CAPITA

Leekbrook Development

Odour Survey Report
April 2015

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Quality Management

Job No	CS078908
Project	Leekbrook Development
Location	Gresham Street, London
Title	Odour Survey Report – April 2015
File reference	C:\Work\CS078908 Leekbrook\C.Issued_Output\Odour Survey Report Leekbrook - 20April 2015.docx
Date	24th April 2015
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Checked by	David Maxwell
Authorised by	Paul Woods

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Executive Summary

Capita Property and Infrastructure has been commissioned by Moorland & City Railways Ltd (MCR) to conduct an odour survey to accompany an outline planning application for residential development at Leekbrook, Staffordshire. It is proposed that the development site will consist of up to 37 dwellings. Leek Sewage Treatment Works (LSTW) is located to the west of the site.

An odour survey on site was carried out on 31 March 2015. It is confirmed that the odour level is very low and there is no evidence of odour presented on the site from LSTW.

There have not been any constraints identified with regards to odour to the proposed development. It is therefore concluded that the proposed scheme is suitable to be considered for planning permission in terms of odour.

1. Introduction

Capita Property and Infrastructure has been commissioned by Moorland & City Railways Ltd (MCR) to conduct an odour survey to accompany an outline planning application for residential development at Leekbrook, Staffordshire. It is proposed that the development site will consist of up to 37 dwellings as shown on the indicative site plan below. An odour survey on site was carried out on 31 March 2015.

Leek Sewage Treatment Works (LSTW) is located to the west of the site.

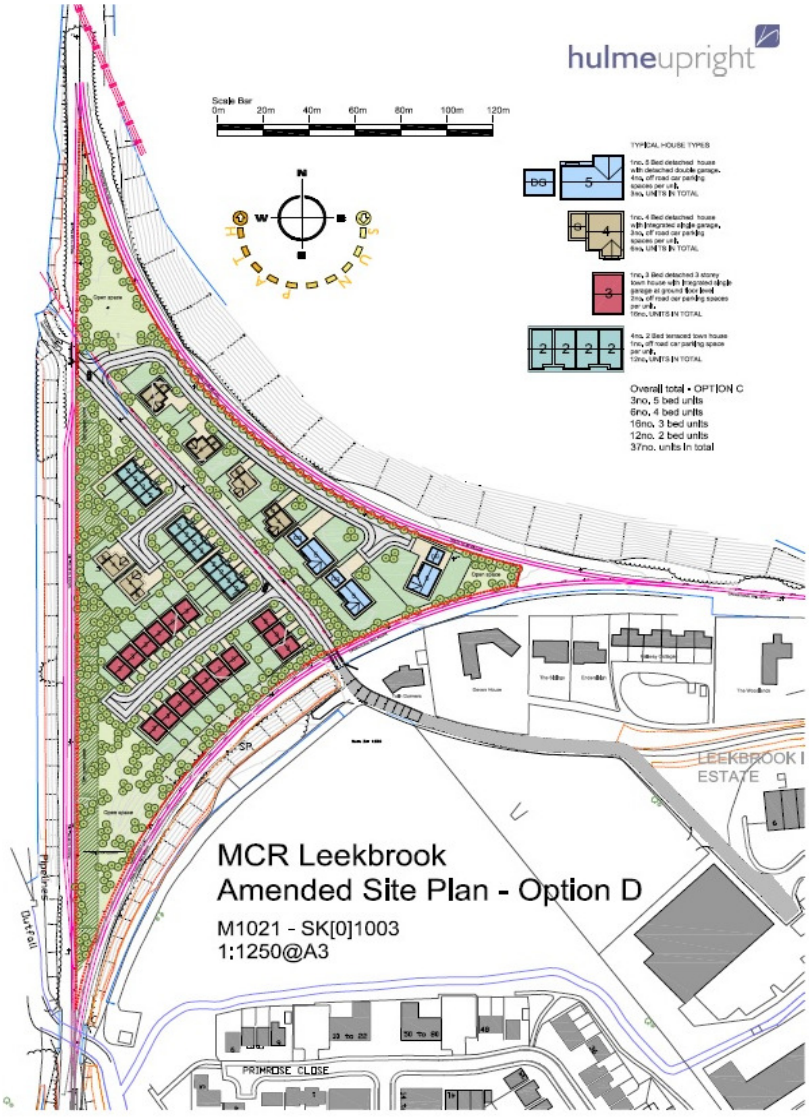

Figure 1 – Indicative Site Layout Plan of Proposed Development

2. Consultation and Guidance

2.1 Consultation

The Pollution Officer, Dr. Daniel McCrory, at Staffordshire Moorlands District Council (SMDC) was consulted and the scope of survey agreed[1].

2.2 Odour Guidance

Odour Guidance for Local Authorities (Defra, March 2010)

The concentration at which an odour is just detectable to a "typical" human nose is referred to as the "threshold" concentration. An odour unit is defined by the BSEN 13725 standard as 1 OU_E, a European Odour Unit. The following guideline values[2] provide some context for discussion about exposure to odours:

- 1 OU_E / m^3 is the point of detection;
- 5 OU_E /m^3 is a faint odour; and
- 10 OU_E/m^3 is a distinct odour.

However, the Guidance also stressed that it is important to realise that these values are based on laboratory measurements and in the general environment other factors affect our sense of odour perception. For example, the population is continuously exposed to a wide range of "background" odours at a range of different concentrations, and usually people are unaware of there being any background odours at all due to normal habituation". Individuals can also develop a "tolerance" to background and other specific odours. In an odour laboratory the determination of detection threshold is undertaken by comparison with non-odorous air, and in carefully controlled, odour-free, conditions. Normal background odours such as those from traffic, vegetation, grass mowing etc, can provide background odour concentrations from 5 to 60 OU_E/m^3 or more.

H4 - Odour Management, Technical Guidance (Environment Agency, 2009)
The horizontal guidance note H4 produced by the Environment Agency provides guidance and advice to operators on controlling and monitoring odour from their operations.

H4 Guidance Part 2 Section 3 provides guidance for odour sampling. Section 3.2.7 discusses Limits of detection and uncertainty. It states that the lower limit of detection for a sample is 50 OU_E, i.e. it must be at least 50 OU_E as collected to allow it to be diluted and presented to the panel at a number of different dilutions (as per the CEN standard).

Guidance on the assessment of odour for planning (IAQM, 2014)

- ***Conventional monitoring approach***, where the Air Quality Practitioner makes the odour measurements in the field, (e.g. using sniff tests, field olfactometry or chemical compound analysis);

[1] *Email sent on 19/2/2015*
[2] *Environment Agency, Draft 2009, H4 - Odour Management , Technical Guidance*

- ***Community assessment approach***, which uses public responses as raw data (e.g. odour diaries, attitude surveys, or complaints monitoring).

It should be noted that it is not possible to monitor ambient odour at receptors as the 98th percentile of 1-hour mean concentrations: concentration benchmarks expressed in this form are designed for use with predictive dispersion modelling, not monitoring.

3. Baseline Conditions

3.1 Odour History of the Site

No odour complaints have been received by SMDC from current neighbouring residents, indicating that there is no history of odour nuisance associated with the LSTW

3.2 LSTW Odour Assessment

LSTW has submitted a number of planning applications, namely Leek Sewage Treatment Works Sludge Dewater Scheme (Ref. SM.99/0130) and Statement in support of Planning Application for the Improvement of Leek Sewage Treatment Works (Ref. SM.99/1141).

The supporting statements for SM.99/1141 and SM.99/0130 contained references to odour:

- Paragraph 5.5 of SM.99/0130 is titled Odour Statement
- Paragraph 6.1 of SM.99/1141 relates to odour

Both paragraphs confirmed there was no odour issue at LSTW.

4. Odour Sampling Survey

4.1 Meteorological Conditions

On 31st March 2015, odour survey was conducted. It was a clear and dry day, with average temperature of 10 ℃ and breeze. Prevailing direction was north-westerly. As the LSTW is located on the west side of the proposed development, odour would be more likely to be detected while there is north-westerly wind if there is a potential odour issue from LSTW.

4.2 Site Activities

On the 31st March 2015 Spectrum Odour Lab performed odour sampling at two locations with 3 samples taken at each location. Location is defined here in as Location 1 and Location 2. The approximate locations are detailed on the site plan provided in Appendix A. These locations are at the closest site boundary to LSTW, representing worst case potential odour exposure.

At each location, 3 odour samples were taken at 15 minute intervals. Ambient odour samples were drawn into odour free nalophan sample bags using the lung method principle of sampling. The sampling tube was held in a tri-pod positioned at head height during sampling to mimic nose height. Each sample was clearly identified and given a customer reference and Odour Lab ID which is shown in Table 1.

Table 1. Sample Identification

Customer Ref	Odour Lab ID	Start Time of Sample
Leekbrook Junc L1	JL15911-01	10:50
Leekbrook Junc L1	JL15911-02	11:05
Leekbrook Junc L1	JL15911-03	11:20
Leekbrook Junc L2	JL15911-04	11:45
Leekbrook Junc L2	JL15911-05	12:00
Leekbrook Junc L2	JL15911-06	12:15

The odour samples were measured at Odour Lab's Worcester based UKAS accredited olfactometry laboratory in accordance with BS EN 13725:2003. The odour sample measurements are reported separately reference JL15911_01.04.15 (Appendix A.2)

4.3 Odour Sampling Results

Table 2 presents the odour sampling results.

Table 2. Olfactometry Report

Sample ID	Sample Description	Sample Accepted/lin time?	ΔT (Hours)	Odour Units ouE/m3
JL15911-06 - (01)	Leekbrook Junc L2	Yes PASS	25	99
JL15911-05 - (01)	Leekbrook Junc L2	Fail * 8	25	144
JL15911-04 - (01)	Leekbrook Junc L2	Fail * 8	25	128
JL15911-03 - (01)	Leekbrook Junc L1	Fail * 8	25	200
JL15911-02 - (01)	Leekbrook Junc L1	Fail * 8	25	108
JL15911-01 - (01)	Leekbrook Junc L1	Fail * 8	25	128

The detailed Lab Report can be found at Appendix A.2. Out of 6 samples, 5 of them show insufficient ITE's to meet BS EN 13725:2003 criteria. The reference to 'Fail' in the table above does **not** mean that the sampling has not been undertaken properly or that the results reveal an odour problem. On the contrary, the results actually demonstrated that odour level was very low and in most cases undetectable. EA H4 guidance states that the lower limit of detection for a sample is 50 OU_E.

Odour Lab has followed all correct sampling procedures and standards. The Lab was unable to achieve 8 Valid ITES for all odour samples because the odour concentrations were consistently low. Full detailed explanation from Odour Lab is included in the Appendix A.3.

Even with recent advances, the current detection limits are in the order of 20–50 OU_E/m^3, hence the applicability of olfactometry to assess ambient air samples around the threshold for nuisance levels (5–10 OU_E m^3) is limited[3] [4]. For example, a fresh cut lawn could have odour units of 100-200 OU_E/m^3. As the sampling is taken as ambient sample, all background smell such as trees, grass and dog walkers on the day could contribute to the concentration level

3 Bokowa A.H (2012), Ambient odour assessment similarities and differences between different techniques, Chemical Engineering Transactions, 30 (2012), pp. 313–318

4 Murioz R. Et al. (2010), Monitoring techniques for odour abatement assessment, Water Research, 44 (2010), pp. 5129–5149

detected. The Defra guidance levels are mainly applicable with predictive dispersion modelling for a single source odour, not ambient monitoring. The concentration in Table 2 is an indication of background odour level.

Overall, the odour sampling results have confirmed that the ambient odour level is very low, There is no evidence that LSTW is the source of odour in this case.

4.4 Site Visit Odour Sniff Test Records

No odour has been detected at the site during any of the site visits so that it is very unlikely that any odour from the LSTW will be detectable on site.

Site visit odour sniff test records during 2015 are included in Appendix B for reference only.

5. Conclusions

The proposed residential development at Leekbrook site, Leek would introduce new residential receptors.

The on -site odour survey confirms that the ambient odour concentration level is very low and there is no evidence of odour presented on the site from LSTW.

There have been no constraints identified with regards to odour to the proposed development. It is therefore concluded that the proposed scheme is suitable to be considered for planning permission in terms of odour.

Appendix A Odour Lab Report

A.1 Odour Survey Sampling Points

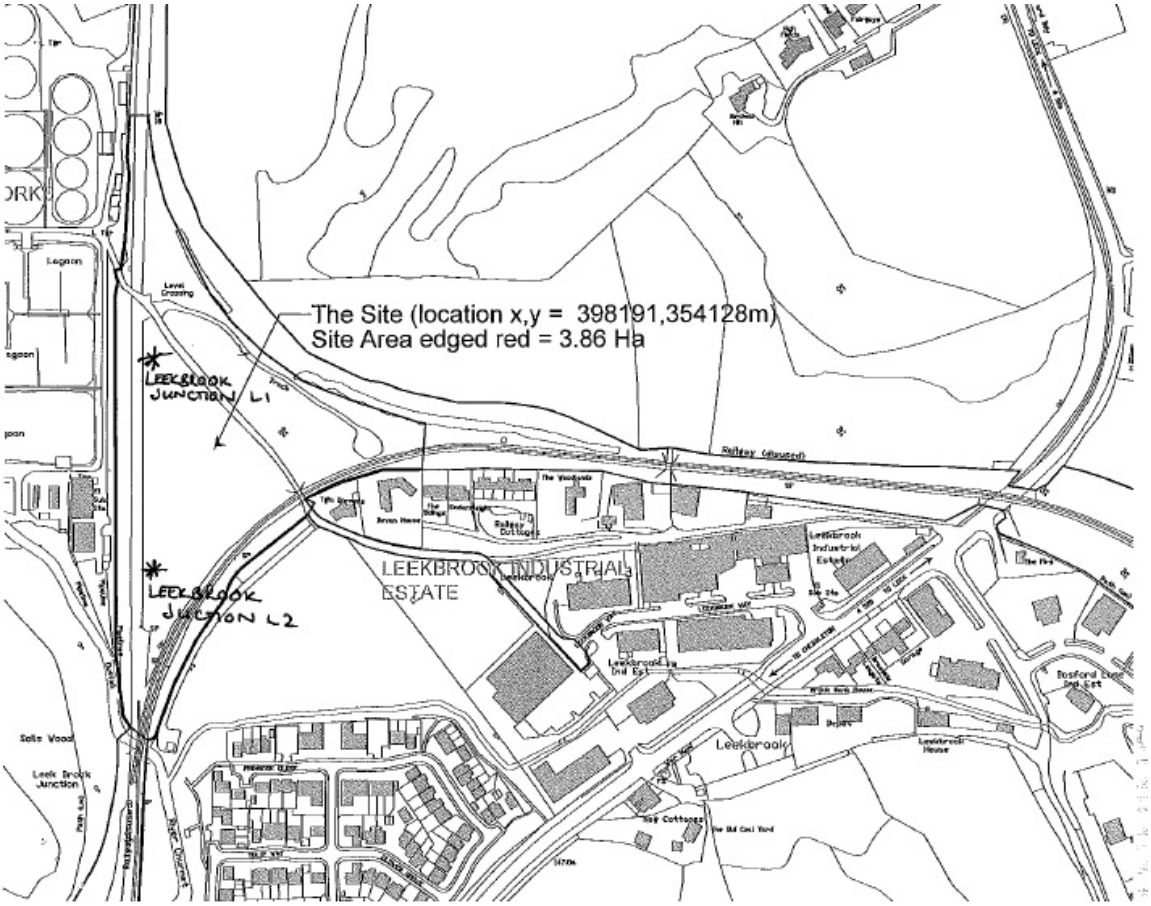

Figure A.1 Odour Sampling Points

A.2 Odour Lab Report

spectrum odour lab

Olfactometry Report

Odour Lab

Air Spectrum Environmental Limited
Spectrum House
Worcester WR3 7JW

Report ID	JL15911_01.04.15
Issue Number	1
Issue Date	08/04/2015

Customer Information

Customer Name	Capita Property and Infrastructure Limited
Address	Gresham Street London EC2V 7NQ
Customer PO	4800048028
Customer Reference	Leekbrook Odour

Laboratory Information

Laboratory Manager	Peter Badham
Laboratory Address	University of Worcester National Pollen & Aerobiology Research Unit Charles Darwin Building Worcester WR2 6AJ
Laboratory Description	Climate controlled environmental chamber

Environmental Conditions

Lab Temperature	21.7 C	must be < 25.0 C
Lab Humidity	50.8%	
Oxygen	20.8%	
CO_2	.5%	must be < 1.5%
Nitrogen	76.0%	

Equipment Information

Olfactometer	IDES SS600
Serial Number	SS101301
Number of Panelists	6
Note	Laboratory predilution is not required

Laboratory Compliance

Laboratory Accuracy, A_{ad}	0.062	Criteria is ≤ 0.217
Laboratory Repeatability, r	0.173	Criteria is ≤ 0.477

Analysis Information

Standard	EN 13725:2003
Methodology	Forced choice method

Certifications

ISO/IEC17025:2005	General requirements of the competence of testing and calibration laboratories
EN 13725:2003	Olfactometry odour threshold determination using dynamic dilution and forced choice method
ISO9001:2008	Quality Management Systems
ISO14001:2004	Environmental Management Systems

Report Approval

Laboratory Operator	Pete Badham
Laboratory Manager	Pete Badham

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Olfactometry Report

Report ID	JL15911_01.04.15
Issue Number	1
Issue Date	08/04/2015

RESULTS

Result Filename	Sample ID	Sample Description	Sample Accepted/ In time?	Bag fill date & time	Analysis date & time	ΔT (hours)	ou_E/m^3	Bag OK
B01041505.csv	JL15911-06 - (01)	Leekbrook Junc L2	Yes PASS	31/03/2015 12:15	01/04/2015 12:46	25	99	Yes
B01041504.csv	JL15911-05 - (01)	Leekbrook Junc L2	Fail * 8	31/03/2015 12:00	01/04/2015 12:33	25	144	Yes
B01041503.csv	JL15911-04 - (01)	Leekbrook Junc L2	Fail * 8	31/03/2015 11:45	01/04/2015 12:21	25	128	Yes
B01041596.csv	JL15911-03 - (01)	Leekbrook Junc L1	Fail * 8	31/03/2015 10:50	01/04/2015 11:30	25	200	Yes
B01041502.csv	JL15911-02 - (01)	Leekbrook Junc L1	Fail * 8	31/03/2015 11:05	01/04/2015 12:08	25	108	Yes
B01041501.csv	JL15911-01 - (01)	Leekbrook Junc L1	Fail * 8	31/03/2015 10:50	01/04/2015 11:56	25	128	Yes

Notes

Panellist acuity within acceptable limits

A number of results recorded less than 8 valid individual threshold estimates (ITE's), those that failed have not met the criteria of BS EN 13725:2003. In all instances the sample threshold was too low for all panel members to correctly detect, further explanation can be found in the accopanying letter REF:JL15911_01.04.15 Support

Sample Fail reasor	1 = Sample to Analysis time > 30 hours	4 = reasons 1 + 3
Refer to code	2 = Sample time not given by Customer	5 = reasons 2 + 3
next to FAIL	3 = Bag contaminated when received	8 = Insufficient ITE's to meet BS EN 13725:2003 criteria

A.3 Odour Lab Support Report

Dr Sian Sheng
Capita
65 Gresham Street
London
EC2V 7NQ

07 April 2015

Report ID: JL15911_01.04.15 Support

Dear Sian,

On Wednesday 1st April 2015 Odourlab performed analysis on 6 odour samples taken at Leekbrook. Five of the six samples did not meet the criteria of odour measurement defined in BS EN 13725:2003. This document explains why the samples did not meet the requirements of BS EN 13725:2003.

With reference to report JL15911_01.04.15 table 1 lists the samples that did not meet the criteria of BS EN 13725:2003 for measurement of odour threshold. Odour measurement consists of a panel of human sensors attempting to identify an odour sample at different dilutions. The odour sample is diluted through a range of dilutions and presented to the panel members alongside an odour free blank through two ports. The olfactometer randomly selects which port will present the diluted odour sample and which port presents odour free air. The panellists are challenged at each dilution to identify the dilute odour sample. They are given the choice between port a and b and asked to identify if their selection is a guess, inkling or if they are certain. Each response is given a numerical format depending on the answer being correct or not (below a list of all possible responses is detailed). A panel member correctly identifies the odour dilution once they have scored two consecutive 6's. The panel members individual threshold estimate (ITE) is calculated as the geomean between the first dilution at which they scored consecutive 6's and the dilution one step higher. For example if a panel member correctly identifies the odorant at a dilution of 256:1 and 128:1 but doesn't identify the same odorant at 512:1, the geomean between 256 and 512 is used to calculate a ITE.

- 1 – Response a guess and incorrect
- 2 – Response a guess and correct
- 3 – Response an inkling and incorrect
- 4 – Response an inkling and correct
- 5 – Response certain and incorrect
- 6 – Response certain and correct.

To meet the criteria for odour measurement in BS EN 13725:2003 8 Valid ITE's are required after screening of results over at least 2 rounds of dilution series. Each panel members ITE's will remain valid only if they score an ITE on both rounds. If they do not score an ITE on both rounds all ITE's for the panel member are discounted. If 8 valid ITE's are available the odour measurement can be calculated in the in ou_E/m^3. The ou_E/m^3 of a sample is calculated as 1 ou_E/m^3 x average of Valid all ITE's dilutions. For example if an odour sample scores 8 Valid ITE's which have an average of 1000, the odour concentration of the odour sample is 1000 ou_E/m^3.

All samples from report JL15911_01.04.15 in Table 1 did not score 8 Valid ITE's which means they do not meet the criteria of BS EN13725:2003. However there is still relevant data from the analysis day which is reported below.

Table 1. Samples that do not meet the criteria of BS EN 13725:2003

Result Filename	Sample ID	Sample Description	Reason Sample Did Not Meet Criteria
B01041504.csv	JL15911-05 - (01)	Leekbrook Junc L2	Only 6 Valid ITE's
B01041503.csv	JL15911-04 - (01)	Leekbrook Junc L2	Only 6 Valid ITE's
B01041596.csv	JL15911-03 - (01)	Leekbrook Junc L1	Only 4 Valid ITE's
B01041502.csv	JL15911-02 - (01)	Leekbrook Junc L1	Only 6 Valid ITE's
B01041501.csv	JL15911-01 - (01)	Leekbrook Junc L1	Only 4 Valid ITE's

Results

Sample ID – JL15911-05-(01) – B01041504

Dilution	512	256	128	64	32	16	ITE's	Valid ITE's
Round 1								
Panelist 1	3	4	3	4	5	6	Not Detected	
Panelist 2	4	3	3	**6**	**6**	0	91	**91**
Panelist 3	3	4	4	1	4	4	Not Detected	
Panelist 4	6	5	**6**	**6**	0	0	181	**181**
Panelist 5	2	**6**	**6**	0	0	0	362	**362**
Round 2								
Panelist 1	4	3	4	4	**6**	**6**	45	
Panelist 2	4	4	4	**6**	**6**	0	91	**91**
Panelist 3	2	2	1	4	5	6	Not Detected	
Panelist 4	5	6	5	**6**	**6**	0	91	**91**
Panelist 5	5	5	**6**	**6**	0	0	181	**181**

Sample ID – JL15911-04-(01) – B01041503

Dilution	512	256	128	64	32	16	ITE's	Valid ITE's
Round 1								
Panelist 1	4	3	6	6	0	0	181	**181**
Panelist 2	4	3	3	6	6	0	91	**91**
Panelist 3	6	3	4	6	3	3	Not Detected	
Panelist 4	5	6	6	0	0	0	362	
Panelist 5	4	3	6	5	6	6	45	**45**
Round 2								
Panelist 1	4	4	6	6	0	0	181	**181**
Panelist 2	6	5	5	6	6	0	91	**91**
Panelist 3	4	4	6	4	6	6	45	
Panelist 4	5	5	5	5	5	6	Not Detected	
Panelist 5	3	6	6	0	0	0	362	**362**

Sample ID – JL15911-03-(01) – File B01041596

Dilution	676	337	168	84	42	ITE's	Valid ITE's
Round 1							
Panelist 1	4	3	3	6	6	119	**119**
Panelist 2	4	4	6	6	0	238	**238**
Panelist 3	1	2	3	6	5	Not Detected	
Panelist 4	5	5	6	5	5	Not Detected	
Panelist 5	4	5	5	6	6	119	
Round 2							
Panelist 1	4	3	5	6	6	119	**119**
Panelist 2	3	6	6	0	0	477	**477**
Panelist 3	2	3	5	5	6	Not Detected	
Panelist 4	6	5	5	5	6	Not Detected	
Panelist 5	1	4	6	5	5	Not Detected	

Sample ID – JL15911-02-(01) – File B01041502

Dilution	512	256	128	64	32	16	ITE's	Valid ITE's
Round 1								
Panelist 1	3	3	4	4	6	6	45	**45**
Panelist 2	3	3	6	6	0	0	181	**181**
Panelist 3	2	1	3	5	4	6	Not Detected	
Panelist 4	5	6	6	0	0	0	362	
Panelist 5	4	6	5	6	6	0	91	
Round 2								
Panelist 1	3	3	4	5	6	6	45	**45**
Panelist 2	3	6	6	0	0	0	362	**362**
Panelist 3	4	5	5	2	6	6	45	
Panelist 4	6	6	0	0	0	0	Too Sensitive	
Panelist 5	3	6	5	6	5	6	Not Detected	

Sample ID – JL15911-01-(01) – File B01041501

Dilution	512	256	128	64	32	16	ITE's	Valid ITE's
Round 1								
Panelist 1	4	6	6	0	0	0	362	**362**
Panelist 2	3	6	5	6	6	0	91	**91**
Panelist 3	5	5	6	4	5	6	Not Detected	
Panelist 4	6	5	6	6	6	0	181	**181**
Panelist 5	3	5	5	6	5	6		
Round 2								
Panelist 1	3	6	5	6	6	0	91	**91**
Panelist 2	4	5	6	6	0	0	181	**181**
Panelist 3	1	1	1	4	4	6	Not Detected	
Panelist 4	5	5	5	5	6	6	45	**45**
Panelist 5	4	3	5	5	6	6	45	

Odourlab was unable to achieve 8 Valid ITES for all odour samples because the odour concentrations were consistently low. It can be seen on all the examples that at the lowest dilution certain panellists were unable to detect the odour dilutions correctly with two consecutive 6's. At such low dilutions large amounts of odour sample are required for the olfactometer which meant it could not be diluted any less in case the odour sample ran out before completion. However the results do have relevance and within the results section all the panellists ITE's have been shown for further observation on Capita's behalf.

I hope that explanations within this document clarify the sample analysis performed upon the 1st April 2015. If you require any further explanation on the matter please feel free to call myself on 01905 362 100, I will be more than happy to help.

Kind Regards,

David Green
Business Development Manager
Odourlab

Appendix B Site Visit Odour Sniff Test Records

Records of site visits odour sniff tests on 16 February, 25 February and 31 March 2015 are presented here.

Odour Sniff Test Record Form	**Date: 16 February 2015**	
Time of the test	11:40am	12:10 noon
Location of test e.g. Street name etc.	future residential locations	west site boundary
Weather conditions (Dry, rain, fog, Snow etc.)	slightly wet, cloudy	slightly wet, cloudy
Temperature (very warm, warm, mild, cold, or degrees if known)	mild	mild
Wind direction (e.g. From S.W.)	South-westerly	South-westerly
Wind strength (none, light, steady, strong, gusting) use Beaufort scale if known	light	light
Intensity (see below)	0	0
Duration (of test)	30mins	20mins
Constant or Intermittent in this period or persistence		
What does it smell like?		
Receptor sensitivity (see below)	high	low
Is the source evident?		
Any other comments or Observations		

Intensity
0 No odour
1 Very Faint odour
2 Faint odour
3 Distinct odour
4 Strong odour
5 Very strong odour
6 Extremely strong odour
Ref: German Standard VDI 3882, Part 14

Receptor sensitivity where odour detected
Low (e.g. footpath, road)
Medium (e.g. Industrial or commercial workplaces)
High (e.g. Housing, Pub/hotel etc.)

Odour Sniff Test Record Form	Date: 25 February 2015	
Time of the test	4:30pm	5:00pm
Location of test e.g. Street name etc.	future residential locations	west site boundary
Weather conditions (Dry, rain, fog, Snow etc.)	wet	wet
Temperature (very warm, warm, mild, cold, or degrees if known)	mild	mild
Wind direction (e.g. From S.W.)	South-westerly	South-westerly
Wind strength (none, light, steady, strong, gusting) use Beaufort scale if known	light	light
Intensity (see below)	0	0
Duration (of test)	20mins	20mins
Constant or Intermittent in this period or persistence		
What does it smell like?		
Receptor sensitivity (see below)	high	low
Is the source evident?		
Any other comments or Observations		

Intensity

0 No odour
1 Very Faint odour
2 Faint odour
3 Distinct odour
4 Strong odour
5 Very strong odour
6 Extremely strong odour
Ref: German Standard VDI 3882, Part 14

Receptor sensitivity where odour detected

Low (e.g. footpath, road)
Medium (e.g. Industrial or commercial workplaces)
High (e.g. Housing, Pub/hotel etc.)

Odour Sniff Test Record Form	**Date: 31 March 2015**	
Time of the test	10:30am	11:30am
Location of test e.g. Street name etc.	north corner of the site	south corner of the site
Weather conditions (Dry, rain, fog, Snow etc.)	Dry	Dry
Temperature (very warm, warm, mild, cold, or degrees if known)	mild	mild
Wind direction (e.g. From S.W.)	North-westerly	North-westerly
Wind strength (none, light, steady, strong, gusting) use Beaufort scale if known	light	light
Intensity (see below)	0	0
Duration (of test)	30mins	20mins
Constant or Intermittent in this period or persistence		
What does it smell like?		
Receptor sensitivity (see below)	low	
Is the source evident?		
Any other comments or Observations	there were dog walkers around	

Intensity

0 No odour
1 Very Faint odour
2 Faint odour
3 Distinct odour
4 Strong odour
5 Very strong odour
6 Extremely strong odour
Ref: German Standard VDI 3882, Part 14

Receptor sensitivity where odour detected

Low (e.g. footpath, road)
Medium (e.g. Industrial or commercial workplaces)
High (e.g. Housing, Pub/hotel etc.)

CAPITA

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