



**Client:** Salford Royal NHS Foundation Trust

**Title:** Indoor Air Quality Monitoring –  
6th Floor, 1 City Approach Building

**Report No.:** 9629917 v2.0



## Indoor Air Quality Monitoring 6th Floor, 1 City Approach Building

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## 1. Executive Summary

- 1.1. Bureau Veritas UK Ltd undertook an indoor air quality assessment on the 6<sup>th</sup> Floor of the 1 City Approach Building leased by Salford Royal NHS Foundation Trust, Eccles on 17<sup>th</sup> September – 13<sup>th</sup> October 2020. The aim of the exercise was to evaluate indoor air quality parameters at four (4) static locations within the 6<sup>th</sup> Floor office and to assess the current means of fresh-air (outside air) provision.
- 1.2. Table 1 below provides a summary of indoor air quality (IAQ) results (data set obtained across all four units for the duration of the monitoring period) obtained from direct reading instrumentation during the assessment:

Table 1: Summary of IAQ Parameters at Salford Royal NHS Foundation Trust, 1 City Approach				
Parameter	Reference Value(s)	Minimum	Maximum	Average
Particulate Matter (PM10)	40 µg/m <sup>3</sup> [0.04 mg/m <sup>3</sup> ] (UK National Objectives & European Directive Limit)	0 mg/m <sup>3</sup>	2.7 mg/m <sup>3</sup>	0.003 mg/m <sup>3</sup>
Carbon Dioxide (CO <sub>2</sub> )	800 ppm – 1000 ppm (CIBSE Guidance)	180 ppm	1165 ppm	455 ppm
Carbon Monoxide (CO)	10 ppm (Building Regulations 2010 Part F)	0 ppm	3 ppm	0 ppm
Total Volatile Organic Compounds (TVOC) (Weeks 3 & 4 only)	300 µg/m <sup>3</sup> (~0.08 ppm)	0.006 ppm	0.027 ppm	0.017 ppm
Temperature (Winter)	21°C – 23°C (CIBSE Guidance)	19.2 °C	27.6 °C	22.0 °C
Relative Humidity	40% – 70% (CIBSE Guidance)	23.4 %	58.5 %	40.9 %

**Key:**

Definition
Outside Guidance Value(s)
Within Guidance Value(s)

- 1.3. Table 2 provides an overview of the recommended maximum occupancy levels based on extract airflow volumes data only.

Note: 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> Floor have been included for information purposes.

Table 2: Summary of Ventilation Data at Salford Royal NHS Foundation Trust, 1 City Approach				
Floor	Reference Value(s)	Total Extract Volume (l/s)	Recommended Maximum Occupancy Level	Current Occupancy Level
6 <sup>th</sup> Floor	10 l/s/p (litres per second per person)	175	17	21
7 <sup>th</sup> Floor (excl. Meeting Rooms)		57	5	5
8 <sup>th</sup> Floor		235	23	20

Note: see Section 3.3 for detail regarding estimation of fresh-air supply.

- 1.4. Based on the results and observations made during this monitoring investigation it is concluded that the current occupancy levels on the 6<sup>th</sup> Floor exceed the recommended maximum occupancy levels.
- 1.5. Several recommendations to improve control have been included in Section 8 for consideration.

## 2. Scope of Works

- 2.1. Works were undertaken in accordance with Bureau Veritas Proposal Reference UK.3912172.
- 2.2. Table 3 outlines the scope of work.

Table 3: Scope of Work		
Location	Measurement Type	Sample Detail
6 <sup>th</sup> Floor Office Area	Indoor Air Quality - Particulate Matter (PM10) - Carbon Dioxide (CO <sub>2</sub> ) - Carbon Monoxide (CO) - Temperature - Humidity	4 x Static Monitoring Positions
	Total Volatile Organic Compounds	4 x Static Monitoring Positions
	Quantification of Extract Volumes	4 x Extraction Grilles
7 <sup>th</sup> Floor Office Area	Quantification of Extract Volumes	6 x Extraction Grilles
8 <sup>th</sup> Floor Office Area	Quantification of Extract Volumes	4 x Extraction Grilles

- 2.3. The data produced by the survey is intended to assist Salford Royal NHS Foundation Trust in completing the risk assessments required under Regulation 3 of the Management of Health and Safety at Work Regulations 1999, and allow building facilities management to make informed judgements regarding the indoor air quality of the building.
- 2.4. The results, observations and conclusions made in this report pertain to the prevailing conditions at the time of the survey and should not be extrapolated to estimate potential exposures under other conditions.

### 3. Sampling Methodology

- 3.1. Sampling was performed in accordance with the Health & Safety Executive Guidance, HS(G)173 “Monitoring strategies for toxic substances”.
- 3.2. Indoor air quality (IAQ) parameters were determined using 3M EVM-7 Direct Reading Monitoring Data Loggers set at an approximate height of 1.5m from the finished floor level. The Data Loggers were left in-situ for a period of four (4) weeks.
- 3.3. Airflow volume measurements were directly measured using an Airflow Instruments PH-731 Balometer at ceiling-mounted extract grilles of all Salford Royal NHS Foundation Trust occupied spaces within the 1 City Approach Building (6<sup>th</sup> Floor, 7<sup>th</sup> Floor and 8<sup>th</sup> Floor).

Note: due to the wall-mounted Fan Coil Unit arrangement/configurations which are located in close proximity to fresh-air inlet vents this results in no hard duct connection between the Fan Coil Unit and fresh-air inlet. The resultant effect of this arrangement is that the fresh-air supply into the premises is variable and will be affected by wind direction/speed. As the extraction volume flowrate is relatively constant, the extraction volumes have been used to estimate minimum fresh-air supply into the premises in this instance – as on the day of the assessment all three (3) office spaces were at positive pressure in relation to the adjacent Lift Foyer. A visual qualitative assessment of each Fan Coil Unit and passive ventilation grille was also undertaken.

- 3.4. Total Volatile Organic Compound concentrations were established by means of passive Tenax desorption tubes exposed at each monitoring station during weeks 3 and 4 of the monitoring exercise.
- 3.5. Table 4 highlights the direct measurement equipment used.

Table 4: Equipment used				
Parameter	Make	Model	Serial Number	Calibration Date
Indoor Air Quality - Particulate Matter - Carbon Dioxide - Carbon Monoxide - Temperature - Relative Humidity	3M	EVM-7	EMP010009	07 September 2020
	3M	EVM-7	EMK030013	17 July 2020
	3M	EVM-7	EMQ060006	01 September 2020
	3M	EVM-7	EMK080009	17 July 2020
Airflow Measurement	Airflow Instruments	PH-731	PH7312031005	16 September 2020

## 4. Indoor Air Quality Standards

4.1. Table 5 shows the Indoor Air Quality parameters and associated guidance.

Table 5: Indoor Air Quality Parameters and Guidance		
Parameter	Value	Comments
Fresh-air	10 l/s/p (litres per second per person)	The Building Regulations 2010 Part F – Ventilation (Department of the Environment)
	5 – 8 l/s/p (litres per second per person)	Workplace (Health, Safety and Welfare) Regulations 1992
Particulate Matter (PM10)	40 µg/m <sup>3</sup>	UK National Air Quality Objectives and European Directive Limit and Target Values for the Protection of Human health.
Carbon Dioxide (CO <sub>2</sub> )	800 ppm – 1000 ppm	CIBSE Guidance
Carbon Monoxide (CO)	10 ppm	The Building Regulations 2010 Part F – Ventilation (Department of the Environment)
Total Volatile Organic Compounds (TVOCs)	300 µg/m <sup>3</sup> (~0.08 ppm)	The Building Regulations 2010 Part F – Ventilation (Department of the Environment)
Temperature	21°C - 23°C	CIBSE Winter Range Guidance
	22°C - 22°C	CIBSE Summer Range Guidance
Relative Humidity	40% - 70%	CIBSE Ideal Conditions Guidance

4.1. Guidance has also been produced by several institutes/associations regarding the provision of ventilation, and in particular fresh-air (outside air) supply, in mitigating the potential transmission of airborne COVID-19 (SARS-CoV-2) virus by means of dilution ventilation, in combination with other control measures (i.e. social distancing, cleaning, hygiene).

4.2. The following guidance has been reviewed and referenced within this report where deemed appropriate to assist in the overall impact and assessment of the current ventilation configurations observed.

- The Chartered Institute of Building Services Engineers (CIBSE) – *COVID-19 Ventilation Guidance Version 3* (15 July 2020);
- The Chartered Institute of Building Services Engineers (CIBSE) – *Guide A Environmental Design* (2015);
- The Chartered Institute of Building Services Engineers (CIBSE) – *Guide B2 Ventilation and Ductwork* (2016);
- The Chartered Institute of Building Services Engineers (CIBSE) – *AM10 Natural Ventilation in Non-Domestic Buildings* (2005);
- The Chartered Institute of Building Services Engineers (CIBSE) – *AM13 Mixed Mode* (2000);
- Federation of European Heating, Ventilation and Air Conditioning Associations (REHVA) – *COVID-19 Guidance Document* (3 August 2020);
- American Conference of Governmental Industrial Hygienists (ACGIH) – *White Paper on Ventilation for Industrial Settings during the COVID-19 Pandemic* (August 2020).

- 4.3. CIBSE reference a carbon dioxide (CO<sub>2</sub>) value of 1000 ppm to indicate if sufficient ventilation is in place, and is normally indicative of an outdoor air supply of 8-10 litres per second per person. CIBSE also references an overall suggested outdoor air supply ventilation rate of 10 litres per second per person for offices and factories (for heavy, light or sedentary works) unless specified for the industrial processes being undertaken (CIBSE Guide A Table 2.5).
- 4.4. CIBSE also reference the following “if there is no obvious ventilation strategy in a room/zone then building users should be discouraged from using these spaces. If they are used only transiently e.g. stairwells, corridors, then more robust cleaning regimes for these locations should be implemented”.
- 4.5. In addition REHVA also references a CO<sub>2</sub> value of 1000 ppm when considering Indoor Air Quality (IAQ) monitoring for areas/buildings which either have no dedicated ventilation system or ventilation control requires manual input from occupants, “*during an epidemic it is recommended to temporarily change the default settings of the traffic light indicator so that the yellow/orange light (or warning) is set to **800 ppm** and the red light (or alarm) up to **1000 ppm** in order to trigger prompt action to achieve sufficient ventilation even in situations with reduced occupancy*”.



## 5. Process and Observations

- 5.1. Salford Royal NHS Foundation Trust leases three (3) floors in the 1 City Approach Building situated on Albert Street, Eccles. The 6<sup>th</sup> Floor was deemed the most occupied of the three (3) floors, with data logging monitoring restricted to this floor.
- 5.2. Four (4) EVM-7 Direct Reading Data Loggers were positioned in each corner of the 6<sup>th</sup> Floor office and set to log in-situ for a period of four (4) weeks.
- 5.3. **Currently** fresh-air supply into each floor of the Building is provided by means of six (6) passive ventilation grilles installed on each façade of the building (North, East, South and West), resulting in a total of twenty four (24) passive ventilation grilles per floor. Multiple heating/cooling Fan Coil Units are also installed around the perimeter of each floor of the building to provide localised temperature control and in general these units are located in close proximity to the passive ventilation grilles. However, due to there being no hard duct connection from the passive ventilation grilles to the air inlet of the Fan Coil Unit this results in their being no constant direct forced fresh-air ventilation being provided.

Note: due to the wall-mounted Fan Coil Unit arrangement/configurations which are located in close proximity to fresh-air inlet vents this results in no hard duct connection between the Fan Coil Unit and fresh-air inlet. The resultant effect of this arrangement is that the fresh-air supply into the premises is variable and will be affected by wind direction/speed. **As the extraction volume flowrate is relatively constant, the extraction volumes have been used to estimate minimum fresh-air supply into the premises in this instance – on the day of the assessment all three (3) office spaces (6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> Floors) were at positive pressure in relation to the adjacent Lift Foyer. A visual qualitative assessment of each Fan Coil Unit and passive ventilation grille was also undertaken.**

- 5.4. For the purposes of this assessment all Fan Coil Units were not adjusted from as-found conditions due to the preference of occupants in close proximity to each unit for heating/cooling as required. However, several Fan Coil Units also were noted to not be operational (see Section 5.8).
- 5.5. Room air is drawn in at the bottom of the Fan Coil Units, through the coils to be heated or cooled, before being recirculated back into the office environment. Each Fan Coil Unit is under manual control with no defined temperature setting. The Fan Coil Unit airflow and temperature performance are controlled via two local potentiometers on the control unit (accessible from the top). The LHS potentiometer controls the fan speed through five (5) speed settings (Ultra Low, Extra Low, Low, Medium or High). The RHS potentiometer controls the temperature with set points ranging from -3 to +3.
- 5.6. Four (4) ceiling-mounted extraction grilles are installed above each walkway in the middle of the 6<sup>th</sup> Floor and 8<sup>th</sup> Floor.
- 5.7. On the 7<sup>th</sup> Floor one (1) central extraction grille is installed, with individual extraction grilles installed in each of the five (5) Meeting Rooms. At the time of monitoring the partition between Meeting Rooms 1 and 2 was removed, resulting in one (1) large meeting room with two (2) extraction grilles.
- 5.8. On the 6<sup>th</sup> Floor six (6) **of the twenty four (24)** fresh-air passive ventilations grilles were observed to be physically restricted, obstructed and/or blocked resulting in a reduced fresh-air supply potential. In addition, several Fan Coil Units were not operational (fans did not operate in any mode). It was observed the previous service date indicated on the majority of Fan Coil Units was June 2018, which is deemed to be the most recent maintenance/service check (undertaken by George Birchall Services Limited) in lieu of any further information available.
- 5.9. Building Management System (BMS) sensors provide information to the Plant Room (situated on the roof of the 1 City Approach Building) to provide heated and cooled water to each of the Fan Coil Units. Extract ventilation from the occupied spaces is also served by a dedicated extraction system located in the Plant Room.
- 5.10. Occupancy levels through all three (3) floors were restricted to approximately 25% of maximum capacity during the COVID-19 pandemic, as follows:
  - 6<sup>th</sup> Floor = 21 occupants (84 workstations)
  - 7<sup>th</sup> Floor = 5 occupants in Main Office Area (20 workstations)
  - 8<sup>th</sup> Floor = 20 occupants (82 workstations)
- 5.11. Figures 1 to 17 are provided below reference purposes.

1 City Approach



**Figure 1:** South elevation to 1 City Approach showing five (5) of the twenty four (24) passive ventilation grilles on the 6<sup>th</sup> Floor.



1 City Approach



**Figure 2:** Fan Coil Unit with external cover installed.



**Figure 3:** Fan Coil Unit with external cover removed showing motor units.



**Figure 4:** Fan Coil Unit control potentiometers.



**Figure 5:** Wall cover removed showing Fan Coil Unit from the side.



**Figure 6:** Blocked passive fresh-air vent.



**Figure 7:** Restricted passive fresh-air vent (dampers in closed position).



**Figure 8:** Obstructed passive fresh-air vent due to location of Fan Coil Unit.



**Figure 9:** Restricted/obstructed passive fresh-air vent/

1 City Approach



Figure 10: Plant Room control panel.



Figure 11: Zone Pumps.



Figure 12: Ceiling-mounted extract grilles.



Figure 13: Exhaust duct termination point (Plant Room roof).

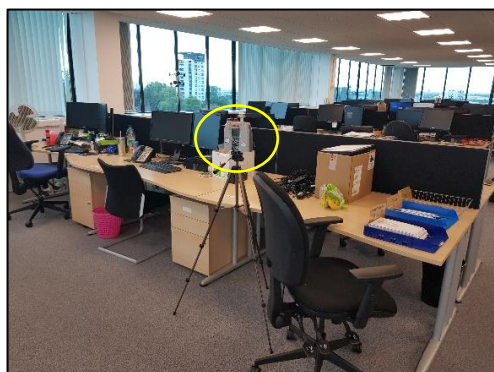


Figure 14: Data Logger EVM-7 EMK080009 at Desk 649 (NE Corner).



Figure 15: Data Logger EVM-7 EMQ060006 at Desk 622 (NW Corner).

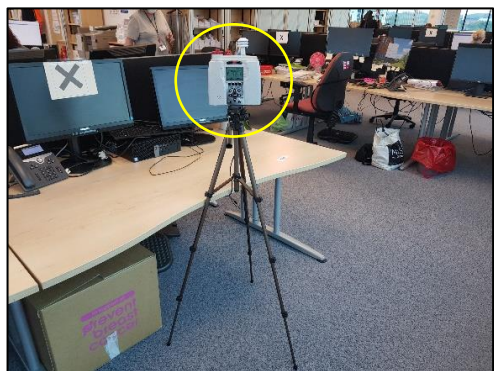


Figure 16: Data Logger EVM-7 EMP010009 at Desk 603 (SW Corner).

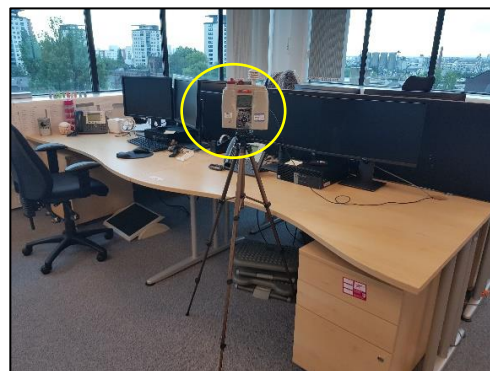


Figure 17: Data Logger EVM-7 EMK030013 at Desk 665 (SE Corner).

## 6. Results Summary

6.1. IAQ data logging was performed at the following locations:

- 6<sup>th</sup> Floor
  - a. North East Corner (Desk 649)
  - b. North West Corner (Desk 622)
  - c. South West Corner (Desk 603)
  - d. South East Corner (Desk 665)

6.2. Table 6 on page 12 provides a summary of all indoor air quality monitoring results.

6.3. Table 7 on page 13 provides a summary of ventilation data obtained and recommended occupancy levels.

Note: A full set of tabulated results from this monitoring exercise are provided in Appendix 1 with IAQ Exposure Graphs provided in Appendix 2. A plan of sampling locations are provided in Appendix 3. Results of the ventilation assessment are provided in Appendix 4. Analytical laboratory results are provided in Appendix 5. Met Office meteorological data is provided in Appendix 6.



**Table 6: Indoor Air Quality Parameter Results at Salford Royal NHS Foundation Trust, 1 City Approach**

Area	Dates	Particulate Matter (PM10)			Carbon Dioxide (CO <sub>2</sub> )			Carbon Monoxide (CO)			Temperature			Relative Humidity			Total Volatile Organic Compounds	
		mg/m <sup>3</sup>			ppm			ppm			°C			%			ppm	
		Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave		
North East Corner - Desk 649	Week 1	0	0.146	0.002	325	975	457	0	1	0	20.3	24.9	22.4	38.6	54.1	45.1	-	
	Week 2	0	0.194	0.002	330	955	431	0	1	0	20.5	24.0	22.0	26.6	51.6	36.4		
	Week 3	0	0.132	0.001	315	620	397	0	1	0	20.6	24.1	22.4	33.2	52.5	43.9		0.017
	Week 4	0	0.174	0.001	340	680	412	0	1	0	21.4	25.9	23.0	31.2	51.9	37.8		
North West Corner - Desk 622	Week 1	0	0.135	0.001	195	915	334	0	0	0	19.2	27.6	21.8	32.4	54.3	43.6	-	
	Week 2	0	0.170	0.001	190	980	305	0	1	0	19.2	25.0	21.2	27.5	50.3	35.7		
	Week 3	0	0.137	0.001	180	595	278	0	1	0	19.2	22.8	21.2	33.1	52.2	44.0		0.018
	Week 4	0	0.156	0.001	200	570	284	0	3	1	20.0	25.4	21.8	30.9	51.6	37.8		
South West Corner - Desk 603	Week 1	0	0.146	0.002	425	1165	566	0	0	0	20.4	27.0	23.1	32.7	49.5	40.5	-	
	Week 2	0	1.457	0.003	415	1155	541	0	0	0	19.9	27.1	22.1	23.4	48.2	33.7		
	Week 3	0	0.925	0.002	315	800	531	0	0	0	20.2	25.3	21.8	33.1	49.7	42.5		0.027
	Week 4	0	2.664	0.003	430	870	539	0	0	0	20.1	27.5	22.1	25.6	50.4	37.2		
South East Corner - Desk 665	Week 1	0	0.156	0.007	435	1115	582	0	1	0	19.3	25.4	21.6	40.2	58.5	48.6	-	
	Week 2	0	0.222	0.007	435	1060	554	0	0	0	19.3	24.5	21.3	28.9	54.9	39.7		
	Week 3	0	0.185	0.005	430	810	528	0	0	0	19.7	24.2	21.6	36.9	56.6	47.5		0.006
	Week 4	0	0.192	0.004	455	785	546	0	0	0	20.3	25.7	22.1	33.6	55.0	41.4		
Guidance Values		0.04 mg/m <sup>3</sup> (PM10)			800 ppm – 1000 ppm			10 ppm			21°C - 23°C (Winter)			40% - 70%			300 µg/m <sup>3</sup> (~0.08 ppm)	

**Key**

Definition
Outside Guidance Value(s)
Within Guidance Value(s)

**Table 7: Ventilation Data Summary at Salford Royal NHS Foundation Trust, 1 City Approach**

Floor	Location	Grille ID	Total Number of Workstations	Theoretical Occupancy Level at 25%	Extract Volume	Total Extract Volume	Recommended Fresh-Air Provision	Recommended Occupancy Level
					l/s	l/s	l/s/person	
6 <sup>th</sup> Floor	North	6-1	84	21	50	175	10	17
	East	6-2			38			
	South	6-3			45			
	West	6-4			42			
7 <sup>th</sup> Floor	Meeting Room 1 & 2	7-1	-	-	13	26	10	2
		7-2			13			1
	Meeting Room 3	7-3	-	-	13	13		1
	Meeting Room 4	7-4	-	-	15	15		1
	Meeting Room 5	7-5	-	-	22	22		2
	Main Room	7-6	20	5	57	57		5
8 <sup>th</sup> Floor	North	8-1	82	20	68	235	10	23
	East	8-2			58			
	South	8-3			55			
	West	8-4			54			

**Key**

Result	Definition
Yellow	Theoretical 25% Occupancy Level exceeds Recommended Level
Green	Theoretical 25% Occupancy Level at or below Recommended Level

## 7. Discussion and Conclusions

### Indoor Air Quality Parameters

- 7.1. Average PM10 levels ranged from 0.001 mg/m<sup>3</sup> to 0.007 mg/m<sup>3</sup> for the duration of the monitoring period. The highest peak levels were recorded at the South West corner monitoring station (0.15 mg/m<sup>3</sup> to 2.66 mg/m<sup>3</sup>). However, peak PM10 concentrations are expected due to local occupancy transit routes and natural movement of occupants throughout workspaces and are not deemed a significant concern.

### Carbon Dioxide

- 7.2. Average Carbon Dioxide (CO<sub>2</sub>) levels ranged from 278 ppm to 582 ppm. However, peak concentrations in excess of the 800 ppm guidance value were recorded at each monitoring station at some point during the monitoring exercise. CO<sub>2</sub> levels are dependent on occupancy levels and the provision of fresh-air (either forced or passive).
- 7.3. Based on third party meteorological data, wind speeds on the 21<sup>st</sup>, 22<sup>nd</sup>, 23<sup>rd</sup> and 26<sup>th</sup> of September 2020 were lower than on other days monitored. A marked increase in CO<sub>2</sub> levels was recorded on these days which provides some evidence that the indoor air quality, and in particular the dilution of CO<sub>2</sub>, within the occupied areas are dependent on natural wind conditions to force fresh-air (outside air) into the office environment.

### Carbon Monoxide

- 7.4. Maximum Carbon Monoxide (CO) levels of 3 ppm were detected during the monitoring period (North West corner) and are deemed acceptable.

### Temperature

- 7.5. Average temperature levels ranged from 21.2°C to 23.1°C during the monitoring period. Minimum and maximum temperature levels were between 19.2°C and 27.6°C, which are indicative of a lack of uniform control. However, this is to be expected due to the local control of the installed Fan Coil Units.

### Relative Humidity

- 7.6. Average humidity levels ranged from 23.4% to 58.5%, at an average of 40.9%.

### Total Volatile Organic Compounds

- 7.7. Total Volatile Organic Compound levels ranged from 0.006 ppm to 0.027 ppm during weeks 3 and 4 of the monitoring period, and are deemed acceptable.

### Recommended Occupancy Levels

- 7.8. Recommended maximum occupancy levels, based on Extract Airflow volumes, were calculated as follows.
- 6<sup>th</sup> Floor : 17
  - 7<sup>th</sup> Floor : 5
  - 8<sup>th</sup> Floor : 23
- 7.9. Occupancy levels for Meeting Rooms on the 7<sup>th</sup> Floor are calculated to be one (1) occupant each for Rooms 3 and 4. In rooms 1 and 2, with the partition removed, a maximum occupancy level of 2 is recommended. Meeting Room 5 is recommended to host a maximum of five (5) occupants.



## Conclusions

- 7.10. Based on the results and observations made during this monitoring investigation it is concluded that current occupancy levels on the 6<sup>th</sup> Floor exceed the recommended maximum occupancy levels, based on fresh-air provision being provided at a constant volume flowrate via the extract system.
- 7.11. Several recommendations to improve control will be included in Section 8 of the final report for consideration.

## 8. Recommendations

- 8.1. Operatives must be informed of the results of this assessment, which should be filed with the risk assessments for the respective departments.
- 8.2. It is recommended the design of the current ventilation configuration is verified as being suitable to facilitate the number of desired occupants with regards to fresh-air provision. Fresh-air supply should not normally fall below 5 to 8 litres per second person, and ideally should be provided at 10 litres per second per person. Currently fresh-air provision is variable and reliant on wind speed/direction.
- 8.3. It is recommended that all restricted, obstructed and / or blocked passive fresh-air ventilation inlet grilles are assessed and remedial works undertaken to ensure unobstructed/unrestricted passive fresh-air ventilation can occur through all passive vents installed **where necessary**.
- 8.4. It is recommended all Fan Coil Units are serviced and maintained appropriately on a routine basis.
- 8.5. Where possible it is recommended that all Fan Coil Units are placed under centralised control in order to unify temperature control throughout the occupied areas.
- 8.6. Consideration should be given to repeating the assessment following the completed actions referenced above.

## Appendix 1 – Results Tables

**Table 8: Indoor Air Quality Parameter Results at Salford Royal NHS Foundation Trust, 1 City Approach**

Area	Dates		Particulate Matter (PM10)			Carbon Dioxide (CO <sub>2</sub> )			Carbon Monoxide (CO)			Temperature			Relative Humidity			Total Volatile Organic Compounds
	Start (10:00 hrs)	End (08:00 hrs)	mg/m <sup>3</sup>			ppm			ppm			°C			%			ppm
			Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	
North East Corner - Desk 649 - 1045368	17/09/2020	24/09/2020	0	0.146	0.002	325	975	457	0	1	0	20.3	24.9	22.4	38.6	54.1	45.1	-
	24/09/2020	30/09/2020	0	0.194	0.002	330	955	431	0	1	0	20.5	24.0	22.0	26.6	51.6	36.4	
	30/09/2020	07/10/2020	0	0.132	0.001	315	620	397	0	1	0	20.6	24.1	22.4	33.2	52.5	43.9	
	07/10/2020	13/10/2020	0	0.174	0.001	340	680	412	0	1	0	21.4	25.9	23.0	31.2	51.9	37.8	
North West Corner - Desk 622 - 1140442	17/09/2020	24/09/2020	0	0.135	0.001	195	915	334	0	0	0	19.2	27.6	21.8	32.4	54.3	43.6	-
	24/09/2020	30/09/2020	0	0.170	0.001	190	980	305	0	1	0	19.2	25.0	21.2	27.5	50.3	35.7	
	30/09/2020	07/10/2020	0	0.137	0.001	180	595	278	0	1	0	19.2	22.8	21.2	33.1	52.2	44.0	
	07/10/2020	13/10/2020	0	0.156	0.001	200	570	284	0	3	1	20.0	25.4	21.8	30.9	51.6	37.8	
South West Corner - Desk 603 - 1140729	17/09/2020	24/09/2020	0	0.146	0.002	425	1165	566	0	0	0	20.4	27.0	23.1	32.7	49.5	40.5	-
	24/09/2020	30/09/2020	0	1.457	0.003	415	1155	541	0	0	0	19.9	27.1	22.1	23.4	48.2	33.7	
	30/09/2020	07/10/2020	0	0.925	0.002	315	800	531	0	0	0	20.2	25.3	21.8	33.1	49.7	42.5	
	07/10/2020	13/10/2020	0	2.664	0.003	430	870	539	0	0	0	20.1	27.5	22.1	25.6	50.4	37.2	
South East Corner - Desk 665 - 477363	17/09/2020	24/09/2020	0	0.156	0.007	435	1115	582	0	1	0	19.3	25.4	21.6	40.2	58.5	48.6	-
	24/09/2020	30/09/2020	0	0.222	0.007	435	1060	554	0	0	0	19.3	24.5	21.3	28.9	54.9	39.7	
	30/09/2020	07/10/2020	0	0.185	0.005	430	810	528	0	0	0	19.7	24.2	21.6	36.9	56.6	47.5	
	07/10/2020	13/10/2020	0	0.192	0.004	455	785	546	0	0	0	20.3	25.7	22.1	33.6	55.0	41.4	
Guidance Values			0.04 mg/m <sup>3</sup> (PM10)			800 ppm – 1000 ppm			10 ppm			21°C - 23°C (Winter)			40% - 70%			300 µg/m <sup>3</sup> (~0.08 ppm)

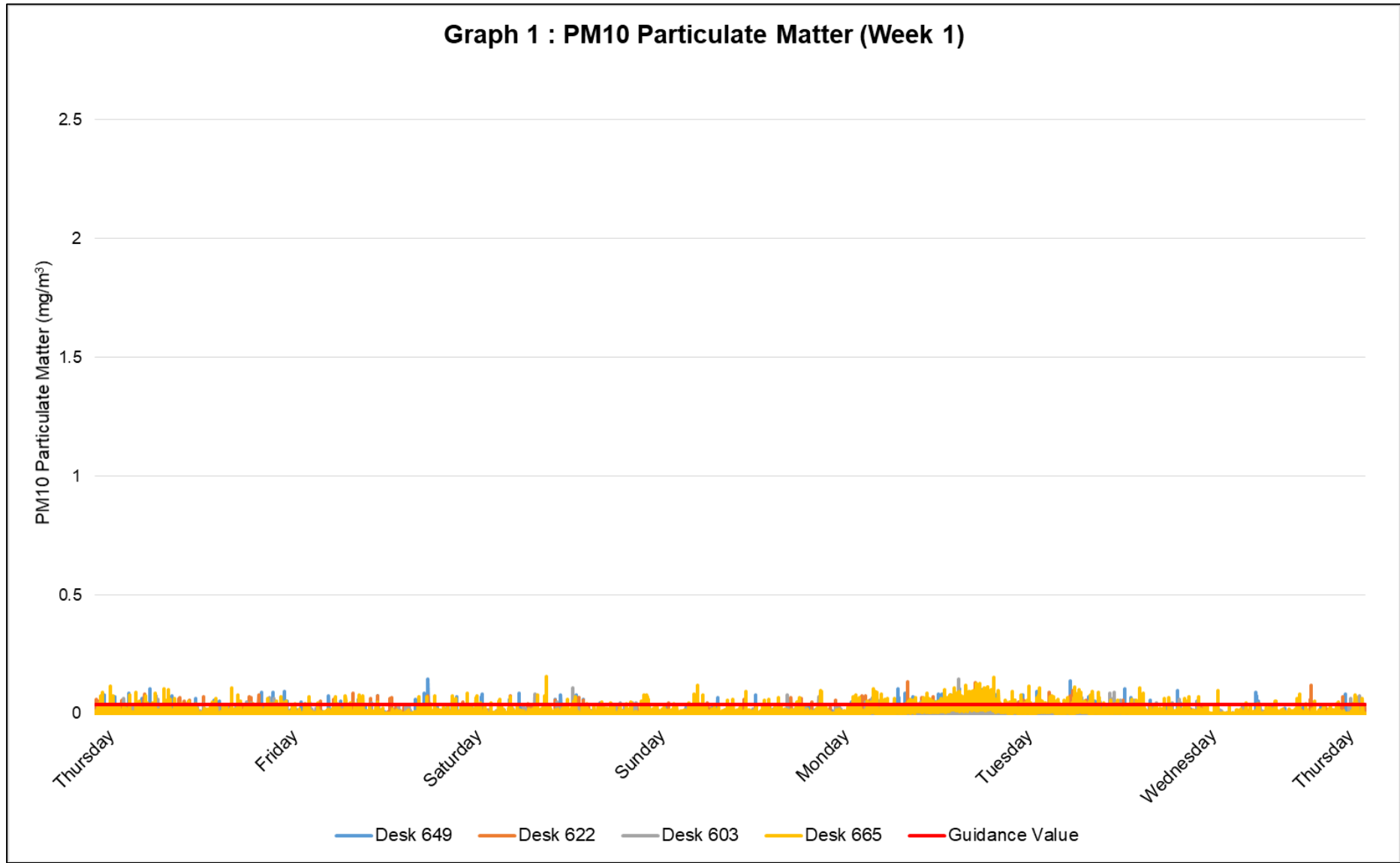
**Key**

Definition
Outside Guidance Value(s)
Within Guidance Value(s)

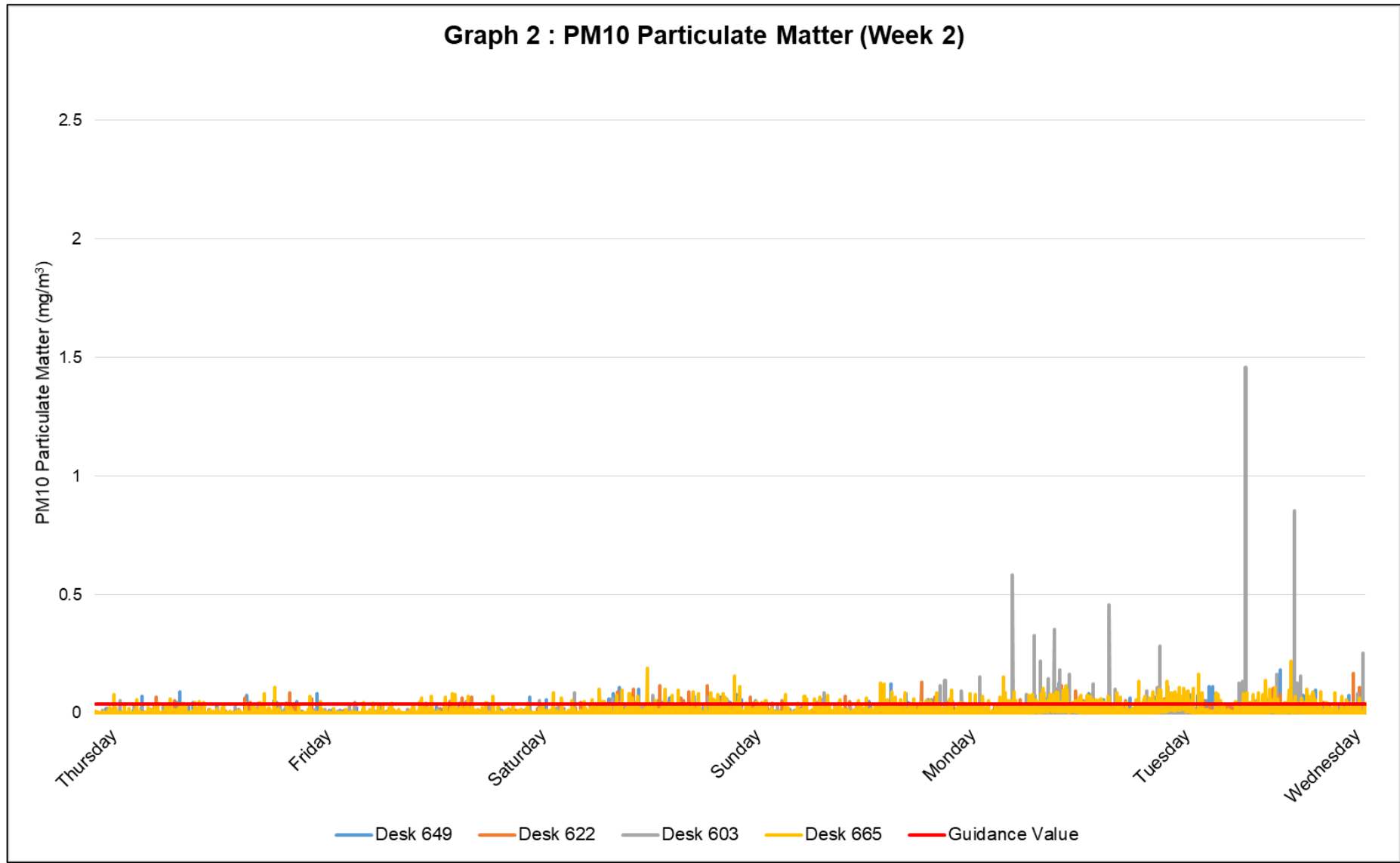


## Appendix 2.1 – Weekly Particulate Matter Concentration Graphs

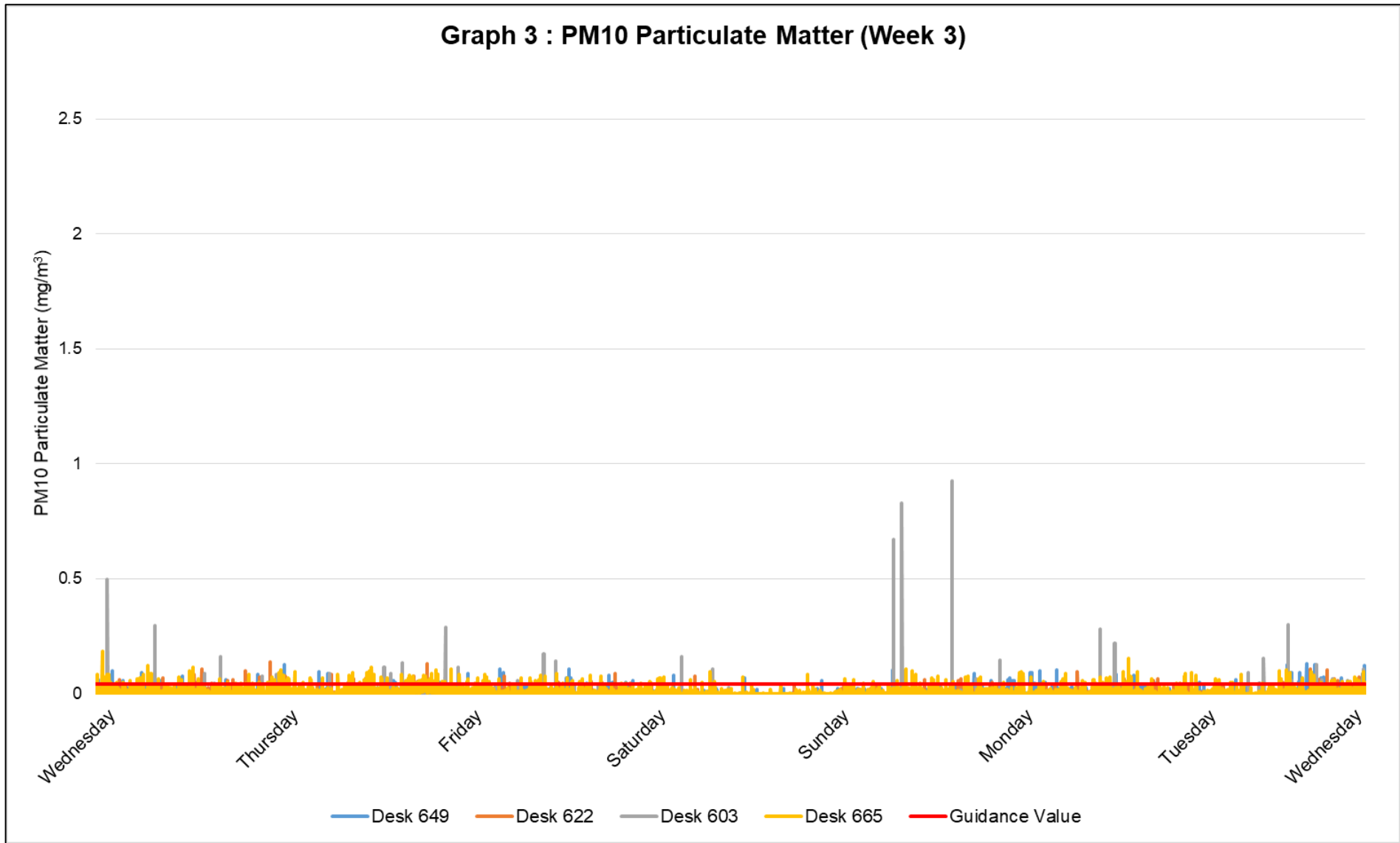
Graph 1 : PM10 Particulate Matter (Week 1)



Graph 2 : PM10 Particulate Matter (Week 2)

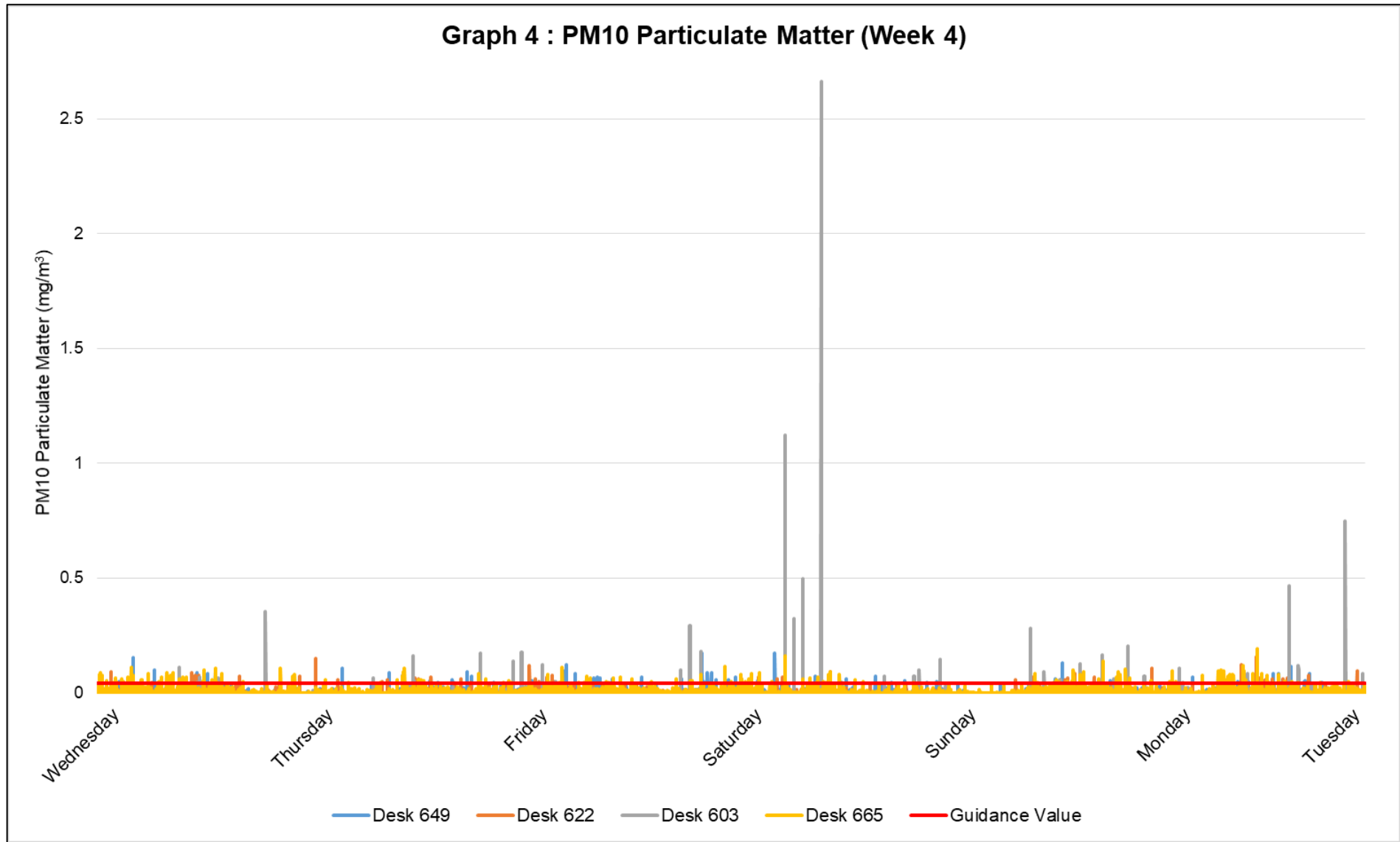


**Graph 3 : PM10 Particulate Matter (Week 3)**



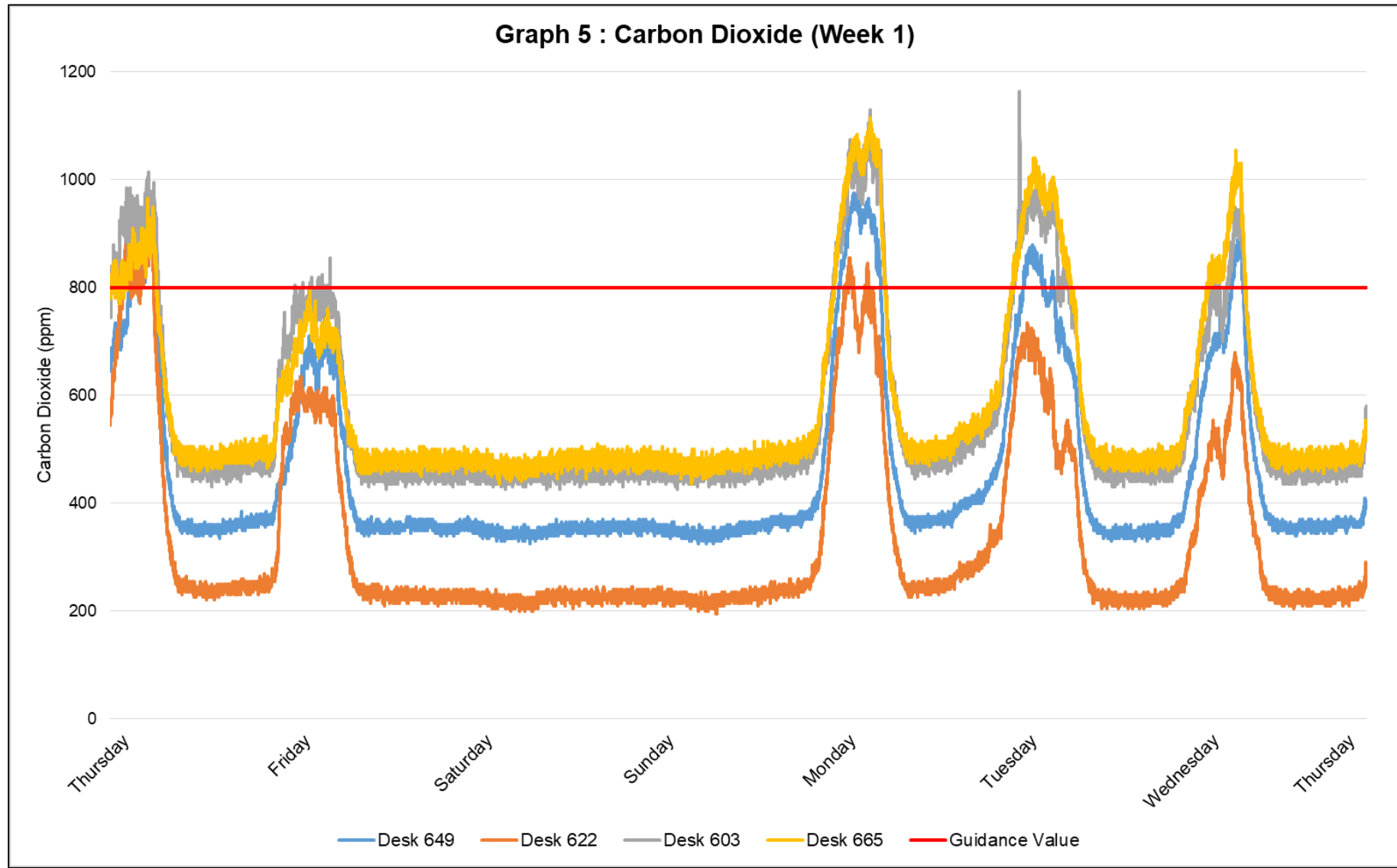


Graph 4 : PM10 Particulate Matter (Week 4)

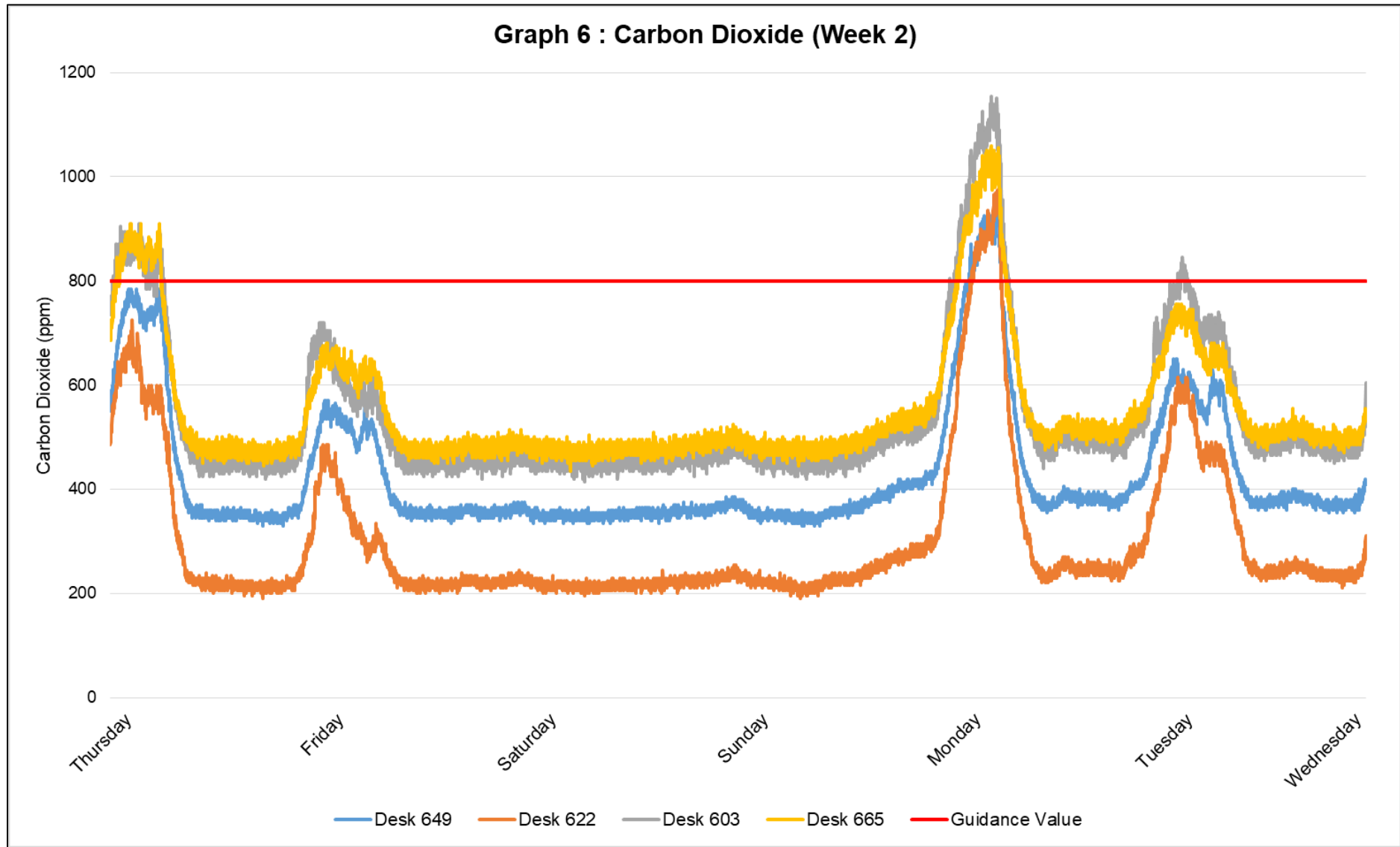


## Appendix 2.2 – Weekly Carbon Dioxide Concentration Graphs

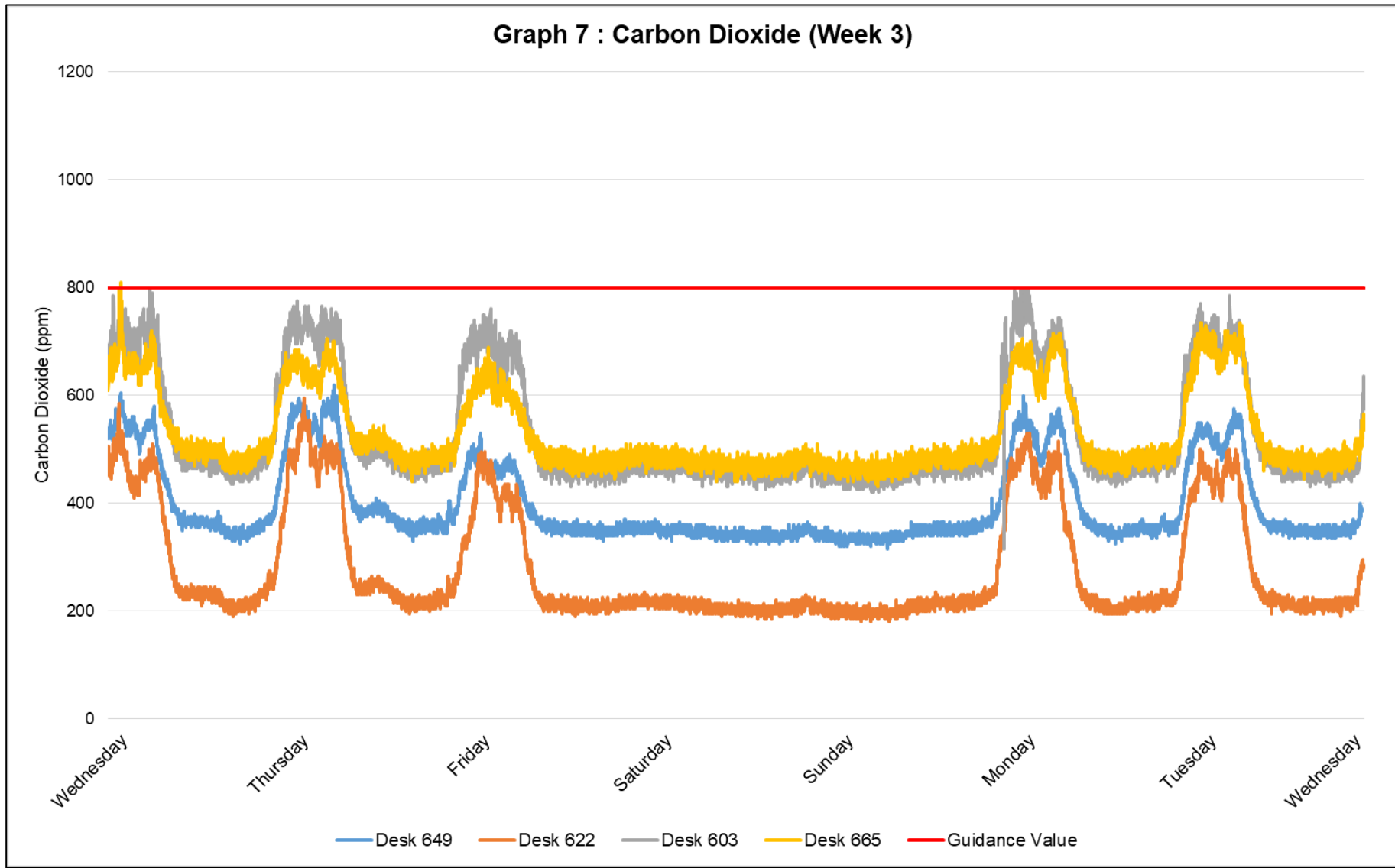
Graph 5 : Carbon Dioxide (Week 1)



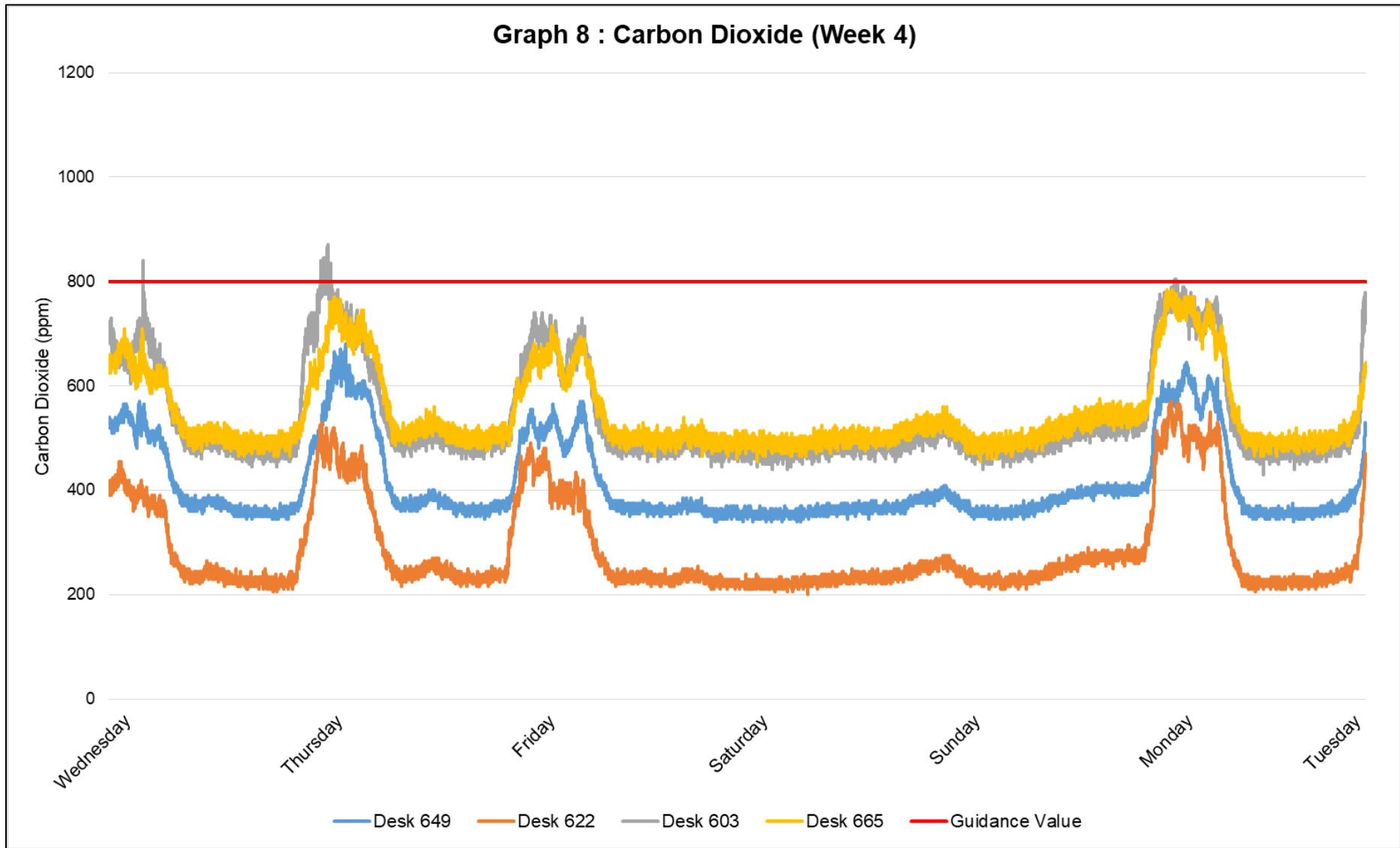
Graph 6 : Carbon Dioxide (Week 2)



**Graph 7 : Carbon Dioxide (Week 3)**



### Graph 8 : Carbon Dioxide (Week 4)

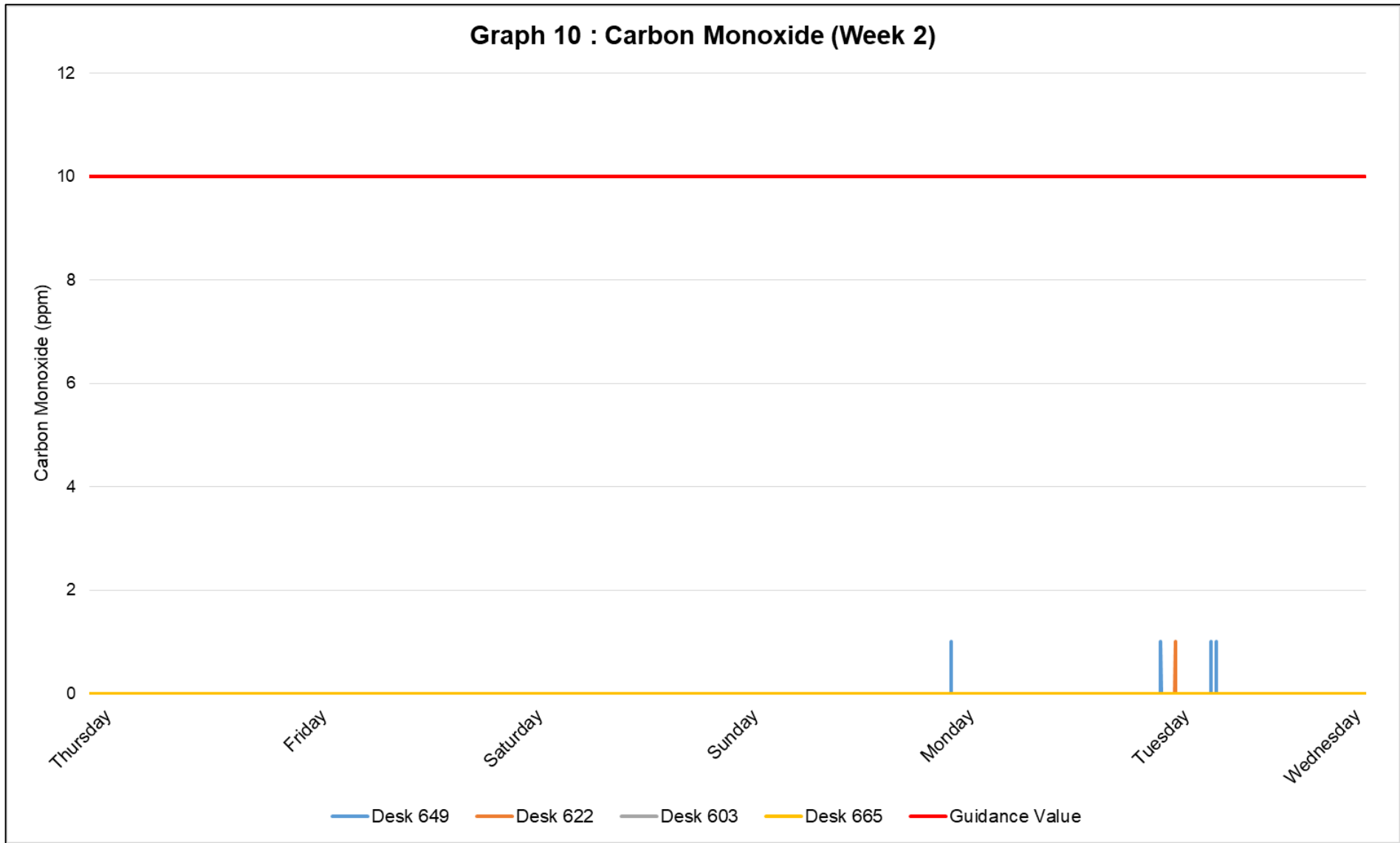


## **Appendix 2.3 – Weekly Carbon Monoxide Concentration Graphs**

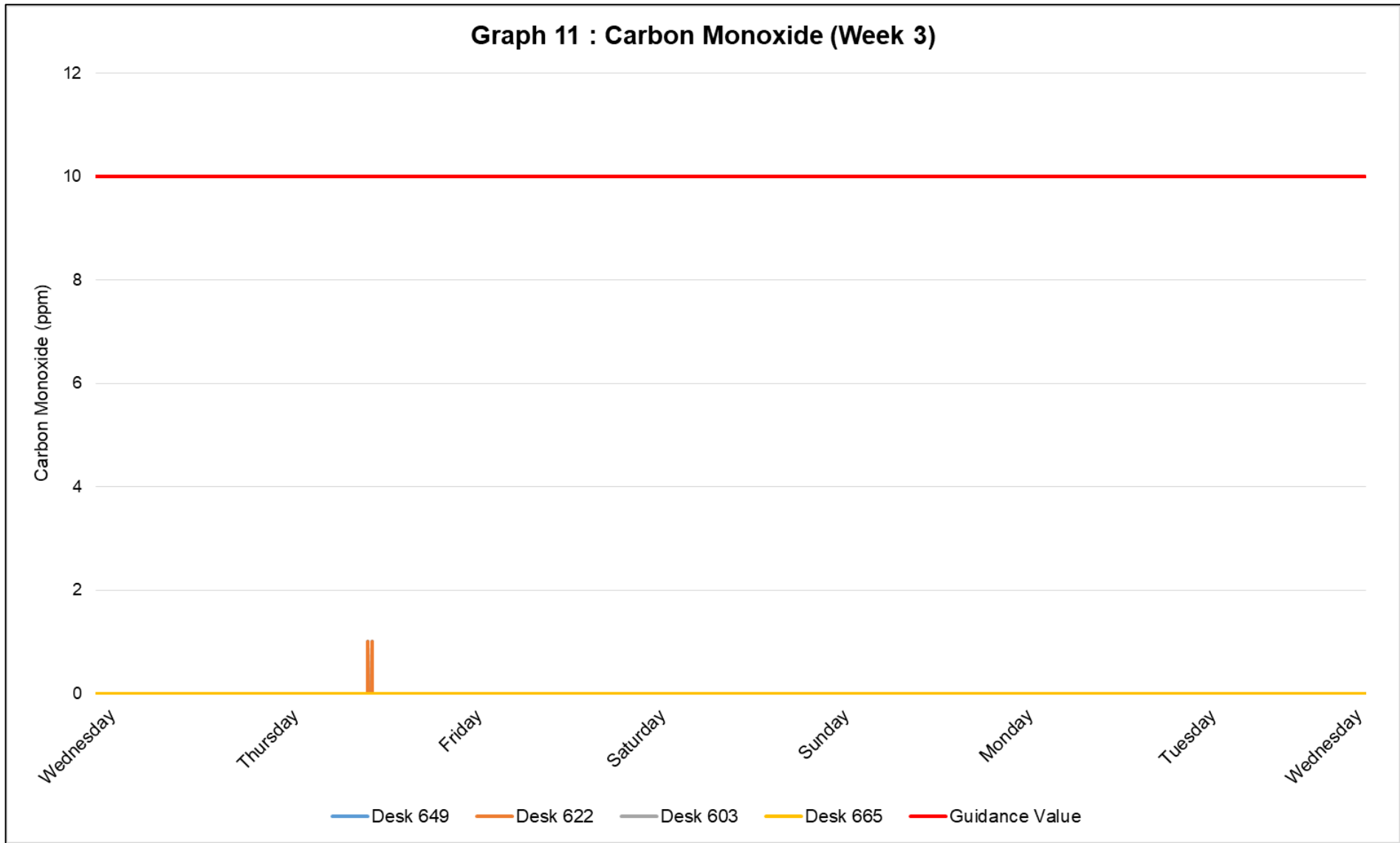




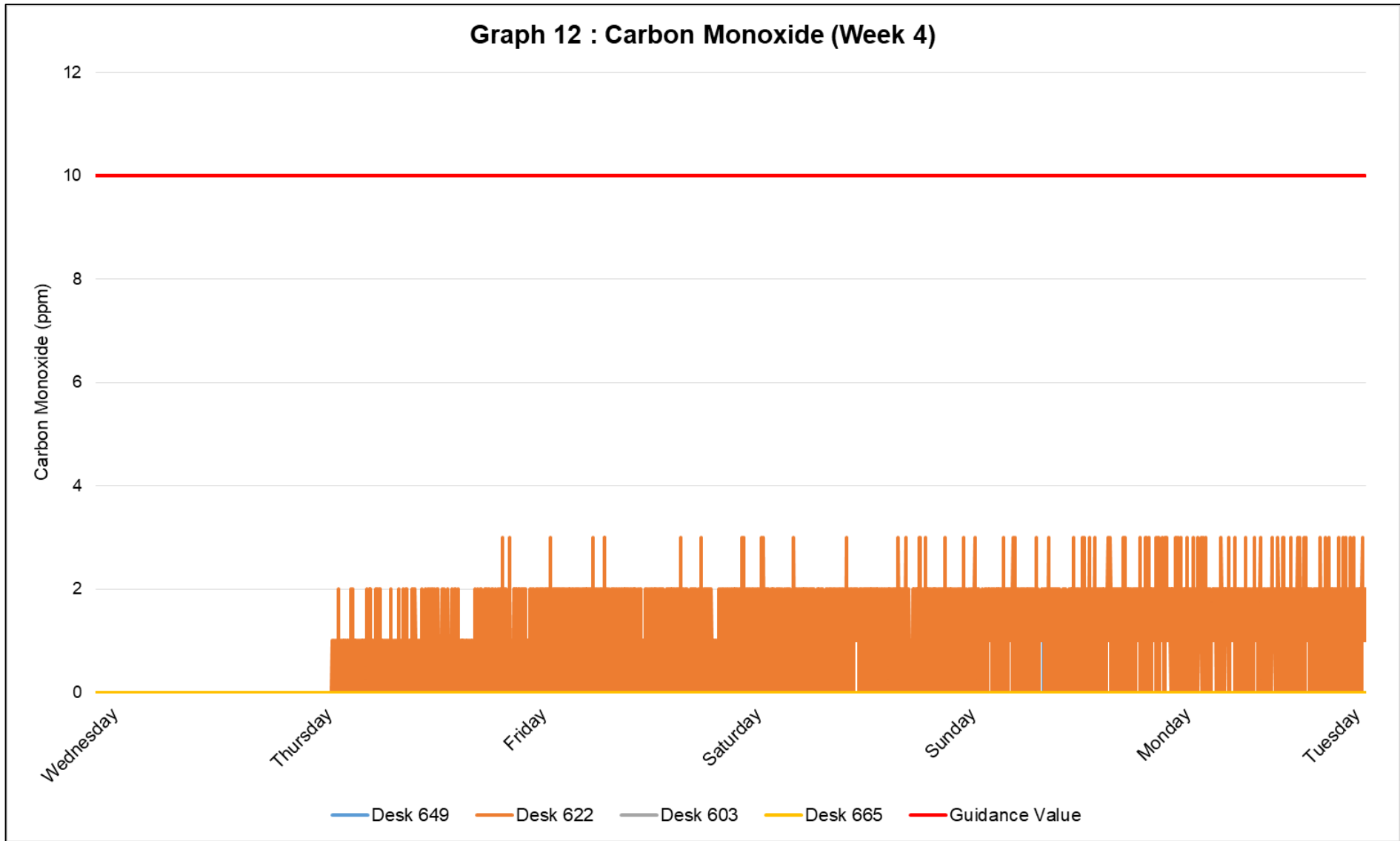
Graph 10 : Carbon Monoxide (Week 2)



Graph 11 : Carbon Monoxide (Week 3)

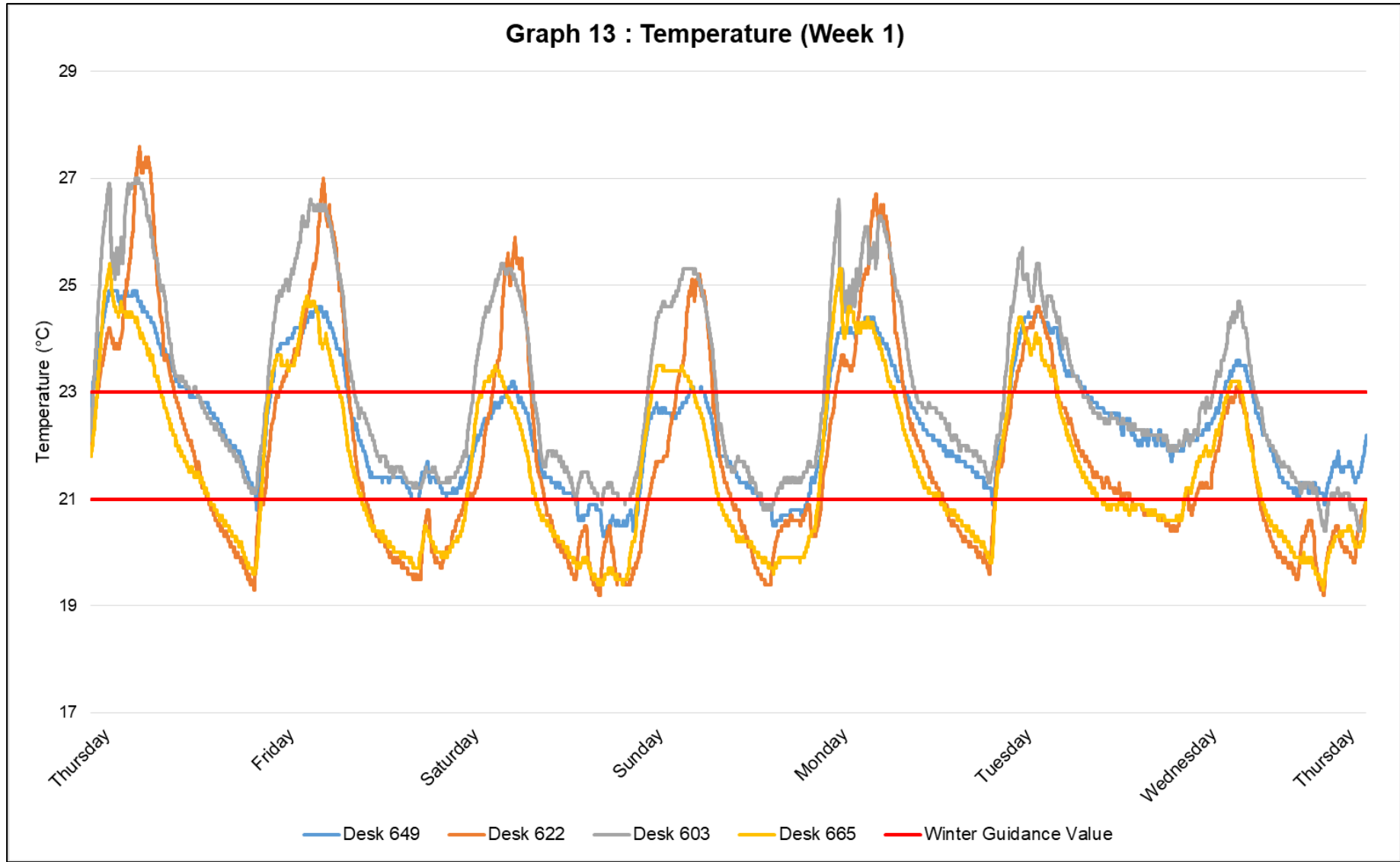


Graph 12 : Carbon Monoxide (Week 4)

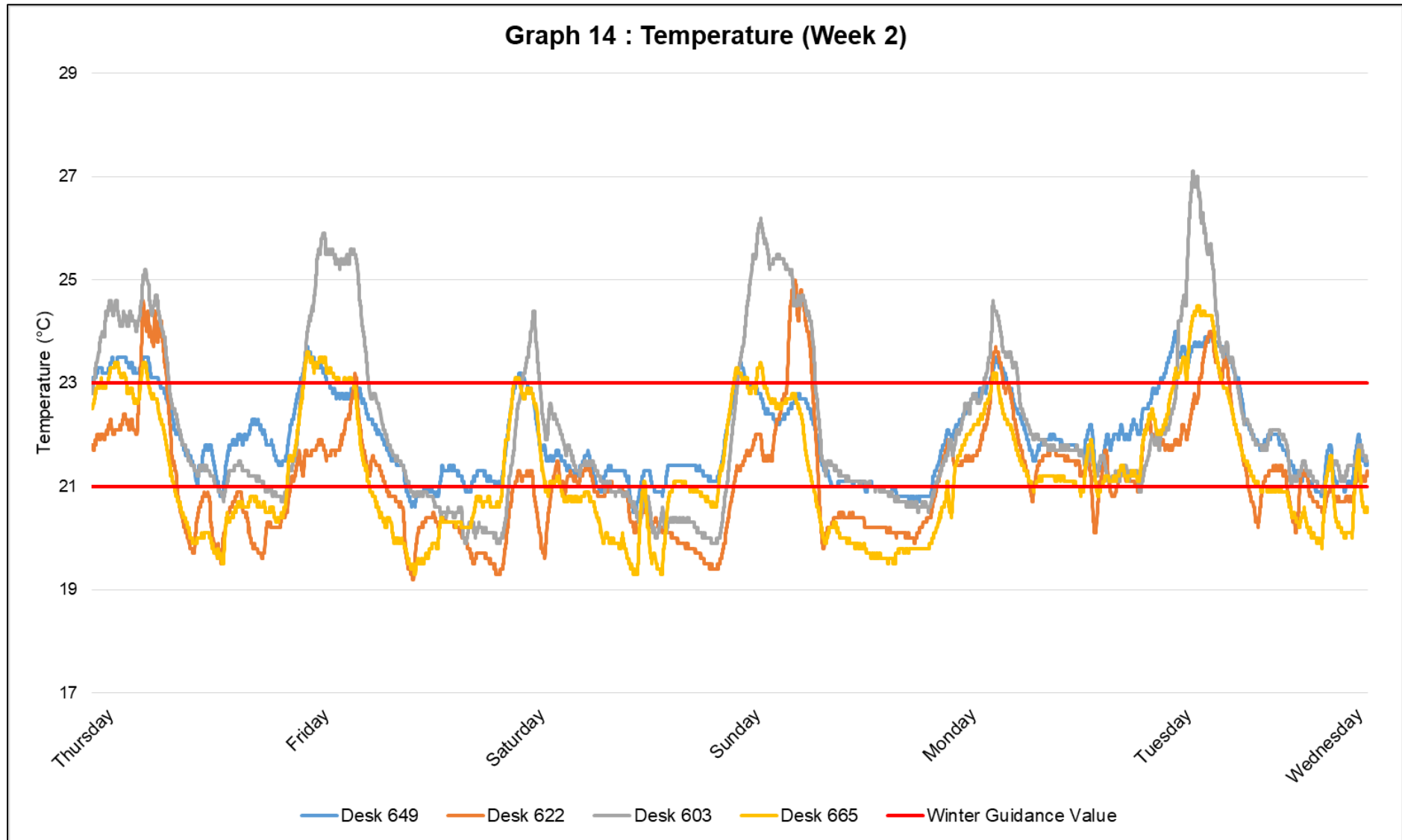


## Appendix 2.4 – Weekly Temperature Concentration Graphs

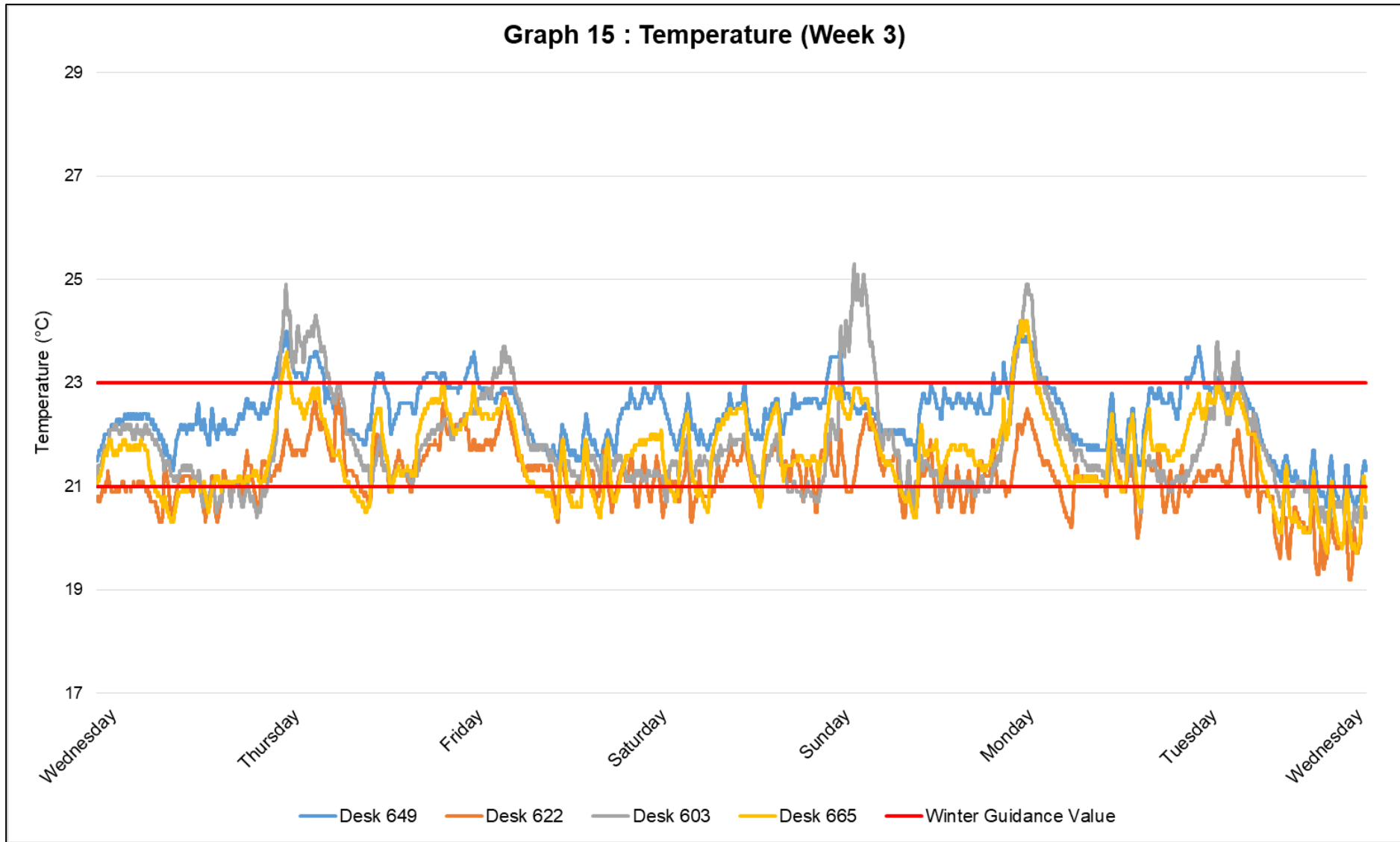
Graph 13 : Temperature (Week 1)



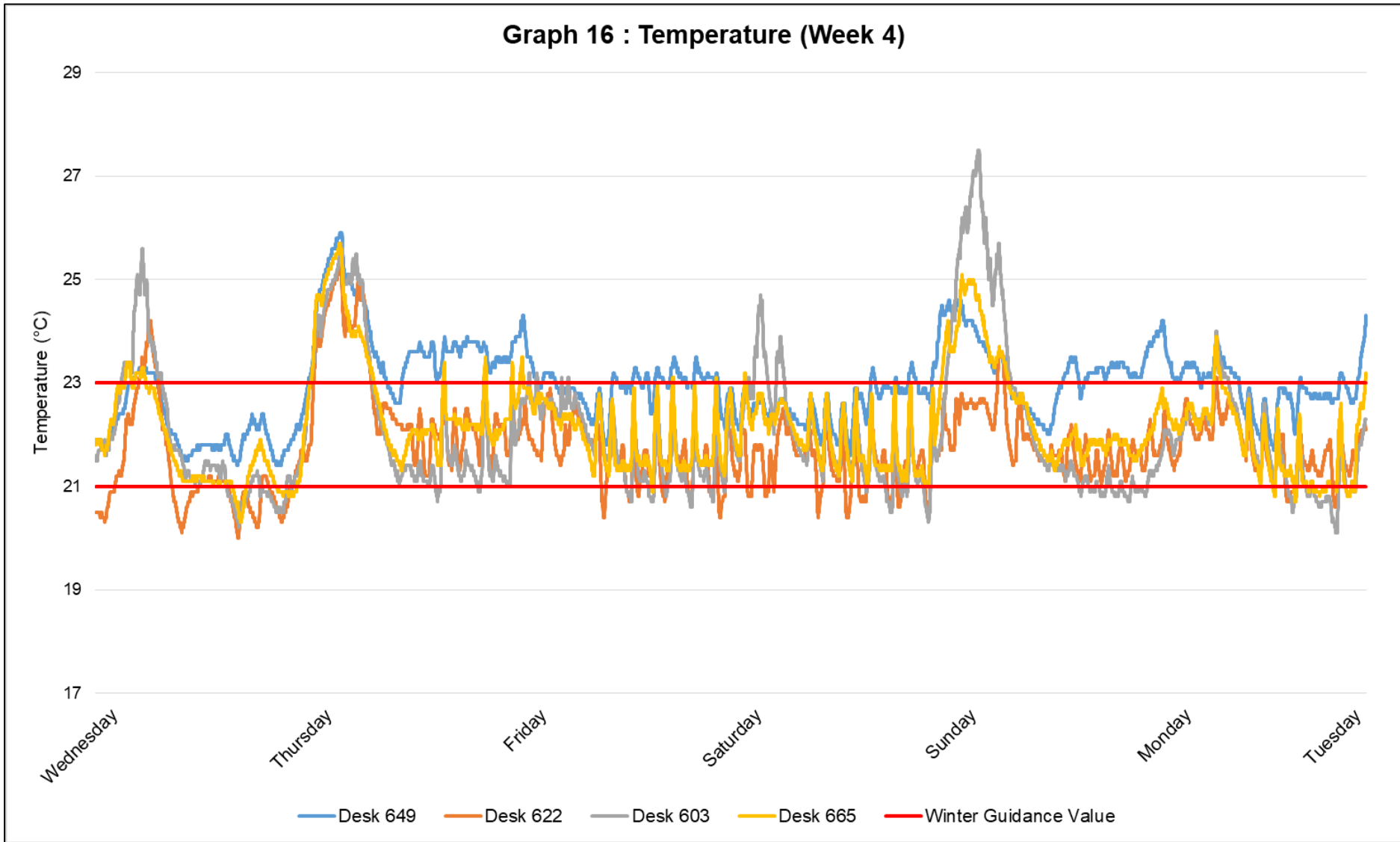
Graph 14 : Temperature (Week 2)



Graph 15 : Temperature (Week 3)



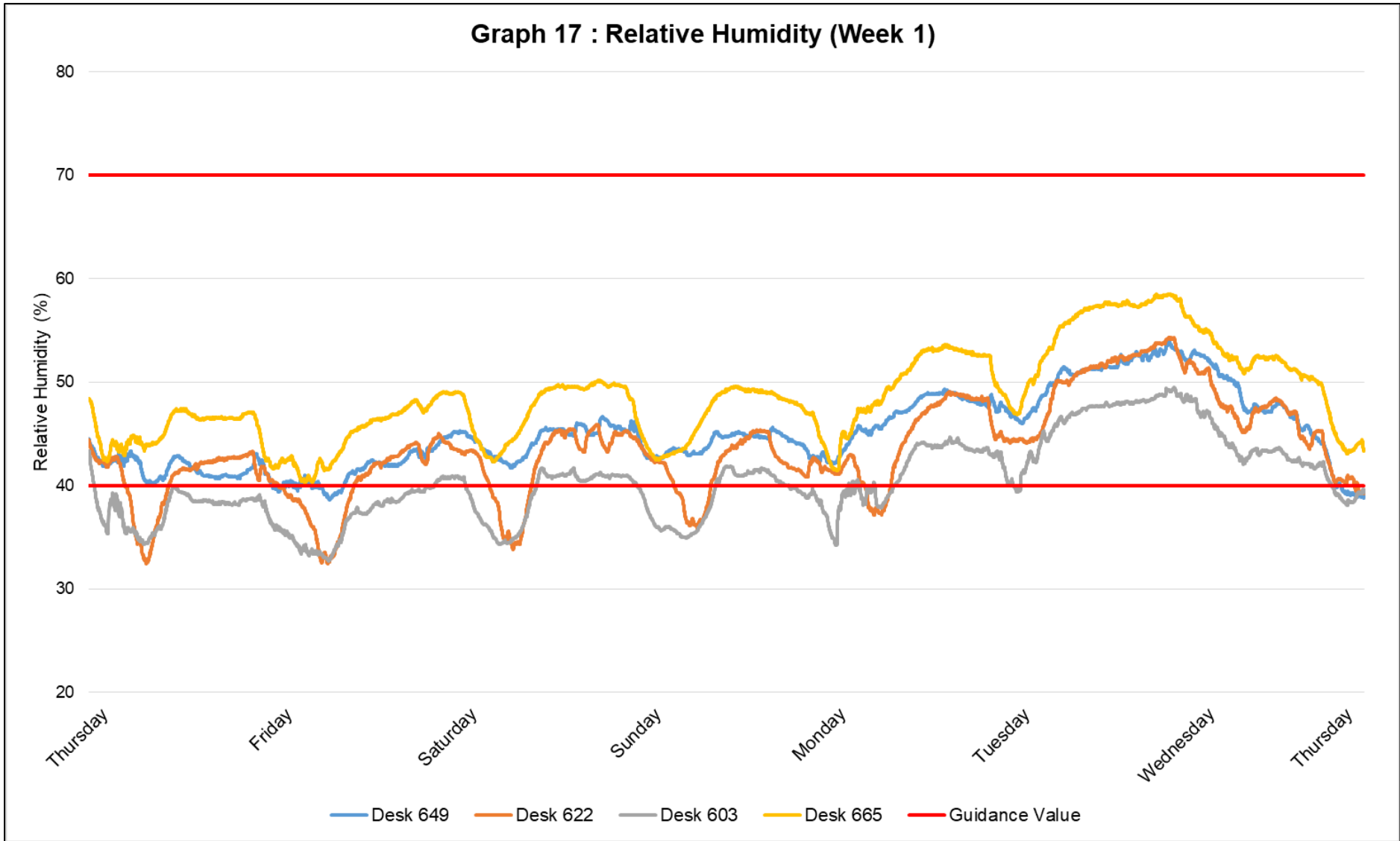
Graph 16 : Temperature (Week 4)



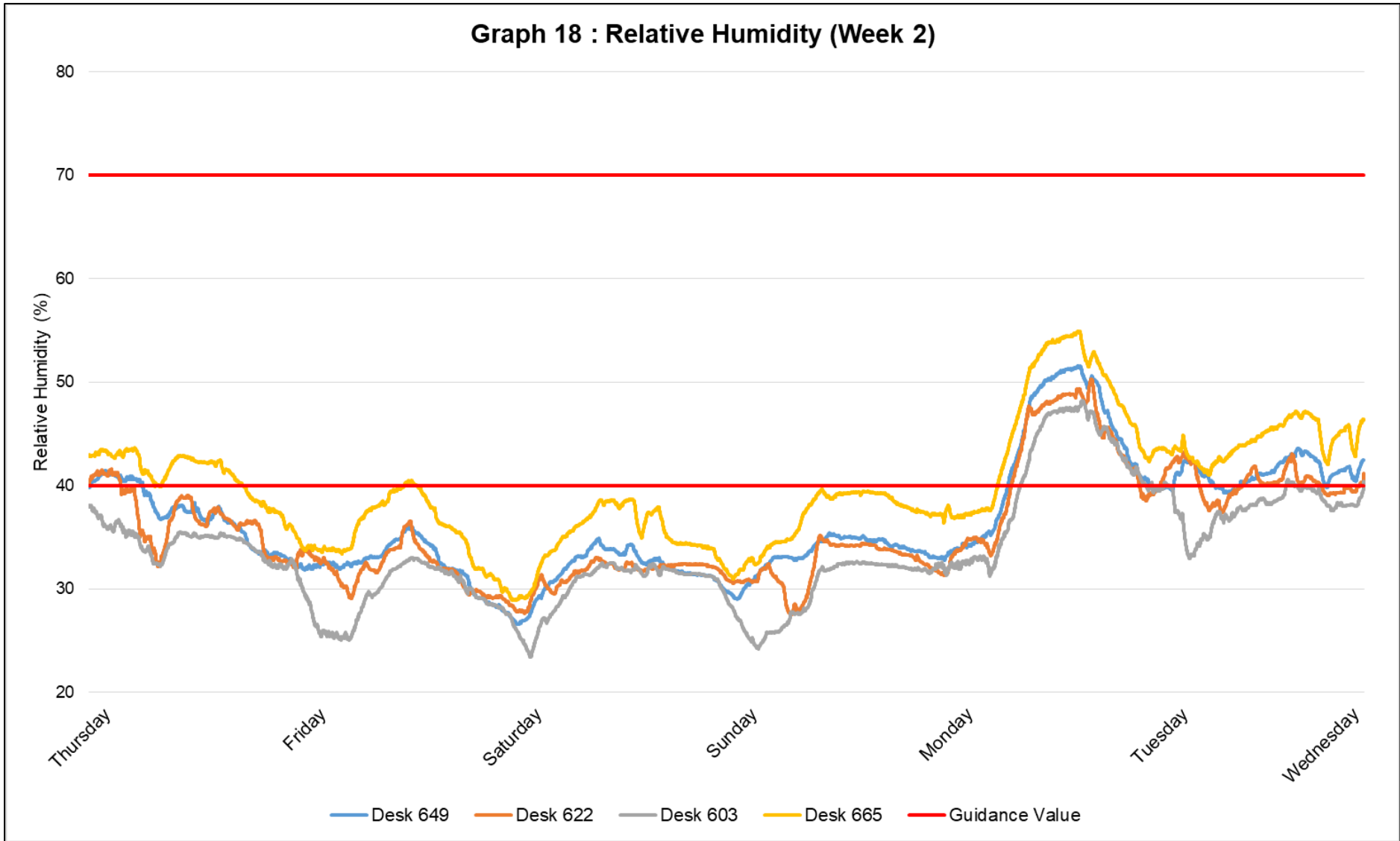


## Appendix 2.5 – Weekly Relative Humidity Concentration Graphs

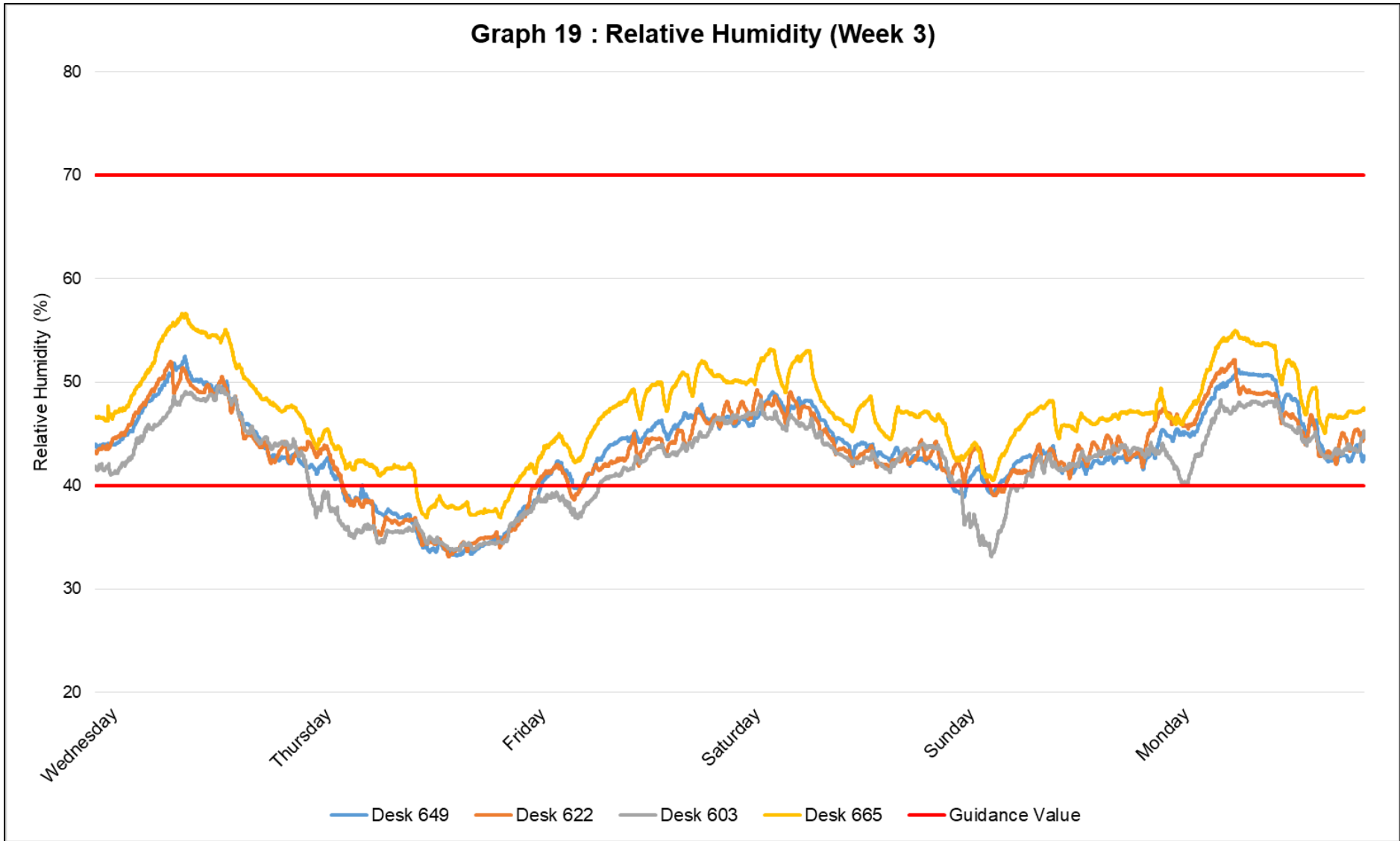
**Graph 17 : Relative Humidity (Week 1)**



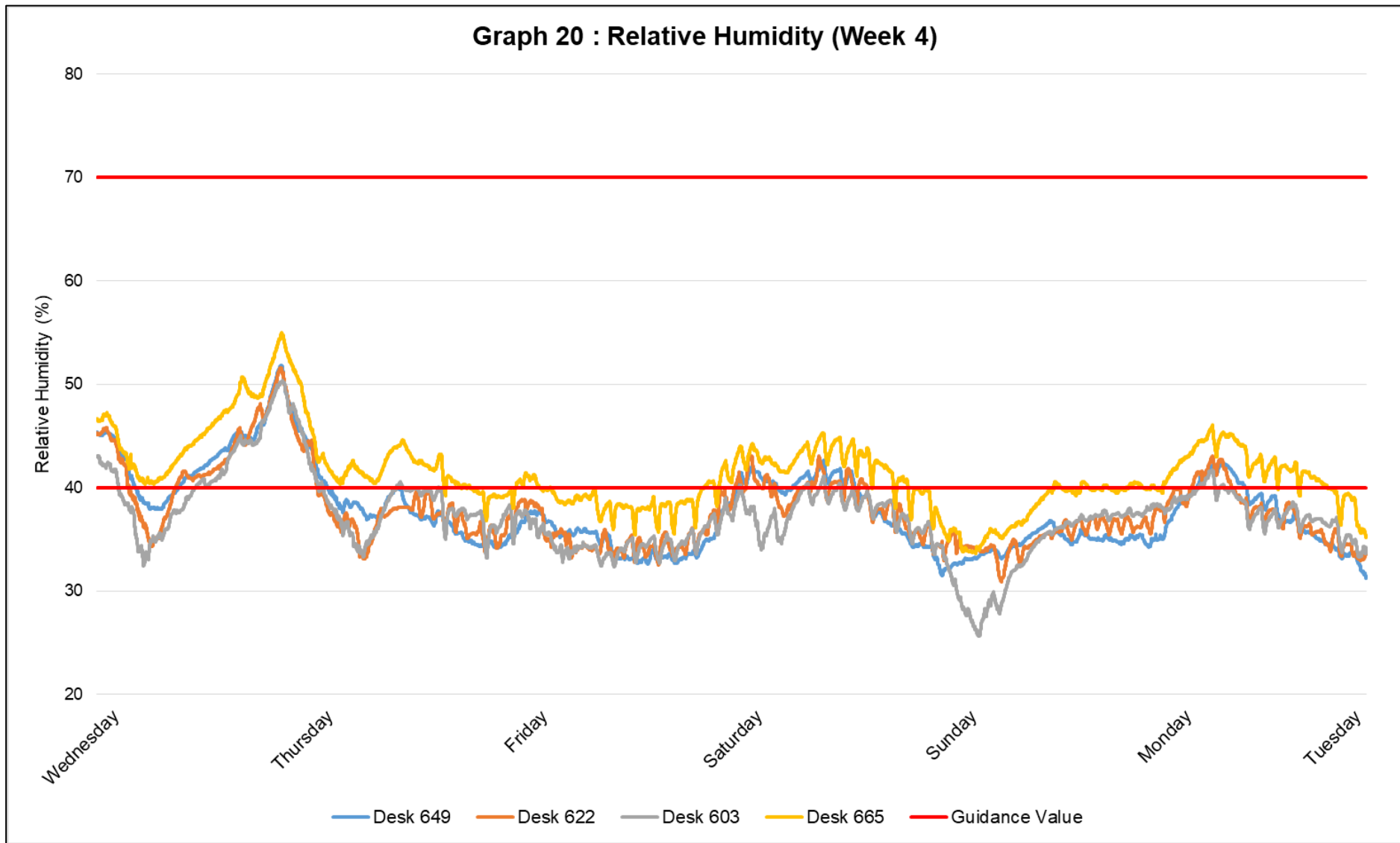
Graph 18 : Relative Humidity (Week 2)



Graph 19 : Relative Humidity (Week 3)



Graph 20 : Relative Humidity (Week 4)

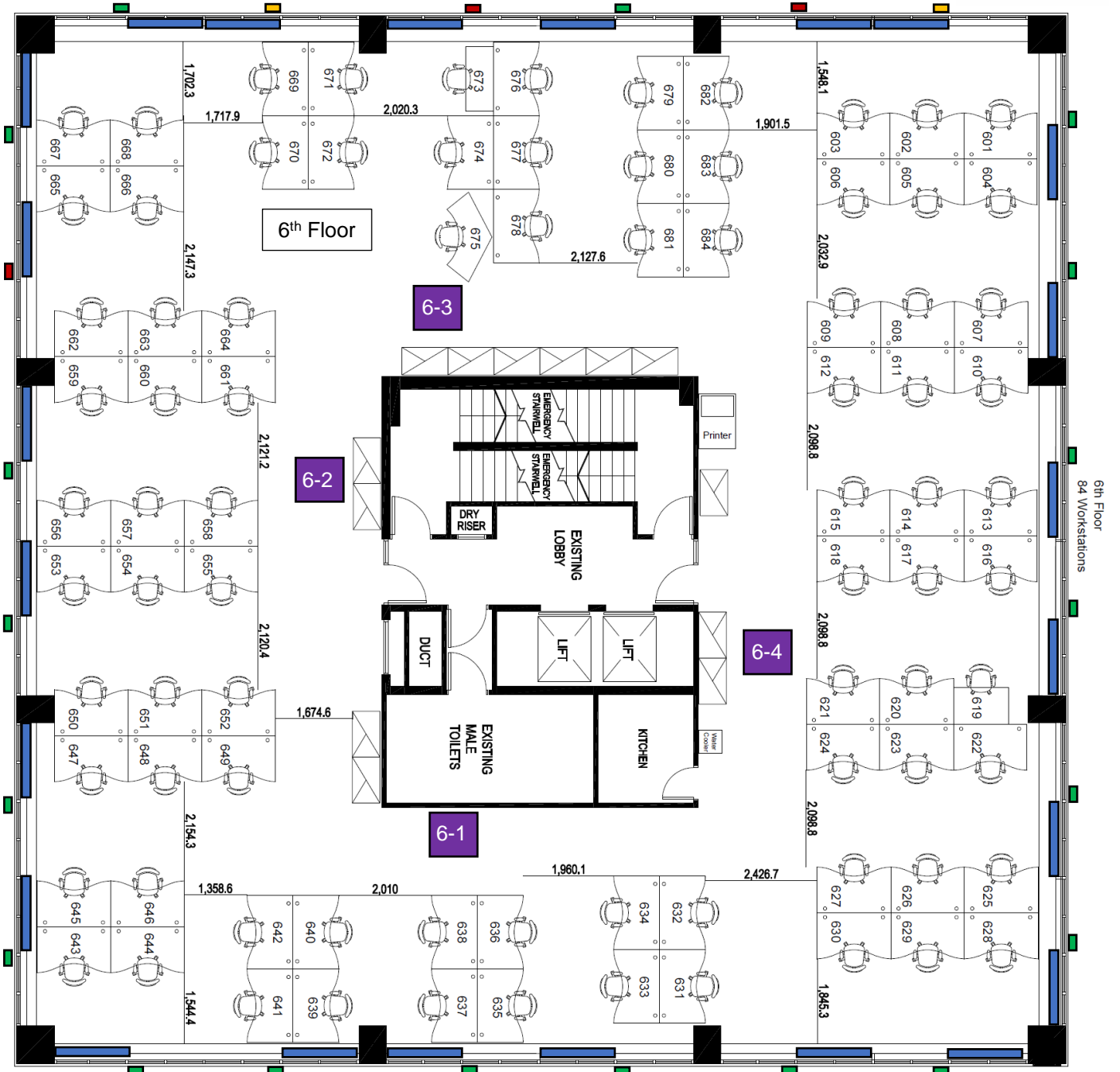


## Appendix 3 – Indoor Air Quality Sampling Locations

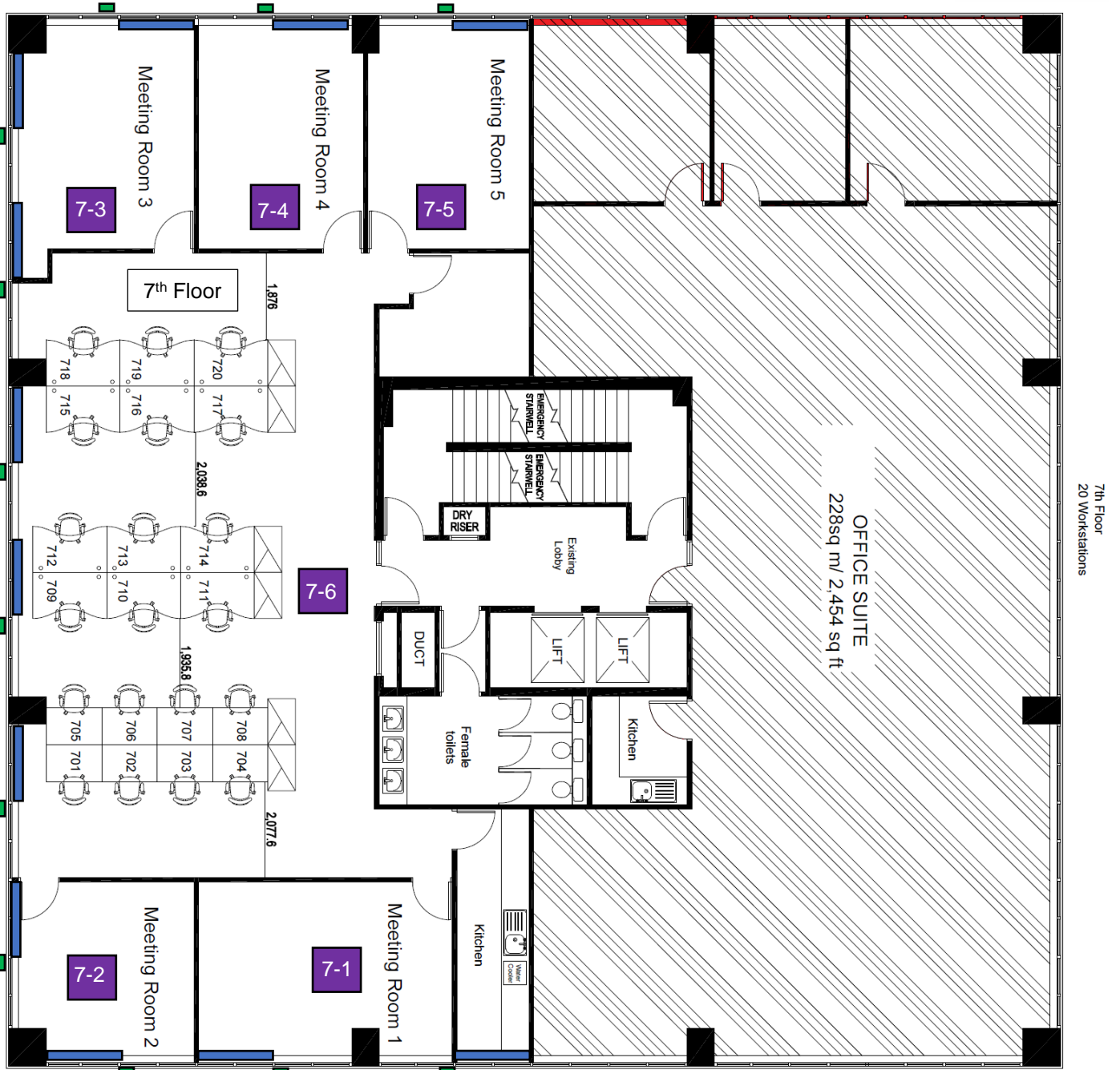


## Appendix 4 – Ventilation Assessment Locations

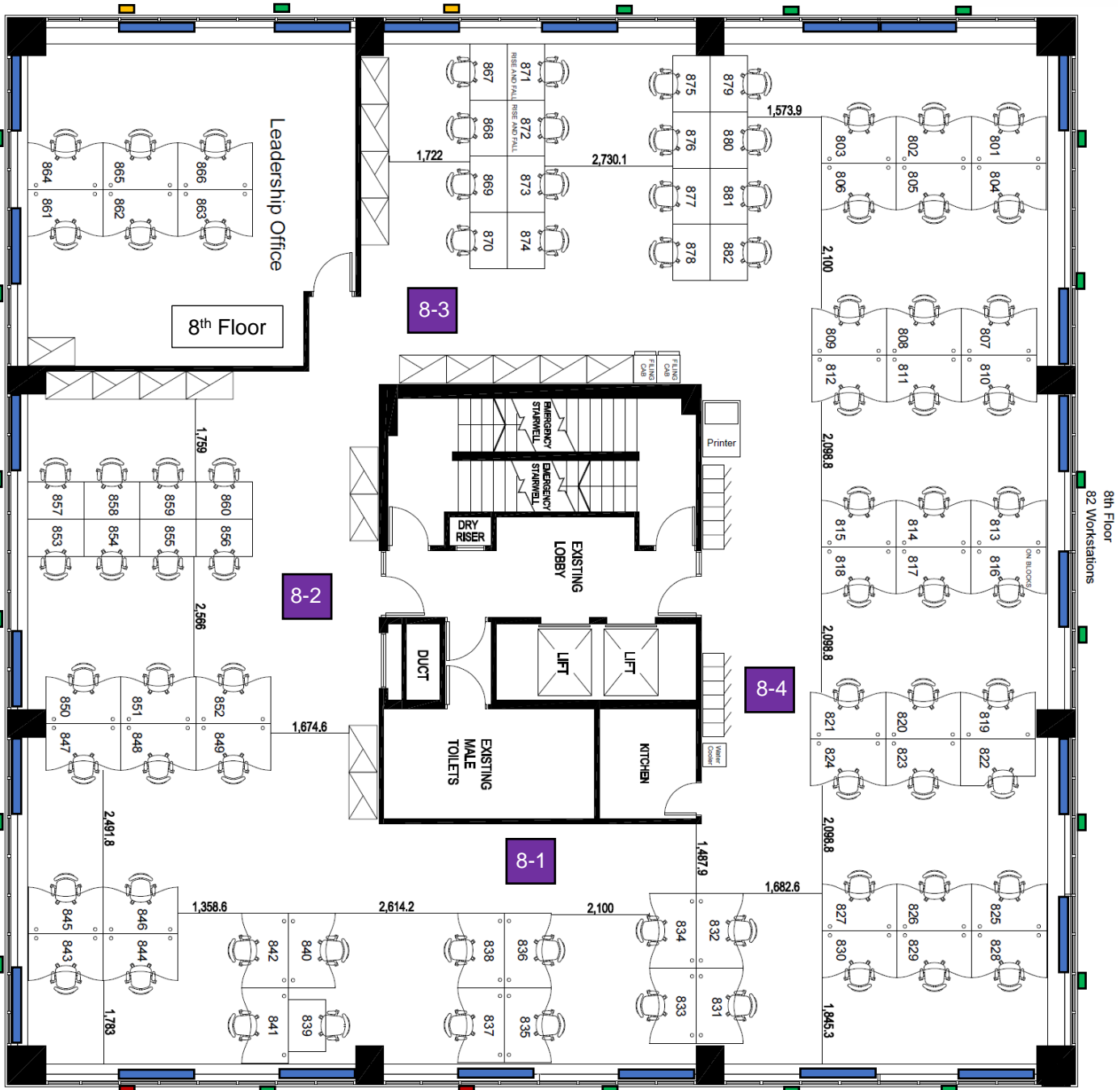




- Extraction Grille
- Fan Coil Unit
- Fresh-air Inlet Grille (clear)
- Fresh-air Inlet Grille (blocked)
- Fresh-air Inlet Grille (obstructed)



- Extraction Grille
- Fan Coil Unit
- Fresh-air Inlet Grille (clear)
- Fresh-air Inlet Grille (blocked)
- Fresh-air Inlet Grille (obstructed)



- Extraction Grille
- Fan Coil Unit
- Fresh-air Inlet Grille (clear)
- Fresh-air Inlet Grille (blocked)
- Fresh-air Inlet Grille (obstructed)

## Appendix 5 – Analytical Laboratory Results



**Marchwood  
Scientific Services**  
CERTIFICATE OF ANALYSIS - V1

60 Smithfold Lane  
Worsley, Gtr Manchester  
M28 0GP  
Tel: 023 8078 6979

Supplement to MSSL reference: 20-15959

Report date: 30-10-2020

Customer: Bureau Veritas  
2nd Floor Atlantic House  
Atlas Business Park  
Wythenshawe  
Manchester  
M22 5PR

Customer contact: [joe.marais@bureauveritas.com](mailto:joe.marais@bureauveritas.com)

Customer reference: 9629917/001  
Customer purchase order: -  
Customer sampling date: -  
Date received: 19-10-2020  
Analysis started: 22-10-2020  
Analysis complete: 23-10-2020  
Conforming: Yes

This report shall not be reproduced except when in full without approval of the laboratory.  
Results only relate to the items tested. Results apply to the samples as received.  
Conformance is contingent upon accurate information being provided by the customer, and customer compliance with relevant sample handling and storage conditions prior to receipt at the laboratory.  
All opinions and interpretations expressed within this report are outside MSSL's scope of accreditation.

Accreditation Key:  
Y : ISO 17025 UKAS  
N : Non Accredited  
M: MCERTS  
(S): Subcontracted

Notes: Supplement report issued to include gas concentration units, at customer's request.

Reported by: Robert Potts  
Position: Laboratory Manager



Approved by: Peter Allen  
Position: General Manager  
For/on behalf of Marchwood Scientific Services Ltd



Marchwood Scientific Services  
Registered in England No. 03604766  
Registered Office: 371 Millbrook Road West, Southampton, Hampshire, SO15 0HW.

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**Analysis of total VOCs from S/S tenax thermal desorption sampling tube(s) by ATD-GC/MS**

MSSL sample ref:	20-15959-001	20-15959-002	20-15959-003	20-15959-004
Customer sample ref:	1045368	1022080	477363	1140729
Customer sampling time (mins):	18720	18720	18720	18720

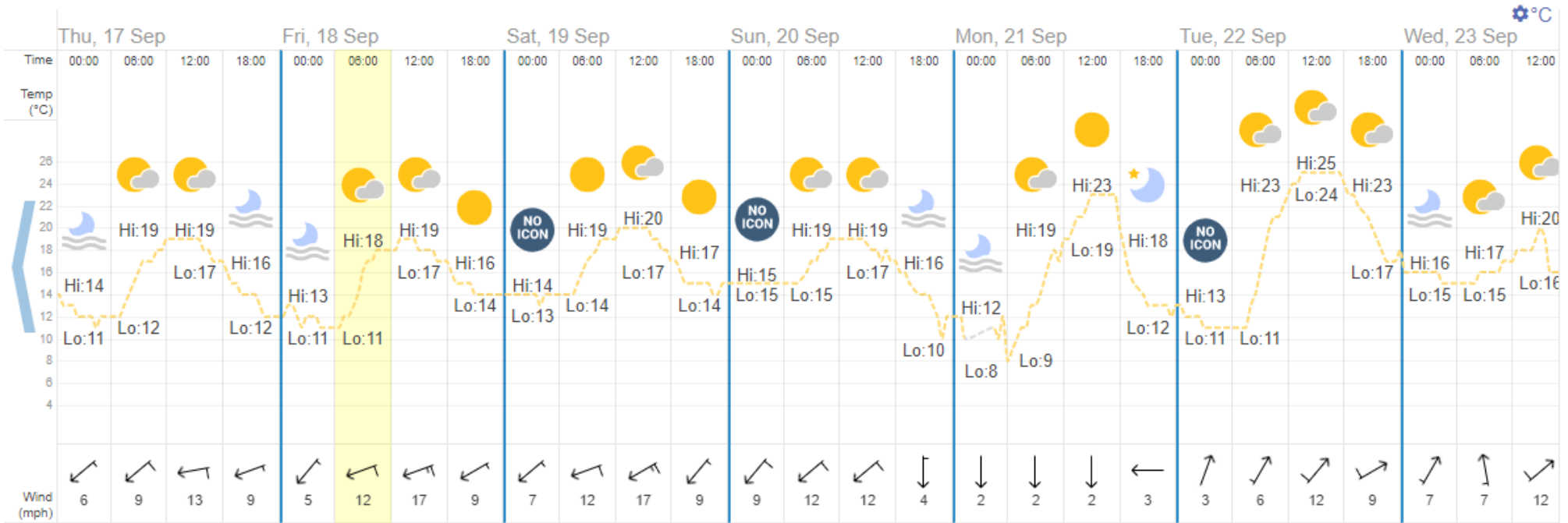
Determinand	Units	LOD	UKAS				
Total VOC	ng	10	N	540	12	180	860
	mg/m <sup>3</sup>	Calc.	N	0.066	0.0015	0.022	0.10
	ppm	Calc.	N	0.017	0.00038	0.0057	0.027

MSSL sample ref:	20-15959-005
Customer sample ref:	1140442
Customer sampling time (mins):	18720

Determinand	Units	LOD	UKAS	
Total VOC	ng	10	N	580
	mg/m <sup>3</sup>	Calc.	N	0.070
	ppm	Calc.	N	0.018

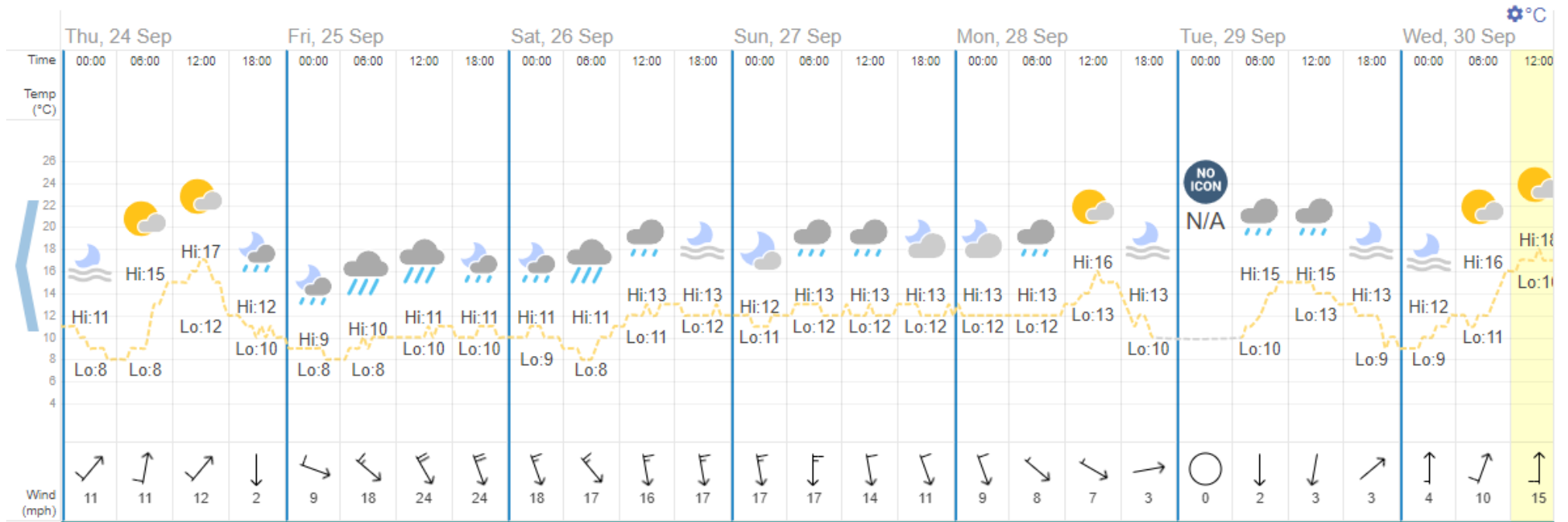
## Appendix 6 – Meteorological Data

## September 2020 Weather in Eccles — Graph

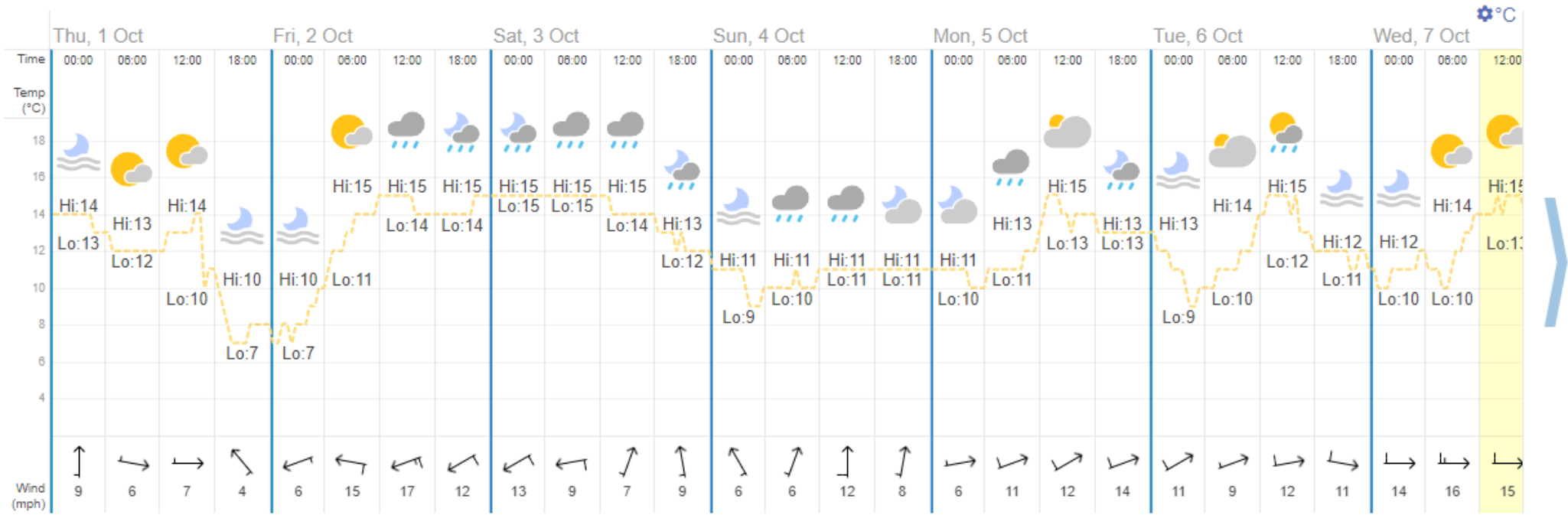




## September 2020 Weather in Eccles — Graph



### October 2020 Weather in Eccles — Graph



## October 2020 Weather in Eccles — Graph

