Llewellyn Street, Rhodes

Natural Ventilation Assessment

Leeds Investment Pty Ltd

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Prepared by:

SLR Consulting Australia

SLR Project No.: 610.031965

Revision: R03-v1.0

13 October 2025

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
R03-v1.0	13 October 2025	Dr Neihad Al-Khalidy Mark Hobday	Mark Hobday Dr Neihad Al-Khalidy	Dr Neihad Al-Khalidy
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Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Leeds 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.

Executive Summary

SLR Consulting Australia has been commissioned by Leeds Investment Pty Ltd to assess the natural ventilation for the proposed mixed-use development at 43B – 57 Blaxland Road, 2A, 2B and 2D Cavell Avenue, 448-458 Concord Road and 2A Lewellyn Street, Rhodes.

SLR has been engaged to assess the effectiveness of natural cross ventilation for a selection of apartments, which have been thoughtfully designed to optimise airflow and natural ventilation. These apartments feature openings that either face into building breezeway connected to ventilation plenums to facilitate air movement or include double-storey terraces that enhance exposure to prevailing breezes or include façade articulation.

- Southeast Building Apartments – Refer **Figure 6**
    - C-UGO5, C-101, C-104, C-105, C-108, C-301, C305, C-308, C504
- East Building Apartments – Refer **Figure 6**
    - D-104, D-201, D204, D-208, D404
- Northeast Building Apartments – Refer **Figure 6**
    - E-101, E-103, E-105, E-106, E-109, E403, E405

This report is in the form of a quantitative assessment utilising Computational Fluid Dynamics (CFD).

The State Environmental Planning Policy (SEPP) 65 supported by the Australian Design Guide is relevant to the assessment of the natural ventilation through residential components of proposed development. Section 4B-3 of the Australian Design Guide states that:

At least 60% of apartments are naturally cross ventilated in the first nine storeys of the building. Apartments at ten storeys or greater are deemed to be cross ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed.

SLR collaborated with the design team to optimise the placement of openings and amplify airflow dynamics driven by pressure differentials across the units. This collaboration led to additional openings where necessary to enhance natural cross ventilation performance.

The proposed development implements a number of the ADG recommendations to maximise the natural cross ventilation throughout the development.

- The proposed development has been provided with openings on multiple sides of the apartments for the majority of proposed floor plans, allowing it to make use of wind-induced natural ventilation throughout the year and thereby minimising energy costs.
- In general, the overall depth of the units does not exceed 18 m as per the Design Criteria of Objective 4B-3.

Natural cross ventilation to many single aspect apartments is achieved via building indentations. This is anticipated within ADG Section 4B which states in its opening paragraph that "*Natural cross ventilation is achieved by apartments having more than one aspect with direct exposure to the prevailing winds,* ***or*** *windows located in significant different pressure regions, rather than relying on purely wind driven air*".

The following conclusions have been reached based on a qualitative review of the floorplans for ADG-compliant dual-aspect units, alongside quantitative modelling of those with access to natural cross-ventilation via the proposed breezeway ventilation plenums:

- The project comprises 169 dual aspect apartments in the first nine levels. Refer Appendix B
- A total of 64 apartments have achieved natural cross-ventilation through access to ventilation plenums via naturally ventilated corridors.
- 233 out of 386 (60.4%) of the apartments in the first nine levels of the current design will be naturally cross ventilated.

The results above are based on a wind speed of 2 m/s at a height of 10 metres. As wind speeds increase, the airflow through the apartments will intensify accordingly.

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1.0 Introduction

SLR Consulting Australia has been commissioned by Leeds Investment Pty Ltd to assess the natural ventilation for the proposed mixed-use development at 43B – 57 Blaxland Road, 2A, 2B and 2D Cavell Avenue, 448-458 Concord Road and 2A Lewellyn Street, Rhodes.

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1.1 Proposed Site

The site is located at 43B – 57 Blaxland Road, 2A, 2B and 2D Cavell Avenue, 448-458 Concord Road and 2A Lewellyn Street, Rhodes. which is within the City of Canada Bay Local Government Area (LGA). The site is legally described in Table 1 above and is currently owned by Leeds Investment Pty Ltd.

The site has frontages to Blaxland Road, Cavell Avenue, Llewellyn Street and Concord Road and is also highly accessible by public transport with the Rhodes Train Station and bus services within easy walking distance.

The site currently accommodates multiple one and two storey detached dwellings which will require demolition in order to allow for the construction of the proposed residential flat buildings and terraces– refer **Figure 1**.

Figure 1 Project Site Location

Image: Courtesy Nearmap April 2025

1.2 Development Description

The proposed residential development application with in-fill affordable housing comprises of:

- Site preparation works including demolition and removal of existing structures on the site, tree and vegetation removal.
- Bulk excavation to accommodate the basement structure and site remediation.
- Construction of seven (7) residential buildings comprising two (2) townhouse buildings ranging from four (4) to five (5) storeys (plus roof terrace), and five (5) residential flat buildings ranging from ten (10) to twenty-nine (29) storeys.
- Together these buildings comprise:
    - Nine (9) townhouses and 640 apartments, comprising 15% affordable housing (including 108 affordable dwellings).
    - Basement parking for private vehicles, visitors and service vehicles.
    - Storage areas and services.
    - Communal open spaces.
- Construction of a public road connecting Blaxland Road and Cavell Avenue
- Associated landscaping and public domain improvements”2 levels of basement car parking,

The proposed buildings have the following breakdown:

Southwest (SW) Tower

- Basement carparking
- Ground level to level 23 with residential units

Northwest (NW) Tower

- Basement carparking
- Ground level to level 27 with residential units

North Terrace (NT) Townhouses

- Basement carparking
- Ground level to level 4 with residential townhouses

South Terrace (ST) Townhouses

- Basement carparking
- Ground level to level 3 with residential townhouses

Southeast (SE) Tower

- Basement carparking
- Ground level to level 10 with residential units

East (E)Tower

- Basement carparking
- Ground level to Level 8 with communal open area

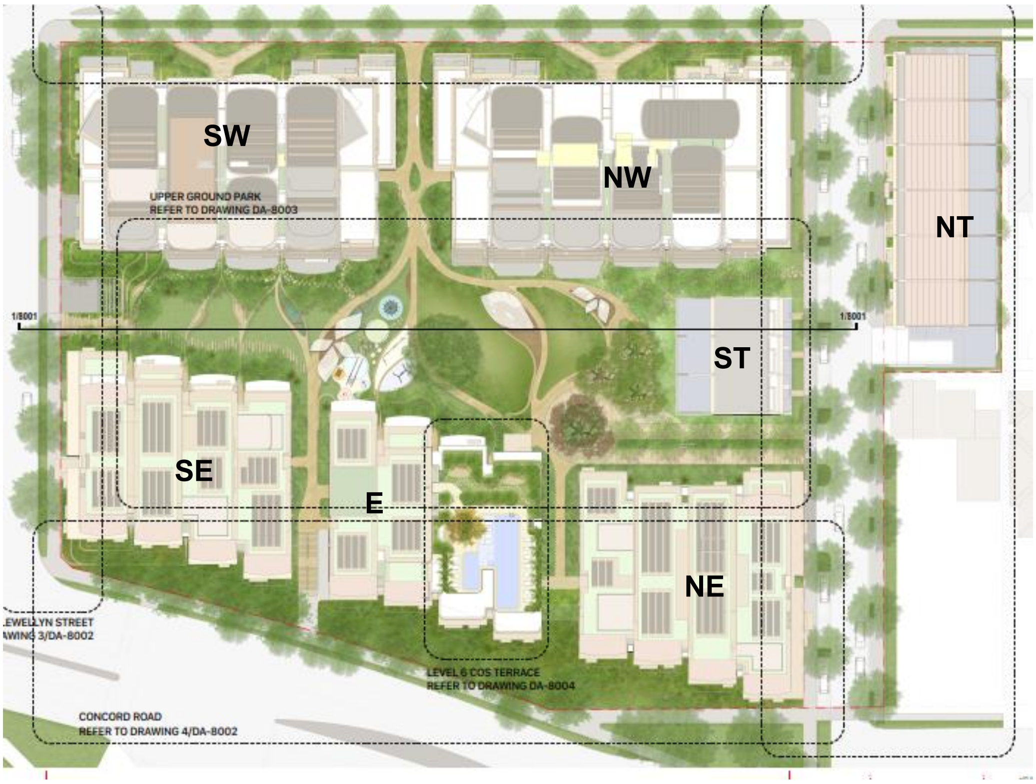
Northeast (NE) Tower

- Basement carparking
- Ground level to level 9 with residential units

Representative site plan and elevations of the proposed development are shown in **Figure 2**.

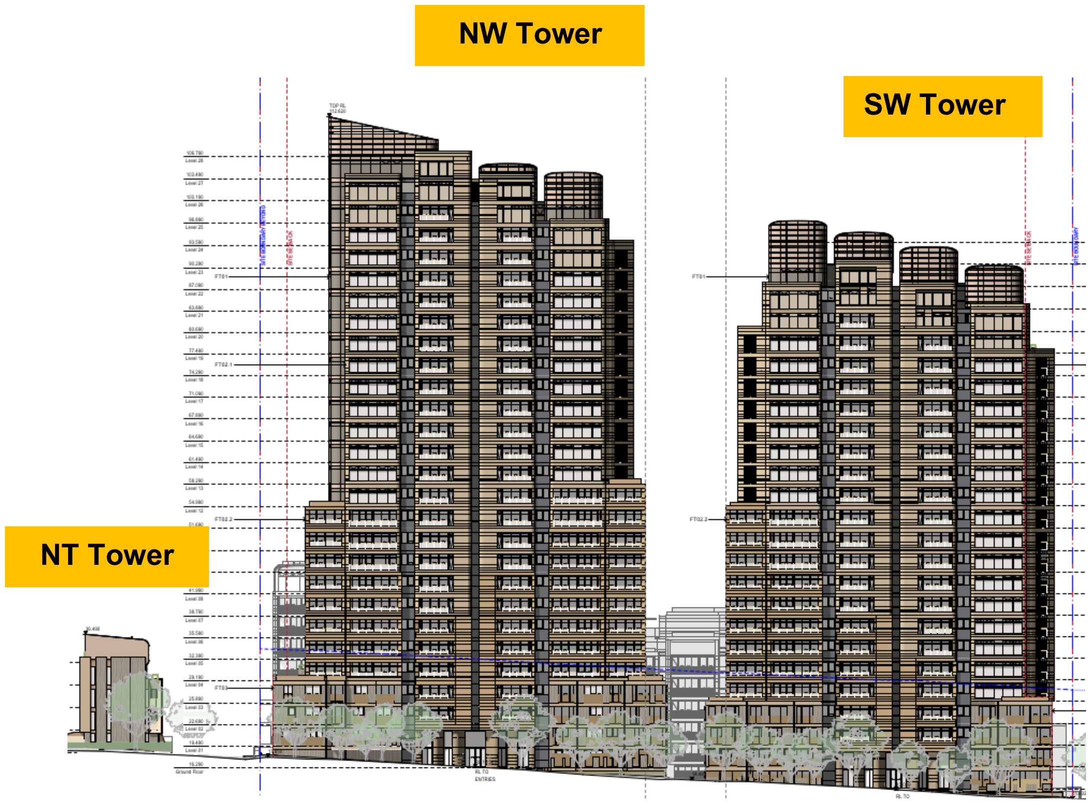
Figure 2 Elevations of the Towers

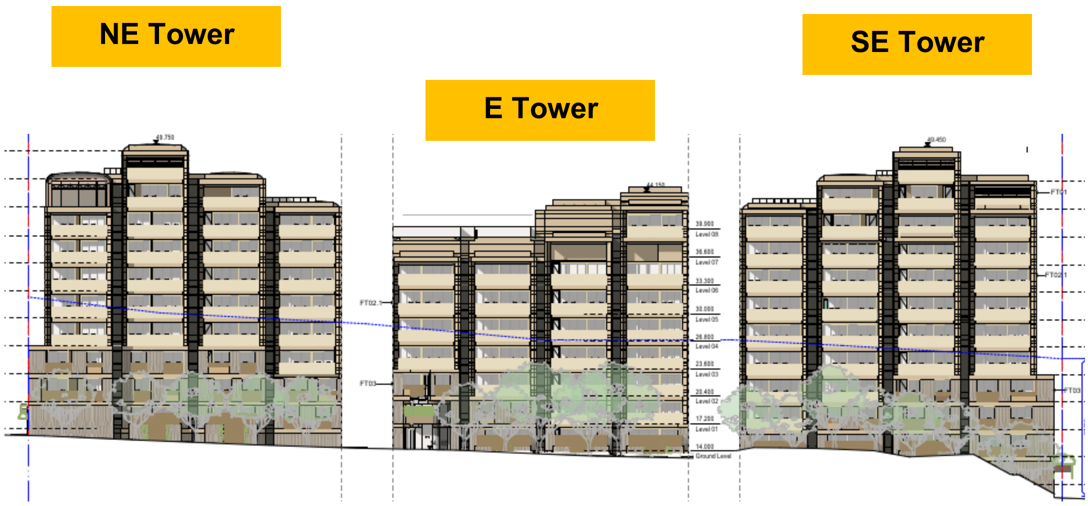
Overall Site Plan



(Fig. 2 cont'd)

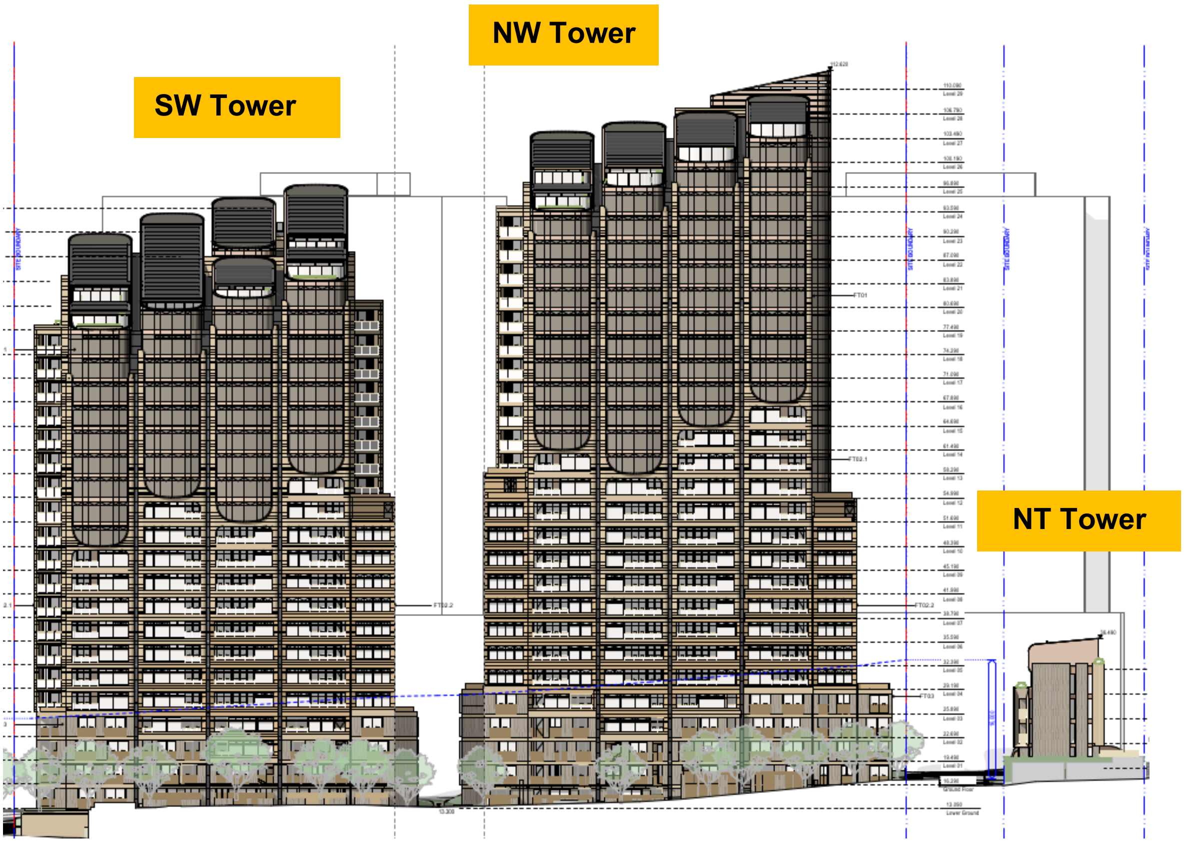
West Elevation

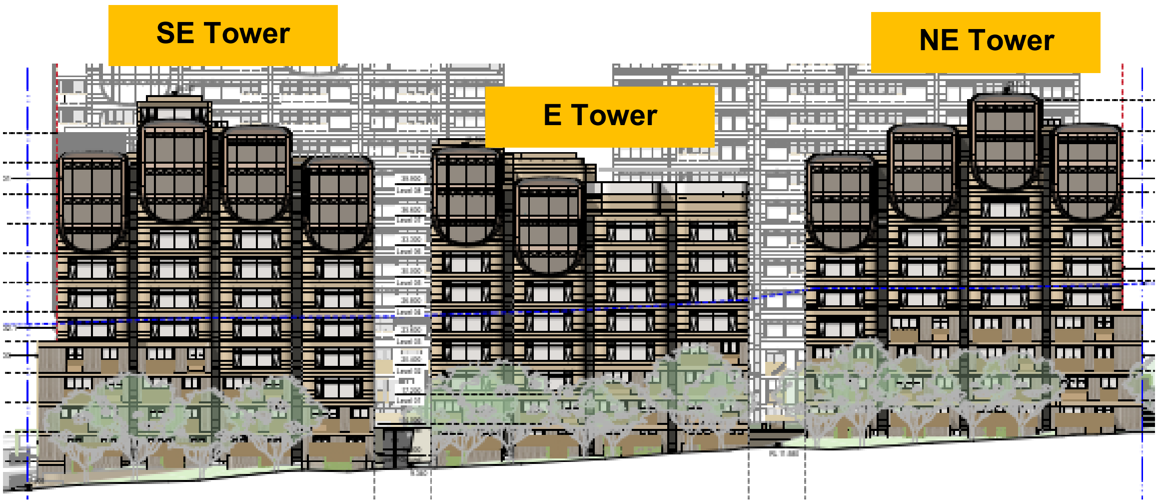




(Fig. 2 cont'd)

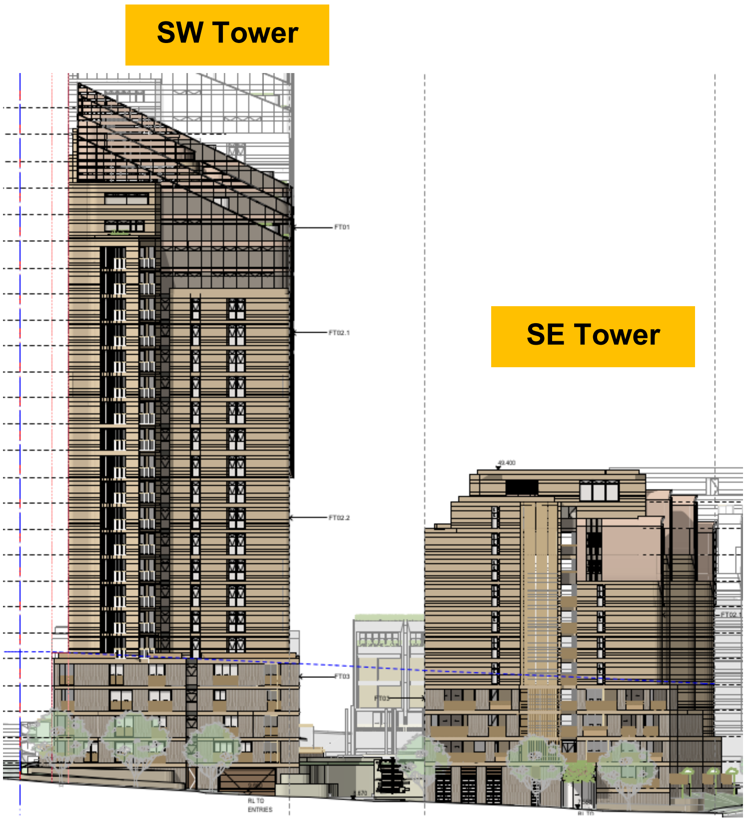
East Elevation



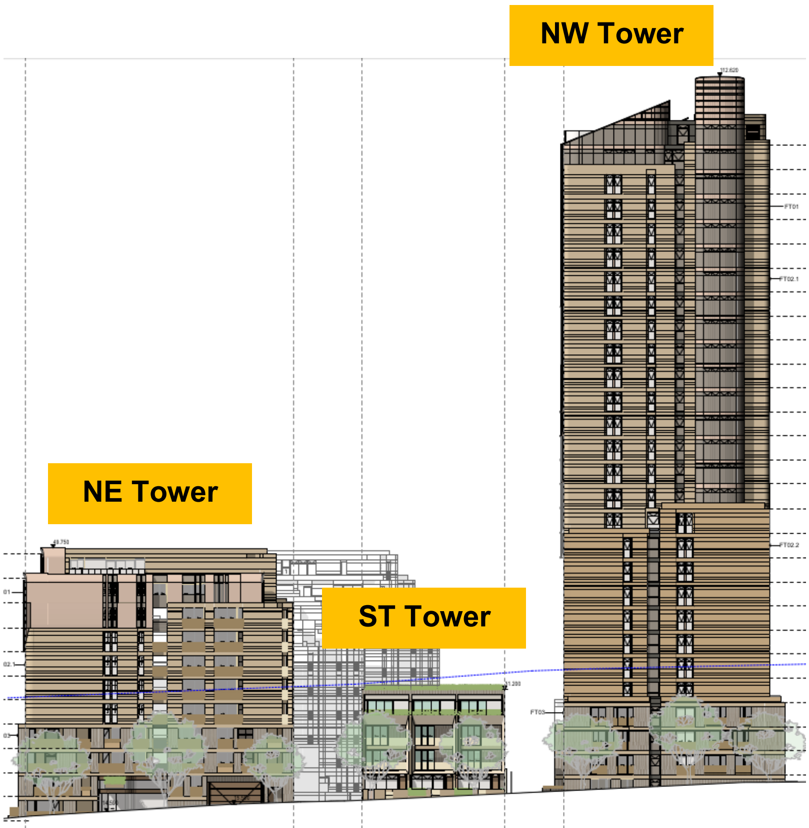


(Fig. 2 cont'd)

South Elevation



North Elevation



1.3 Surrounding Built Environment

In terms of the surrounding terrain and topography:

- **North:** Directly north of the site is the St. Mary & St. Merkorious Coptic Orthodox Church and Rhodes Community Centre, together with more low density / detached residential buildings.
- **East:** To the east of the site is Concord Road. Further the east is residential development consisting of detached dwellings and townhouses.
- **South:** Directly to the south is a recently demolished site with basement construction underway. The site has an active DA with Canada Bay Council for a mixed-use development**.**
- **West:** To the west of the site is the T9 rail line. Further to the west (across the railway line) is the Rhodes West mixed-use precinct.
- The site is located in Rhodes. Rhodes has been identified as an important Strategic Centre in the Eastern City District Plan, with significant opportunities to create additional jobs and homes. Rhodes is approximately 12km north-west of Sydney Central Business District (CBD) and approximately 7.5km east of Parramatta CBD. To the South of Rhodes is the Concord Health district which comprises a Public Teaching Hospital and various other health services.
- The site benefits from excellent access to the arterial road network (via Concord Road), which provides connections to key centres in Greater Sydney. Further to this, the site is also in close proximity to Rhodes Train Station which runs on the T9 (Northern) rail line. This line runs from Hornsby through Rhodes to Sydney CBD and north to Gordon.
- The terrain falls to the east and west towards Brays Bay and Homebush Bay; and respectively with minimal variations to the north and south.

Figure 3 Project Site Surrounds

2.0 SYDNEY'S WIND CLIMATE

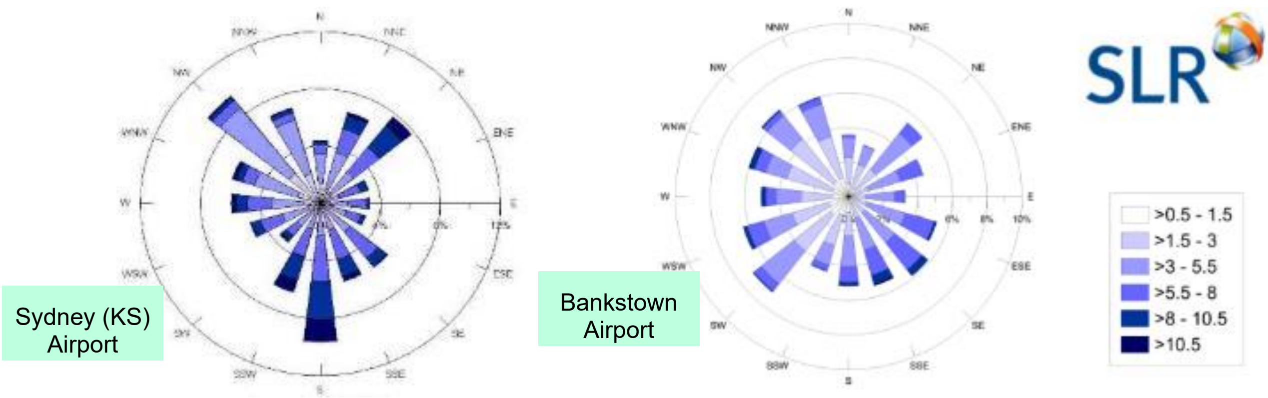
The data of interest in this study are the mean hourly wind speeds and largest gusts experienced throughout the year (especially higher, less frequent winds), how these winds vary with azimuth, and the seasonal break up of winds into the primary Sydney Region wind seasons.

2.1 Annual and Seasonal Variations

Key characteristics of Sydney's Regional Wind Climate are illustrated in two representative wind roses shown in **Figure 4** taken from Bureau of Meteorology (BoM) data recorded during the period 1999-2017 at Sydney (Kingsford Smith) Airport and Bankstown Airport. A review of the associated seasonal wind roses (refer **Appendix A**) shows that Sydney is affected by two primary wind seasons with relatively short (1-2 month) transition periods in between:

- Summer winds occur mainly from the northeast, southeast and south. While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast and southerly winds generally provide the strongest gusts during summer. Both northeast winds (as sea breezes) and stronger southerly winds associated with "Southerly Busters" and "East Coast Lows" typically have a significantly greater impact along the coastline. Inland, these systems lose strength and have altered wind direction characteristics.
- Winter/Early Spring winds occur mainly from west quadrants and to a lesser extent from the south. West quadrant winds provide the strongest winds during winter and in fact for the whole year, particularly at locations away from the coast.

Figure 4 Annual Wind Roses for Sydney (KS) Airport and Bankstown Airport (BoM Data)



2.1 Wind Exposure at the Site – the "Local"' Wind Environment

Close to the ground, the "regional" wind patterns described above are affected by the local terrain, topography and built environment, all of which influence the "local" wind environment.

- As noted in **Section 1.3**, the site is currently surrounded by low-rise buildings to all directions.
- The site will, therefore, receive low wind shielding at lower levels, with upper levels exposed to higher winds from a number of wind directions.

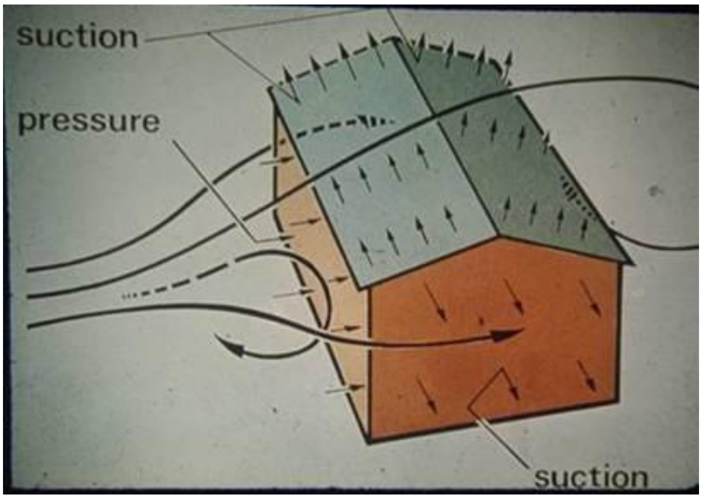
2.2 General Principles

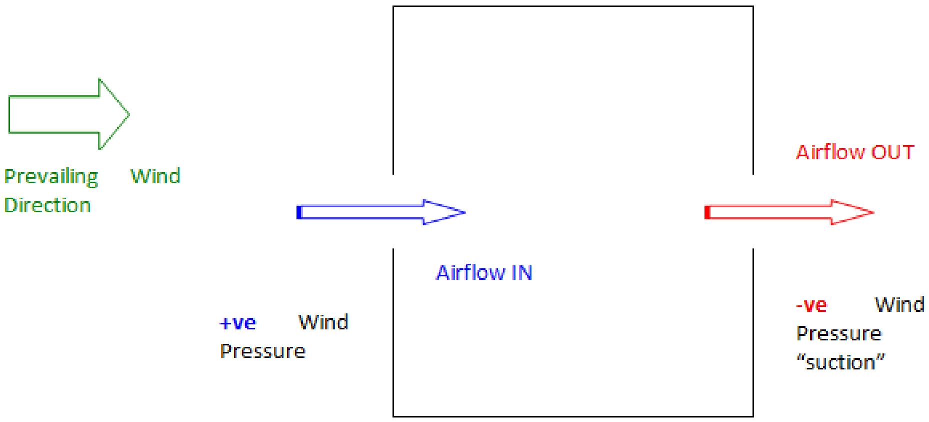
A key feature of the proposed development is the incorporation of façade openings designed to enable various spaces within the development buildings to make use of wind–induced natural ventilation throughout the year thereby minimising energy costs.

Wind-induced natural ventilation works on the straightforward principle of differential pressure. If a building envelope has multiple openings and there exists a pressure difference between those openings, e.g. the wind pressure at one opening is greater than the pressure at the other opening; airflow will be pushed through the building in the direction positive to negative.

The resulting amount of airflow through the building envelope will be a function of the magnitude of the pressure differential, size of the various building openings and degree of “blockage” in between. These features are illustrated in **Figure 5.**

Figure 5 Wind-Induced Natural Ventilation via Differential Pressure





3.0 Apartment Design Guide Requirements

The State Environmental Planning Policy (SEPP) 65 supported by the Australian Design Guide is relevant to the assessment of the natural ventilation through residential components of proposed developments.

The guide begins by defining natural ventilation as the movement of sufficient volumes of fresh air through an apartment to create a comfortable indoor environment. This is generally achieved by apartments having more than one aspect with direct exposure to the prevailing winds, or windows located in significant different pressure regions, rather than relying on purely wind driven air.

The guide comes in three parts. The first looks at the ventilation of all habitable room. The second deals with the ventilation of single aspect apartments and the third covers natural cross ventilation.

Section 4B-3 of the Australian Design Guide has the following design criteria:

- At least 60% of apartments are naturally cross ventilated in the first nine storeys of the building. Apartments at ten storeys or greater are deemed to be cross ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed.
- Overall depth of a cross-over or cross-through apartment does not exceed 18m, measured glass line to glass line.

The following points from the design guide are also noted.

- The area of unobstructed window openings should be equal to at least 5% of the floor area served.
- Design depths should be a maximum of 8 metres (Section 4D of the guide) to maximise ventilation and airflow.
- Courtyards or building indentations have a width to depth ratio of 2:1 or 3:1 to ensure effective air circulation and avoid trapped smells.

Natural cross ventilation to many single aspect apartments is achieved via building indentations. This is anticipated within ADG Section 4B which states in its opening paragraph that “Natural cross ventilation is achieved by apartments having more than one aspect with direct exposure to the prevailing winds, or windows located in significant different pressure regions, rather than relying on purely wind driven air”.

3.1 Effective Cross Ventilation

There are no specific requirements (eg air changes per hour) in the ADG guideline. However, AS1668.2-2002 “The use of ventilation and air-conditioning in buildings Part 2” states:

- Ventilation design for indoor air contaminant control (excluding requirements for the health aspects of tobacco smoke exposure)” recommends 3 air changes per hour for habitable rooms to satisfy the air quality requirements.

ASHRAE recommends that homes receive 0.35 air changes per hour but not less than 15 cubic feet of air per minute (cfm) per person (7.5 l/s/person).

The City of Sydney CoS)has provided a design guide to be used to confirm the adequacy of natural ventilation proposals in apartment buildings in that do not meet the prescriptive requirements of the Apartment Design Guide (ADG) Objective 4B-1 (eg apartments in noisy road).

- The CoS design guide requires 10 litres/second/person where the number of persons is equal to the number of bedrooms in the apartment +1 for 85% of all hours in the year for cross-through and cross-over apartments, or 90% of all hours in the year for all other apartments.
- This allows designs to deliver smaller opening sizes than required by the prescriptive design guidance of the ADG.
- The CoS design guideline also states that specific façade pressure coefficients may be determined using wind tunnel or computational fluid dynamic (CFD) testing which more accurately accounts for the surrounding features (buildings, streets, topography).

The objective of the ADG is to ensure that indoor air quality and thermal comfort is optimised, and reliance on mechanical ventilation reduced. The ADG provides design guidance to allow for effective cross ventilation well above the minimum ASHRAE or City of Sydney (Alternative natural ventilation of apartments in noisy environments) requirements.

SLR considers the 3 air changes per hour suitable to provide effective cross ventilation, reduce reliance on mechanical ventilation and satisfy the air quality requirements. The adopted air changes per hour in the current study is significantly above the minimum ASHRAE or City of Sydney air quality requirements.

4.0 Quantitative CFD Methodology and Assessment

Recesses and articulations create pressure and velocity differences across the various facades and encourage cross ventilation through an increased number of apartments. From experience SLR has found that numerical solutions including Computational Fluid Dynamics (CFD) and wind tunnel studies can prove these apartments to provide appropriate through apartment ventilation and circulation for natural ventilation requirements.

SLR has been engaged to assess the effectiveness of natural cross ventilation for a selection of apartments, which have been thoughtfully designed to optimise airflow and natural ventilation. These apartments feature openings that either face into building breezeway connected to ventilation plenums to facilitate air movement or include double-storey terraces that enhance exposure to prevailing breezes or include façade articulation.

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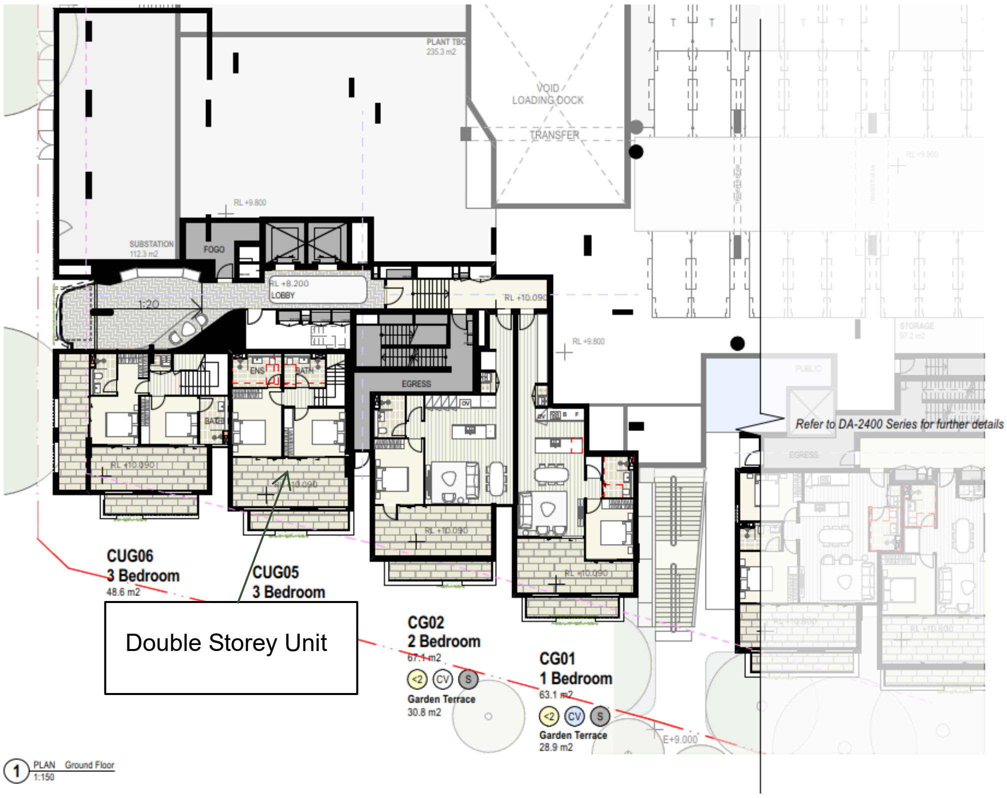
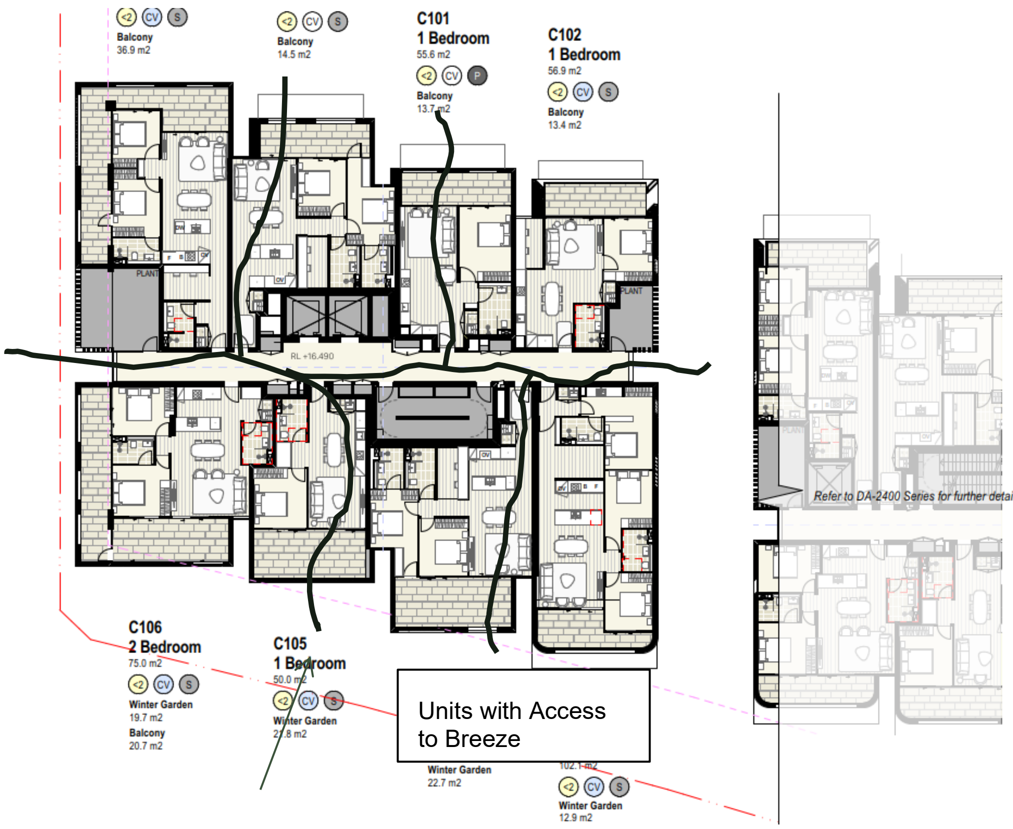
SLR has collaborated with the design team during the early design stage to maximize the openings and enhance the airflow movement due to the pressure differences between the openings for the subjected units. As a result, the size of the openings facing the open bridge have been increased. An example of the final design scheme is presented in **Figure 6**.

Figure 6 Examples of Modelled Apartment

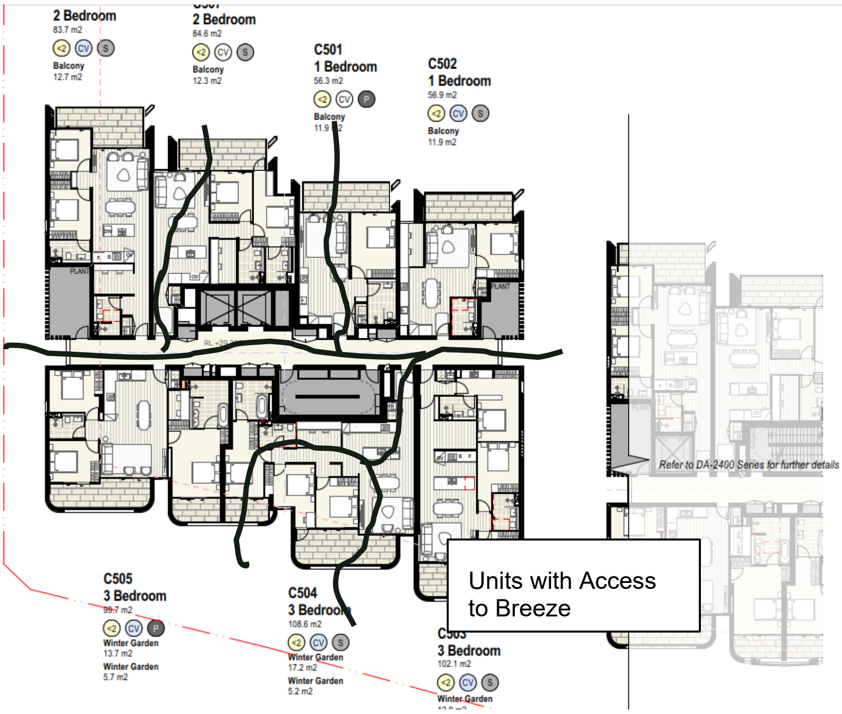
Southeast Tower – Double Storey Unit C-UG05



Southeast Tower – Level 1

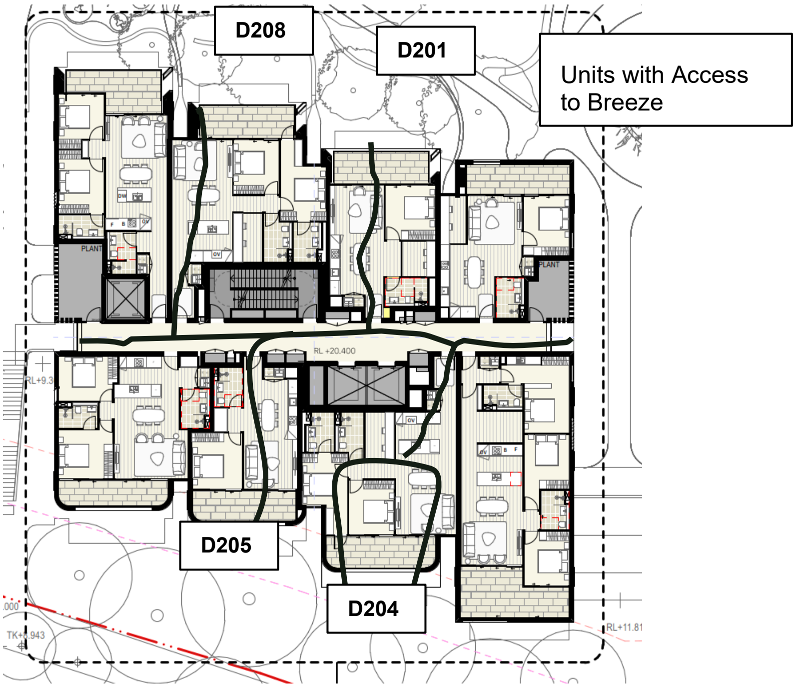


Southeast Tower – Level 5

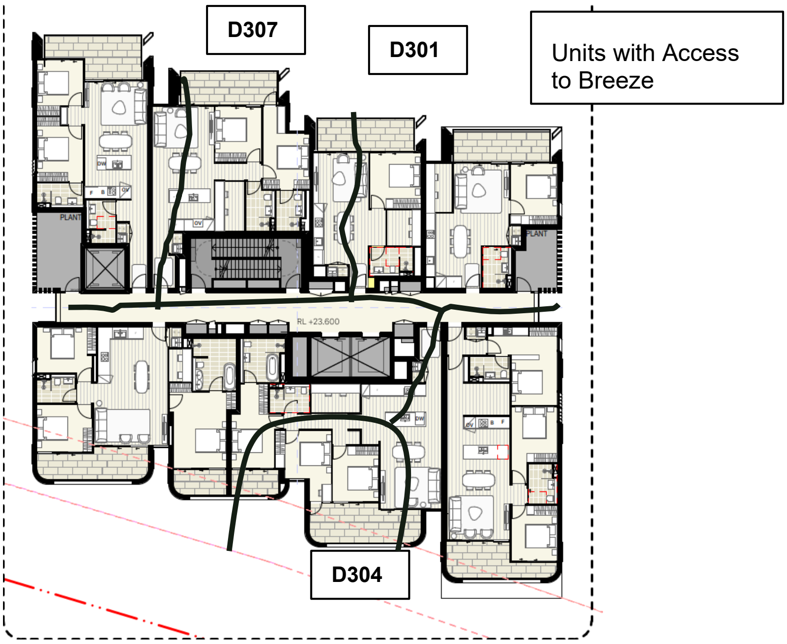


East Tower – Level 1

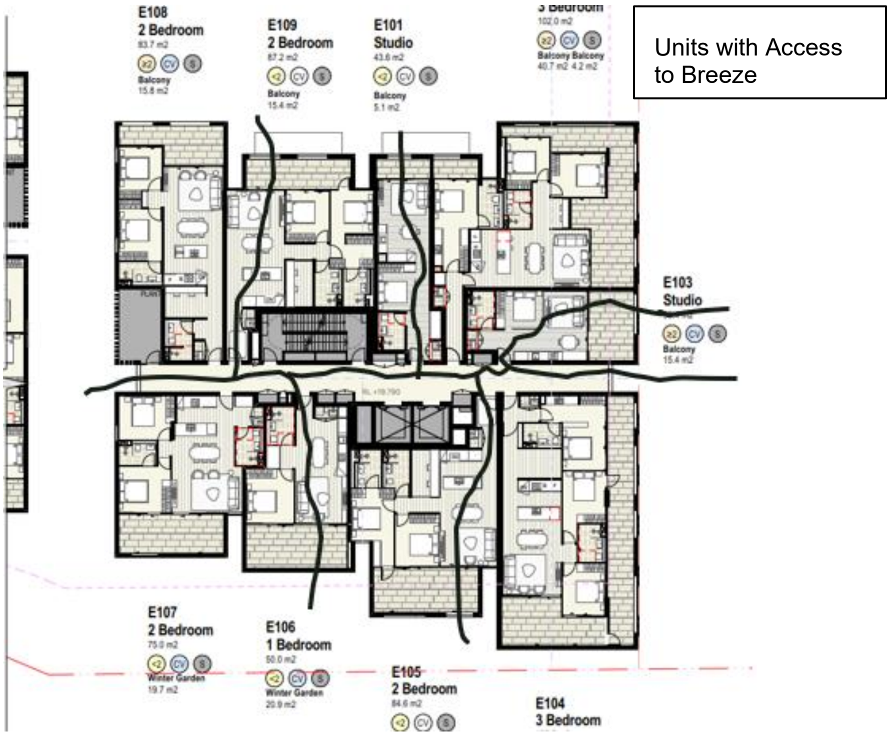
East Tower – Level 2



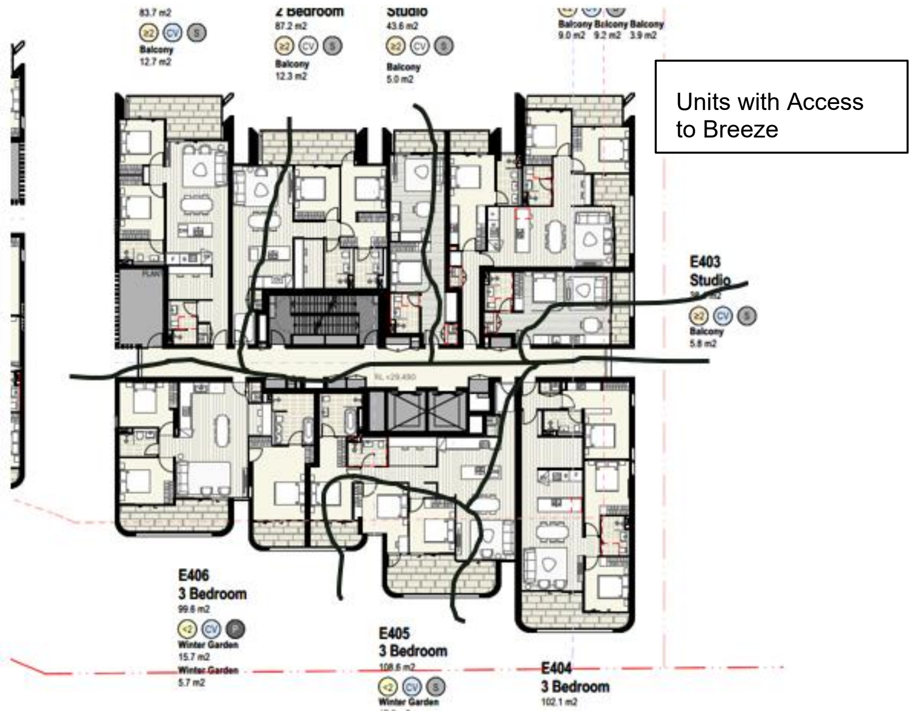
East Tower – Level 3



Northeast Tower – Level 1



Northeast Tower – Level 4



4.1 Geometry for CFD Modelling

SLR modelled the proposed development and the surrounds using the Creo Parametric software package. This was then imported to ANSYS to prepare the model for solving. The model details are shown in **Figure 7** and example of modelled apartments are shown in **Figure 8** and Figure **9**.

Figure 7 Computational Domain for CFD Modelling

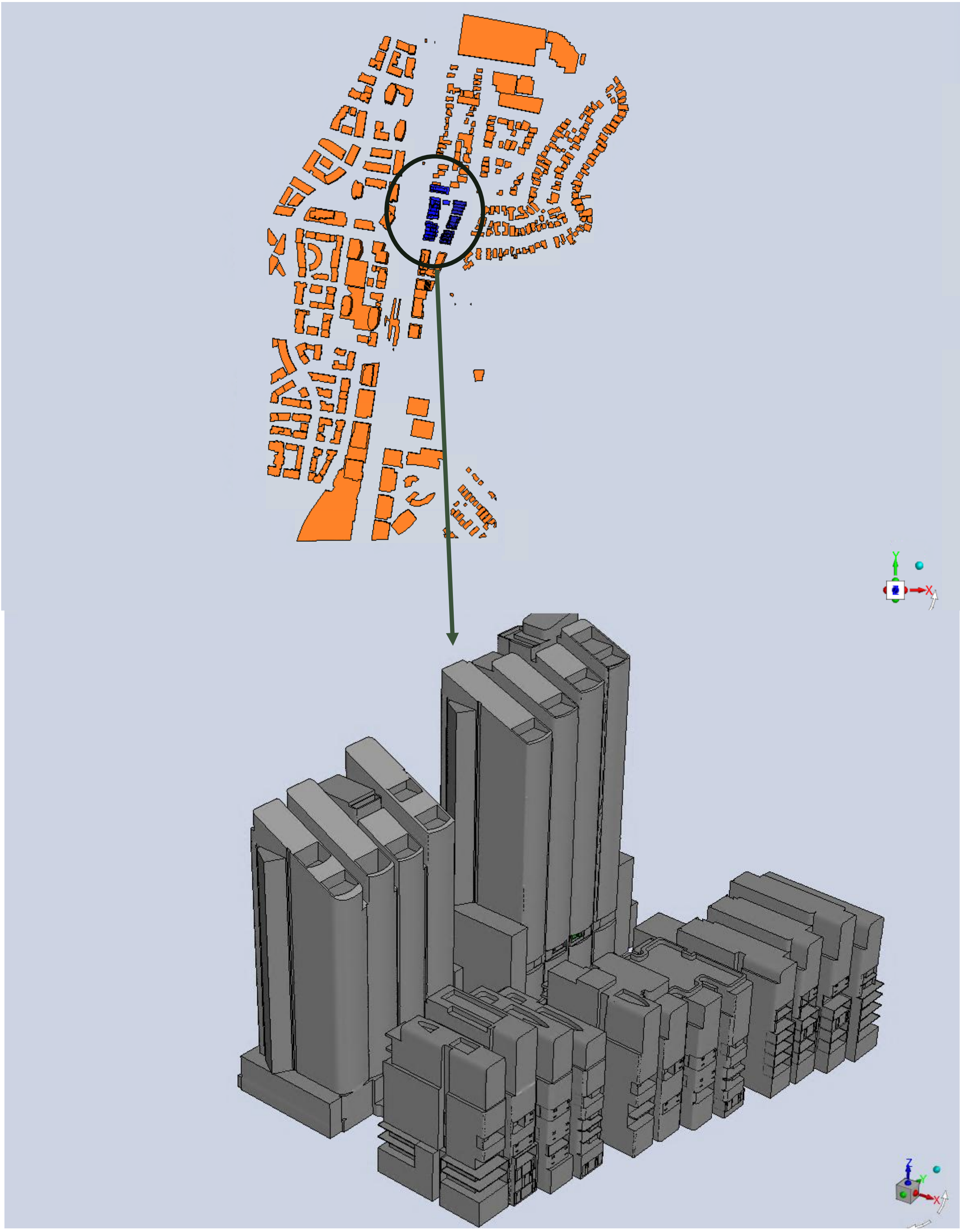


Figure 8 Example of Modelled Apartment – C105

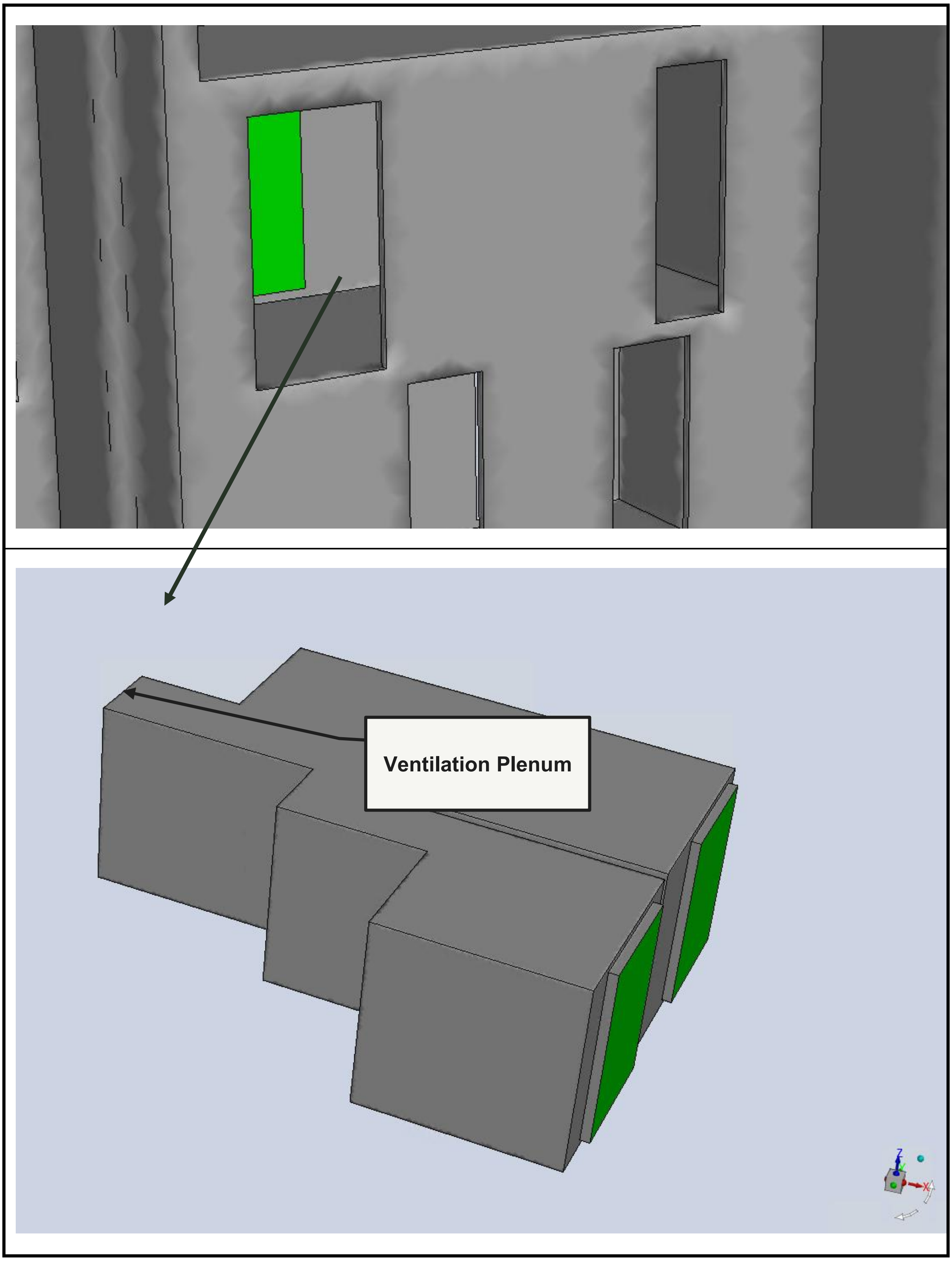
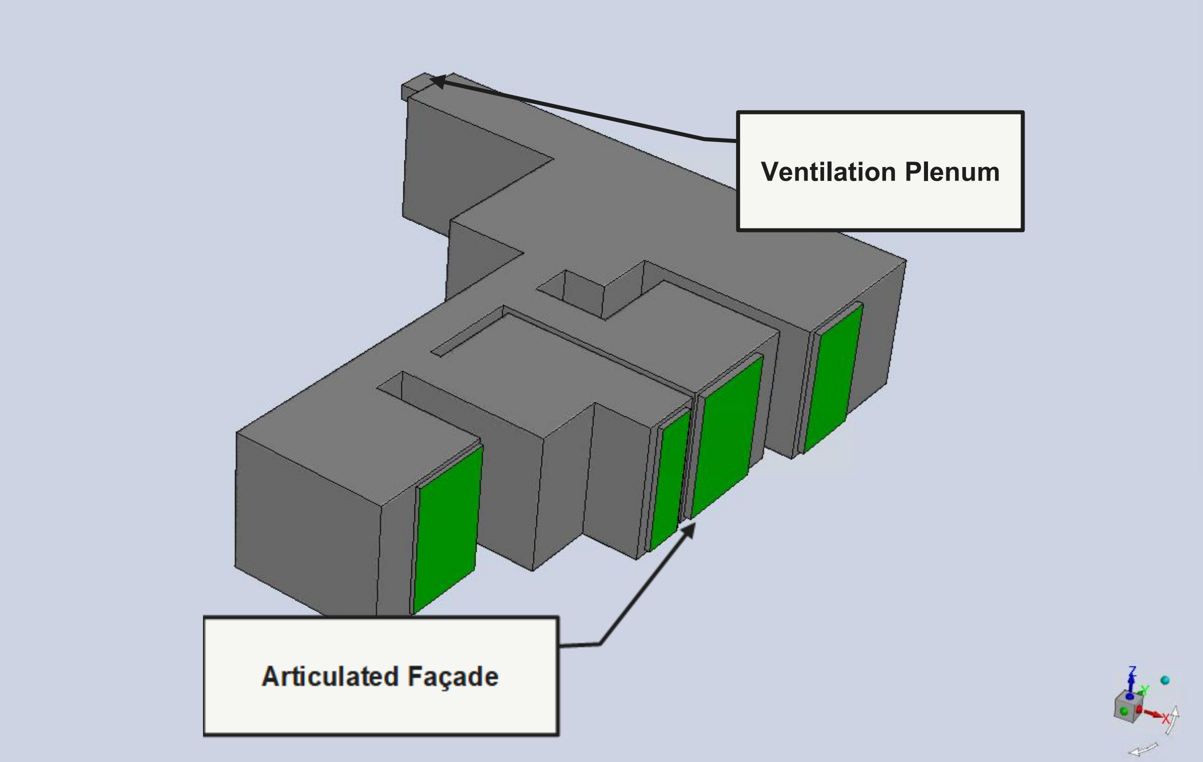


Figure 9 Example of Modelled Apartment – C504



4.2 Discretisation

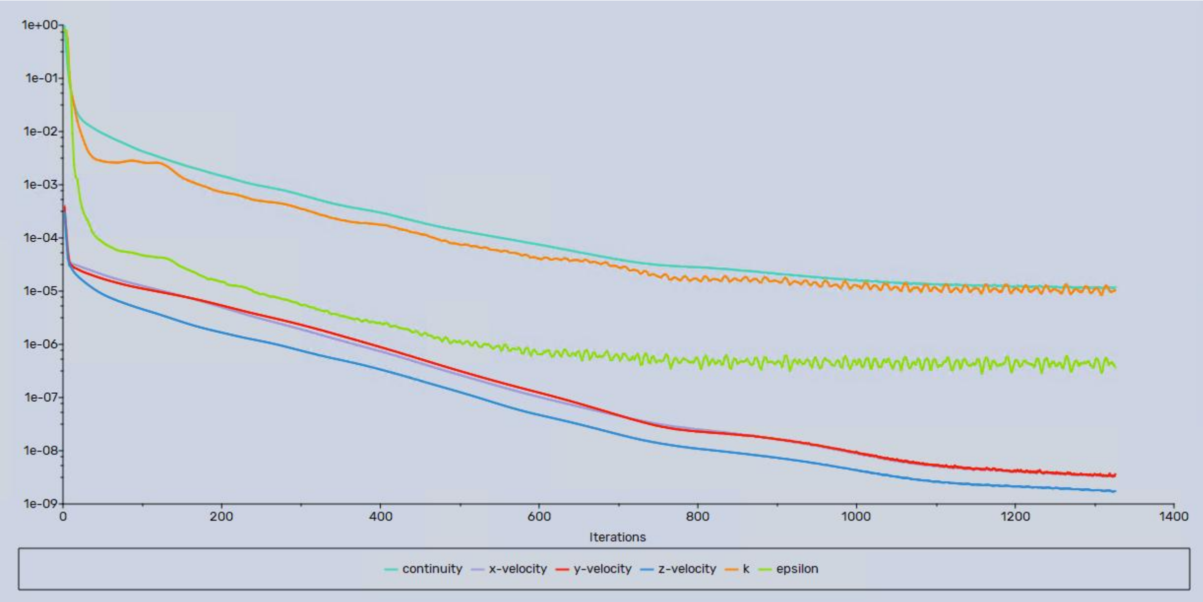
The software package utilised in the current CFD analysis is the commercially available code ANSYS-FLUENT. The CFD model solves continuity, energy (if required) and momentum equations in the computational domain to predict the airflow inside and around the development.

For the current analysis, polyhedral cells with a total number of 43,061,676 nodes were used to cover the computational domain.

- The initial CFD runs were completed using approximately 40 million mixed used cells and the final runs were conducted using polyhedral cells based on a mesh sensitivity analysis. The developed model allows for a combined internal-external flow assessment.
- Polyhedral cells are especially beneficial for handling recirculating flows and used to provide more accurate results than even hexahedra mesh. For a hexahedral cell, there are three optimal flow directions which lead to the maximum accuracy while for a polyhedron with 12 faces there are six optimal directions which, together with the larger number of neighbours lead to a more accurate solution with a lower cell count.
- A Realizable k-epsilon (rke) turbulence model was used for all analysed cases due to its ability to handle recirculation, high gradients and computational time advantages.
- A second order numerical scheme was used for discretization of pressure and momentum to obtain more accurate results.
- An iterative procedure was used to estimate the air velocity in terms of three directions, pressure profile and turbulence parameters.

The normalised residuals of continuity for all cases were reduced by at least four orders of magnitude while the normalised residuals of x-, y-, and z-velocity, k and epsilon were reduced between five and eight orders of magnitude demonstrating a valid solution (Refer **Figure 10**).

Figure 10 Scaled Residuals – NE Wind



4.3 CFD Modelling Set

A detailed computer model of the development was created using the architectural DWG drawings provided. The Computational Fluid Dynamics (CFD) specialised software FLUENT was used to model the following prevailing wind directions.

- Northeast
- Southeast
- South
- Southwest
- West
- Northwest

In each case, a wind speed of 2 m/s was used at reference 10 m height.

SLR has carried out a detailed study of Sydney Basin wind speeds using continuous records of wind speed and direction measured at the Bureau of Meteorology's (BoM) Sydney weather stations.

For the Project site, SLR has determined that local upper-level winds reflective of the weather systems experienced at the site would have characteristics closer to Bankstown Airport compared to Sydney (KS) Airport, given site's distance (18 km) inland from the coast compared to Bankstown Airport (25 km) and Sydney (KS) Airport (8 km).

- Based on actual wind data analysis, the average wind speed measured at the project site is higher than 2 m/s approximately 74% of the time across.

The site's numerical modelling results in this study are therefore conservative and the volume of air moving through the apartments will likely increase with increasing approaching wind speeds.

Simple blocks were used for nearby surrounding buildings to include the impact of the surroundings on the natural ventilation for the proposed building. All velocities in the images are in metres per second and the simulation results are presented at a height of 1.5 metres above the floor level. This height is indicative only to show the flow around the apartment. SLR uses the modelled mass flow rates to check there is at least three air changes per hour for each apartment.

Typical apartment openings are outlined as follows: Balconies are accessed through sliding doors, featuring a large operable area. The effective open area of windows and the proposed plenums has been modelled in accordance with the provided architectural drawings

4.4 CFD Results

Figure 11 shows an example of the CFD Simulation output – for Northeast winds – covering the entire project domain.

- The proposed development receives some low-level shielding for the upstream buildings to the north and east
- The CFD model captures the fluid flow characteristics in significant detail. Wind is approaching the site from the northeast at 45˚ as per the given boundary condition. Wind is then tunnelled between the buildings and accelerated near the edges and stagnated and recirculated behind the buildings.

Figure 11 Site-Wide Wind Output from the CFD Simulation (Northeast Winds)

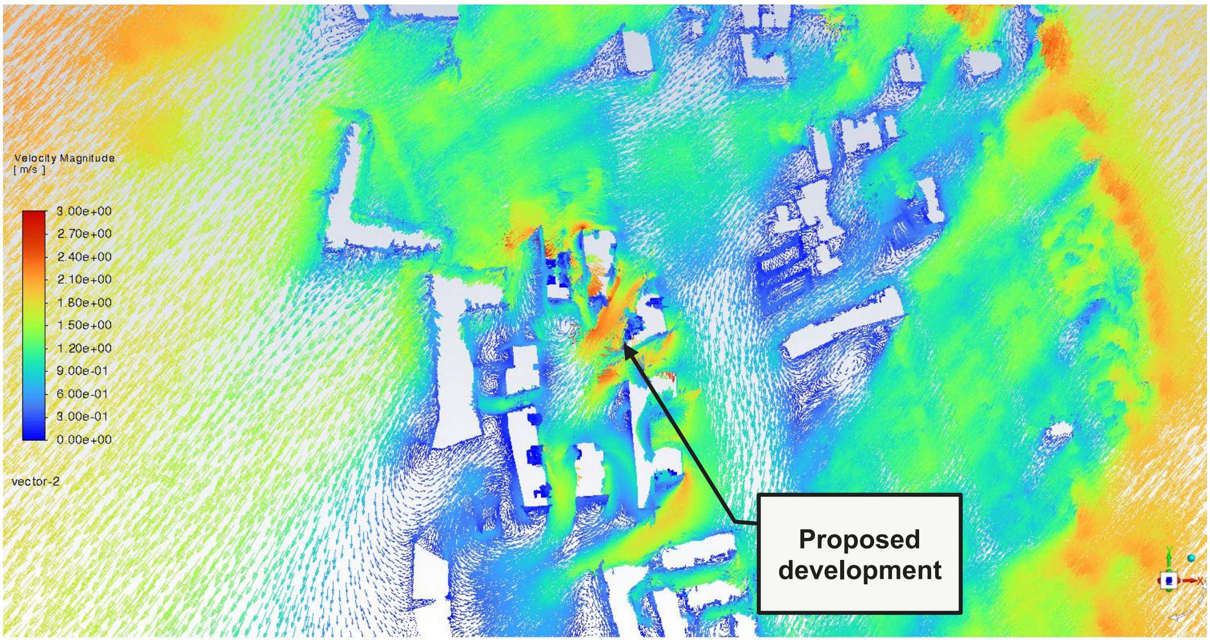
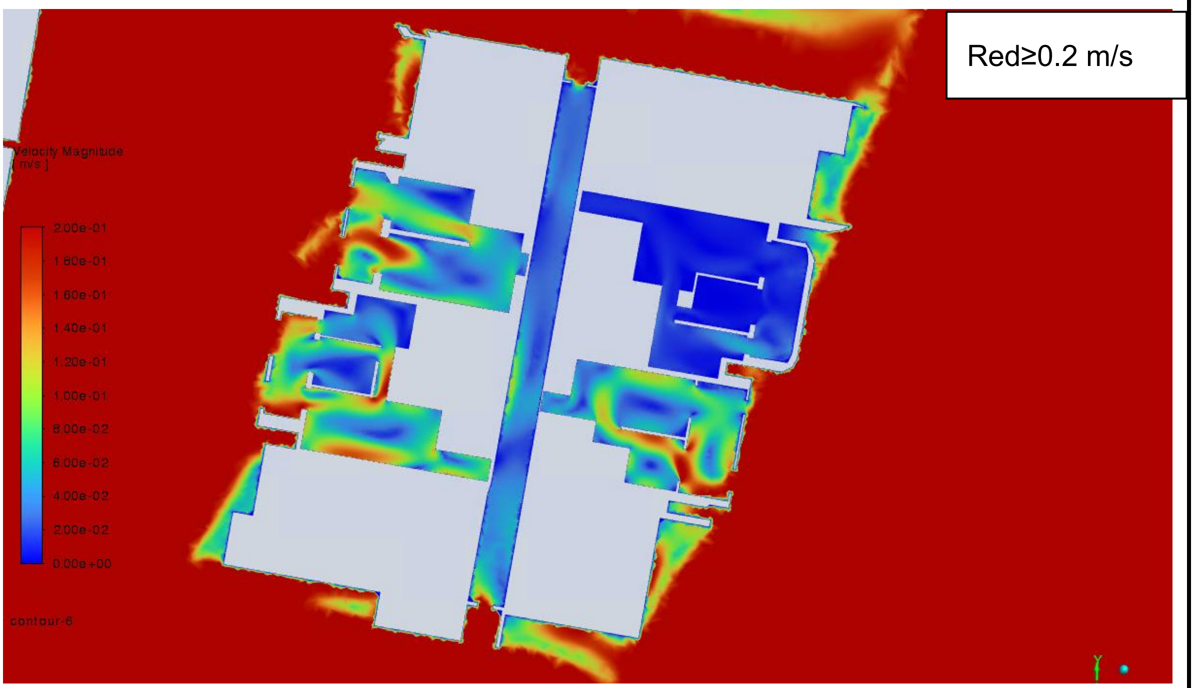


Figure 12 and **Figure 13** below show examples of the flow patterns through apartment C-105, and C-505 in north easterly winds.

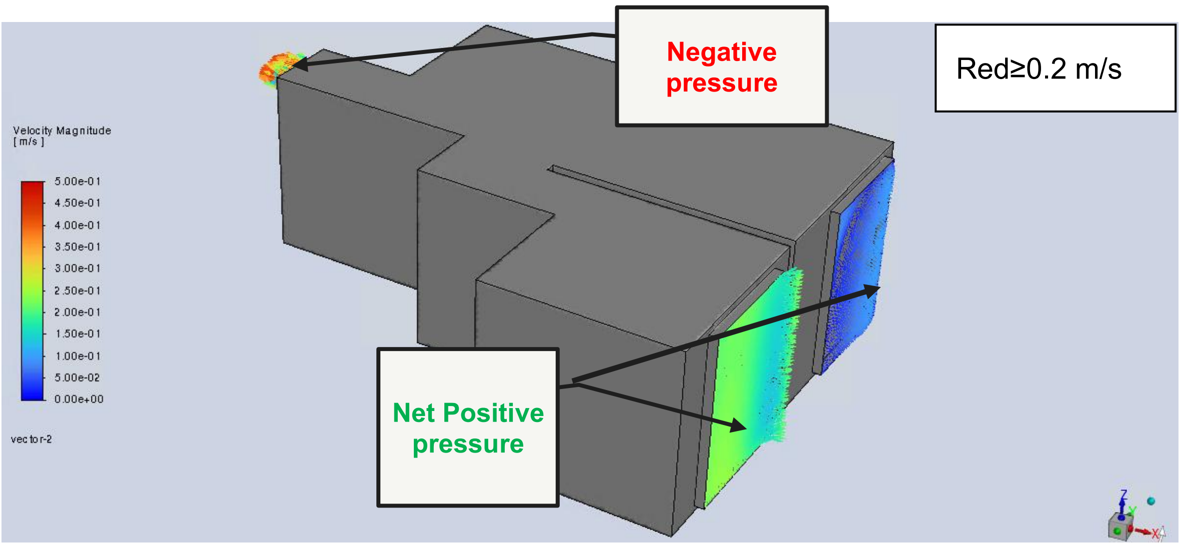
- **Figure 12** demonstrates air entering and flowing through the living space of units C1-05, exiting through the breezeway, driven by the pressure differences between the openings.
- **Figure 13** demonstrates limited air flow though through the living and bedroom spaces of articulated Unit C-504 for the NE wind direction.

The results for all other units and wind directions are detailed in Appendix A.

Figure 12 Airflow Example Northeasterly Wind – Southeast Building, Unit C105

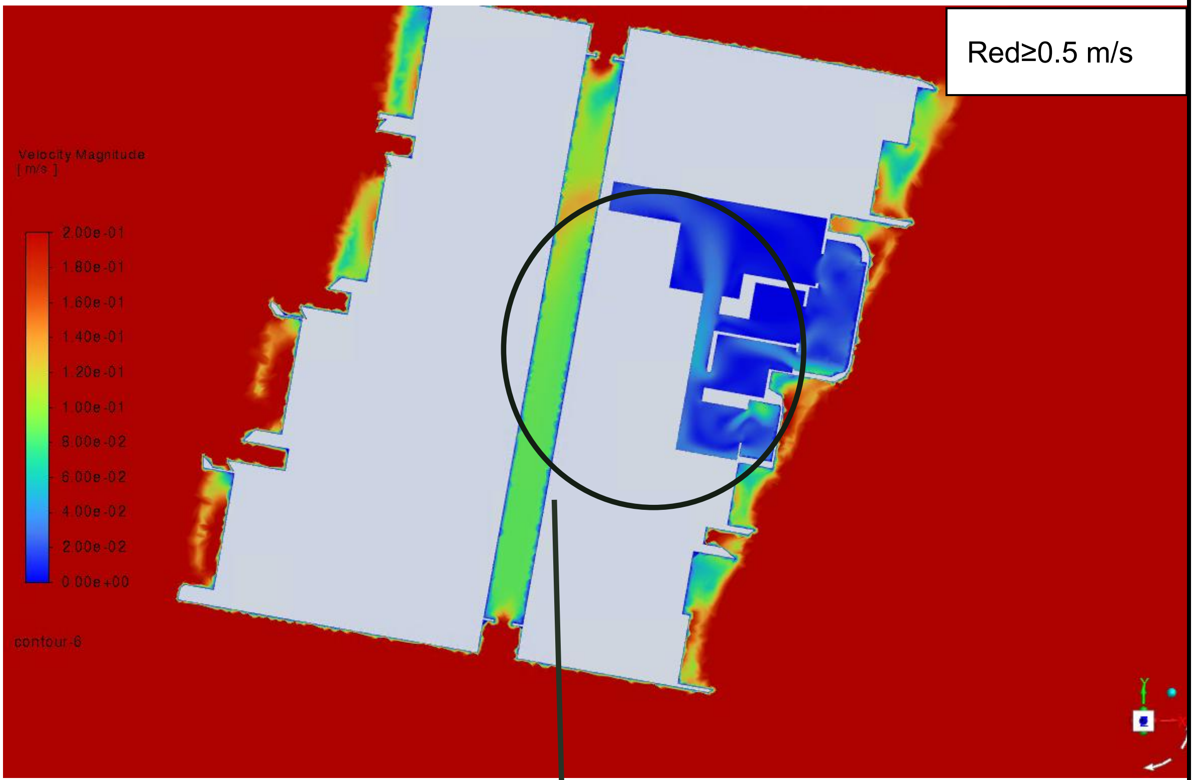


A: 2D Section at a typical Chest Level On 0-0.2 m/s Scale

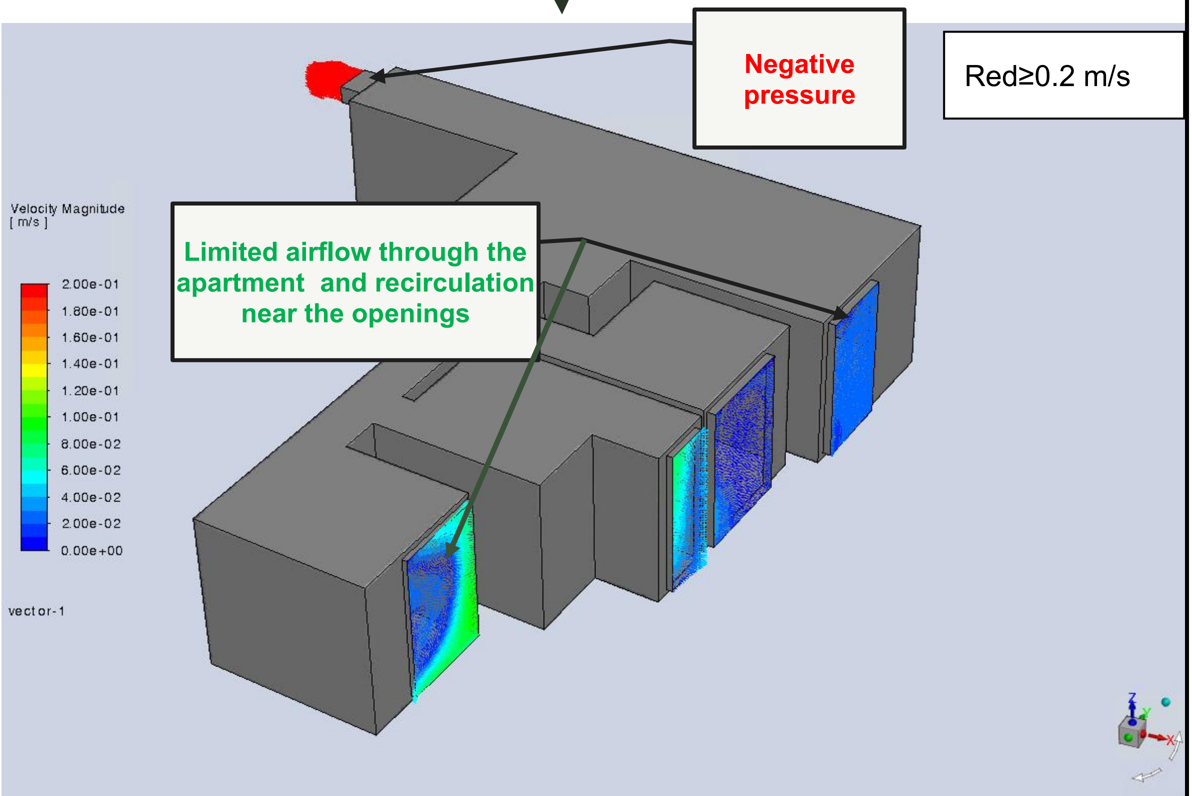


B: Velocity Vector at the Openings On 0-0.5 m/s Scale

Figure 13 Airflow Example Northeasterly Wind – Southeast Building, Unit C504



A: 2D Section at a typical Chest Level on 0-5 m/s Scale



B: Velocity Vector at the Openings On 0-0.2 m/s Scale

SLR deems an apartment to have adequate natural cross ventilation if it shows reasonable airflow. Reasonable airflow is defined as achieving a weighted average of at least three air changes per hour, with a minimum airflow of 0.1 m/s in certain areas and shows good flow from room to room without short circuiting. The ADG also states *"For an apartment to be considered cross ventilated, the majority of the primary living space and n-1 bedrooms (where n is the number of bedrooms) should be on a ventilation path"*.

Images of the CFD results are detailed in Appendix A and summarised in the following table.

Table 1 Air Changes per Hour

Tested Apartment	Northeast Winds	Southeast Winds	South Winds	Southwest Winds	West Winds	Northwest Winds	Weighted average[21]
c101[1]	4.48	8.91	4.54	11.50	4.50	10.64	**4.18**
c104[2]	5.39	5.07	3.93	2.75	1.87	15.17	**2.30**
c105[3]	12.51	12.73	6.25	2.09	1.57	7.89	**7.81**
c108[4]	8.82	6.38	2.38	1.38	4.56	1.01	**3.72**
c301[5]	9.14	12.70	3.37	3.83	7.86	18.12	**4.74**
c305[6]	1.89	1.95	1.59	4.79	4.84	10.85	**4.21**
c308[7]	8.41	6.05	4.76	3.05	2.17	3.19	**4.63**
c504	1.21	6.96	3.25	0.52	0.90	1.55	**2.53**
cug05	5.31	5.78	4.79	4.94	1.13	2.21	**2.35**
d104[9]	12.25	4.25	3.83	1.63	2.13	7.06	**5.99**
d201[10]	3.79	11.92	6.32	0.96	1.75	2.20	**5.01**
d204[11]	6.83	5.54	5.66	7.99	1.52	2.59	**2.22**
d208[12]	1.84	6.26	4.58	0.86	1.05	1.39	**4.15**
d404[13]	4.27	37.21	20.19	0.38	3.86	1.72	**3.00**
e101[14]	2.65	17.10	13.98	0.30	3.13	0.87	**3.78**
e103[15]	9.01	3.42	1.72	1.91	3.58	10.94	**3.47**
e105[16]	1.98	5.31	2.77	0.31	2.08	1.49	**6.12**
e106[17]	5.38	5.10	3.37	1.55	1.82	7.96	**8.36**
e109[18]	2.19	6.98	5.80	0.32	1.67	1.89	**7.48**
e403[19]	7.46	45.36	18.73	1.64	9.53	2.69	**4.36**
e405[20]	7.21	6.13	3.78	0.00	0.63	6.33	**4.42**

Note 1: The results of apartment C201 are expected to be similar

Note 2: The results of apartments on higher levels (204, 304, 404, 504, 604, 704) are expected to be similar.

Note 3: The results of apartment C205 are expected to be similar

Note 4: The results of apartment C208 are expected to be similar

Note 5: The results of apartments on higher levels (401, 501, 601, 701) are expected to be similar.

Note 6: The results of apartment C405 are expected to be similar

Note 7: The results of apartments on higher levels (408, 507, 607, 707) are expected to be similar.

Note 8: Windows have been added to these units to enable natural cross ventilation

Note 9: The results of apartments on higher levels (205, 605) are expected to be similar.

Note 10: The results of apartments on higher levels (301, 401, 501, 601) are expected to be similar.

Note 11: The results of apartment D304 and D604 on the levels above is expected to be similar.

Note 12: The results of apartments on higher levels (307, 407, 507, 608) are expected to be similar.

Note 13: The results of apartment D504 on the level above is expected to be similar.

Note 14: The results of apartments on higher levels (201, 301, 401, 501, 601, 701) are expected to be similar.

Note 15: The results of apartments on higher levels (203, 303) are expected to be similar.

Note 16: The results of apartments on higher levels (205, 305) are expected to be similar.

Note 17: The results of apartments on higher levels (206, 306) are expected to be similar.

Note 18: The results of apartments on higher levels (209, 309, 409, 508, 608, 708) are expected to be similar.

Note 19: The results of apartments on higher levels (503, 603, 703) are expected to be similar.

Note 20: The results of apartments on higher levels (505, 605, 705) are expected to be similar.

Note 21: The weighted average is determined based on the probability of occurrence at the project site. The wind frequency from the west quadrant (e.g. west) is greater than that from the east quadrant (e.g., northeast).

The following conclusions have been drawn from the following conclusion has been reached based on a qualitative review of the floorplans of the ADG complaint dual aspect units and quantitative numerical modelling of non-dual aspect units:

- The project comprises 169 dual aspect apartments in the first nine levels. Refer Appendix B
- A total of 64 apartments have achieved natural cross-ventilation through access to ventilation plenums via naturally ventilated corridors.
- 233 out of 386 (60.4%) of the apartments in the first nine levels of the current design will be naturally cross ventilated.

fThe results above are based on a wind speed of 2 m/s at a height of 10 metres. As wind speeds increase, the airflow through the apartments will intensify accordingly.

In conclusion, the pressure difference between the openings is sufficient to generate the necessary flow through the apartments in question.

5.0 Conclusion

SLR Consulting Australia has been commissioned by Leeds Investment Pty Ltd to assess the natural ventilation for the proposed mixed-use development at 43B – 57 Blaxland Road, 2A, 2B and 2D Cavell Avenue, 448-458 Concord Road and 2A Lewellyn Street, Rhodes.

SLR has been engaged to assess the effectiveness of natural cross ventilation for a selection of apartments, which have been thoughtfully designed to optimise airflow and natural ventilation. These apartments feature openings that either face into building breezeway connected to ventilation plenums to facilitate air movement or include double-storey terraces that enhance exposure to prevailing breezes or include façade articulation.

- Southeast Building Apartments – Refer **Figure 6**
  - C-UGO5, C-101, C-104, C-105, C-108, C-301, C305, C-308, C504
- East Building Apartments – Refer **Figure 6**
  - D-104, D-201, D204, D-208, D404
- Northeast Building Apartments – Refer **Figure 6**
  - E-101, E-103, E-105, E-106, E-109, E403, E405

This report is in the form of a quantitative assessment utilising Computational Fluid Dynamics (CFD).

The State Environmental Planning Policy (SEPP) 65 supported by the Australian Design Guide is relevant to the assessment of the natural ventilation through residential components of proposed development. Section 4B-3 of the Australian Design Guide states that:

At least 60% of apartments are naturally cross ventilated in the first nine storeys of the building. Apartments at ten storeys or greater are deemed to be cross ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed.

SLR collaborated with the design team to optimise the placement of openings and amplify airflow dynamics driven by pressure differentials across the units. This collaboration led to additional openings where necessary to enhance natural cross ventilation performance.

The proposed development implements a number of the ADG recommendations to maximise the natural cross ventilation throughout the development.

- The proposed development has been provided with openings on multiple sides of the apartments for the majority of proposed floor plans, allowing it to make use of wind-induced natural ventilation throughout the year and thereby minimising energy costs.
- In general, the overall depth of the units does not exceed 18 m as per the Design Criteria of Objective 4B-3.

Natural cross ventilation to many single aspect apartments is achieved via building indentations. This is anticipated within ADG Section 4B which states in its opening paragraph that "*Natural cross ventilation is achieved by apartments having more than one aspect with direct exposure to the prevailing winds,* ***or*** *windows located in significant different pressure regions, rather than relying on purely wind driven air*".

The following conclusions have been reached based on a qualitative review of the floorplans for ADG-compliant dual-aspect units, alongside quantitative modelling of those with access to natural cross-ventilation via the proposed breezeway ventilation plenums:

- The project comprises 169 dual aspect apartments in the first nine levels. Refer Appendix B
- A total of 64 apartments have achieved natural cross-ventilation through access to ventilation plenums via naturally ventilated corridors.
- 233 out of 386 (60.4%) of the apartments in the first nine levels of the current design will be naturally cross ventilated.

The results above are based on a wind speed of 2 m/s at a height of 10 metres. As wind speeds increase, the airflow through the apartments will intensify accordingly.

6.0 Feedback

At SLR, we are committed to delivering professional quality service to our clients. We are constantly looking for ways to improve the quality of our deliverables and our service to our clients. Client feedback is a valuable tool in helping us prioritise services and resources according to our client needs.

To achieve this, your feedback on the team's performance, deliverables and service are valuable and SLR welcome all feedback via https://www.slrconsulting.com/en/feedback. We recognise the value of your time, and we will make a $10 donation to our Charity Partner - Lifeline, for every completed form.

Appendix A Vector Flow Diagrams

Llewellyn Street, Rhodes

Natural Ventilation Assessment

Leeds Investment Pty Ltd

SLR Project No.: 610.032889

Revision: R02-v1.0

23 September 2025

Northeast Winds

Building C

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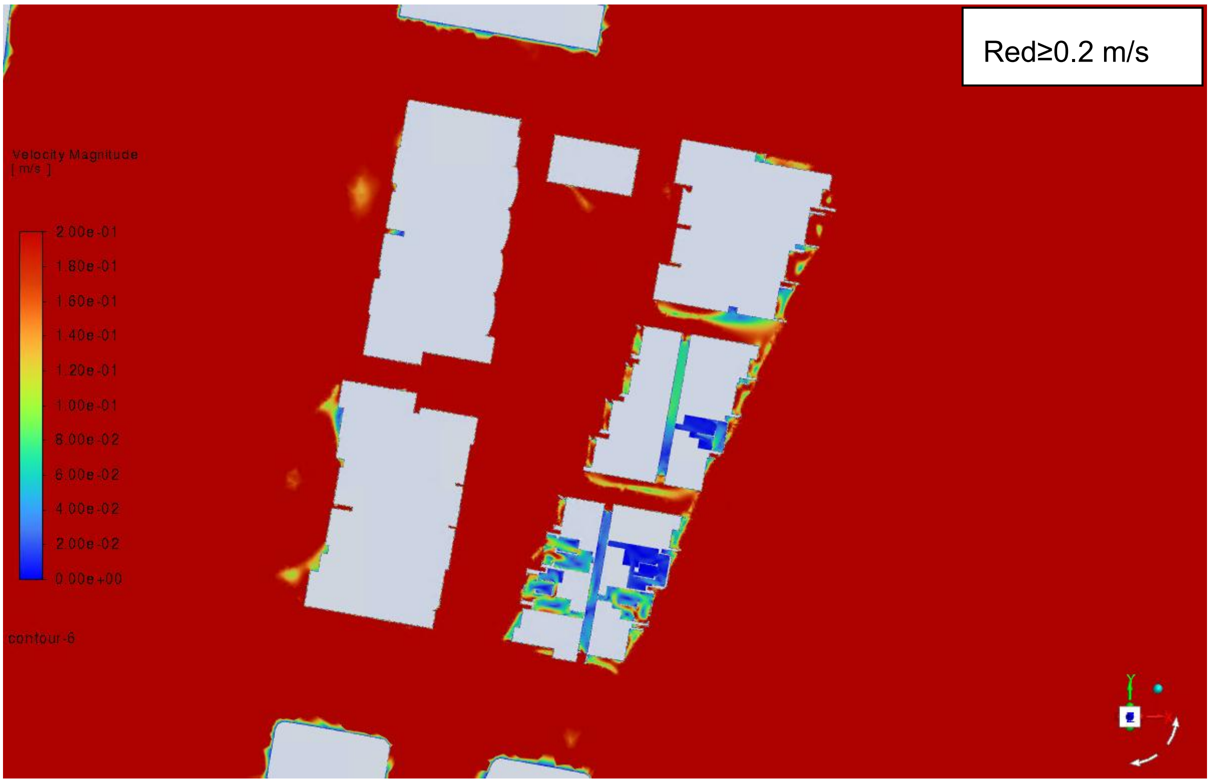

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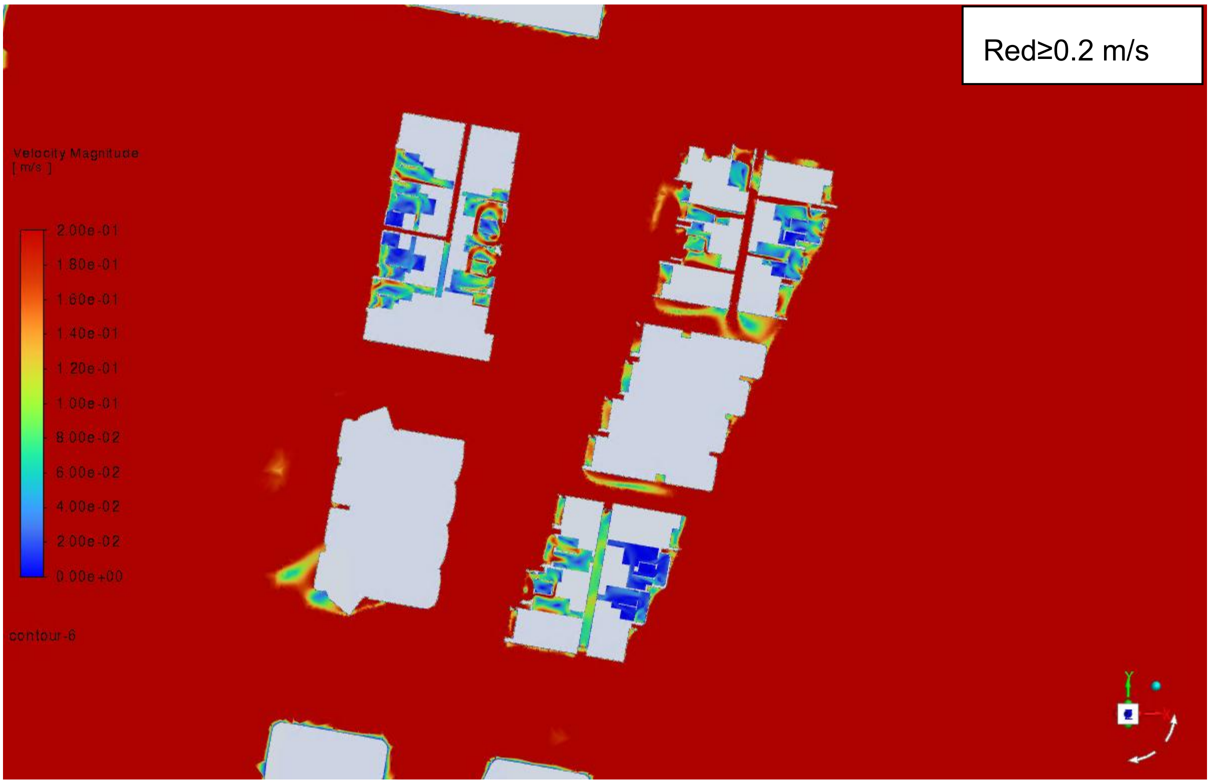

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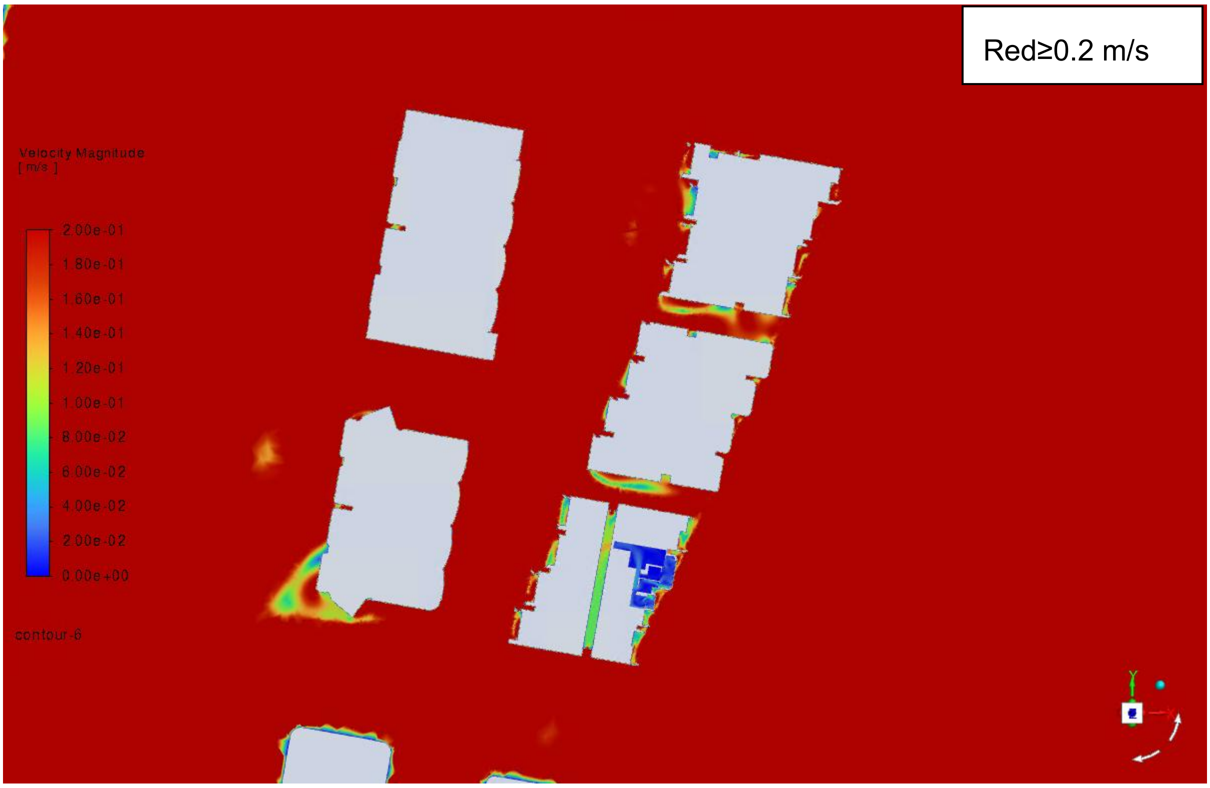
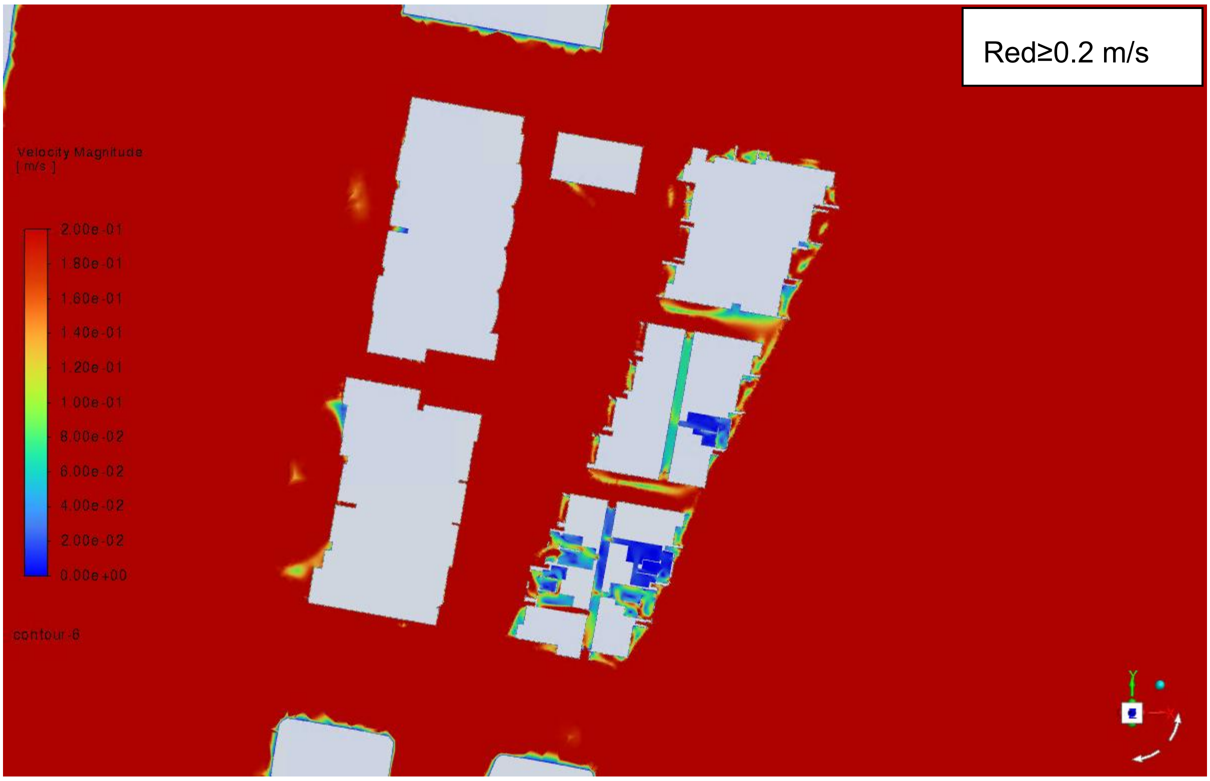


Building D

Level 1



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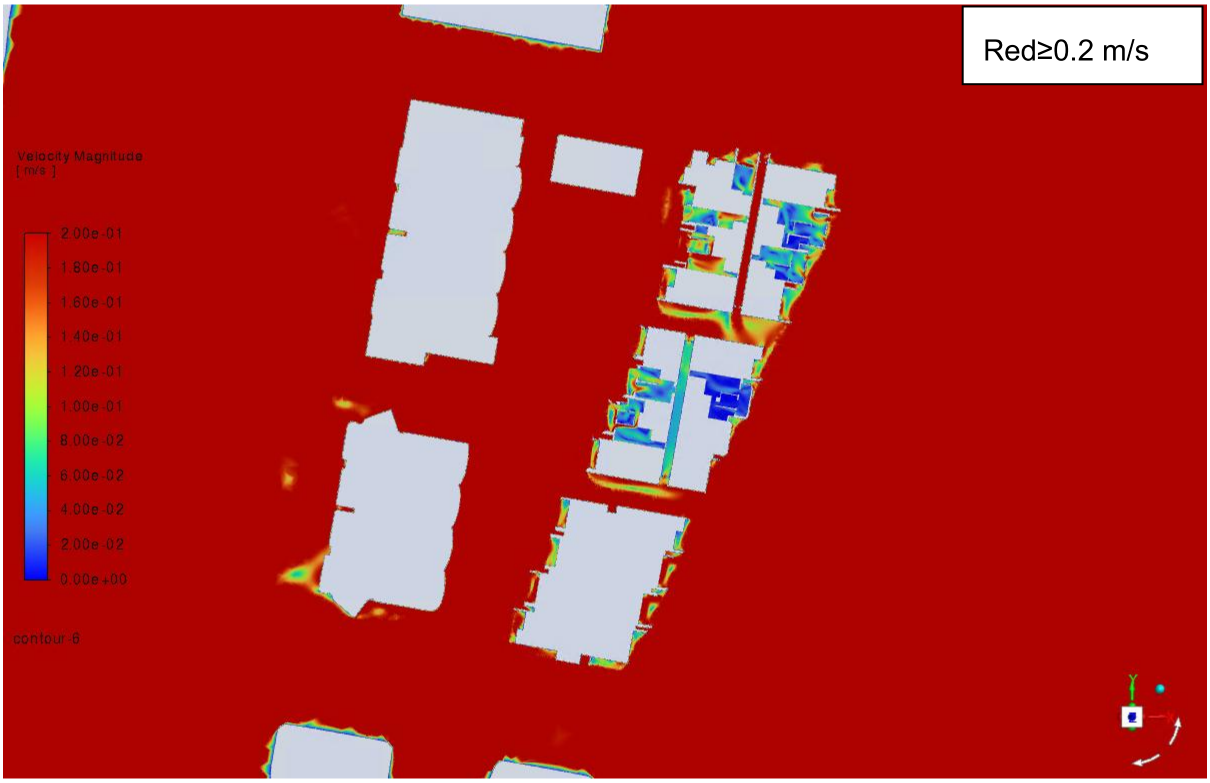

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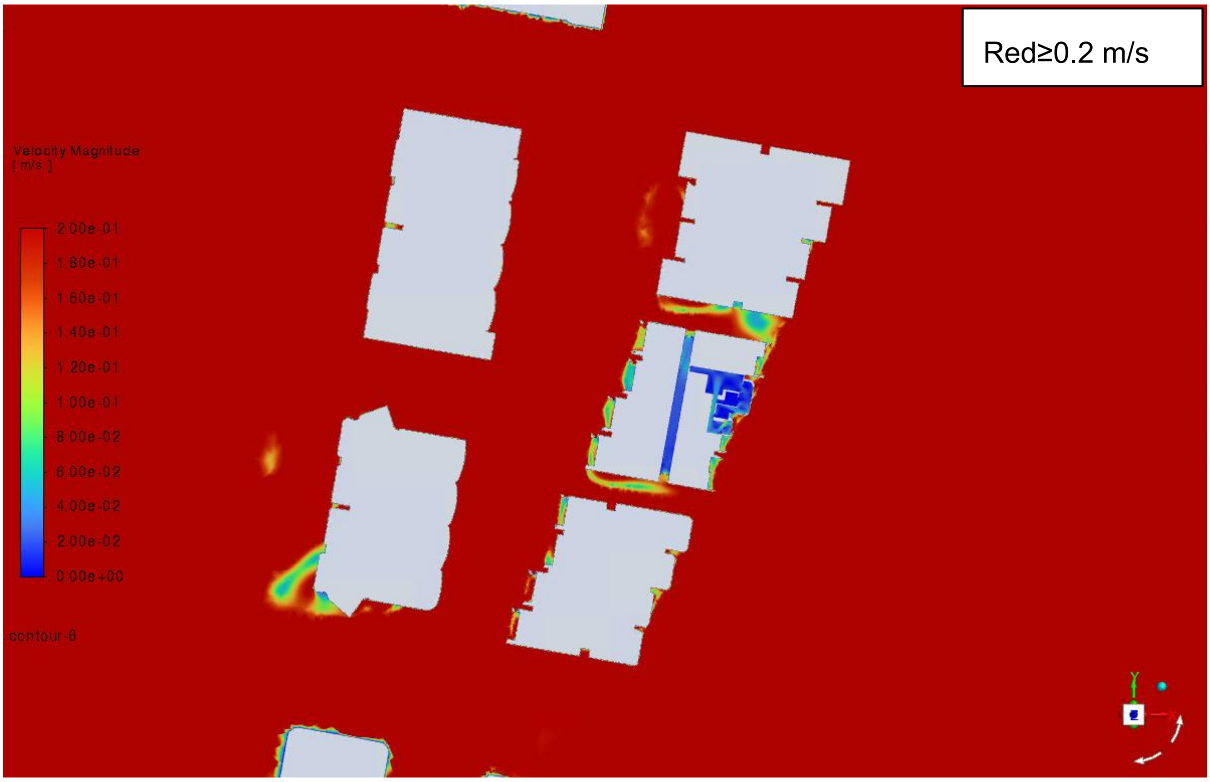
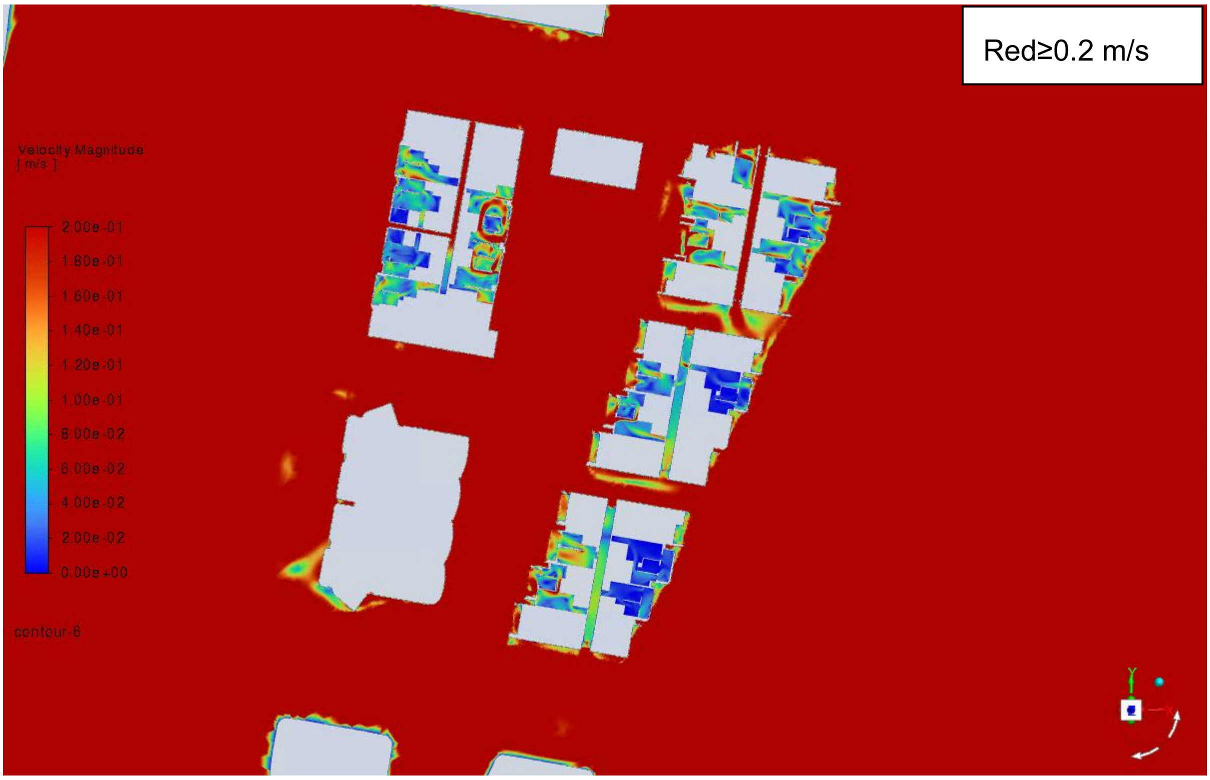


Building E

Level 1



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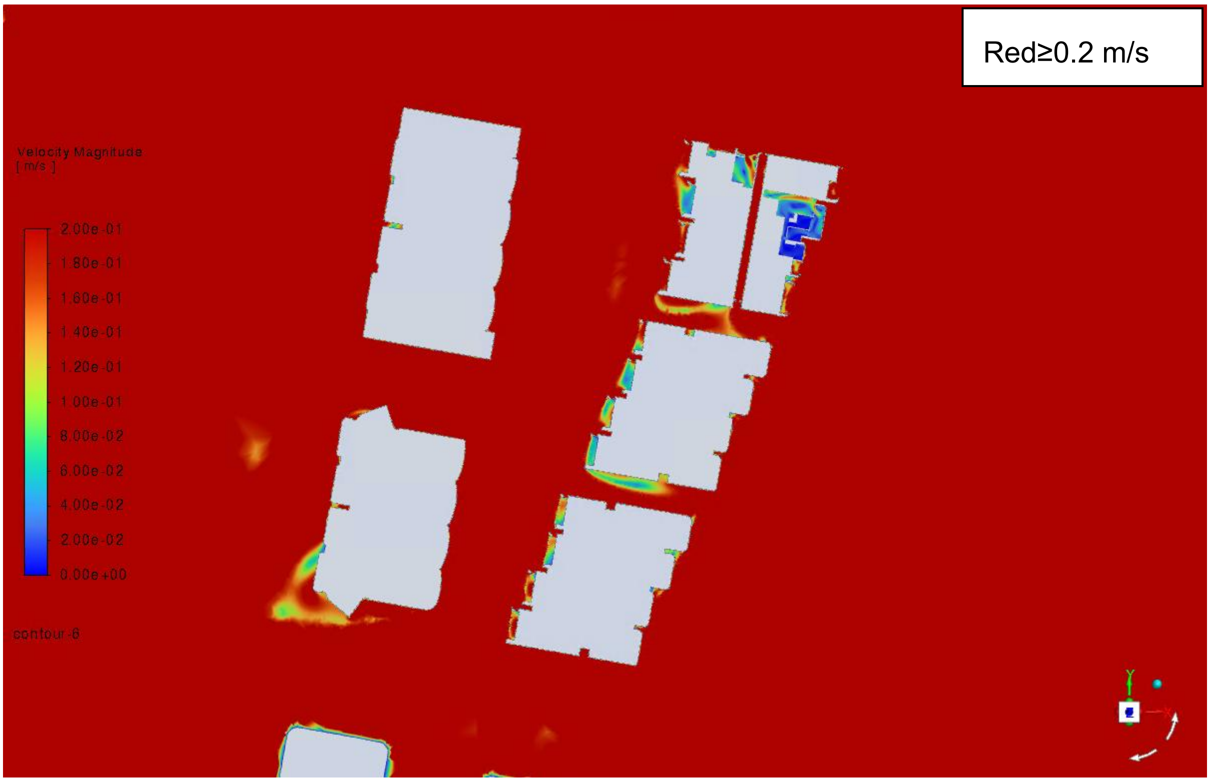

Southeast Winds

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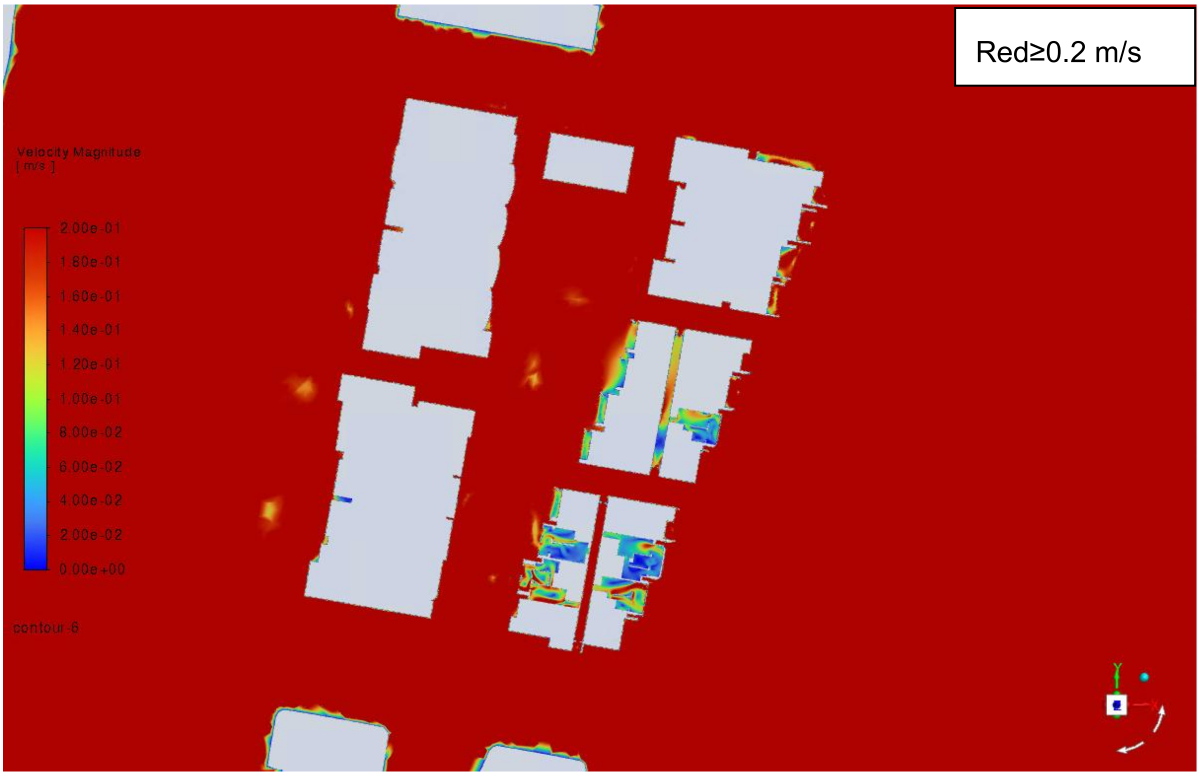

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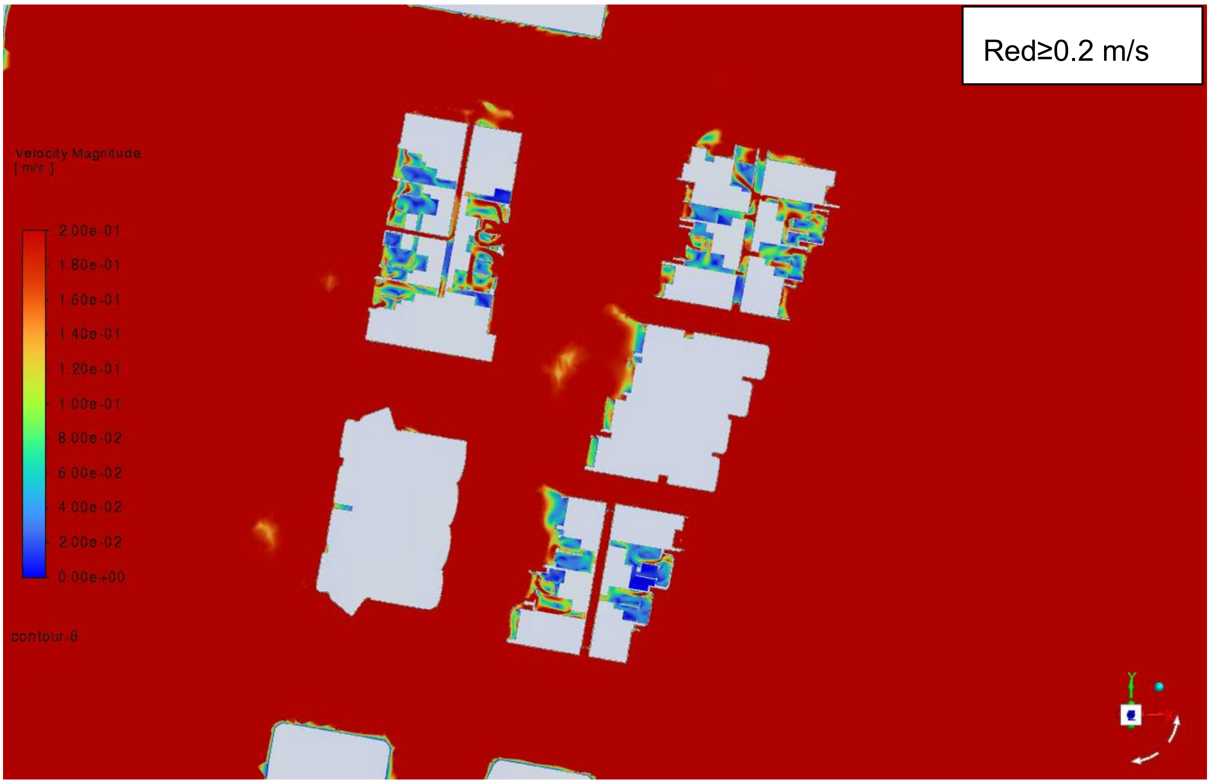

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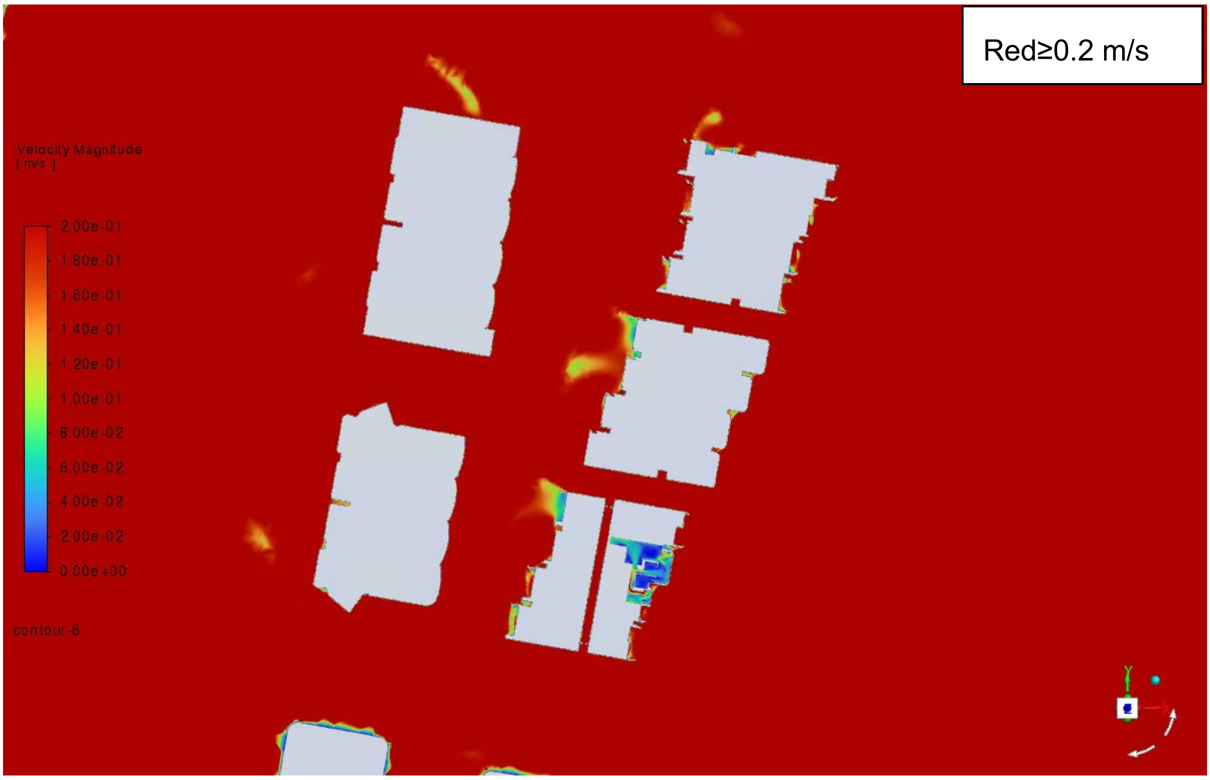

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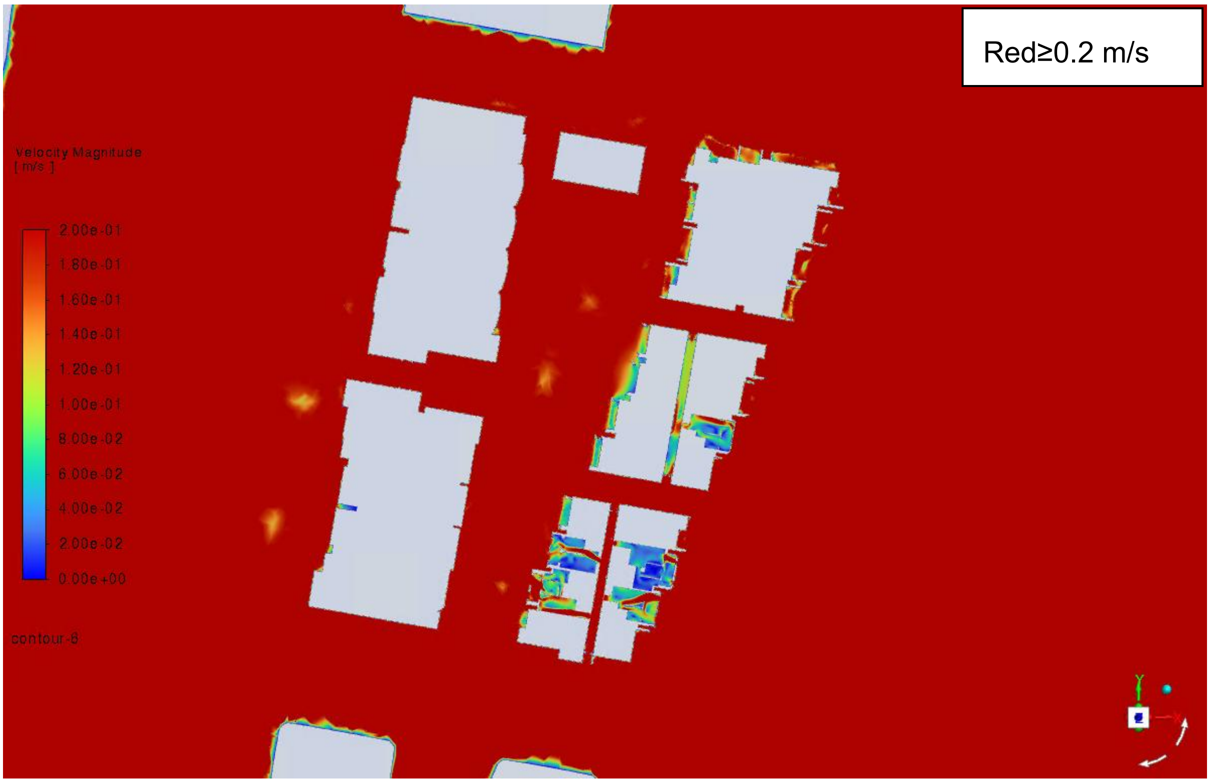

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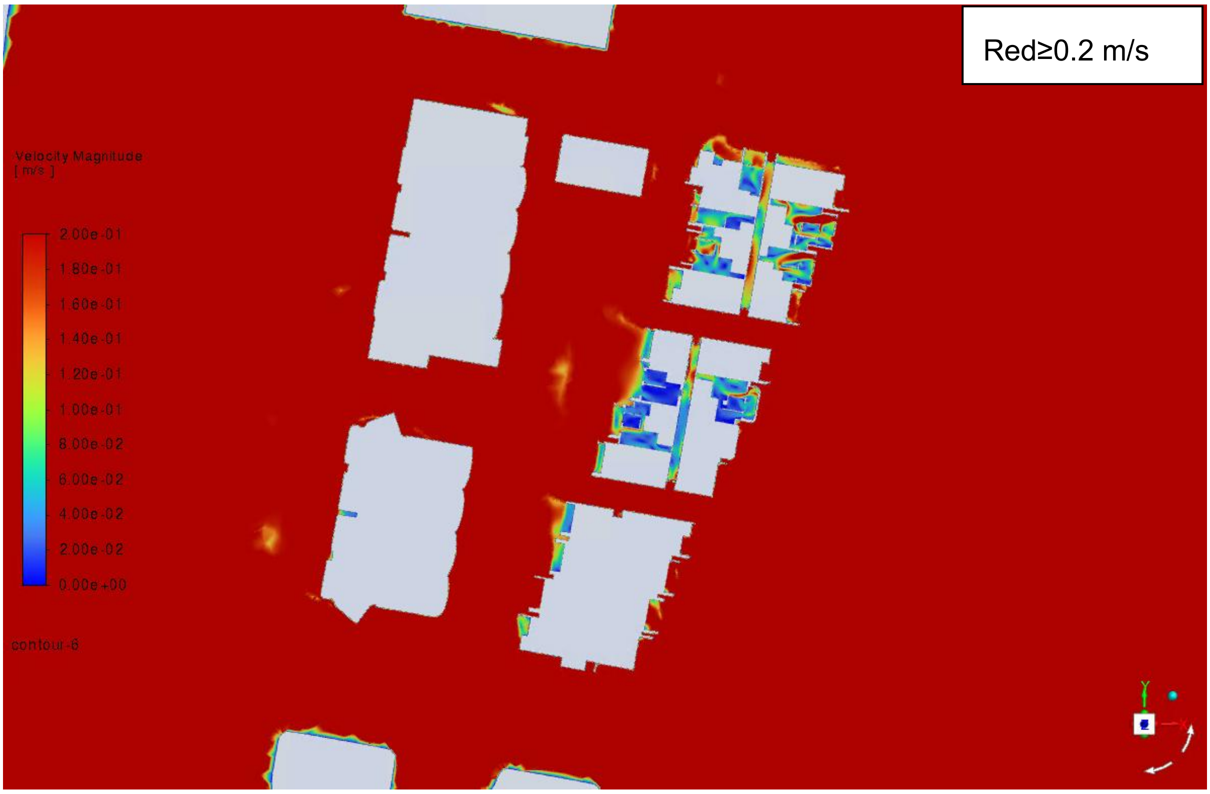

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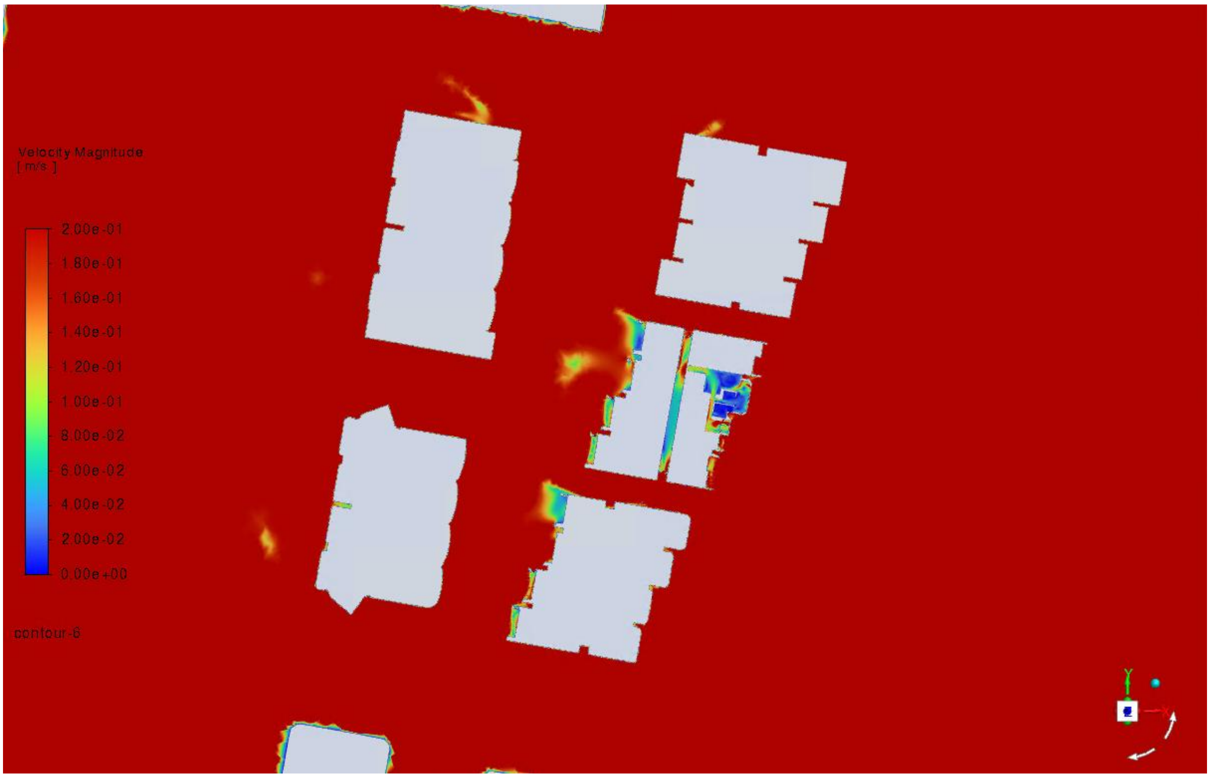

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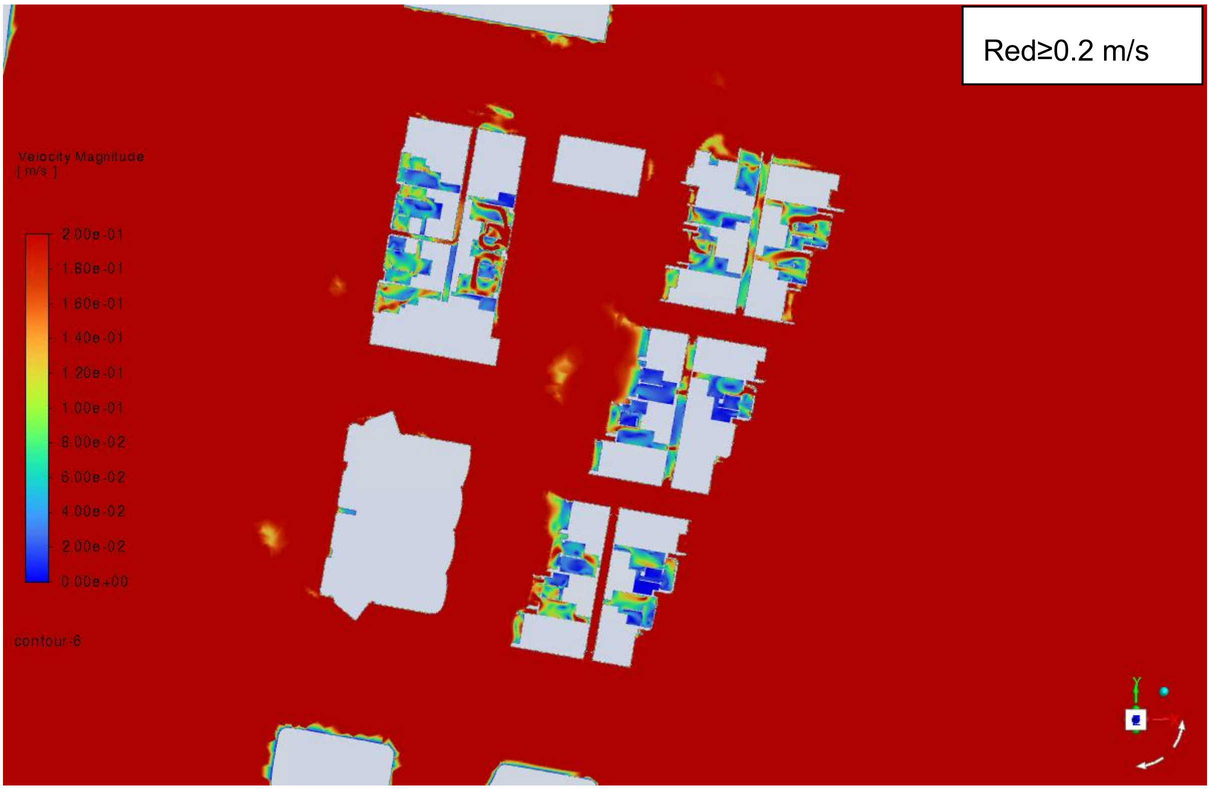
Level 1



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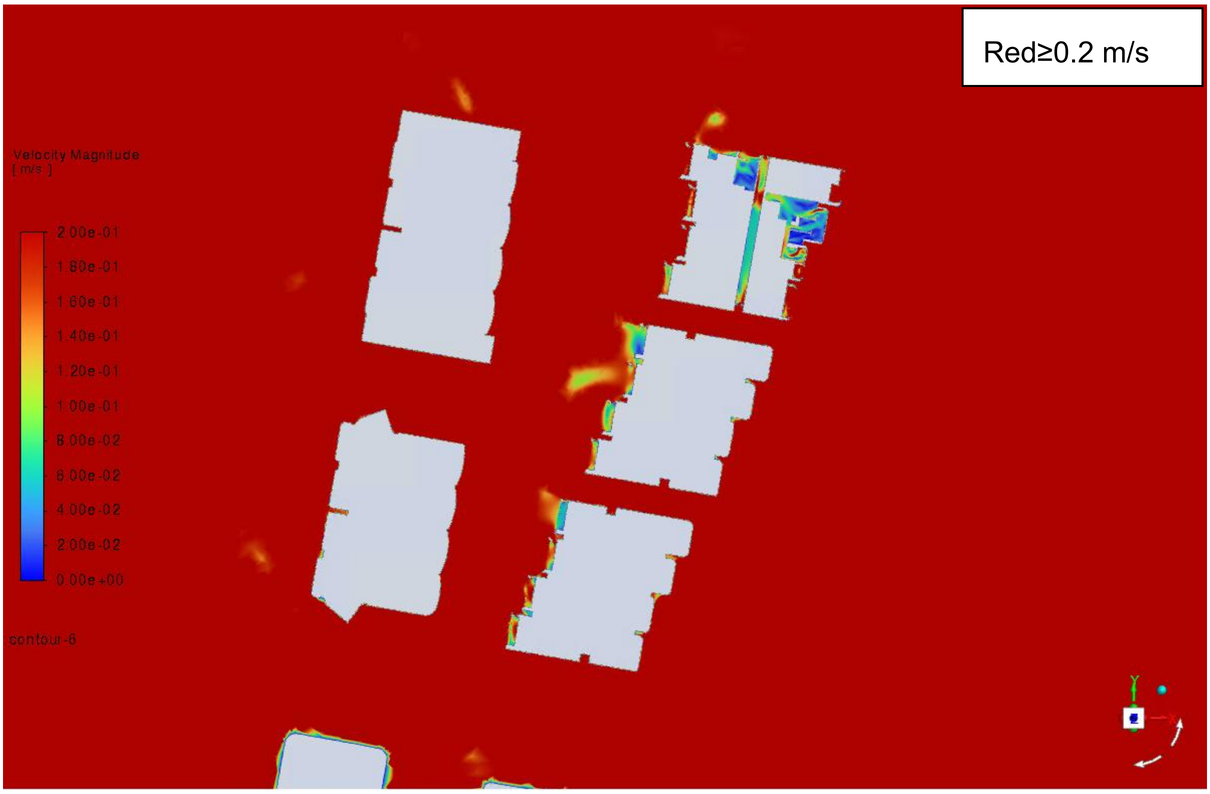

South Winds

Building C

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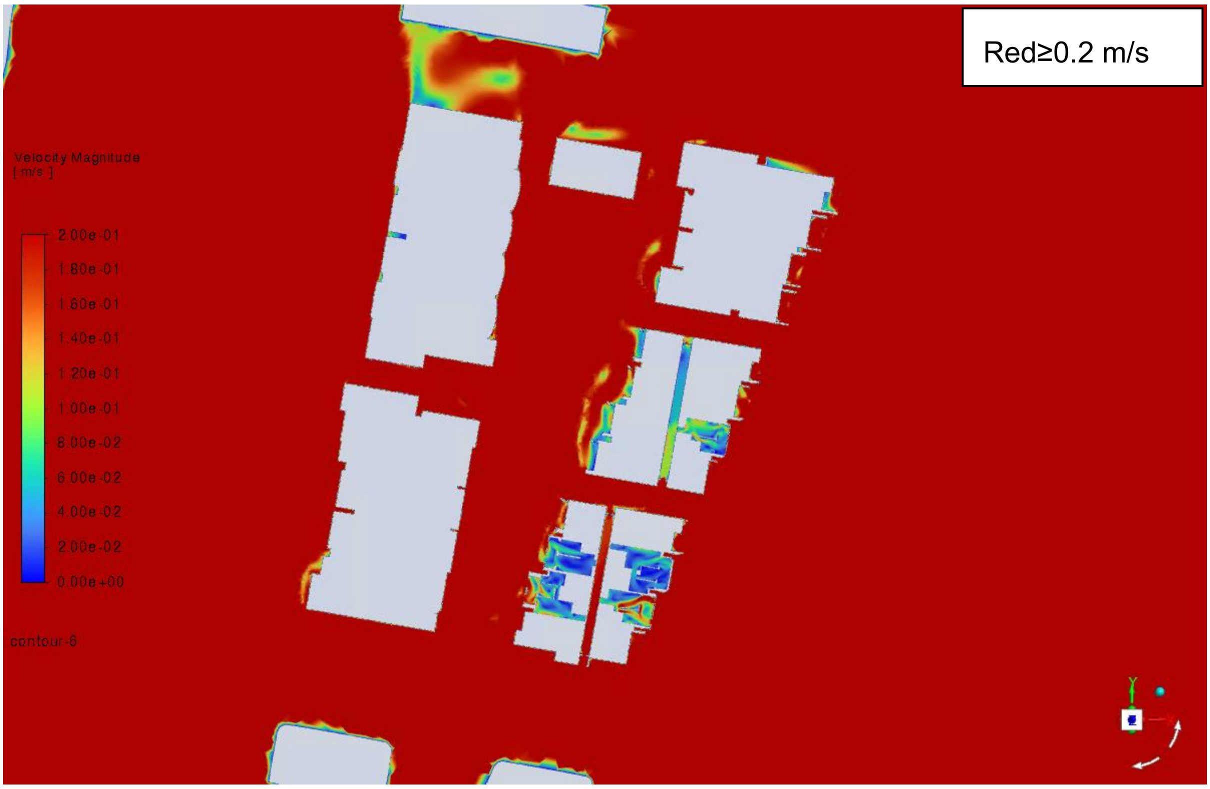

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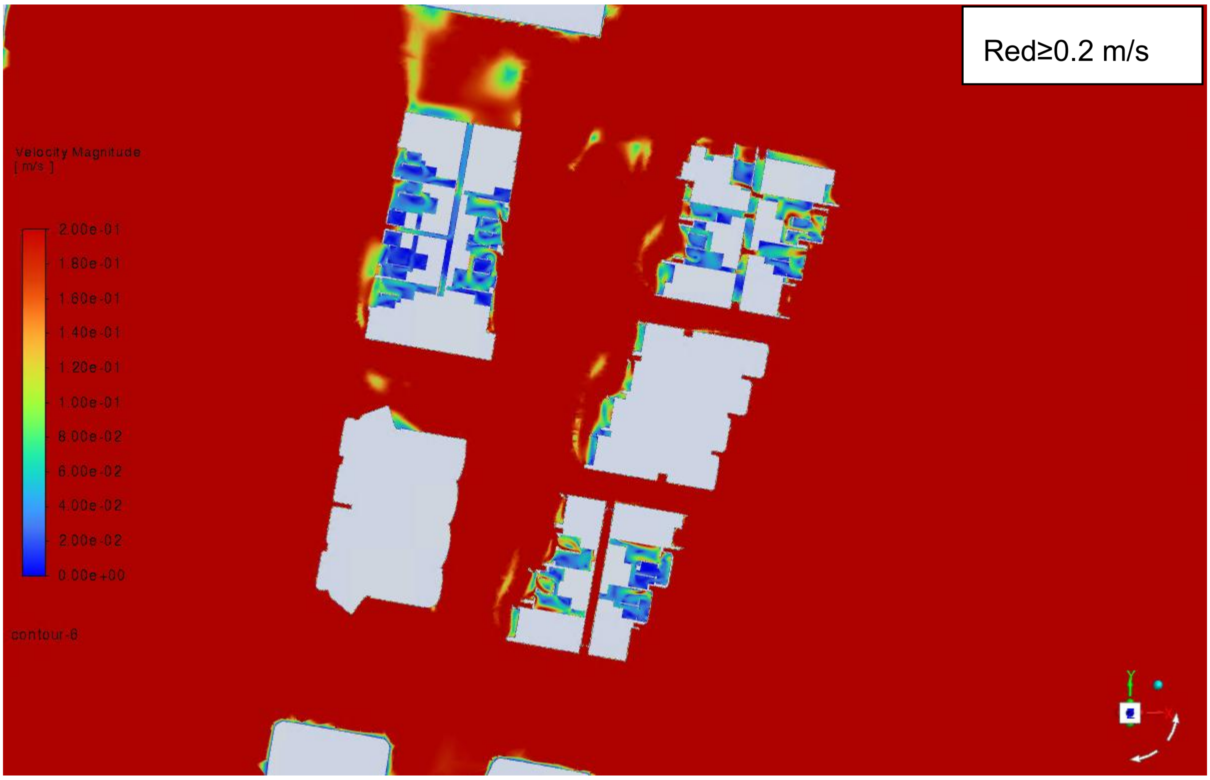

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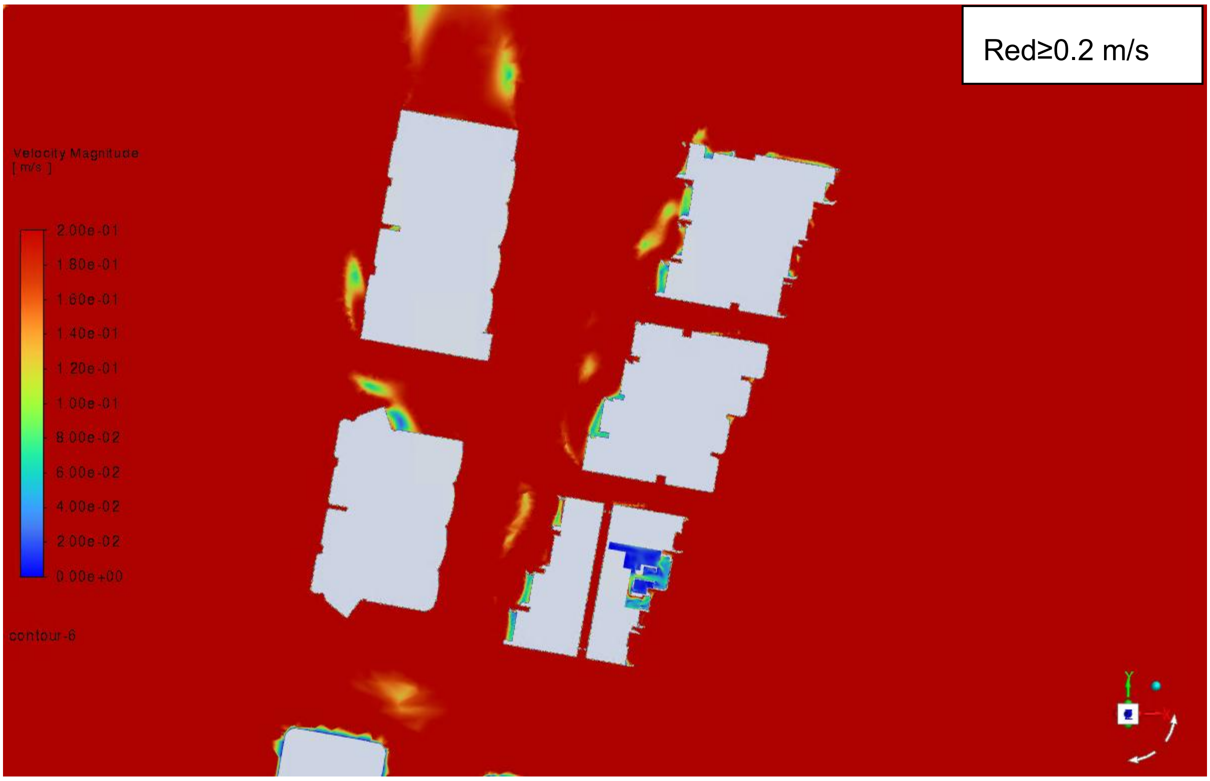

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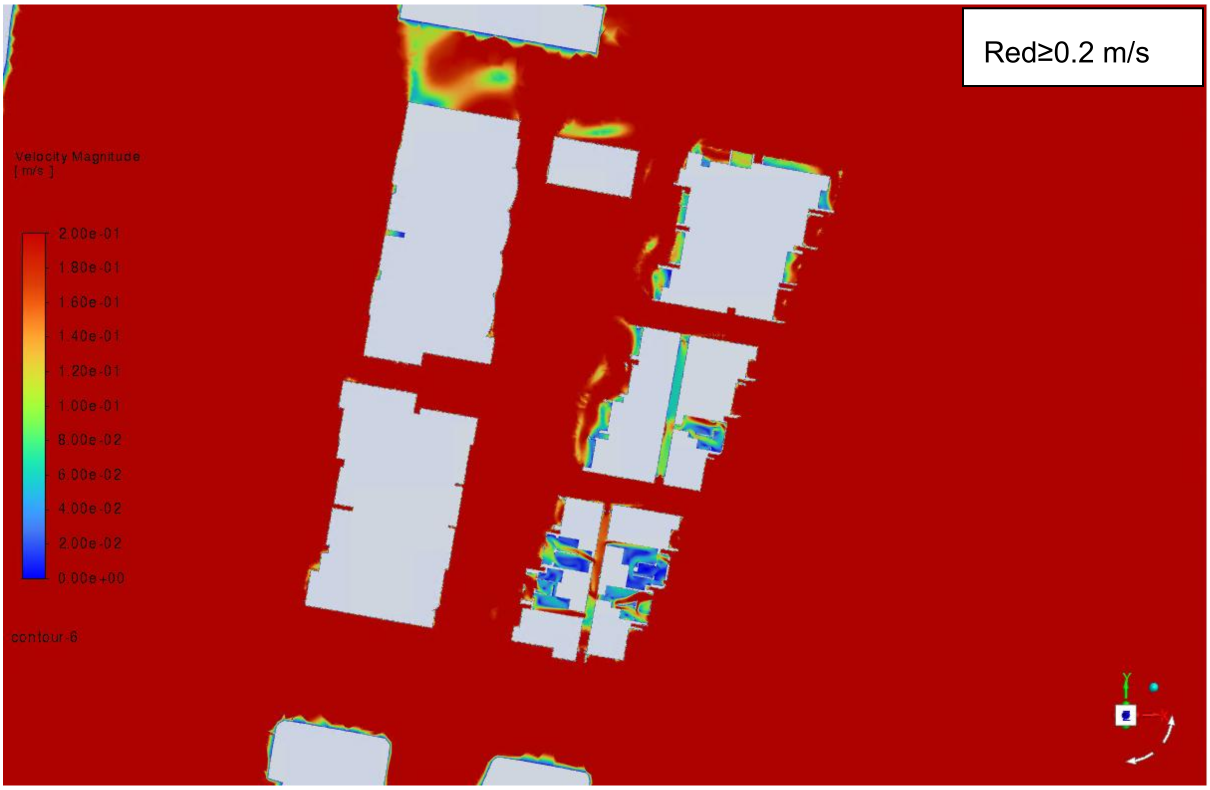

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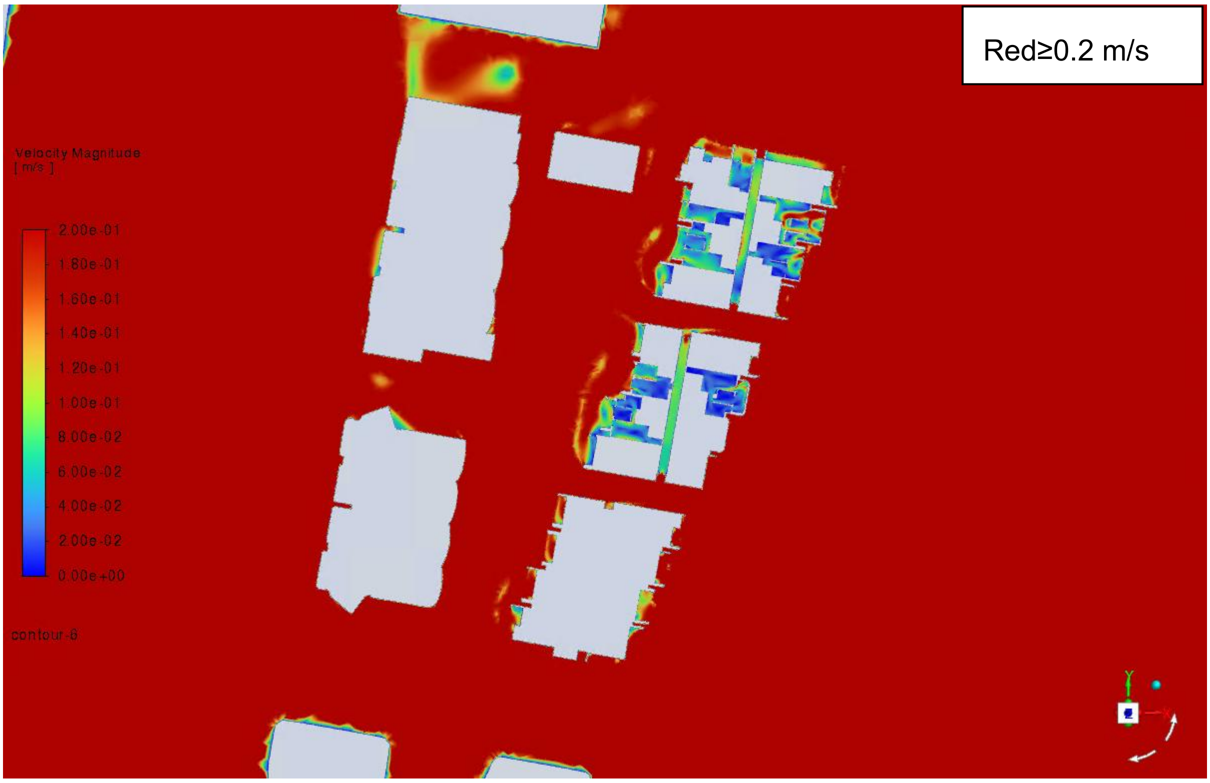

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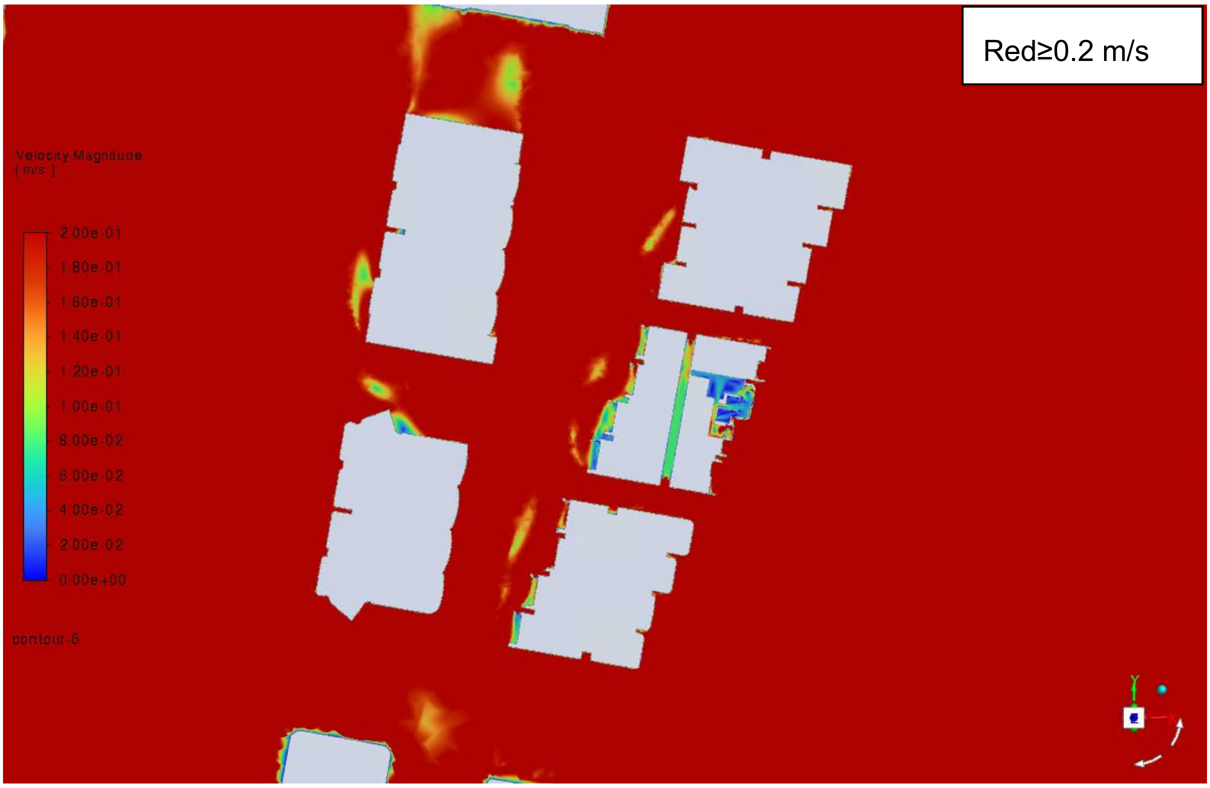

Building E

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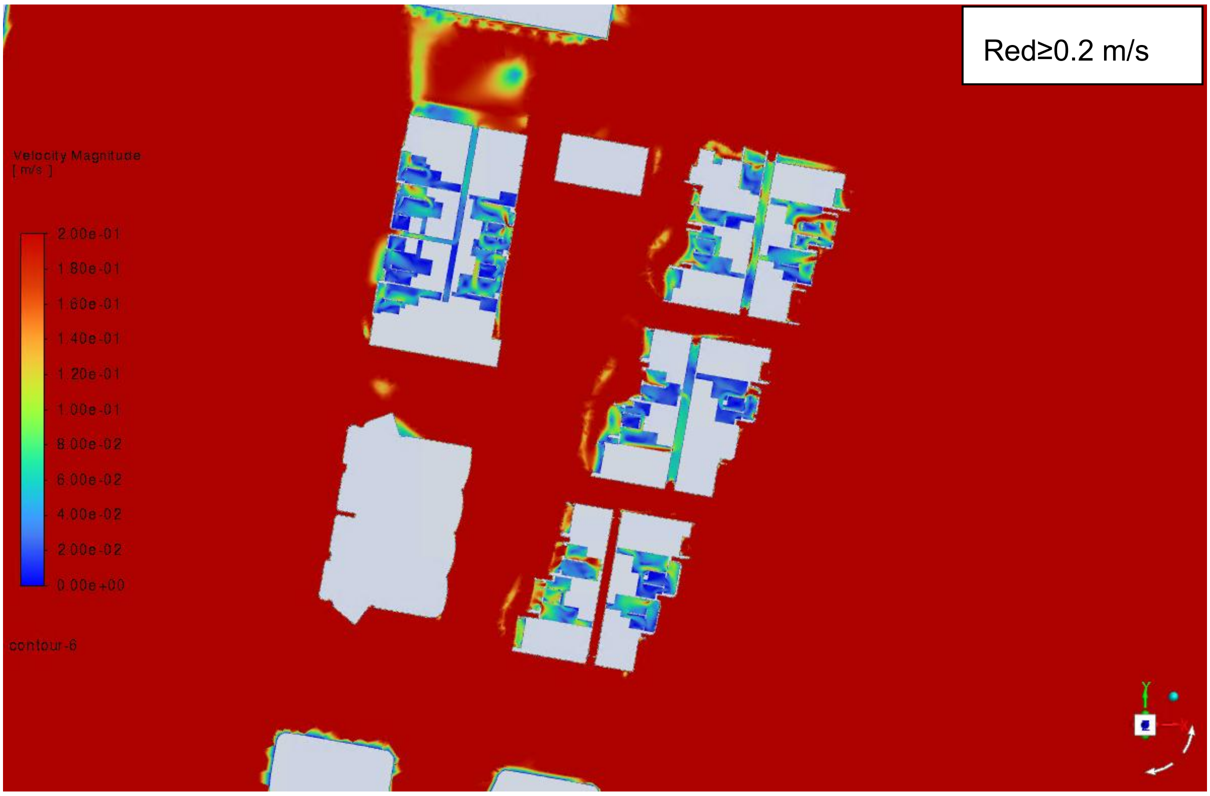

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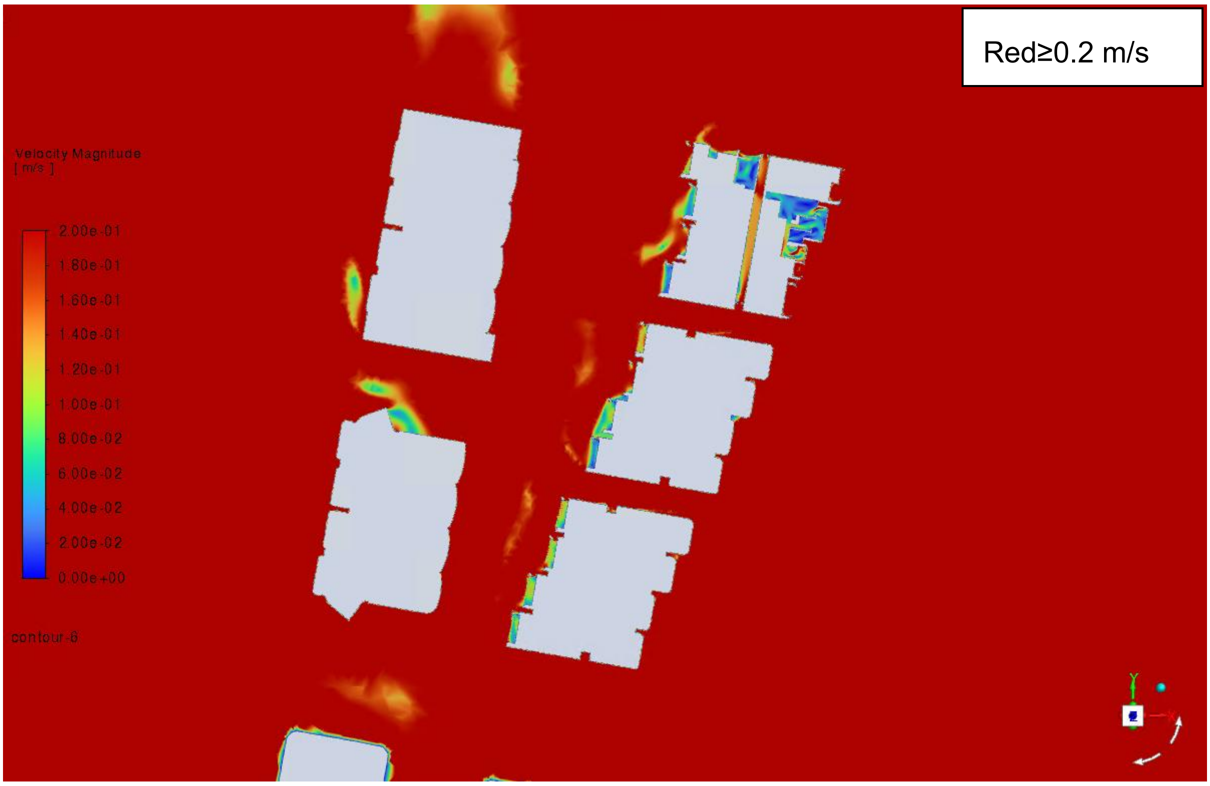

Southwest Winds

Building C

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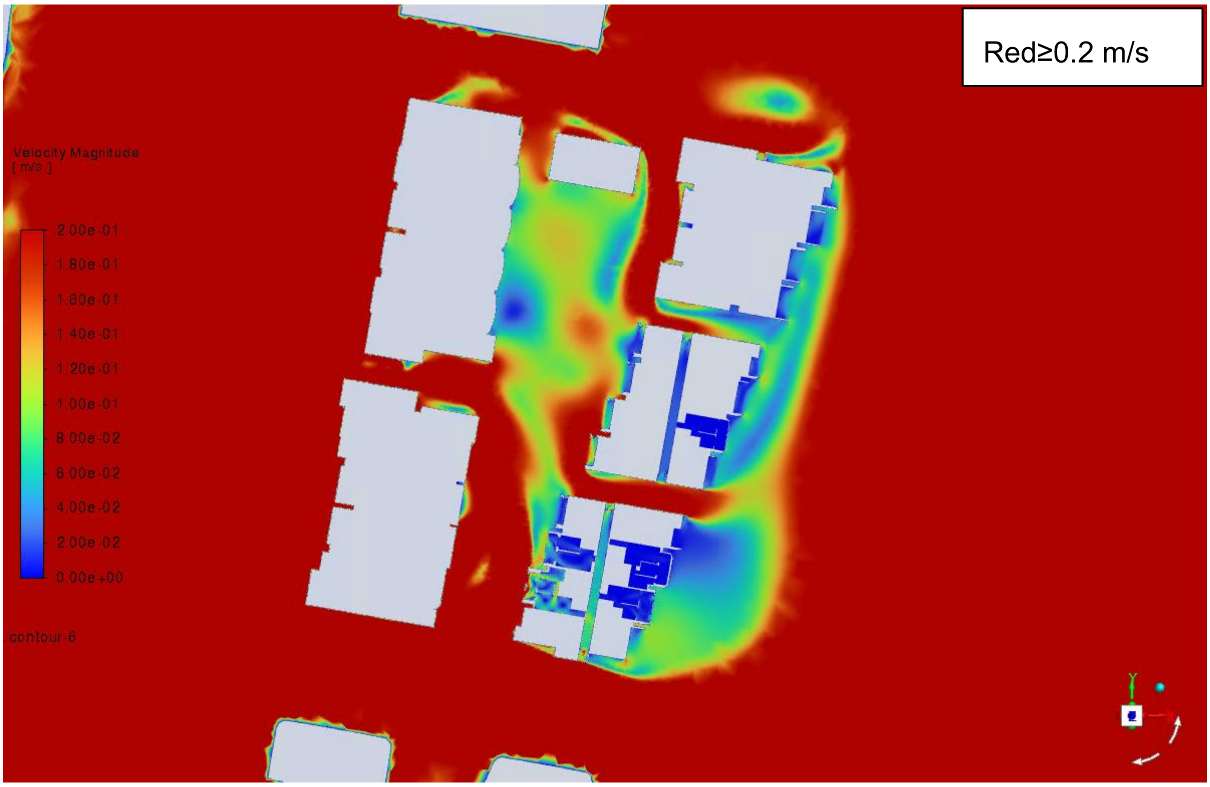

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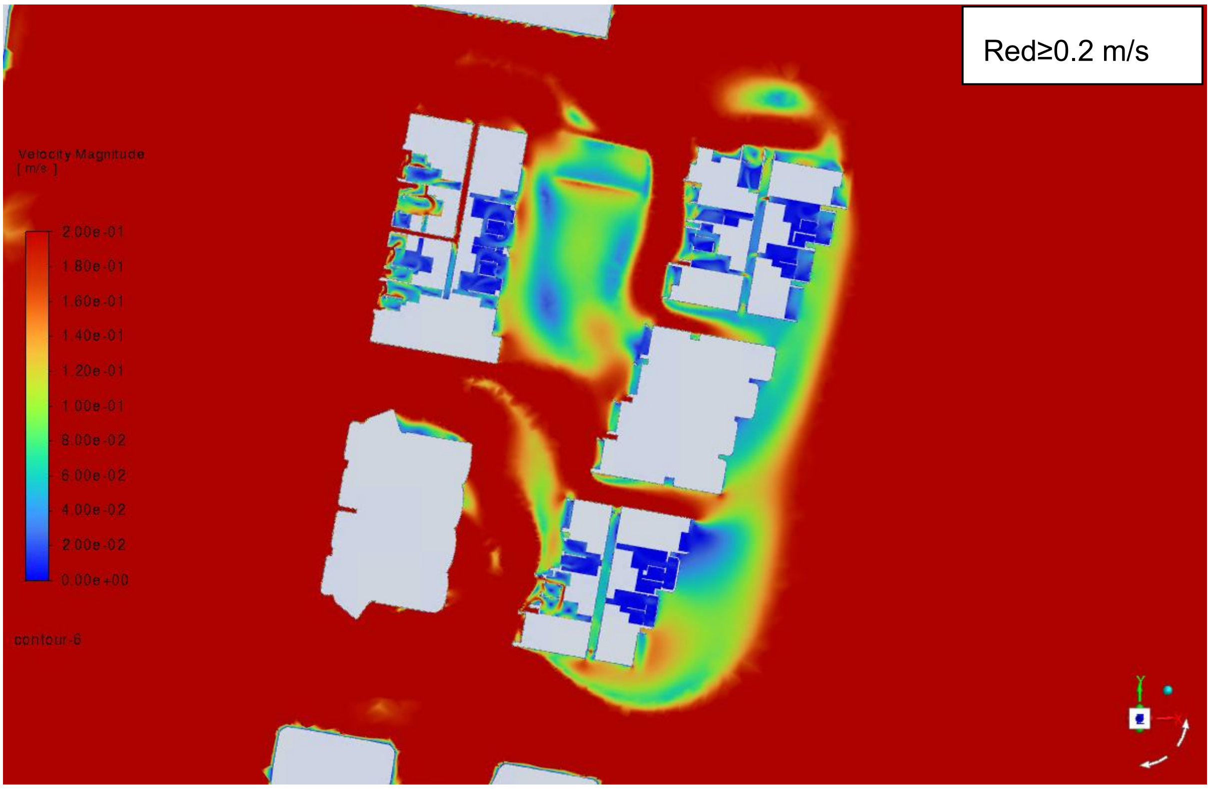

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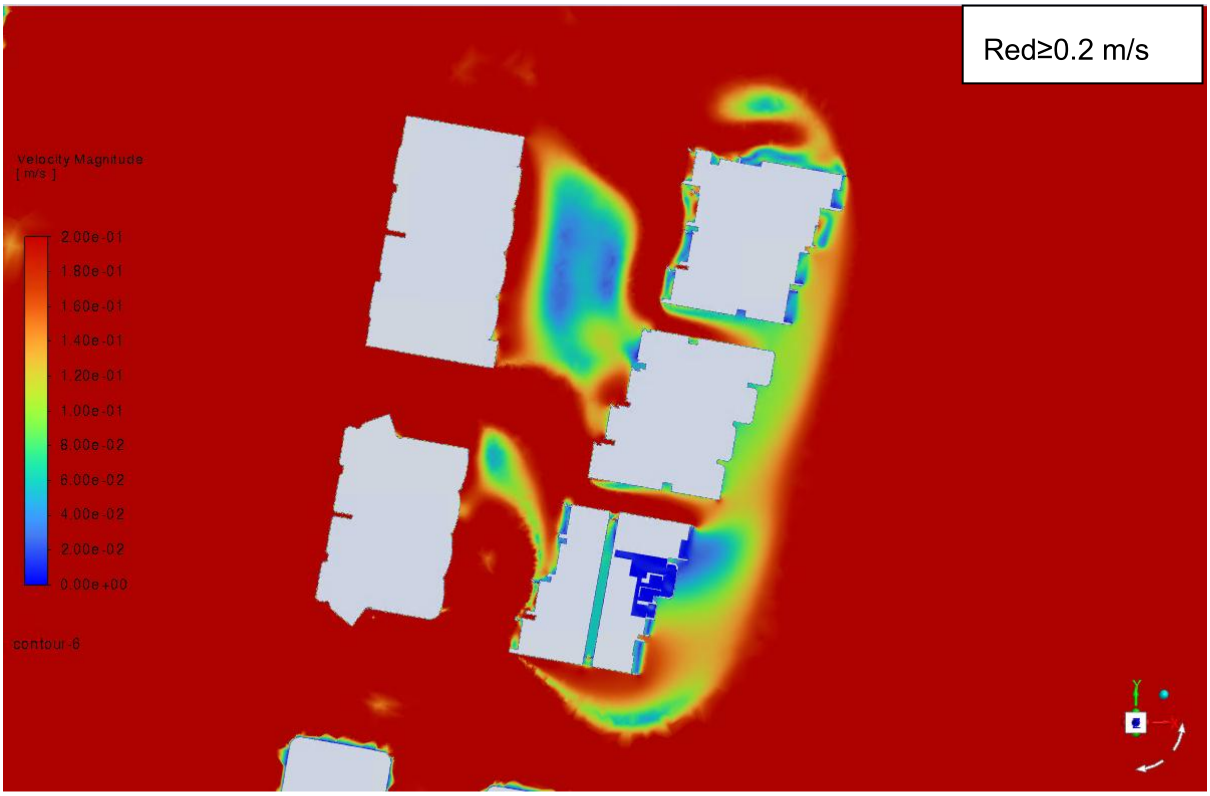

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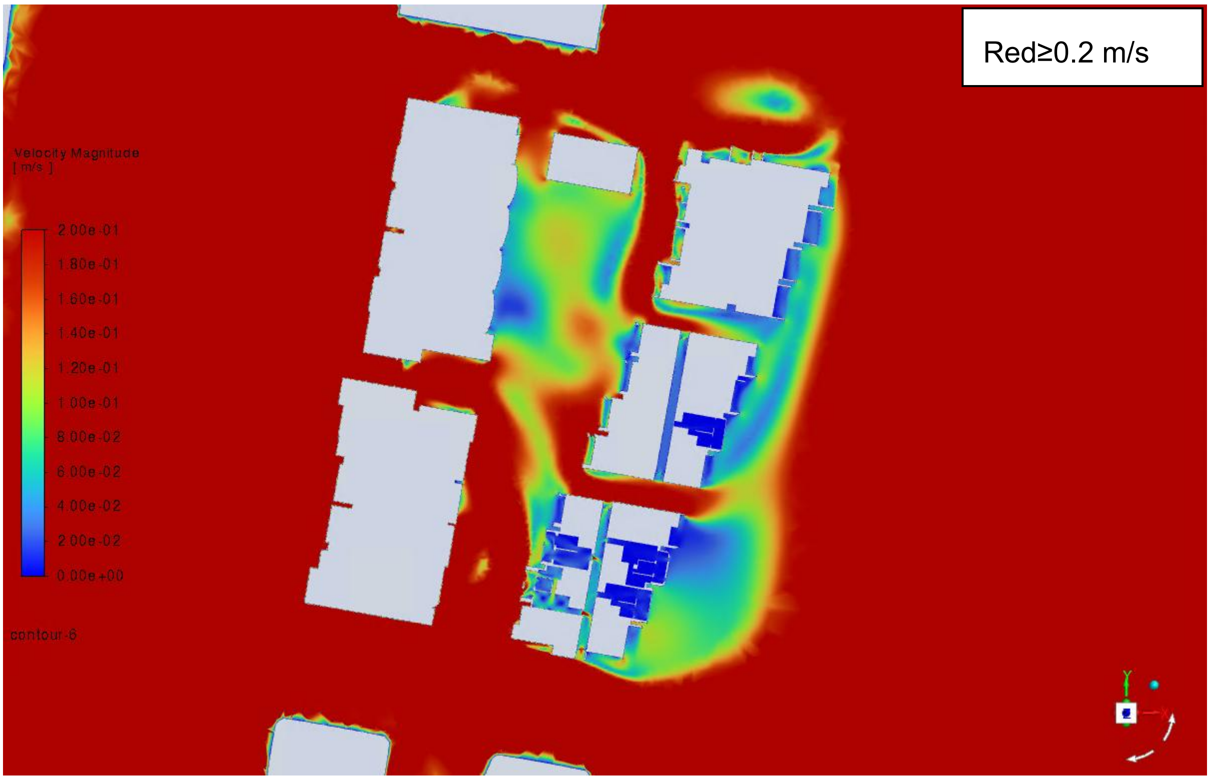

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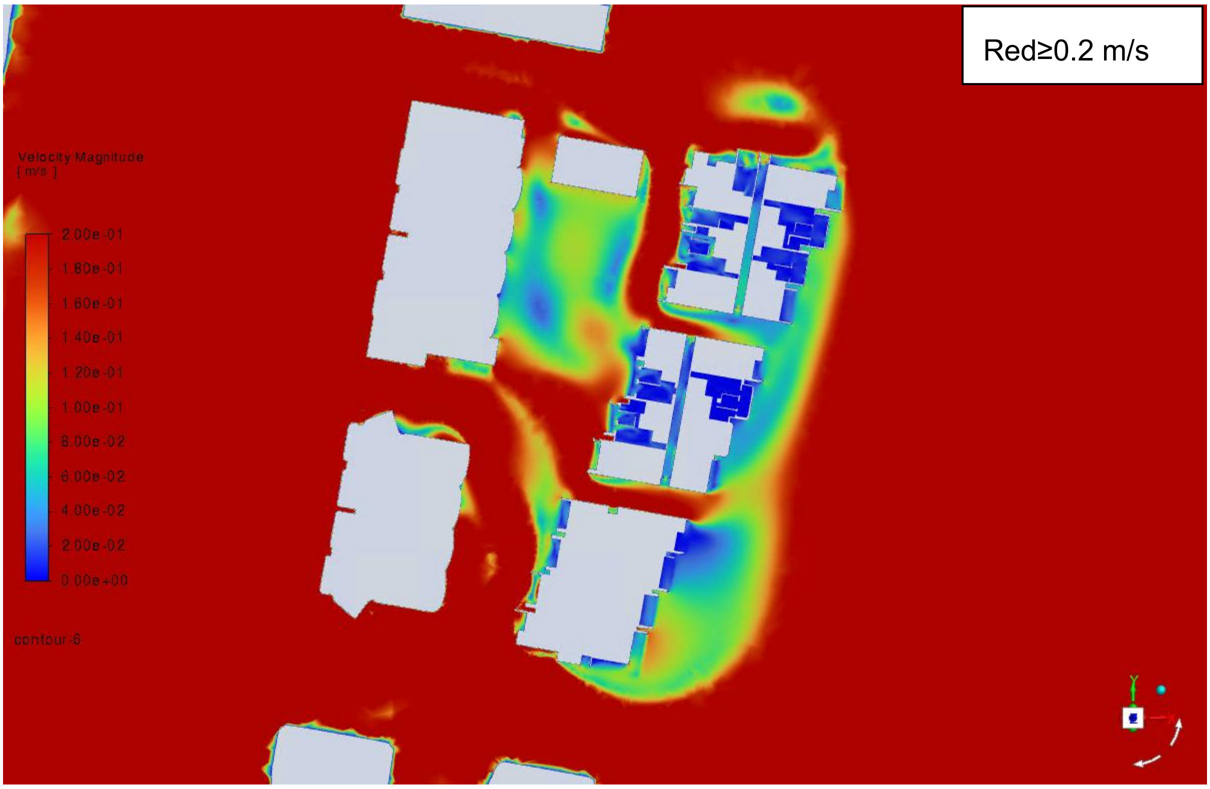

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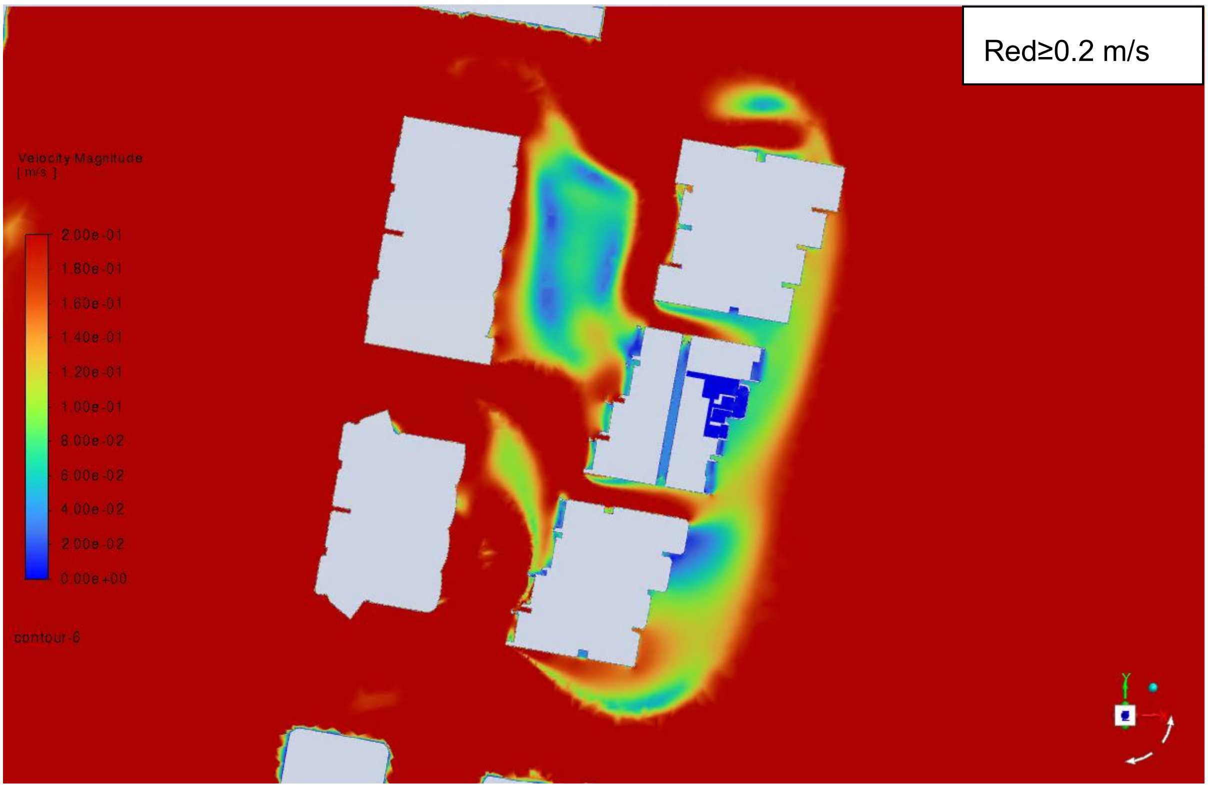

Building E

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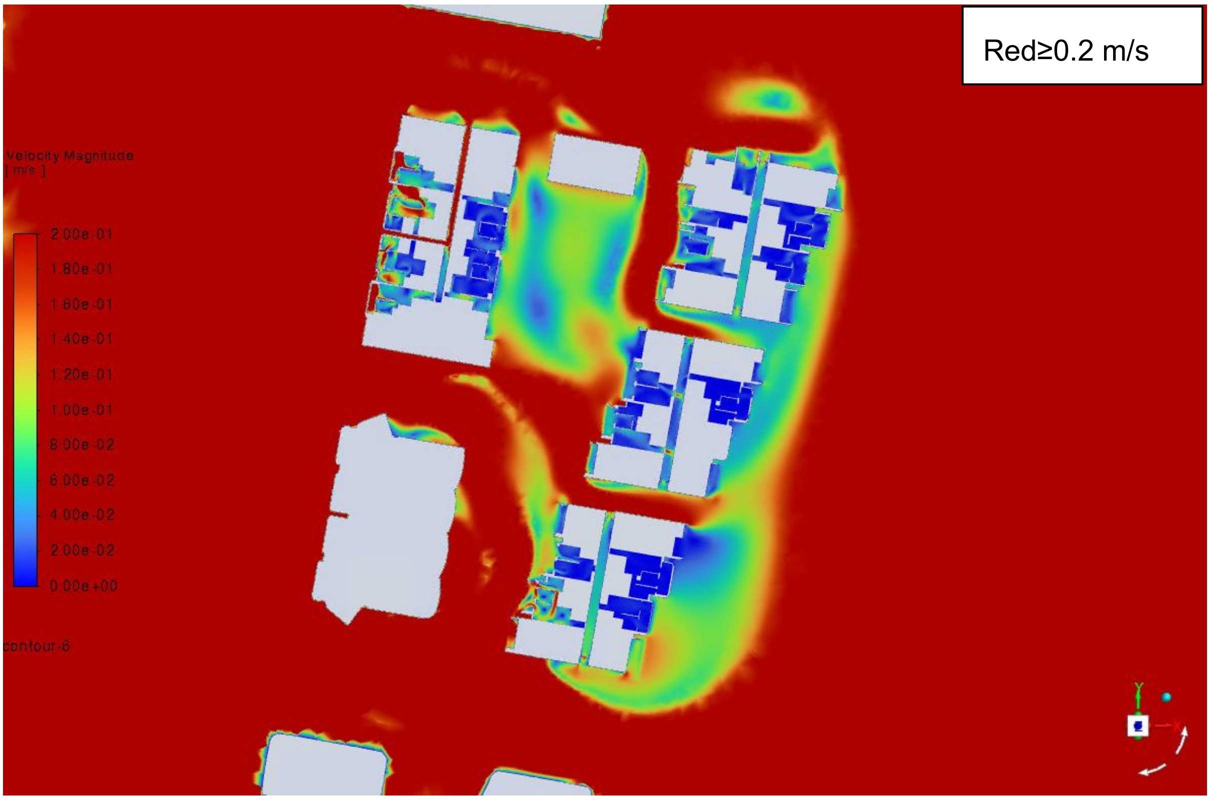

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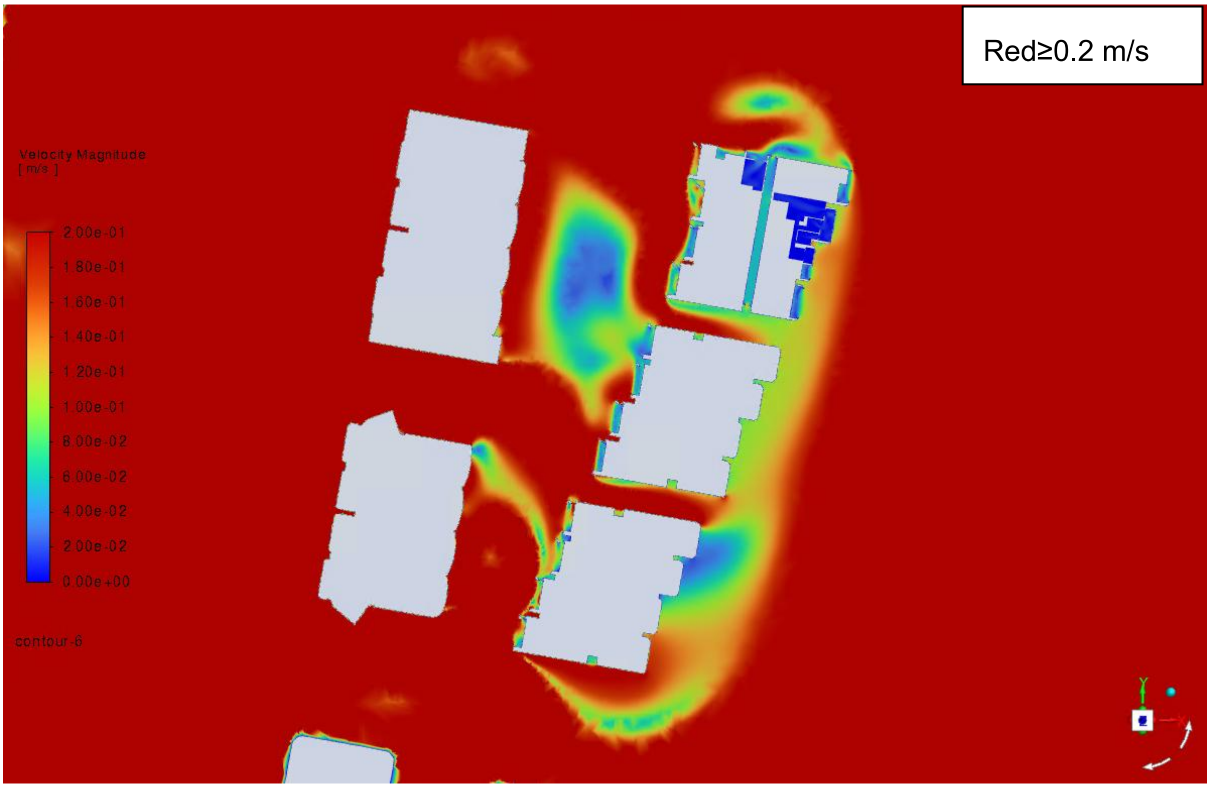

West Winds

Building C

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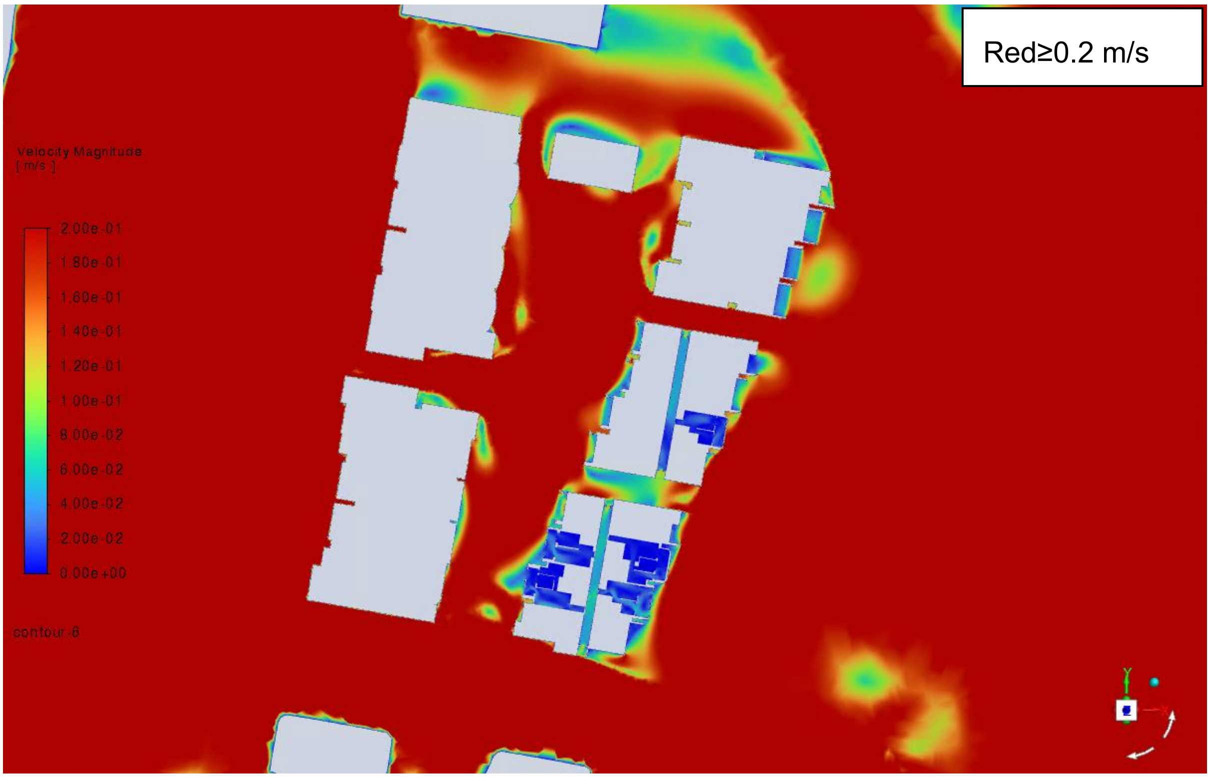

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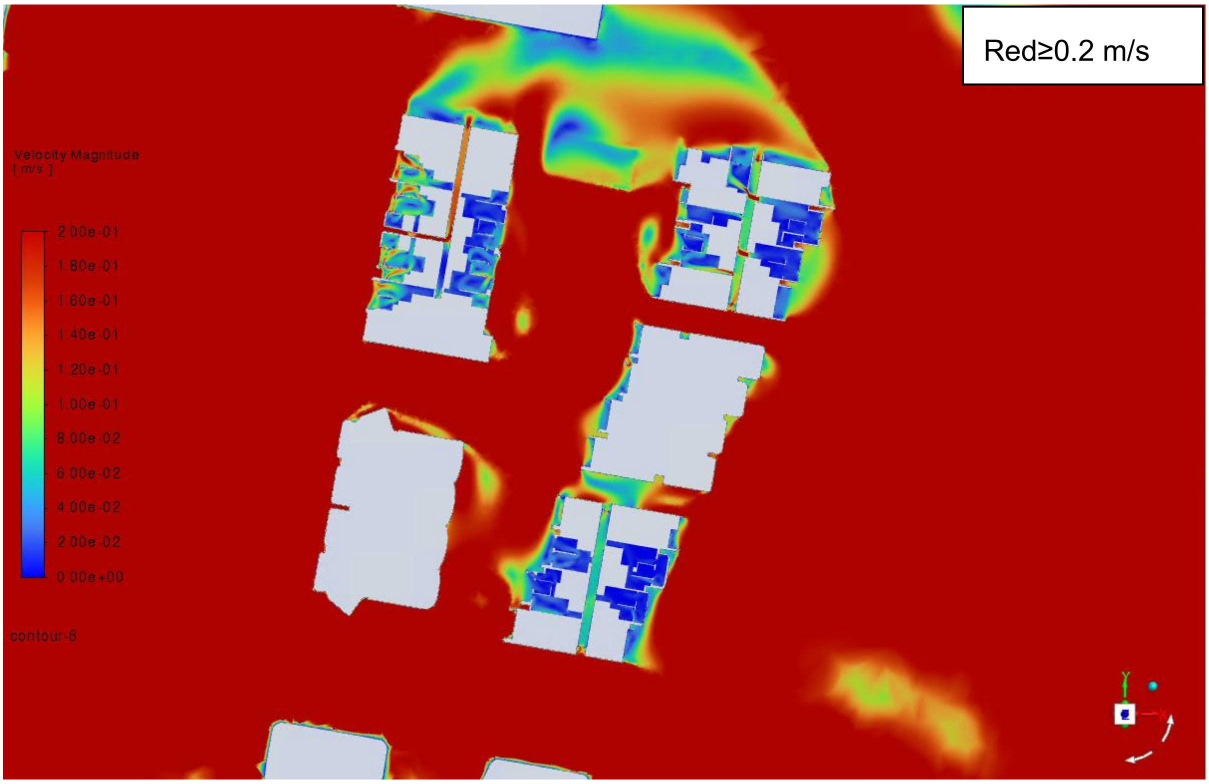

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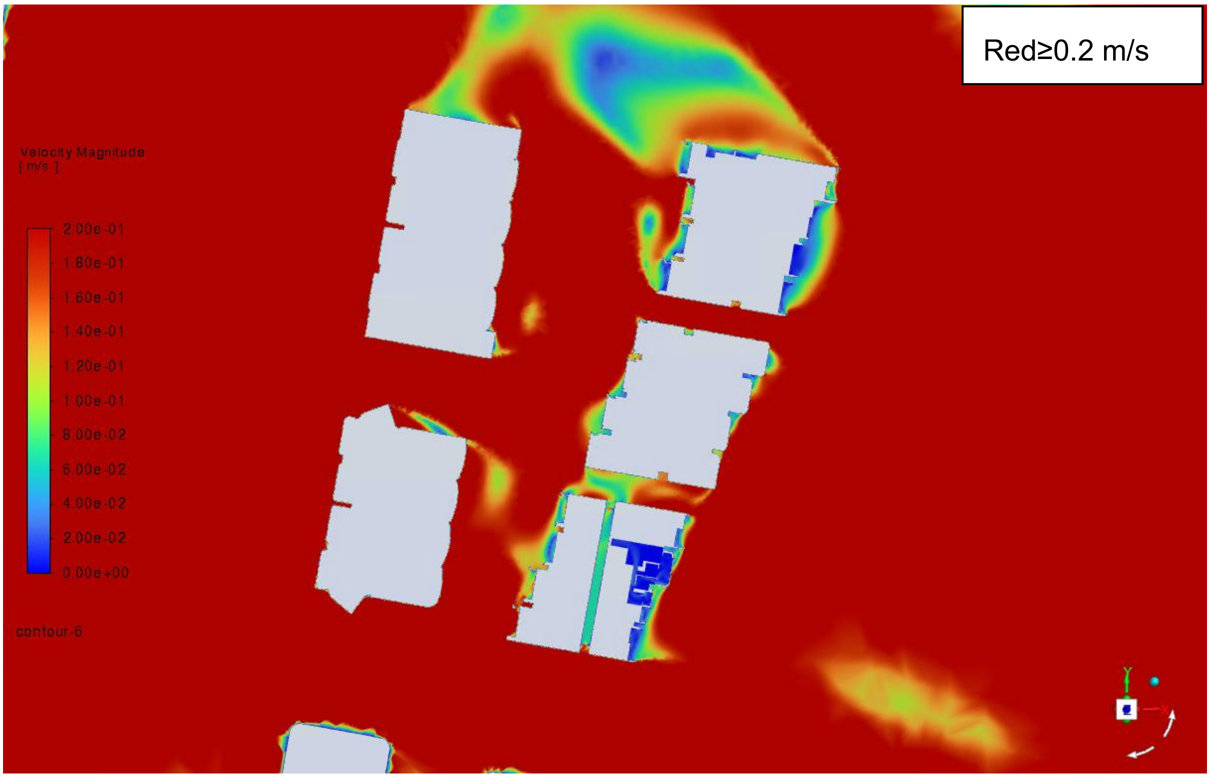

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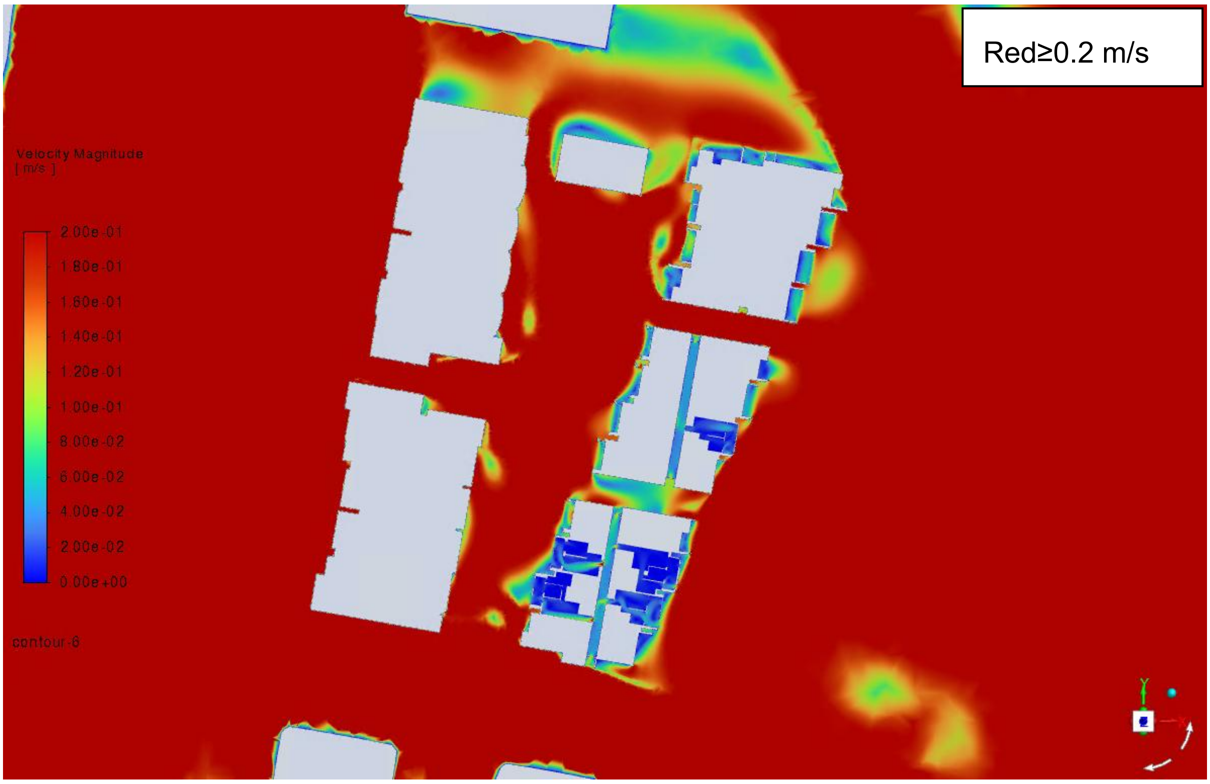

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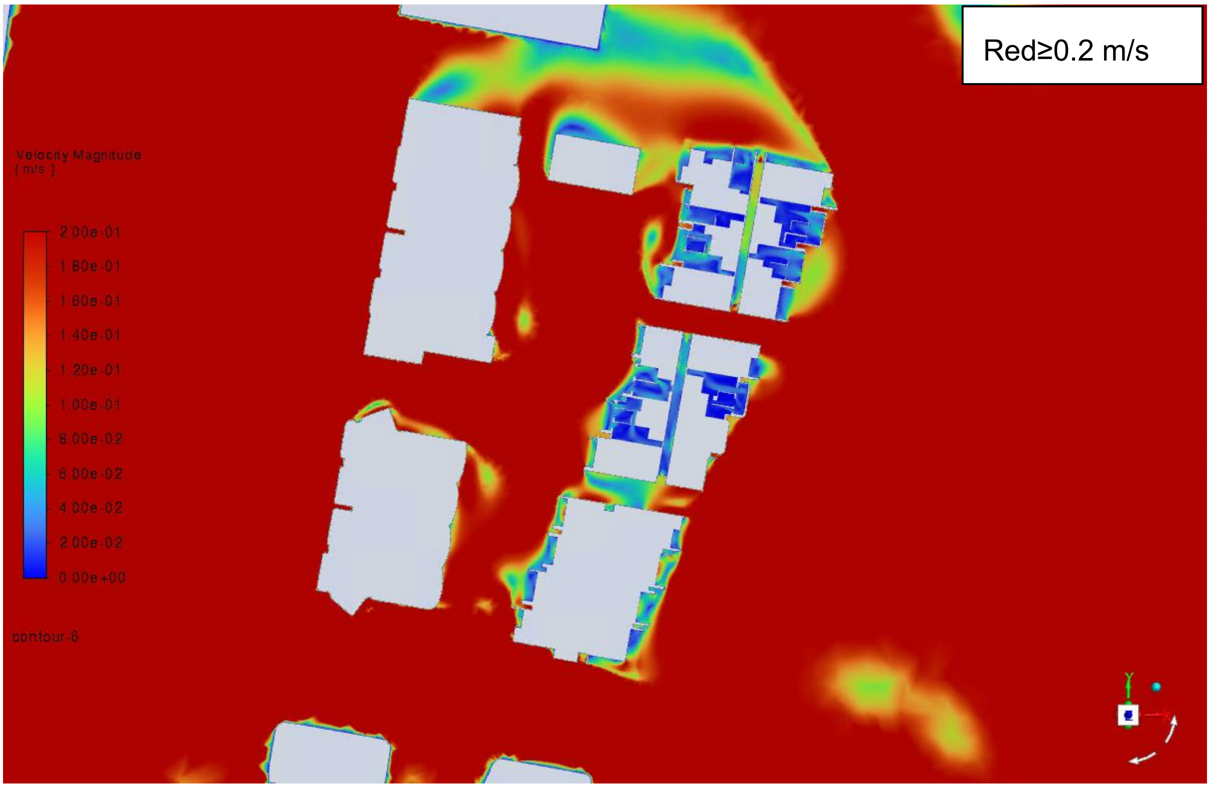

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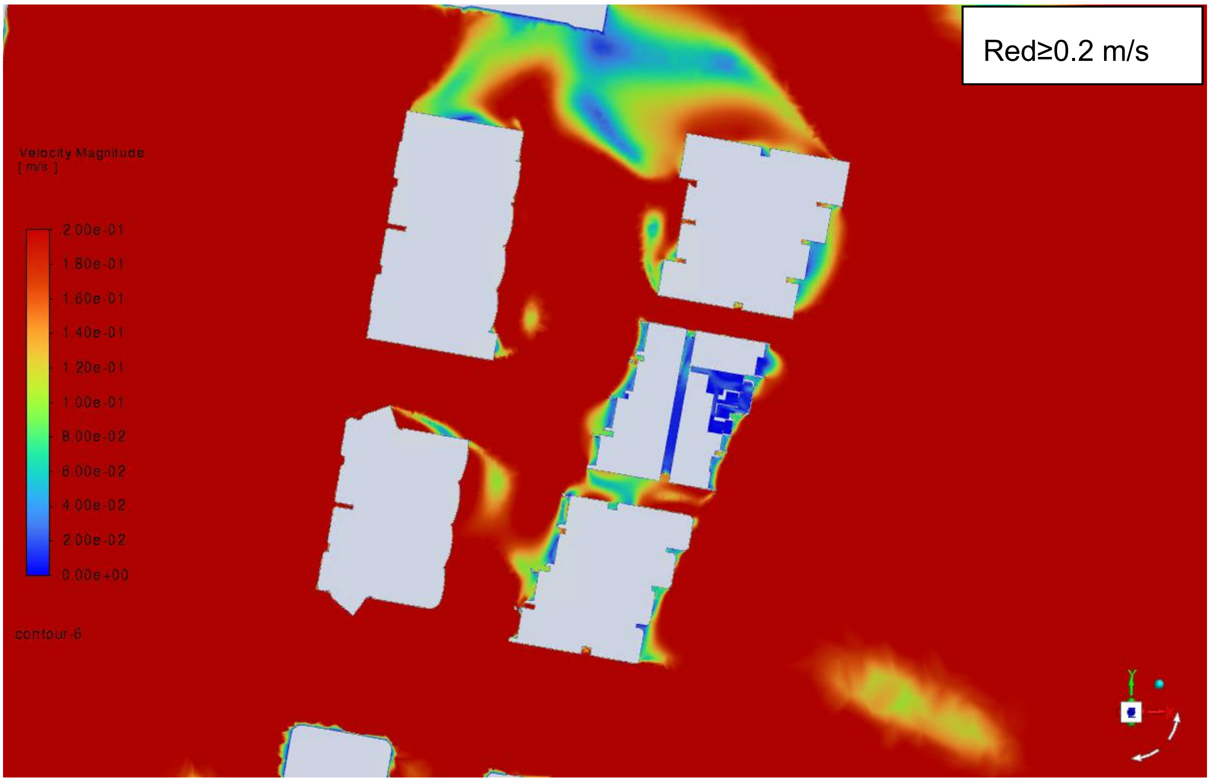

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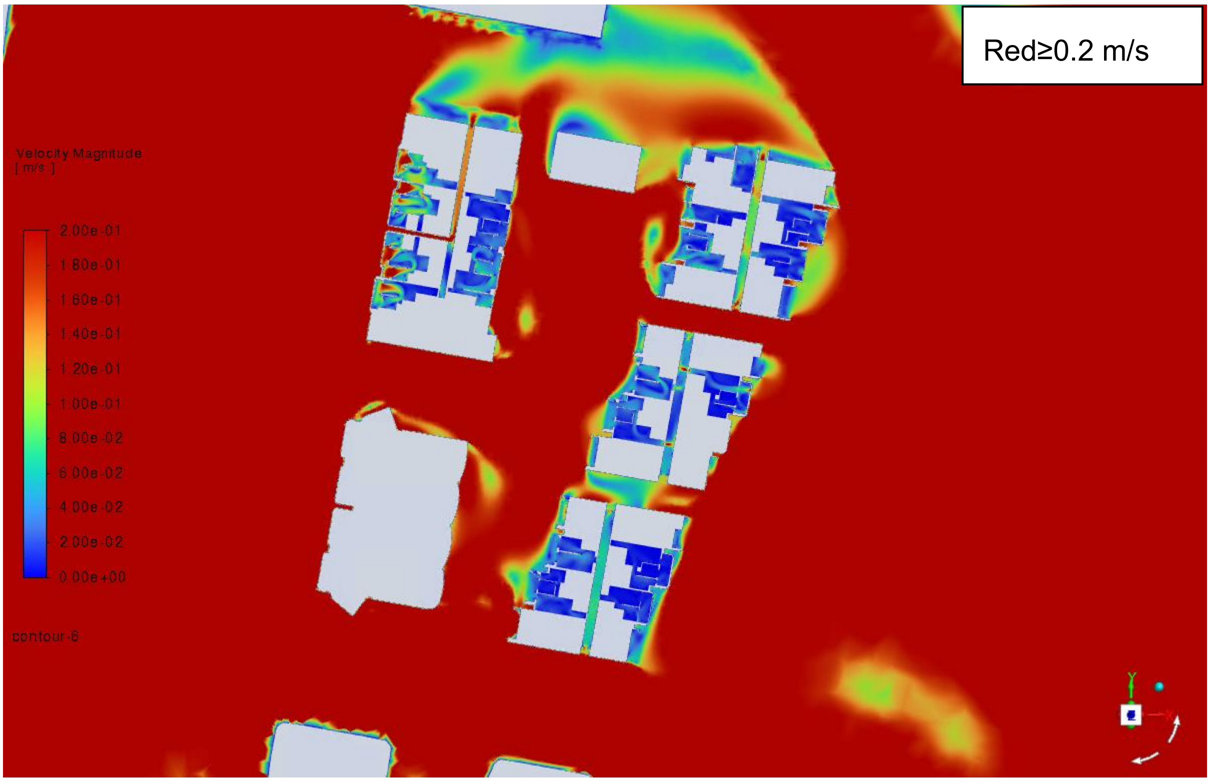

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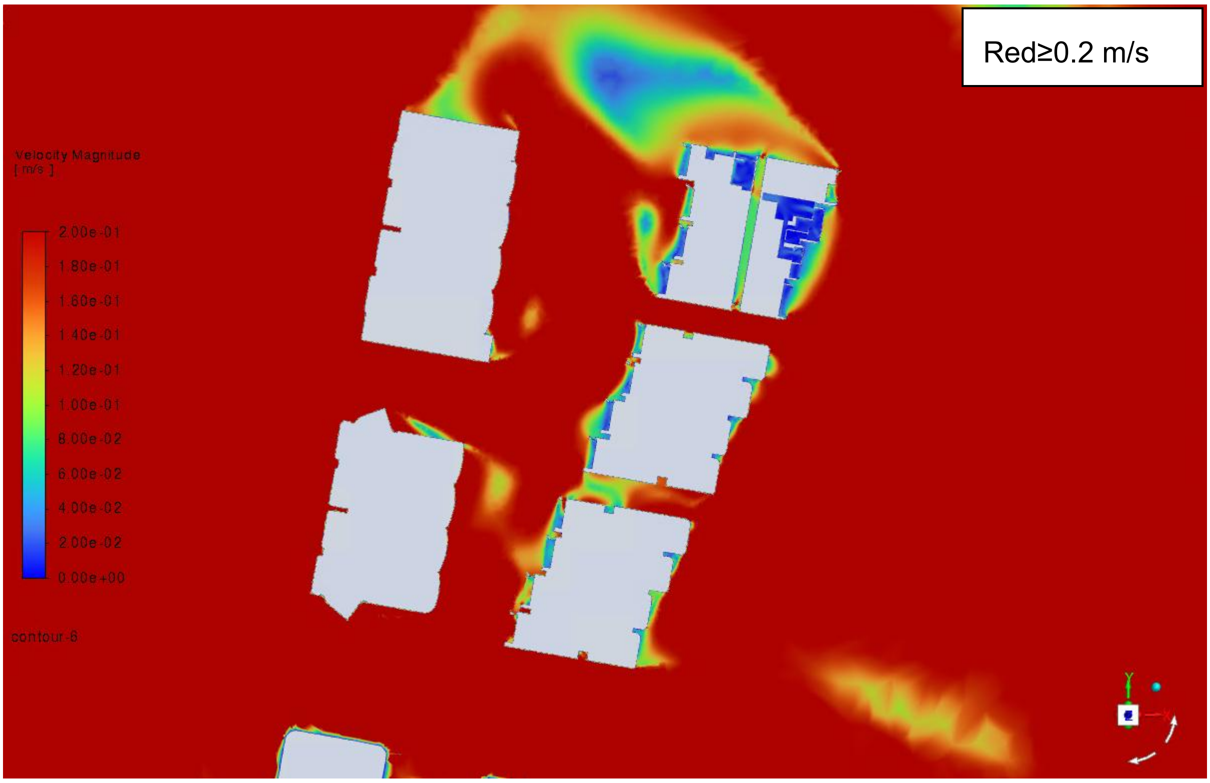
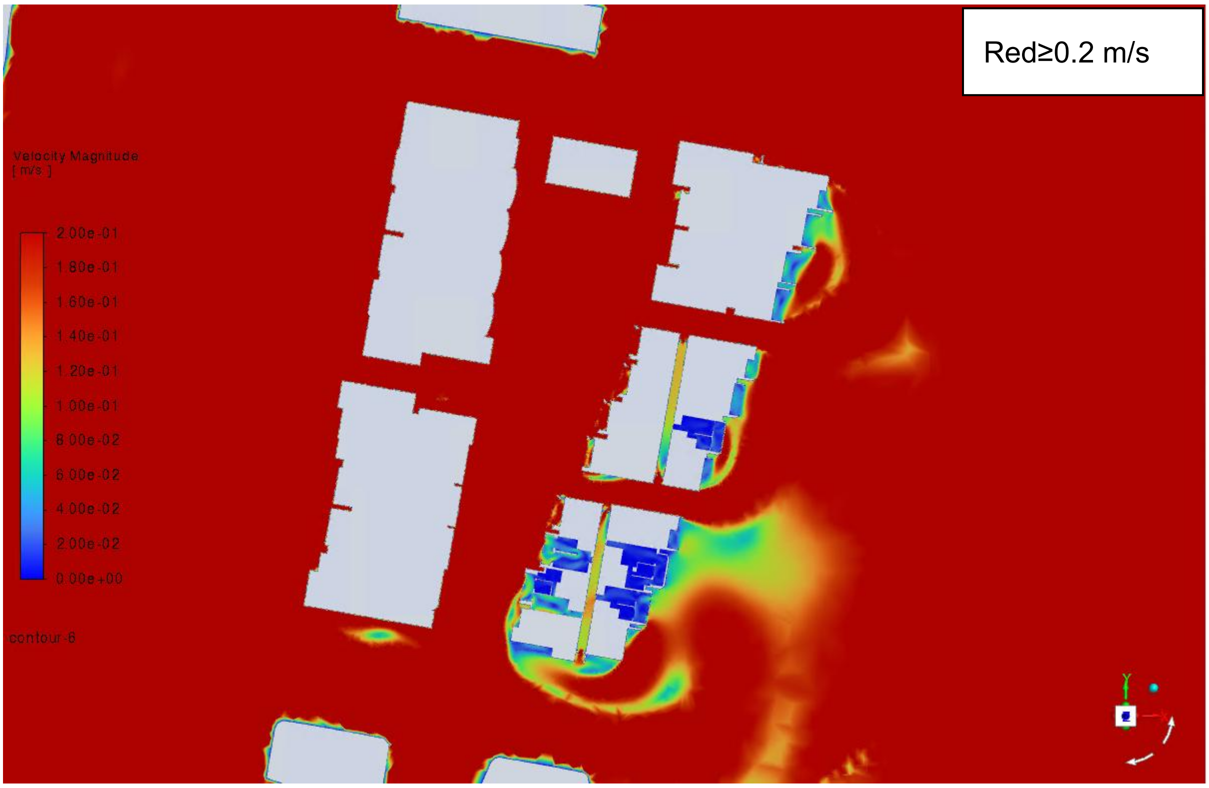


Northwest Winds

Building C

Level 1



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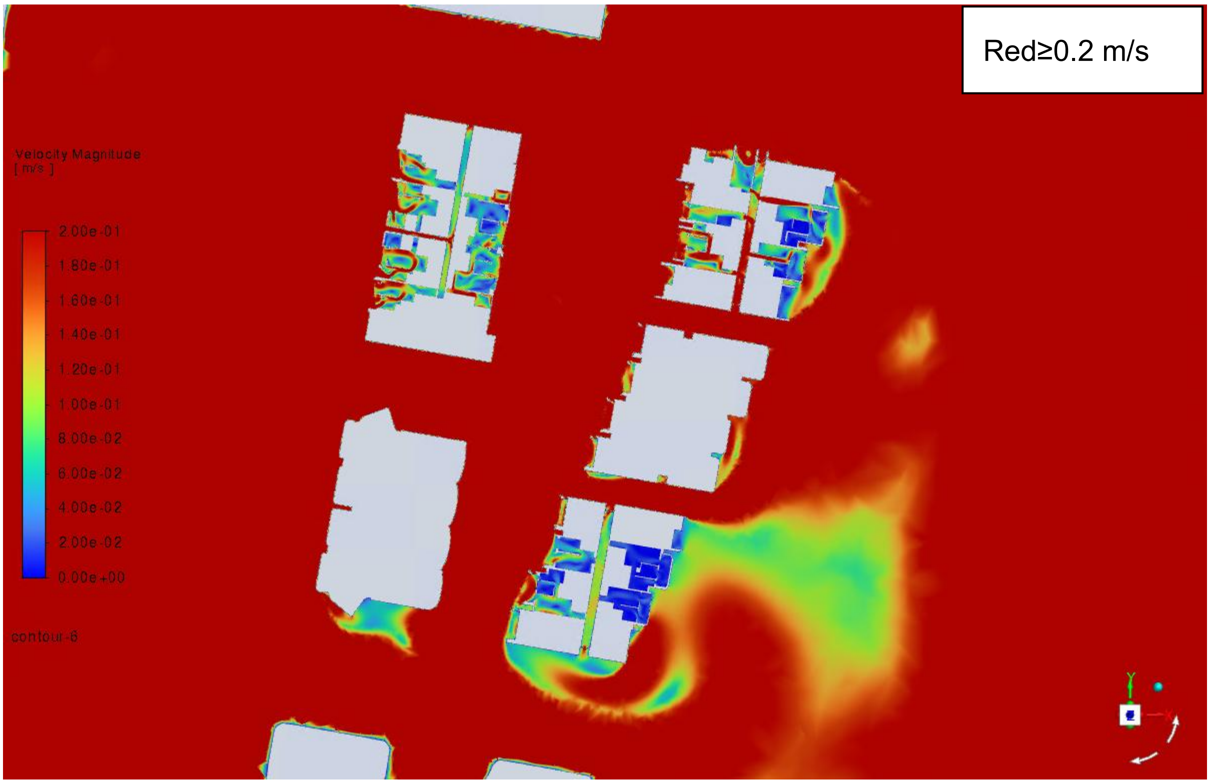

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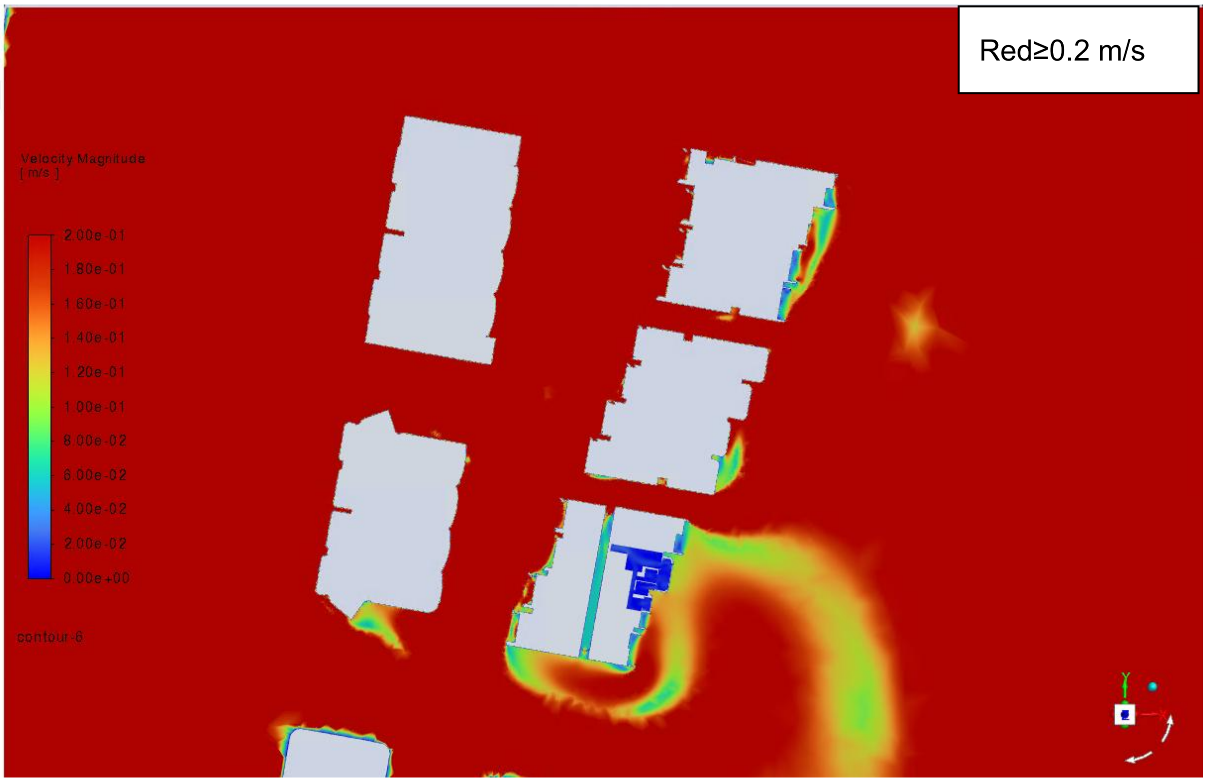

Building D

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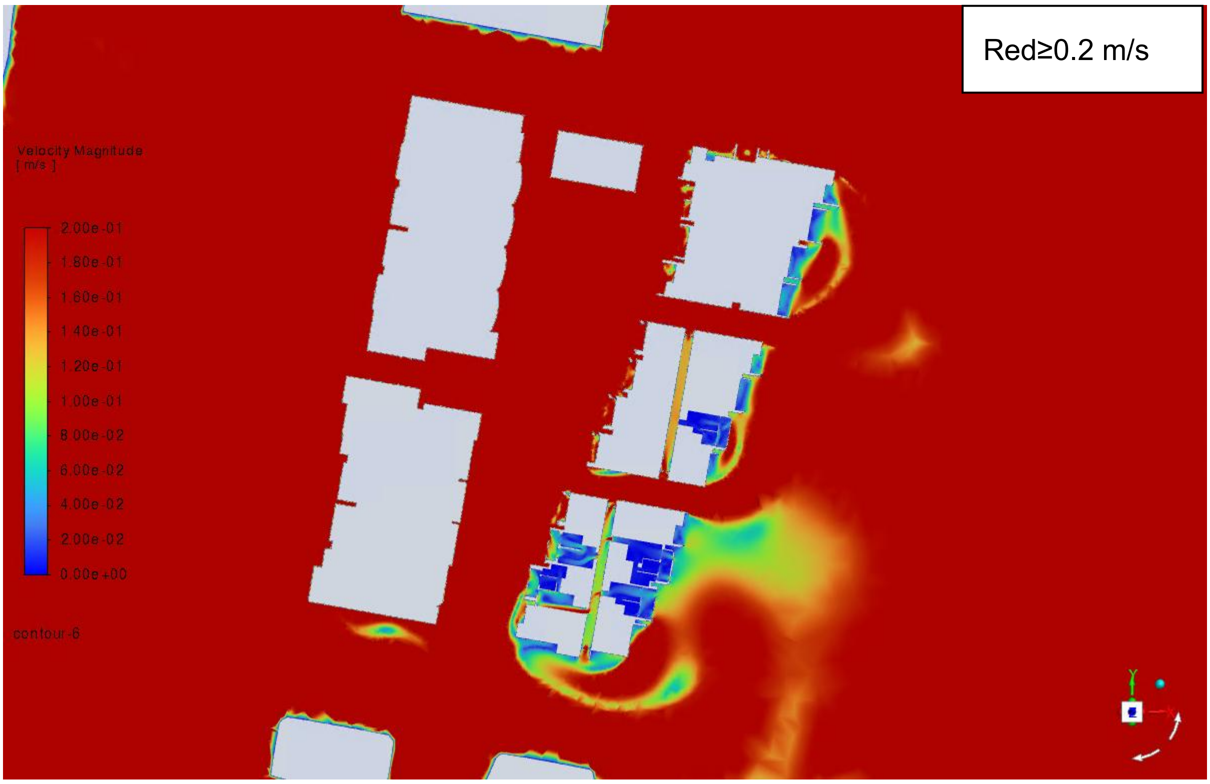

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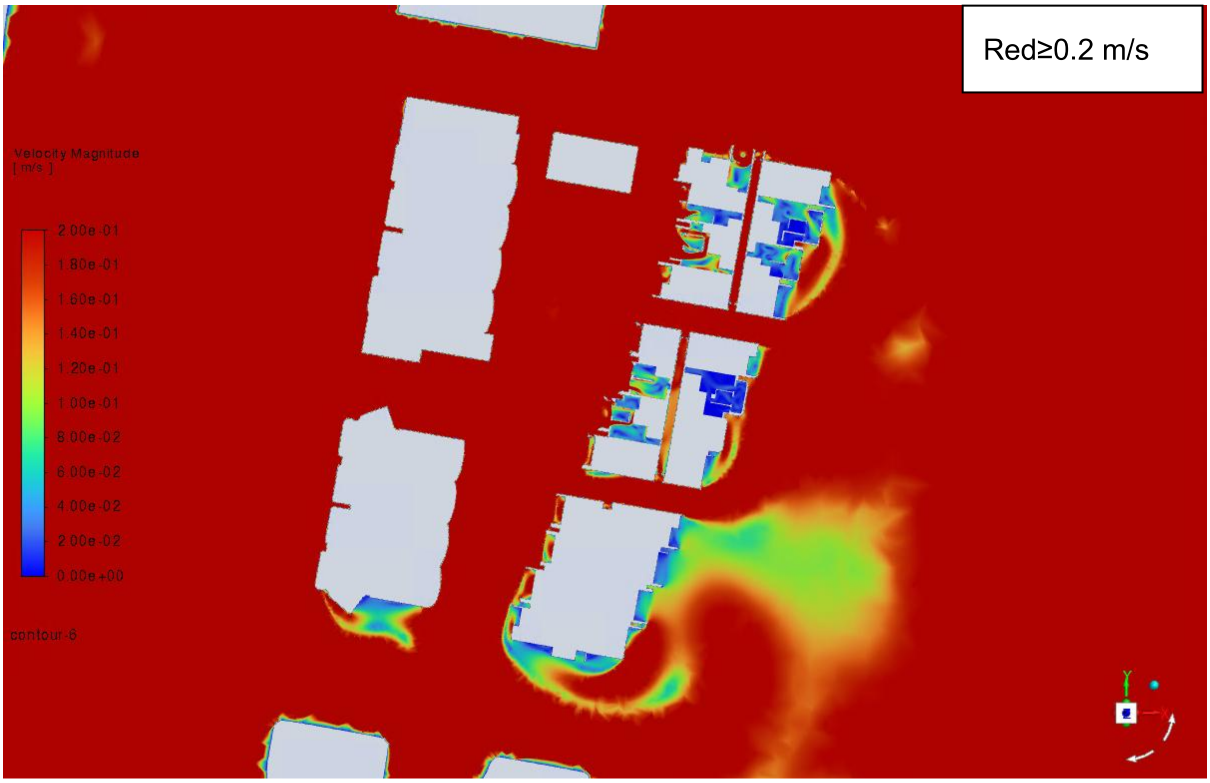
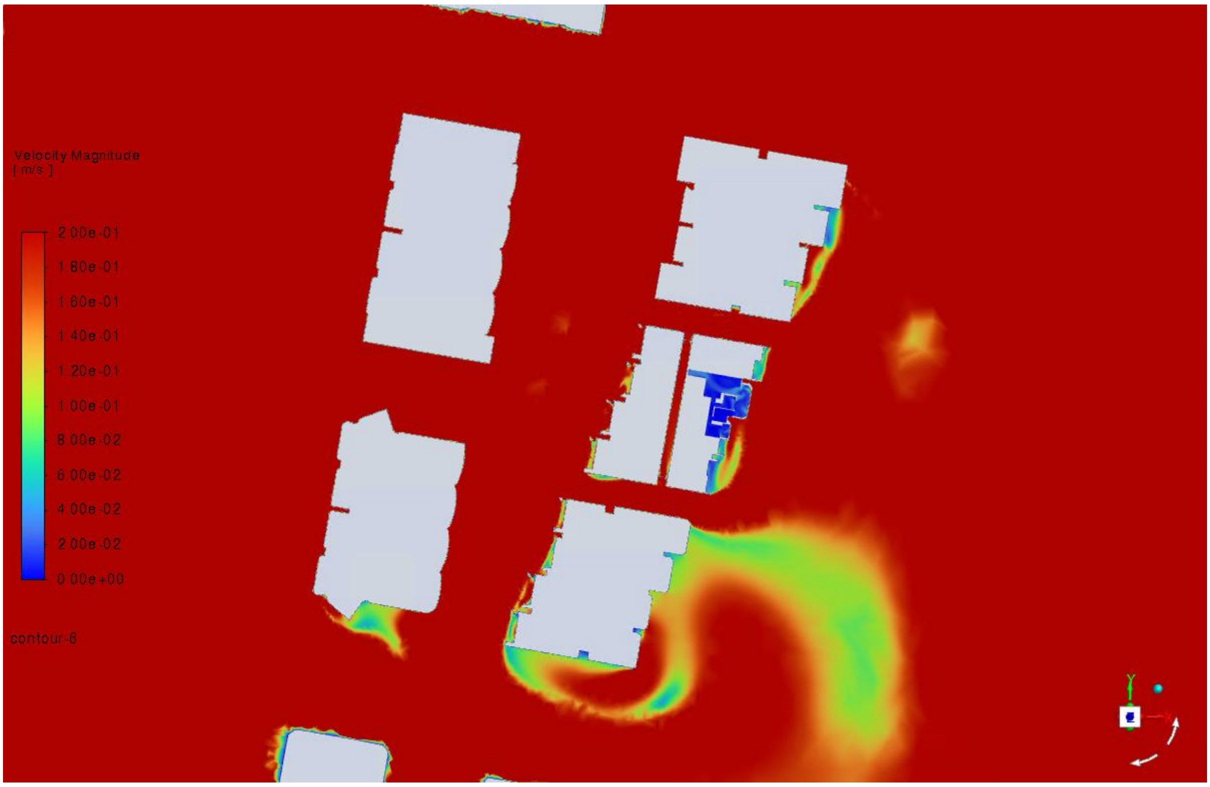
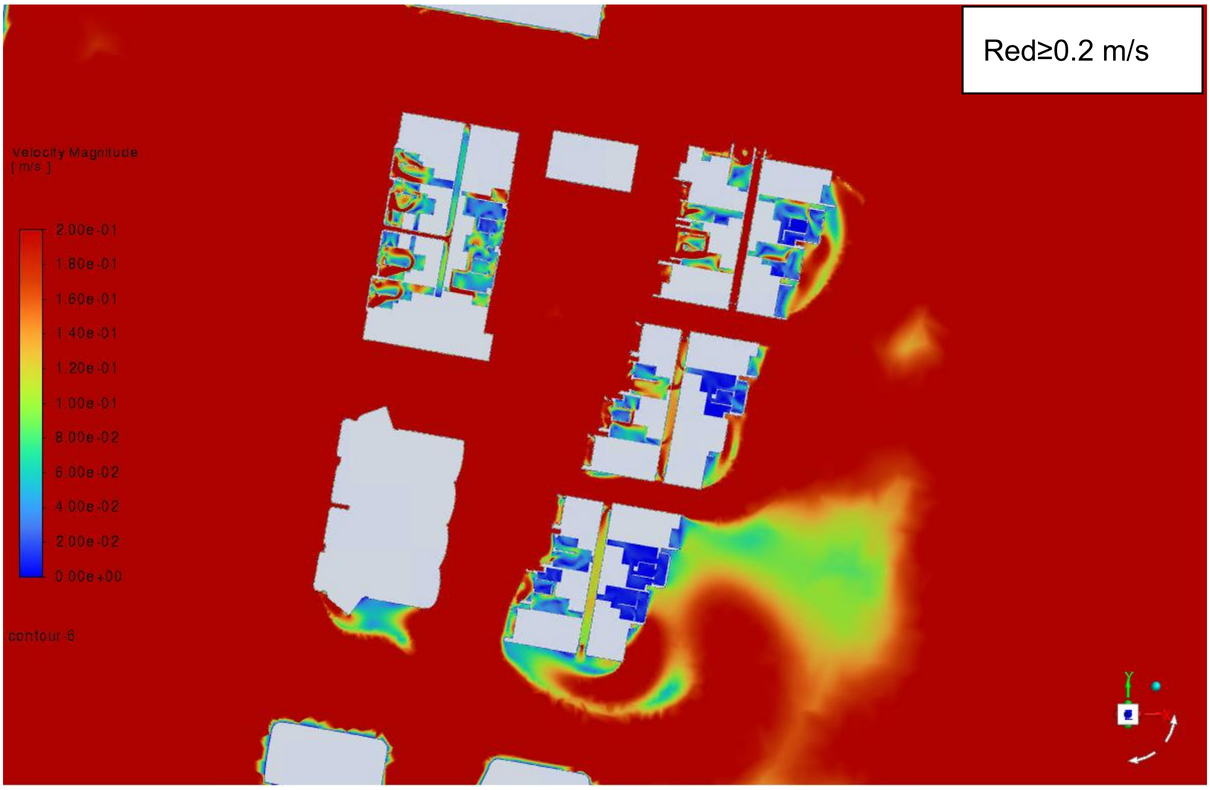


Level 4

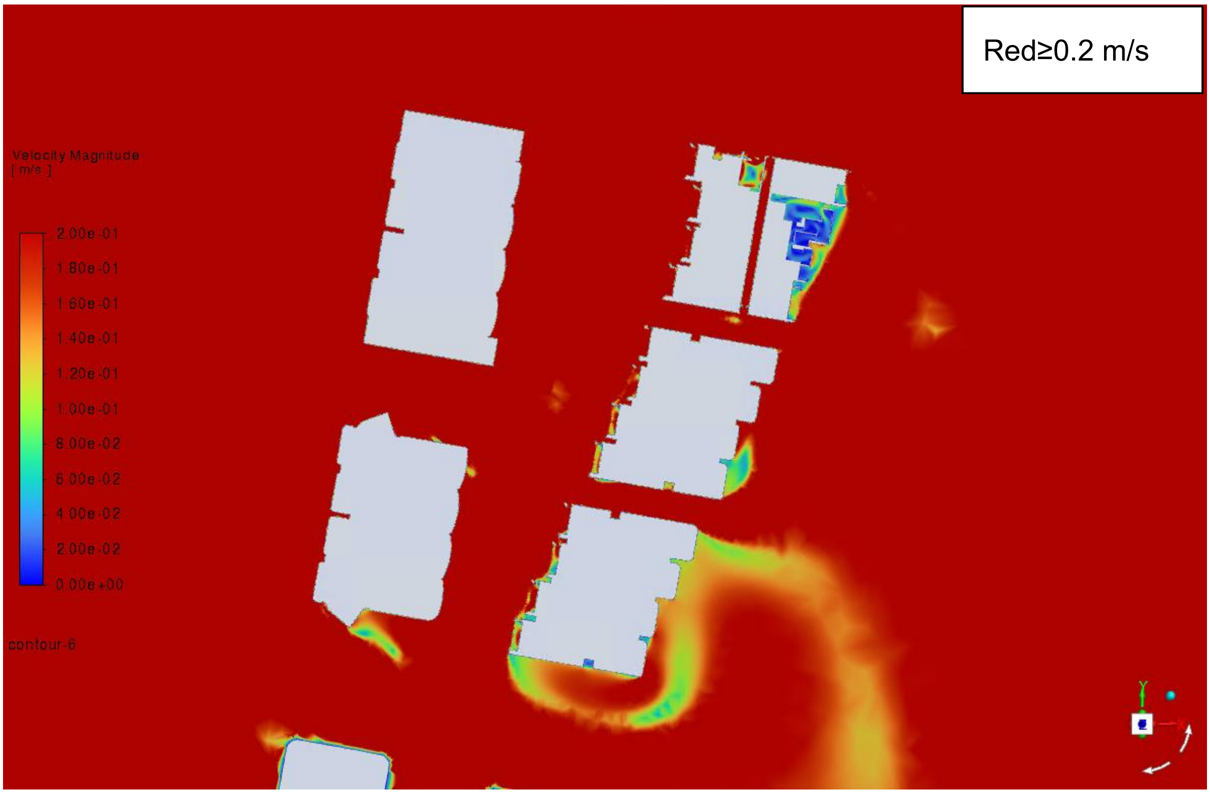


Building E

Level 1



Level 4



Appendix B Passing Methods

Building A			
Level	Unit	Results	Method
G	AG01	Fail	
	AG02	Fail	
	AG03	Pass	ADG
	AG04	Pass	ADG
	AG05	Fail	
	AG06	Fail	
	AG07	Fail	
	AG08	Fail	
	AG09	Pass	ADG
	AG10	Pass	ADG
	AG11	Fail	
1	A101	Fail	
	A102	Fail	
	A103	Pass	ADG
	A104	Pass	ADG
	A105	Fail	
	A106	Fail	
	A107	Fail	
	A108	Fail	
	A109	Pass	ADG
	A110	Pass	ADG
	A111	Fail	
2	A201	Fail	
	A202	Fail	
	A203	Fail	
	A204	Pass	ADG
	A205	Pass	ADG
	A206	Fail	
	A207	Fail	
	A208	Fail	
	A209	Fail	
	A210	Pass	ADG
	A211	Pass	ADG
	A212	Fail	
	A213	Fail	
3	A301	Fail	
	A302	Fail	
	A303	Fail	
	A304	Pass	ADG
	A305	Pass	ADG
	A306	Fail	
	A307	Fail	
	A308	Fail	
	A309	Fail	
	A310	Pass	ADG
	A311	Pass	ADG
	A312	Fail	
	A313	Fail	
4	A401	Fail	
	A402	Fail	
	A403	Pass	ADG
	A404	Pass	ADG
	A405	Fail	
	A406	Fail	
	A407	Pass	ADG
	A408	Pass	ADG
	A409	Fail	
5	A501	Fail	
	A502	Fail	
	A503	Pass	ADG
	A504	Pass	ADG
	A505	Fail	
	A506	Fail	
	A507	Pass	ADG
	A508	Pass	ADG
	A509	Fail	
6	A601	Fail	
	A602	Fail	
	A603	Pass	ADG
	A604	Pass	ADG
	A605	Fail	
	A606	Fail	
	A607	Pass	ADG
	A608	Pass	ADG
	A609	Fail	
7	A701	Fail	
	A702	Fail	

Building B			
Level	Unit	Results	Method
LG	BLG01	Fail	
	BLG02	Fail	
	BLG03	Pass	ADG
G	BG01	Pass	ADG
	BG02	Fail	
	BG03	Fail	
	BG04	Fail	
	BG05	Fail	
	BG06	Pass	ADG
	BG07	Pass	ADG
	BG08	Fail	
	BG09	Fail	
1	B101	Fail	
	B102	Fail	
	B103	Pass	ADG
	B104	Pass	ADG
	B105	Fail	
	B106	Fail	
	B107	Fail	
	B108	Fail	
	B109	Fail	
	B110	Fail	
	B111	Pass	ADG
	B112	Pass	ADG
	B113	Fail	
2	B201	Fail	
	B202	Fail	
	B203	Fail	
	B204	Pass	ADG
	B205	Pass	ADG
	B206	Fail	
	B207	Fail	
	B208	Fail	
	B209	Fail	
	B210	Fail	
	B211	Pass	ADG
	B212	Pass	ADG
	B213	Fail	
	B214	Fail	
	B215	Fail	
3	B301	Fail	
	B302	Fail	
	B303	Fail	
	B304	Pass	ADG
	B305	Pass	ADG
	B306	Fail	
	B307	Fail	
	B308	Fail	
	B309	Fail	
	B310	Fail	
	B311	Pass	ADG
	B312	Pass	ADG
	B313	Fail	
	B314	Fail	
	B315	Fail	
4	B401	Fail	
	B402	Fail	
	B403	Pass	ADG
	B404	Pass	ADG
	B405	Fail	
	B406	Fail	
	B407	Pass	ADG
	B408	Pass	ADG
	B409	Fail	
	B410	Fail	
5	B501	Fail	
	B502	Fail	
	B503	Pass	ADG
	B504	Pass	ADG
	B505	Fail	
	B506	Fail	
	B507	Pass	ADG
	B508	Pass	ADG
	B509	Fail	
	B510	Fail	
6	B601	Fail	
	B602	Fail	

Building C			
Level	Unit	Results	Method
G	CG01	Fail	
	CG02	Fail	
UG	CUG05	Fail	
	CUG06	Pass	ADG
	CUG01	Fail	
	CUG02	Pass	ADG
	CUG03	Pass	ADG
	CUG04	Fail	
	CUG07	Pass	ADG
	CUG08	Fail	
1	C101	Pass	CFD
	C102	Pass	ADG
	C103	Pass	ADG
	C104	Fail	
	C105	Pass	CFD
	C106	Pass	ADG
	C107	Pass	ADG
	C108	Pass	CFD
2	C201	Pass	CFD
	C202	Pass	ADG
	C203	Pass	ADG
	C204	Fail	
	C205	Pass	CFD
	C206	Pass	ADG
	C207	Pass	ADG
	C208	Pass	CFD
3	C301	Pass	CFD
	C302	Pass	ADG
	C303	Pass	ADG
	C304	Fail	
	C305	Pass	CFD
	C306	Pass	ADG
	C307	Pass	ADG
	C308	Pass	CFD
4	C401	Pass	CFD
	C402	Pass	ADG
	C403	Pass	ADG
	C404	Fail	
	C405	Pass	CFD
	C406	Pass	ADG
	C407	Pass	ADG
	C408	Pass	CFD
5	C501	Pass	CFD
	C502	Pass	ADG
	C503	Pass	ADG
	C504	Fail	
	C505	Pass	ADG
	C506	Pass	ADG
	C507	Pass	CFD
6	C601	Pass	CFD
	C602	Pass	ADG
	C603	Pass	ADG
	C604	Fail	
	C605	Pass	ADG
	C606	Pass	ADG
	C607	Pass	CFD
7	C701	Pass	CFD
	C702	Pass	ADG
	C703	Pass	ADG
	C704	Fail	
	C705	Pass	ADG
	C706	Pass	ADG
	C707	Pass	CFD

Total Units	63
Passing Units	50
Percentage	0.793651

Building D			
Level	Unit	Results	Method
G	DG01	Fail	
	DG02	Fail	
	DG03	Fail	
	DG04	Pass	ADG
UG	DUG01	Fail	
	DUG02	Pass	ADG
	DUG03	Fail	
	DUG04	Fail	
	DUG05	Pass	ADG
	DUG06	Pass	ADG
	DUG07	Fail	
1	D101	Fail	
	D102	Pass	ADG
	D103	Fail	
	D104	Pass	CFD
	D105	Pass	ADG
	D106	Pass	ADG
	D107	Fail	
2	D201	Pass	CFD
	D202	Pass	ADG
	D203	Pass	ADG
	D204	Fail	
	D205	Pass	CFD
	D206	Pass	ADG
	D207	Pass	ADG
	D208	Pass	CFD
3	D301	Pass	CFD
	D302	Pass	ADG
	D303	Pass	ADG
	D304	Fail	
	D305	Pass	ADG
	D306	Pass	ADG
	D307	Pass	CFD
4	D401	Pass	CFD
	D402	Pass	ADG
	D403	Pass	ADG
	D404	Pass	CFD
	D405	Pass	ADG
	D406	Pass	ADG
	D407	Pass	CFD
5	D501	Pass	CFD
	D502	Pass	ADG
	D503	Pass	ADG
	D504	Pass	CFD
	D505	Pass	ADG
	D506	Pass	ADG
	D507	Pass	CFD
6	D601	Pass	CFD
	D602	Pass	ADG
	D603	Pass	ADG
	D604	Fail	
	D605	Pass	CFD
	D606	Pass	ADG
	D607	Pass	ADG
	D608	Pass	CFD

Total Units	55
Passing Units	42
Percentage	0.763636

Building E			
Level	Unit	Results	Method
G	EG01	Pass	ADG
	EG02	Fail	
	EG03	Fail	
	EG04	Pass	ADG
UG	EUG01	Fail	
	EUG02	Fail	
	EUG03	Pass	ADG
	EUG04	Fail	
	EUG05	Fail	
	EUG06	Pass	ADG
	EUG07	Pass	ADG
	EUG08	Fail	
1	E101	Pass	CFD
	E102	Pass	ADG
	E103	Pass	CFD
	E104	Pass	ADG
	E105	Pass	CFD
	E106	Pass	CFD
	E107	Pass	ADG
	E108	Pass	ADG
	E109	Pass	CFD
2	E201	Pass	CFD
	E202	Pass	ADG
	E203	Pass	CFD
	E204	Pass	ADG
	E205	Pass	CFD
	E206	Pass	CFD
	E207	Pass	ADG
	E208	Pass	ADG
	E209	Pass	CFD
3	E301	Pass	CFD
	E302	Pass	ADG
	E303	Pass	CFD
	E304	Pass	ADG
	E305	Pass	CFD
	E306	Pass	CFD
	E307	Pass	ADG
	E308	Pass	ADG
	E309	Pass	CFD
4	E401	Pass	CFD
	E402	Pass	ADG
	E403	Pass	CFD
	E404	Pass	ADG
	E405	Pass	CFD
	E406	Pass	ADG
	E408	Pass	ADG
	E409	Pass	CFD
5	E501	Pass	CFD
	E502	Pass	ADG
	E503	Pass	CFD
	E504	Pass	ADG
	E505	Pass	CFD
	E506	Pass	ADG
	E507	Pass	ADG
	E508	Pass	CFD
6	E601	Pass	CFD
	E602	Pass	ADG
	E603	Pass	CFD
	E604	Pass	ADG
	E605	Pass	CFD
	E606	Pass	ADG
	E607	Pass	ADG
	E608	Pass	CFD
7	E701	Pass	CFD
	E702	Pass	ADG
	E703	Pass	CFD
	E704	Pass	ADG
	E705	Pass	CFD
	E706	Pass	ADG
	E707	Pass	ADG
	E708	Pass	CFD

Total Units	71
Passing Units	64
Percentage	0.901408

Terrace Building 1			
Level	Unit	Results	Method
T	T01	Pass	ADG
	T02	Pass	ADG
	T03	Pass	ADG

Total Units	3
Passing Units	3
Percentage	1

Terrace Building 1			
Level	Unit	Results	Method
T	T01	Pass	ADG
	T02	Pass	ADG
	T03	Pass	ADG
	T04	Pass	ADG
	T05	Pass	ADG
	T06	Pass	ADG

Total Units	6
Passing Units	6
Percentage	1

Total Units	386
Passing Units	233
Total Percentage	60.4%

	A703	Pass	ADG
	A704	Pass	ADG
	A705	Fail	
	A706	Fail	
	A707	Pass	ADG
	A708	Pass	ADG
	A709	Fail	
8	A801	Fail	
	A802	Fail	
	A803	Pass	ADG
	A804	Pass	ADG
	A805	Fail	
	A806	Fail	
	A807	Pass	ADG
	A808	Pass	ADG
	A809	Fail	
Total Units	93		
Passing Units	36		
Percentage	0.387096774		

	B603	Pass	ADG
	B604	Pass	ADG
	B605	Fail	
	B606	Fail	
	B607	Pass	ADG
	B608	Pass	ADG
	B609	Fail	
	B610	Fail	
7	B701	Fail	
	B702	Fail	
	B703	Pass	ADG
	B704	Pass	ADG
	B705	Fail	
	B706	Fail	
	B707	Pass	ADG
	B708	Pass	ADG
	B709	Fail	
	B710	Fail	
Total Units	95		
Passing Units	32		
Percentage	0.336842		

Making Sustainability Happen