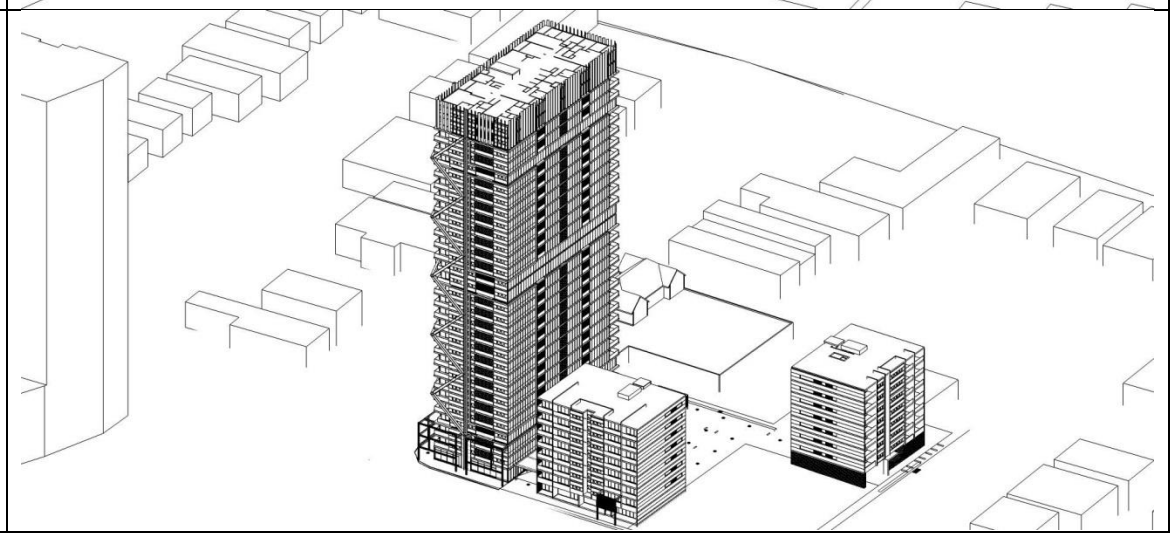
The table reproduces for reference in reduced form the half-hourly views from the sun for June 21. The projections were prepared by me from a 3D digital model in *Trimble SketchUp v8*.

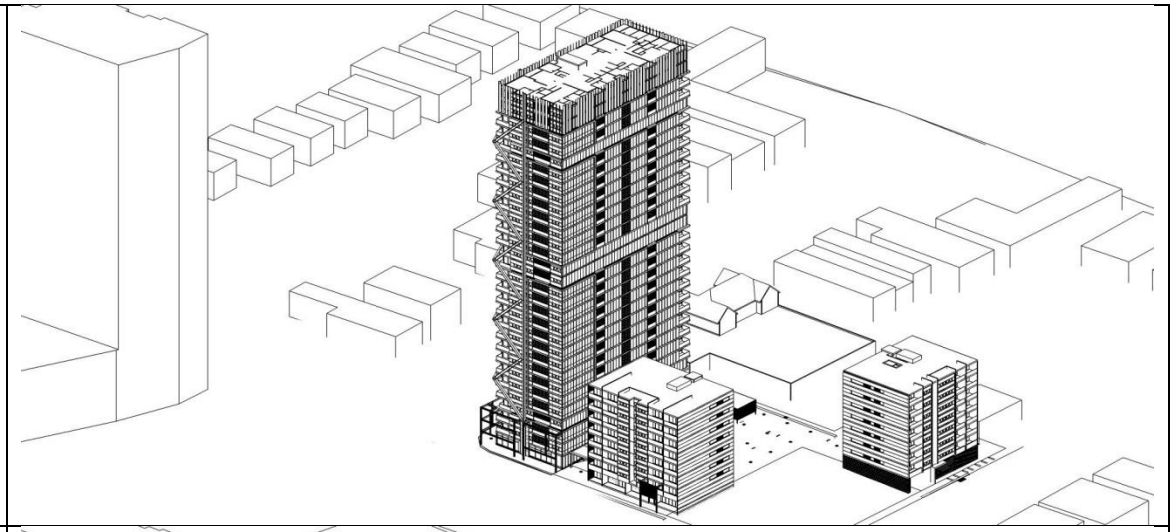
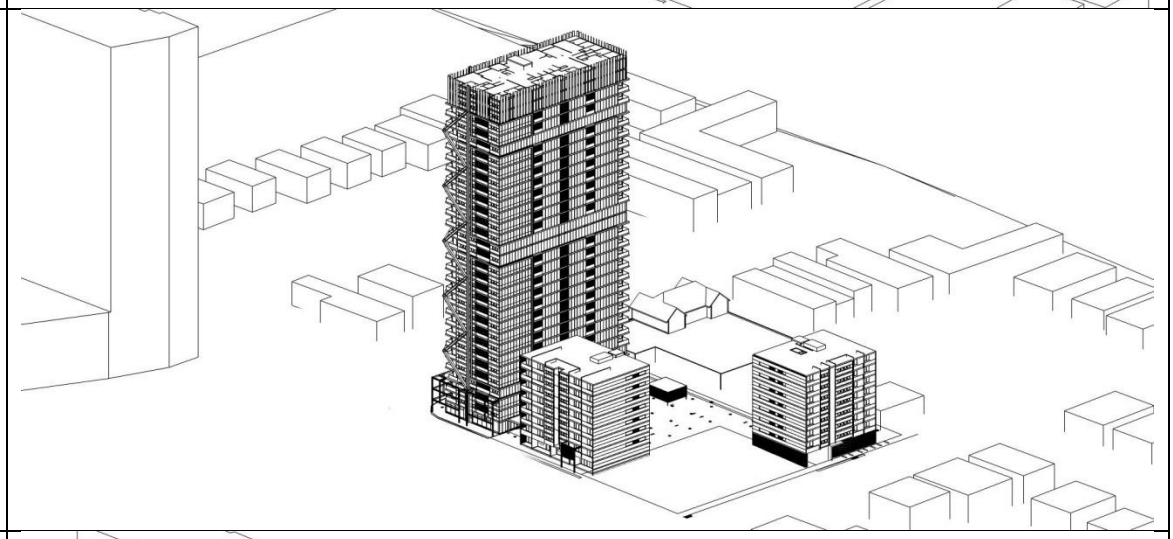
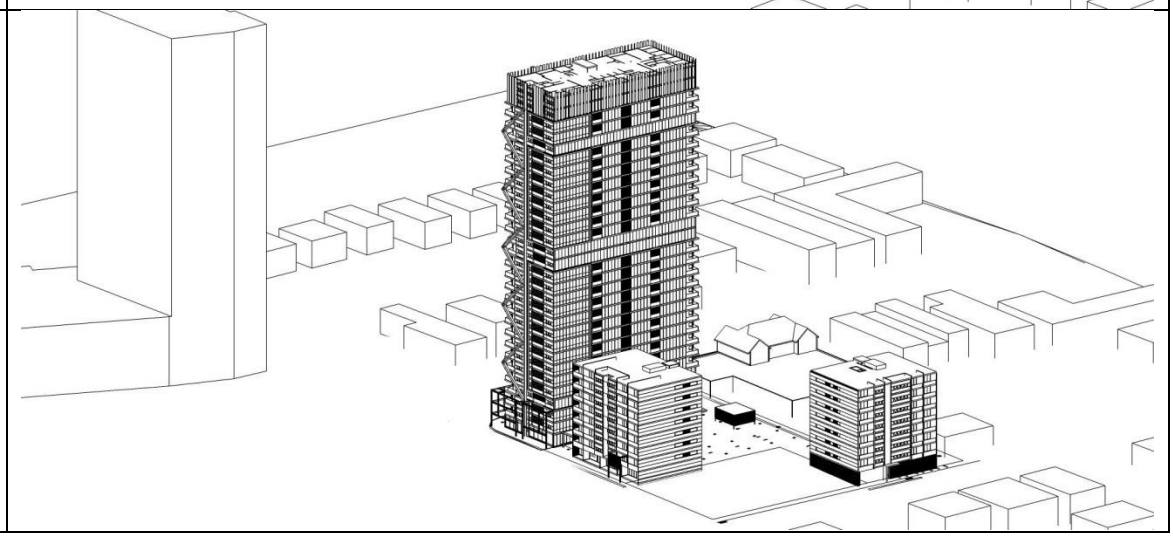
Note that the model in these views has not been updated with the additional storey on the Tower building, but that does not affect the analysis.

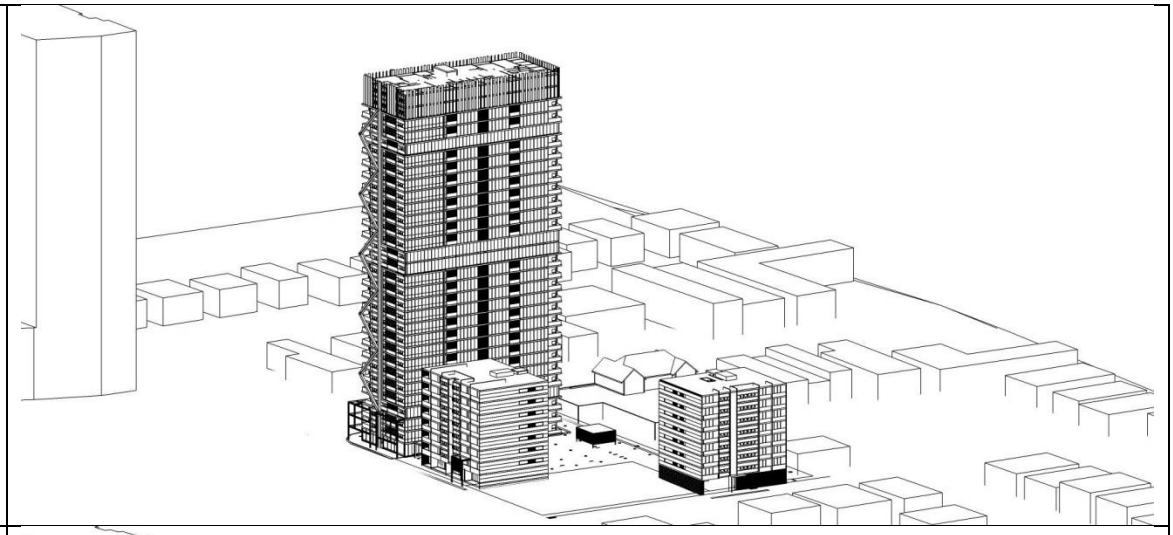
0800	
0830	
0900	

0930	
1000	
1030	

1100	
1130	
1200	

1230	
1300	
1330	

1400	
1430	
1500	

1530	
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