Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Examining Authority's Second Written Round of Questions and Requests for Information

Response from Thames Water

Air Quality and Emissions

Doc Ref: **APP47**

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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Responses to second written questions
Q20 Air Quality & Emissions

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Abbreviations

BPG	Best Practice Guidance
CoCP	Code of Construction Practice
CSO	combined sewer overflow
DCO	development consent order
SPG	Supplementary Planning Guidance

1 Question: 20.1

What would be the impact on the CoCP, practices on site and subsequent air quality of incorporating the new draft SPGs into the CoCP?

1.1 Our response

1.1.1 There is no impact on the *Code of Construction Practice* (*CoCP*) practices onsite and subsequent air quality, from incorporating the new draft Supplementary Planning Guidance (SPG) (Greater London Authority, 2013).

1.1.2 The *CoCP* Part A (Section 7, Air Quality) was written with the new draft SPG in mind and includes a reference to state that the measures within the existing Best Practice Guidance (BPG) (*The control of dust and emissions from construction and demolition*, London Councils, 2006) or subsequent updated guidance (or SPG) would be used.

1.1.3 We were involved in the initial working group developing the new SPG which was held by the Greater London Authority and were therefore aware of the changes that were being implemented. As the control measures within the document were based on those within the previous BPG, we assumed that these control measures would be used on site.

1.1.4 Both the existing BPG and the new draft SPG aim to help control dust, particulates and NO_X emissions and, as such, aim to safeguard air quality. As the control measures were already stipulated (and assessed as in place), air quality impact would be minimised.

1.1.5 As the *CoCP* stipulates that the BPG or SPG will be followed, any more stringent controls will have a positive impact on air quality.

2 Question: 20.2

Provide evidence to show how dispersion modelling assesses the impact of odour on high rise residential blocks in the vicinity of the ventilation shafts.

1.1 Our response

1.1.1 Dispersion modelling was carried out for each of the shaft sites for the Thames Tideway Tunnel project (the 'project') to predict the 98th percentile odour concentration and the number of hours with concentrations above 1.5ou$_E$/m^3. Predictions were made at ground level and at various heights where there are nearby buildings and people could potentially be exposed to air released from the tunnel system.

1.1.2 Table 2.1 gives the predicted values for the 98th percentile odour concentration and the number of hours with concentrations above1.5 ou$_E$/m^3. The Environment Agency odour benchmark would allow 175 hours per year or two per cent of the year to be above1.5 ou$_E$/m^3. To allow some reference point for this value it is an industry standard that 1.0 ou$_E$/m^3 is when half the panel of trained assessors detect some odour under laboratory conditions.

1.1.3 As indicated in Table 2.1, the active sites at Acton Storm Tanks, Carnwath Road Riverside and Abbey Mills Pumping Station would havethe most frequent discharges. Acton Storm Tanks and Carnwath Road Riverside are the only two sites with potential impacts on residential properties in the vicinity and as explained below none would be assessed as being subject to adverse odour conditions.

1.1.4 For all sites and at all elevations modelled, the 98th percentile was within the benchmark concentration of 1.5ou$_E$/m^3 as stated in the Environment Agency H4 guidance note.

1.1.5 The modelled concentrations assume that the ventilation column is in a location that would result in the highest concentrations at properties, that is, a worst case location. Where buildings (offices, residences etc) are present in the vicinity at each site, these are noted on Table 2.1.

Table 2.1 Typical year dispersion modelling predictions at ground level and at height

Site	Buildings present in vicinity	Predicted 98th percentile at ground level(1) (ou$_E$/m^3)	Number of hours 1.5ou$_E$/m^3 exceeded at ground level (hours/year)	Predicted 98th percentile at worst height (ou$_E$/m^3)	Number of hours 1.5ou$_E$/m^3 exceeded at height (hours/year)	Height with highest 98th percentile concentration (m)
Acton Storm Tanks	Residential	<0.1	9	<0.1	10	15
Hammersmith Pumping Station(2)	Residential	0	0	NOTE (3)	NOTE (3)	NOTE (3)

Site	Buildings present in vicinity	Predicted 98th percentile at ground level[(1)] (ou_E/m^3)	Number of hours $1.5ou_E/m^3$ exceeded at ground level (hours/year)	Predicted 98th percentile at worst height (ou_E/m^3)	Number of hours $1.5ou_E/m^3$ exceeded at height (hours/year)	Height with highest 98th percentile concentration (m)
Barn Elms	Residential	0	0	NOTE (3)	NOTE (3)	NOTE (3)
Putney Embankment Foreshore	Residential	0	0	NOTE (3)	NOTE (3)	NOTE (3)
Carnwath Road Riverside	Residential	0.4	22	0.8	75	12
Dormay Street	Industrial	0	0	NOTE (3)	NOTE (3)	NOTE (3)
King George's Park	Residential	0	0	NOTE (3)	NOTE (3)	NOTE (3)
Falconbrook Pumping Station	Community	0	0	NOTE (3)	NOTE (3)	NOTE (3)
Cremorne Wharf Depot	Residential	0	2	NOTE (3)	NOTE (4)	NOTE (3)
Chelsea Embankment Foreshore	Residential	0	6	NOTE (3)	NOTE (4)	NOTE (3)
Kirtling Street	Residential	0	0	NOTE (3)	NOTE (3)	NOTE (3)
Heathwall Pumping Station[(2)]	Residential	0	4	NOTE (3)	NOTE (4)	NOTE (3)
Albert Embankment Foreshore	Commercial	0	2	NOTE (3)	NOTE (4)	NOTE (3)
Victoria Embankment Foreshore	Commercial	0	3	NOTE (3)	NOTE (4)	NOTE (3)
Blackfriars Bridge Foreshore	Commercial	0	7	NOTE (3)	NOTE (4)	NOTE (3)
Chambers Wharf	Residential	0	2	NOTE (3)	NOTE (4)	NOTE (3)
King Edward Memorial Park Foreshore	Residential	0	8	NOTE (3)	NOTE (4)	NOTE (3)
Earl Pumping Station[(2)]	Residential	0	6	NOTE (3)	NOTE (4)	NOTE (3)
Deptford	Commercial	0	14	NOTE (3)	NOTE (4)	NOTE (3)

Site	Buildings present in vicinity	Predicted 98th percentile at ground level[(1)] (ou_E/m^3)	Number of hours $1.5ou_E/m^3$ exceeded at ground level (hours/year)	Predicted 98^{th} percentile at worst height (ou_E/m^3)	Number of hours $1.5ou_E/m^3$ exceeded at height (hours/year)	Height with highest 98^{th} percentile concentration (m)
Church Street						
Greenwich Pumping Station[(2)]	Residential	0.1	2	0.1	1	7.6
Abbey Mills Pumping Station[(2)]	Residential	0.6	24	0.2	3	4.5

(1) Ground level is taken as 1.5m above ground.
(2) Values given are outside the Thames Water compound.
(3) NOTE (3) means that there are no value at height because there is no value at ground level
(4) Note (4) means that because the number of hours at ground level was very small the value at height would be even less and tends to or is zero, since dispersion at height is greater

1.1.6 The actively ventilated sites would have taller ventilation columns than the passively ventilated sites (see our response to first written question 1.9). The highest concentrations are found at the exit from the stack and so there is the potential for the higher concentrations to occur at height and affect the concentration at high buildings. This potential was carefully considered where there are high rise buildings close to the ventilation column particularly at the actively ventilated sites.

1.1.7 The assessment of odour values adjacent to the vents and up to 500m from the vent was performed by using an industry standard program 'AERMOD' which was developed for this type of application by the US Environmental Protection Agency. The simulations are in three dimensions and are based on 5m x 5m gird therefore impacts within the area simulated can be clearly shown, both at the ground surface, at height and at distance. The model includes references to building and building effects on air movement.

1.1.8 In the assessments we assigned particular grids as a 'receptor' of interest and in this way were able to determine what value of odour could occur for the conditions simulated. For example, at Carnwath Road Riverside the stack would be 15m high but a critical receptor along Carnwath Road is located at 12m. Any location within the grid can be extracted from the simulation results but for brevity we have only included the maximum values or for critical locations which, as indicated in Table 2.1, are low values and short durations.

1.1.9 For example, at Carnwath Road Riverside the 98^{th} percentile odour concentration at a critical residential receptor (located at 12m elevation) is predicted to be $0.8ou_E/m^3$, thus about half the benchmark level and essentially an undetectable level of odour. To illustrate the assessment further, Table 2.2 provides a summary of dispersion analysis for ground conditions and at height at Carnwath Road Riverside.

1.1.10 At all the building heights analysed for emissions from Carnwath Road Riverside, the number of hours with concentrations greater than 1.5 ou_E/m^3 are all well within the permissible 175 hours per annum set by the Environment Agency.

Table 2.2 Typical year dispersion modelling predictions at height for Carnwath Road Riverside with ventilation column at worst location

Elevation (m)	Predicted 98th percentile (ou_E/m^3)	Number of hours when odour >1.5ou_E/m^3
1.5	0.4	22
6	0.3	19
12	0.8	75
15	0.3	14

3 Question: 20.3

Explain why the hydrogen sulphide concentration is expected to be higher at KEMPF than at other sites.

1.2 Our response

1.2.1 Our response to first written question 1.9 includes further discussion of the reasons for a 5m ventilation stack and reasons for higher hydrogen sulphide levels at King Edward Memorial Park Foreshore.

3.1.1 The reason for the high hydrogen sulphide concentration at this site (during the one in 15-year storm event) is the higher than average concentration of dissolved sulphide liquid in the combined sewage discharge at Abbey Mills Pumping Station. Although the CSO drop shaft at King Edward Memorial Park Foreshore is 3.9km upstream from Abbey Mills Pumping Station, once the main tunnel shaft at the pumping station is drowned out, that is when the water level in the tunnel reaches the crown of the tunnel, King Edward Memorial Park Foreshore is the first air release location that would be reached since the main tunnel would fill from the Abbey Mills Pumping Station end.

3.1.2 We carried out dispersion modelling for extreme release conditions that could occur during the one in 15-year design storm. At this site, for a stack height of 4m, the analysis predicted an hourly concentration spike of 238µg/m^3 between the two ventilation columns. This is higher than the 150µg/m^3 environment assessment level for short-term, one hour exposure given in the Environment Agency's H1 guidance note. The next highest spike was predicted to be 57µg/m^3, which indicates that the spike of 238µg/m^3 would be unusually high.

3.1.3 Although we do not consider it likely that a person would stand between the ventilation columns for one hour during a one in 15-year storm, it is prudent to raise the columns by 1m to reduce the predicted spike during the storm event to 107µg/m^3 in order to meet the Environment Agency guidance.

3.1.4 It should be noted that, for a column height of 4m in typical year conditions, the maximum hourly concentration of hydrogen sulphide was predicted to be 4µg/m^3, which is well within the environment assessment level. This concentration would be even lower with the proposed 5m columns.

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