

FINAL V1

Pembrokeshire County Council Waste Transfer Station



Odour Impact Assessment

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1.0 Introduction

SLR Consulting (SLR) has been commissioned by Pembrokeshire County Council (PCC) to undertake an Odour Impact Assessment to support the Environmental Permit (EP) variation and planning applications for the proposed Waste Transfer Station (WTS) at Unit 41, The Dockyard, Pembroke Dock, Pembrokeshire, SA72 6TD, hereafter referred to as 'the Site'.

1.1 Site Description and Location

The Site is situated in Pembroke Dock which is approximately 3km north west of Pembroke in south west Wales. The Site is located within The Dockyard and is accessed via Whites Farm Way which links into the A477 further to the east. The National Grid Reference (NGR) for the Site is SM 95702 03746.

The immediate surrounding land use is predominantly industrial/commercial beyond which is a residential area to the south and Milford Haven waterway to the north. The Site's location and surrounding locale is illustrated in Figure 4-1.

1.2 Proposed Development

PCC are undertaking a service change from comingled to kerbside sort recycling collections. The EP Variation seeks to extend the permit boundary of the existing Site, which is permitted under an EP (Ref EPR/PB3490HV). The permit boundary would extend to the west of Unit 41, encompassing Units 29, 29A and 35. As such, Units 29 and 29A would become operational to allow for expansion of the permitted waste types accepted at the Site. At present the Site accepts black and orange bag waste in addition to food waste. The expansion would accommodate wastes such as separated paper, glass, plastic, mixed cans and plastic and mixed card.

An existing exemption (S2: Storing waste in a secure place) is in place on Site and will remain following this Variation. Glass will ordinarily be tipped inside, with the exception of commercial glass, which will be tipped into a designated container outside. The exemption will be used as a contingency for the storage of glass outside in a container. Permitted waste tonnage at the Site would remain the same.

1.3 Scope of the Assessment

The report considers the potential for the proposed EP Variation at the WTS to impact upon amenity at human receptors within the surrounding area. The assessment incorporates site olfactory surveys to inform baseline conditions and an assessment of potential impacts based upon a review of source magnitude potential, the distance, direction and sensitivity of proposed receptors and prevailing meteorological conditions.

2.0 Air Quality Legislation, Policy and Guidance

2.1 Environmental Permitting Regulations

The proposed development would be regulated via the Environmental Permit for the wider site under the Environmental Permitting (England and Wales) Regulations¹ (the EP Regulations). As such, emissions to air are regulated under the EP Regulations by National Resource Wales (NRW).

2.2 Odour Assessment Guidance

2.2.1 H4 Odour Management

Guidance Notes produced by NRW are used to provide the basis for permit conditions regards releases to air and mitigation measures. With reference to odour these are defined within '*H4 Odour Management*'², the guidance includes:

- a description of how an 'odour boundary condition' (i.e. no pollution beyond the site boundary at a receptor) should be interpreted and compliance assessed;
- guidance on identification of sources, mitigation measures and monitoring; and
- what is required in an Odour Management Plan.

2.2.2 IAQM - Odour for Planning Guidance

The Institute of Air Quality Management (IAQM) published '*Guidance on the assessment of odour for planning*' in 2014³. Though this guidance has been composed for assessing odour impacts for planning purposes, it provides a useful a framework for evaluating the significance of effects on amenity.

The IAQM guidance presents a step-by-step approach to determine the most appropriate assessment method to determine potential odour impacts from existing odorous activities based upon the potential for the proposed development to experience adverse odour effects. If there is a low likelihood (risk) of adverse odour effects, the IAQM guidance considers that '*a single assessment tool may suffice and/or may be more qualitative than quantitative*'. This assessment approach meets the requirements in the air quality section of the NPPG for assessments to be '*proportionate to the nature of scale of development proposed and the level of concern*'.

¹ The Environmental Permitting (England and Wales) Regulations 2007

² National Resource Wales, How to comply with your environmental permit - H4 Odour Management (v.2 2014).

³ Bull et al (2014). IAQM Guidance on the assessment of odour for planning, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/odourguidance (2014)

3.0 Assessment Methodology

There is neither European nor United Kingdom (UK) specific regulatory standards for the assessment of the impact of odours (i.e. numerical standards in relation to exposure). However, it may be reasonably argued that complaints are likely to occur when odours become detectable and recognisable on a frequent basis. The longer the odour detection persists for an individual, the greater the level of complaints may be expected, particularly if the odours are unpleasant.

The potential for odorous compounds to cause nuisance is dependent upon a wide range of factors, including:

- the rate of emission of the compound(s);
- the duration and frequency of exposure;
- the time of the day that this emission occurs;
- the prevailing meteorology;
- the sensitivity of the 'receptors' to the emission, i.e. whether the odorous compound is more likely to cause nuisance, such as the sick or elderly, who may be more sensitive;
- the odour detection capacity of individuals to the various compound(s); and
- the individual perception of the odour, (i.e. whether the odour is regarded as unpleasant). This is greatly subjective and may vary significantly from individual to individual. For example, some individuals may consider some odours as pleasant, such as petrol, paint and creosote.

The IAQM guidance recommends a range of techniques (a multi-tool approach) are applied in odour assessment. For this assessment the following have been undertaken:

- olfactory survey to inform the baseline; followed by
- qualitative risk assessment.

Initial olfactory field surveys were undertaken to assess potential odour from the WTS. Results from the surveys were then utilised within the IAQM Qualitative Odour Assessment. The methodology for Olfactory Field Surveys and Qualitative Odour Assessment are outlined below.

3.1 Olfactory Field Surveys

Odour monitoring using olfactory field surveys has been undertaken at locations surrounding the Site, in order to assess potential odour from the existing WTS. The odour monitoring survey was undertaken in accordance with the (IAQM) *Guidance*.

Sniff testing was undertaken on three separate days by personnel from the SLR Air Quality team. The survey locations used in each assessment are illustrated in Appendix AQ3. The times of each assessment were as follows:

Assessment No. 1:	23 rd January 2019	11:25 – 13:35; and
Assessment No. 2:	26 th February 2019	11:05 – 12:45 and 14:10 – 15:35;
Assessment No. 3:	27 th February 2019	08:50 – 10:05 and 10:40 – 12:05.

The procedure for the olfactory survey is detailed within Box 4 - Appendix 2 of the IAQM guidance³. The procedure involves the tester making observations on frequency, intensity, duration and offensiveness at a series of locations within the area of interest selected on the

basis of wind direction. The intention is to delineate the extent of the odour plume and potential exposure in the surrounding area.

The test locations were identified during a desktop review before an initial walkover of the surrounding area, taking into account the WTS, the orientation in relation to the prevailing wind direction and the distance from source to the sample area needed to cover.

The intensity, frequency and duration are then considered together to assess potential exposure using a matrix provided in the guidance. The procedure outlined in the guidance has been reproduced in Appendix AQ1.

3.2 Qualitative Odour Assessment

The assessment of fugitive odour emissions from the proposed development has been undertaken on the basis of a conceptual model that takes into consideration the potential sources, surrounding receptors, and the effectiveness of the pathway between source and receptor in order to assess the magnitude of risk.

Specifically, the following aspects are reviewed:

- the type of activities undertaken on site including designed-in mitigation measures in order to determine 1) the potential magnitude of releases in general terms and 2) the nature of that release;
- the location of receptors in the surrounding area with specific consideration of the type of receptor and therefore their potential sensitivity according to guidance; and
- the pathway between source and receptors incorporating buffer distance between receptors and any mitigating features, the frequency of wind conditions likely to result in the dispersion of emissions towards receptors.

4.0 Baseline Environment

4.1 Site Setting and Sensitive Receptors

The Proposed Development is within the PCC area of administration at approximate location NGR: x195745, y203700. The Proposed Development is located within Pembroke Dockyard with the immediate locale characterised by industrial units to the north and east, Pembroke Dock WwTW situated to the west and South Pembrokeshire Hospital approximately 60m south, as illustrated in Figure 4-1. Other land uses within the wider area include:

- Surehaven Pembroke Hospital;
- Pembroke Dock Heritage Centre museum;
- golf course;
- residential dwellings;
- places of worship;
- restaurants and eateries; and
- hotels.

The closest proposed residential receptors to the WTS, as shown below in Figure 4-1 are located approximately 120m to the south-west on Martello Road and 170m south on Saint Patricks Hill, beyond the hospital. Therefore, winds blowing from north-east and north have the potential to disperse odour towards the sensitive receptors. The hospital and residential dwellings are elevated and positioned on an incline overlooking Pembroke Dock.

A number of sensitive receptors in the surrounding environment have been selected for the purposes of undertaking the odour assessment. In general, they represent the nearest sensitive receptors in each direction. The selected receptors are shown in Figure 4-1 and listed in Table 4-1.

Figure 4-1: Site Setting and Sensitive Receptor Locations

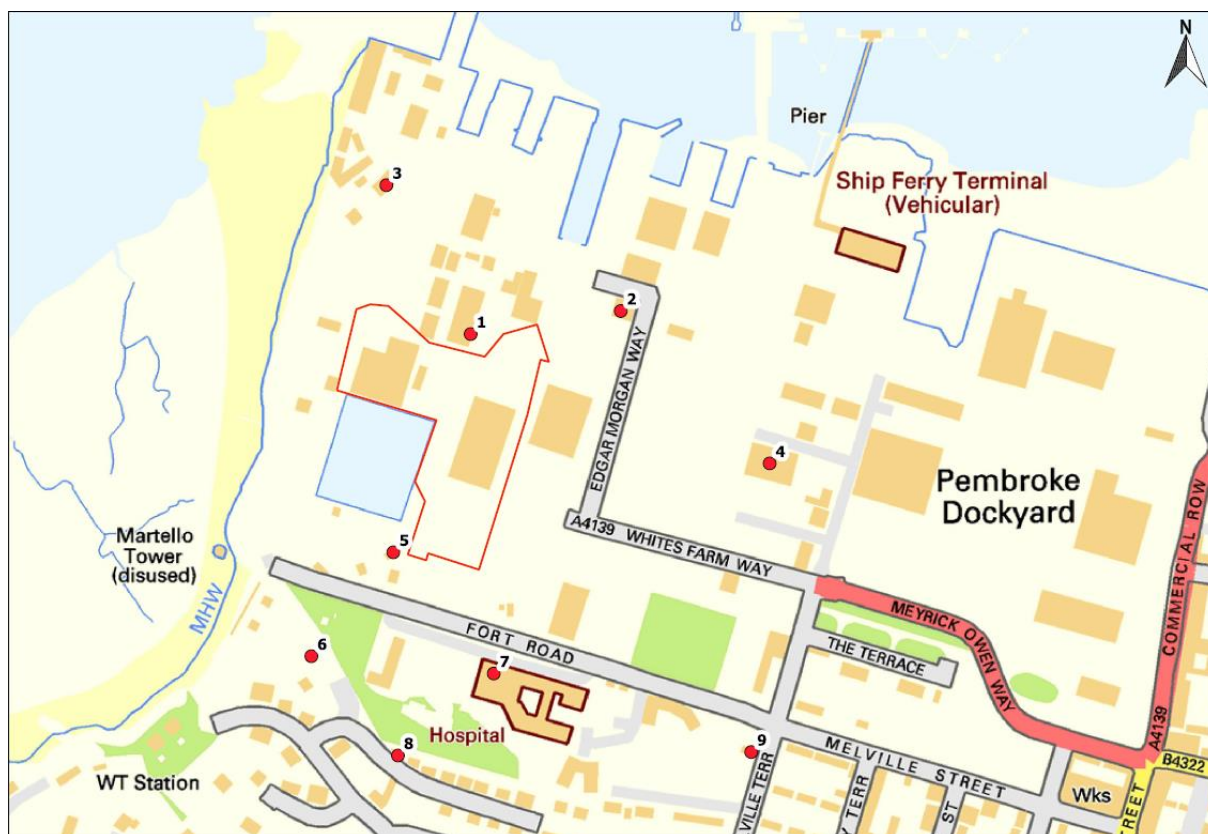


Table 4-1: Sensitive Receptor Locations

ID	Receptor	Type	Applied Sensitivity to Odour
R1	Unit 19 - Workshop	Industrial	Low
R2	Mainstay Marine Solutions	Industrial	Low
R3	Svitzer Marine	Commercial	Medium
R4	Redhall Engineering Solutions	Industrial	Low
R5	Workshop	Commercial	Low
R6	Martello Road	Residential	High
R7	South Pembrokeshire Hospital	Hospital	High
R8	St. Patrick's Hill	Residential	High
R9	Melville Terrace	Residential	High

Figure 4-1: Site Setting and Sensitive Receptor Locations



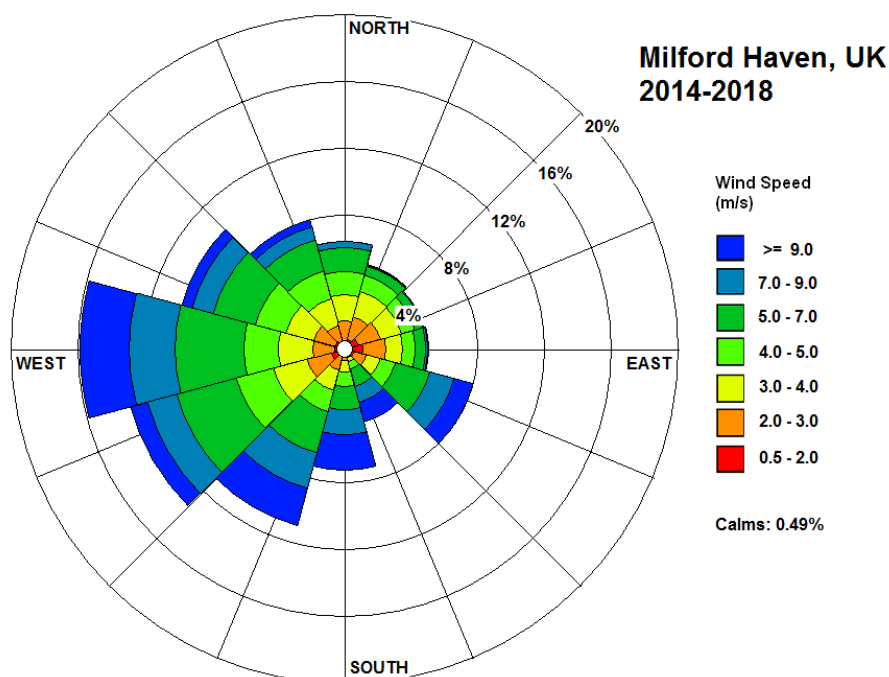
4.2 Meteorology

The most important climatic parameters governing the release and dispersal of fugitive emissions from the Site are:

- wind direction which determines the broad direction of dispersal; and
- wind speed will affect ground level emissions by increasing the initial dilution of pollutants in the emission.

A windrose from Milford Haven meteorological station located approximately 6.5km west, providing the frequency of wind speed and direction is presented in Figure 4-2 below. It is evident that winds from the south west and west predominate in the area and north easterlies tend to be infrequent. Light winds (below approximately 4m/s) occur relatively infrequently and rarely from the south.

Figure 4-2: Windrose for Milford Haven Meteorological Station (2014-2018)



4.3 Local Odour Sources

4.3.1 Olfactory Survey

Olfactory surveys were undertaken on 23rd January 2019, 26th February 2019 and 27th February 2019. Appendix AQ3 presents the results of the survey. In summary, odour that could be attributed to the WTS was only detected at monitoring locations on and within the Site boundary, with the exception for the second survey undertaken on 27th February 2019 during which, WTS odour was detected approximately 15m from the permit boundary.

4.3.2 Other Potential Odour Sources

Mapping information for other potential odour sources (e.g. sewage works), including information from the NRW⁴ for other permitted facilities in the area, has been reviewed, alongside observations made during the Site visit. On the basis of this review there are a couple of other major sources of waste odour in the immediate vicinity; Jenson's Metals, a metal recycling facility and Pembroke Dock WwTW. Additional odour sources such as, street drainage and vehicle exhausts may also contribute to odorous emissions within the locale.

Jenson's Metals operates five days a week, Monday to Friday, recycling scrap metal and dismantling vehicles. Pembroke Dock WwTW is operated by Welsh Water and treats the wastewater for Pembroke Dock.

An odour diary completed by PCC indicates the odour associated with WwTW has been detected at Unit 41. The diary provides observations during the period August 2018 – February 2019, specifying when the sewage pumps were running and whether an odour was detected during this time. Observations suggest unpleasant odours are more frequent, with increased intensity during the summer. All entries for August detected an odour with 31% classified as strong or very strong. Odours were detected less frequently during September and October. From late October to December the majority of entries (80%) note despite the

⁴<https://naturalresources.wales/evidence-and-data/maps/find-details-of-permitted-waste-sites/?lang=en> accessed March 2019

sewage pumps running, no odour at Unit 41 was detected. Entries in January to mid-February indicate odour was detectable approximately 52% of the time when sewage pumps were operational.

Given the WwTW is situated west of Unit 41, odours from the WwTW are likely to be detected during light westerly and north-westerly winds. As shown in Figure 4-2, westerly winds are the most predominant, however become less frequent as light winds (<4m/s). During the sniff tests undertaken by SLR, WwTW related odours were detected on one occasion (23.01.19) at location 9.

4.4 Complaints Data and Compliance Records

It is understood that the Site received complaints when the Site was under different management. Since PCC have been responsible for managing the Site, action has been taken to resolve the odour issues and implement an Odour Management Plan, which is strictly adhered to. PCC have not received any odour complaints associated with the WTS to date.

5.0 Odour Impact Assessment

5.1 Risk Factors

5.1.1 Odour Source Potential

Operation Overview

The WTS is currently permitted to collect and store 74,000 tonnes per annum (tpa) of non-hazardous household, commercial and industrial waste, which will not increase with the EP Variation. The waste currently handled in Unit41 includes residual black bag and orange bag material. The Site also accepts biodegradable wastes within Unit41, which have the potential to generate odour.

With the EP Variation, the proposed incoming waste into Unit41 would comprise paper, card, glass, cans, tetras and plastic, which has been separated at kerbside and therefore does not require sorting or treatment at the Site. Waste is transferred into the relevant bay for storage ready for collection and transportation off-site. Biodegradable food and any other high moisture content wastes would remain within Unit41. This waste is temporarily stored in containers that are sealed at the bottom and sides, before being transported to a suitably permitted facility. Outgoing loads are sheeted, with waste collected 4-5 times per week depending on tonnages.

Additionally, proposals for Unit41 illustrate a baler located in the southern extent of the building. This plant would be utilised for baling plastics and cardboard for export off site.

As for the waste in Unit29 and 29A, this would comprise residual black bag, mixed recycling, orange bag waste and Absorbent Hygiene Products (AHPs). This waste would be transferred to storage bays ready for collection, before being transported offsite for treatment.

The Site currently operates between 07:30 and 19:30 Monday to Saturday and occasionally between 09:00 and 16:00 on Sundays and Public Holidays. Operating hours are to be revised in line with the planning application.

In summary, the changes to the operation resulting from the Proposed Variation would comprise:

- residual black bag and orange bag waste would no longer be handled in Unit41 as this operation would move to Unit29 and 29A;
- kerbside recycled material would be handled in Unit41; and
- glass would be stored outside and inside

In terms of inherent odour and pleasantness/unpleasantness:

- Plastic, metallic, glass, textiles, paper and cardboard are not generally considered inherently odorous;
- Mixed recyclables, such as Dry Mixed Recycling (DMR) are not generally considered odorous given the waste is predominantly clean, uncontaminated and dry;
- AHPs, including disposable nappies, adult incontinence and feminine hygiene products have the potential to be highly odorous but generally controlled if contained within sealed bags or containers, as proposed within Unit 29 and 29A;
- Mixed Municipal Waste (residual black bag) waste also has the potential to be odorous due to high levels of contamination from other waste potentially including higher levels of

putrescible material and high moisture content. However, PCC WTS will not be treating this waste and as such, the waste will remain sealed within the bags therefore unlikely to be considered as odorous;

- Biodegradable food has the potential to be highly odorous with its unpleasantness based on variable constituents but generally controlled by its level of degradation and onset of anaerobic conditions. Moreover, this waste will remain within containers sealed at the bottom and sides and stored within the building thereby reducing the potential for odour; and
- Waste streams such as electrical items and batteries are generally considered to have a very low odour potential.

The changes to the operation sought by the Proposed Variation would result in the handling and bulking of higher risk wastes (i.e. black and orange bag waste) being moved to a location more distant from the higher sensitivity receptors to the south.

Odour Management

In order to control odour emissions the Site operates to an 'Odour Management Plan'⁵ (OMP) approved by NRW that details odour controls and management measures at the Site. The current and proposed activities would operate under this OMP. The approach to control of odour at the WTS would be as follows:

- Wastes is delivered to the Site in covered or sealed vehicles;
- Incoming material is inspected at the weighbridge prior to acceptance. Loads with an unacceptable odour are rejected and recorded in the Site diary;
- Material will be processed as soon as practicably possible and within 72hrs of receipt, except for AHP, which may be stored for a maximum of 7 days within a suitably sealed container. Stockpiled waste material shall not exceed 570 tonnes;
- Offending feedstock is segregated and isolated from other waste. Following which it will be removed from Site in an enclosed container for disposal on the same day;
- Only 1 door will be open at any one time in order to prevent a through-draft, to further minimise any fugitive odour escaping the facility;
- The building is cleaned thoroughly on a daily basis;
- The majority of odorous waste is stored at locations furthest from sensitive receptors, notably the hospital located south of the Site; and
- Biodegradable food waste will remain within containers sealed at the bottom and sides in the northern extent of Unit 41.

In regard to odour monitoring at the Site, the OMP states the following:

"The Site Manager is responsible for ensuring that monitoring is conducted at the Site, identifying any sources of odour and establishing if any odours are discernible. Monitoring is conducted a minimum of three times per week on Monday, Wednesday and Friday.

All odour monitoring starts at an upwind location, as determined by prevailing wind conditions. Monitoring comprises sniff tests to be undertaken along the Site perimeter and at offsite at nearby sensitive receptors, the locations of which are shown in the drawing included in Appendix A4.

⁵ Pembroke Dock Waste Recycling Facility Odour Management Plan, Sundorne Products (Llanidloes) Limited, June 2017

All off-site olfactory monitoring is also carried out with reference to the protocol in Appendix 1 of the H4 Technical Guidance Note, and an odour assessment form is completed. Results are also recorded in the daily Site checklist and odour diary, copies of which are included in Appendix B”.

In the event an odour is detected, the OMP outlines both an internal odour procedure and an external complaints procedure to ensure any odour issues are dealt with quickly and effectively.

Site Odour Emissions

Olfactory surveys were undertaken on 23rd January 2019, 26th February 2019 and 27th February 2019. Appendix AQ3 presents the results of the survey. In summary, odour that could be attributed to the WTS was only detected at monitoring locations on and within the Site boundary, with the exception for the second survey undertaken on 27th February 2019 during which, WTS odour was detected approximately 15m from the permit boundary.

The findings of the survey indicate that the magnitude of emissions are predominantly small and odour management practices effective. The Proposed Variation will result in changes to the location of odour sources, however it does not seek to change the tonnages of waste handled at the Site. As such, it is considered unlikely that a significant change to the current magnitude of odour emissions occurs.

On review of the above, changes associated with the Proposed Variation, Units 29 and 29A, have been assigned a *medium* odour source potential on the basis of handling AHPs, residual black bag and orange bag waste. Unit 41 has the potential to be less odorous and as such, a *small* odour source potential has been assigned (within the IAQM classification).

5.1.2 Pathway Effectiveness

The pathway effectiveness (i.e. the factors influencing the odour flux to the receptors) has been considered in terms of the distance and frequency of winds from the direction of the existing and proposed facility. Pathway effectiveness has been classified following IAQM guidelines as ineffective, moderately effective, or highly effective (see Table 5-1). Odour episodes tend to occur during stable atmospheric conditions with low wind speed which result in poor dispersion and dilution, therefore low wind speeds (less than approximately 4m/s) have also been examined.

Table 5-1: Pathway Effectiveness

ID	From WTS (Baseline Unit41)					From Proposed Unit29 and 29A					All Units Operational		
	Distance (m) ^(C)	Wind Direction (°)	Freq. all speeds (%)	Freq. low speeds (%) ^(D)	PE ^(A)	Distance (m) ^(C)	Wind Direction (°)	Freq. all speeds (%)	Freq. low speeds (%) ^(D)	PE ^(A)	Freq. all speeds (%)	Freq. low speeds (%) ^(D)	PE ^(A)
R1	50	135-180	11.7%	2.2%	I	40	210-270	39.9%	11.0%	M	51.6%	13.2%	M
R2	125	210-240	24.1%	7.0%	M	165	245-260	29.0%	8.4%	M	53.1%	15.4%	M
R3	200	145-165	4.5%	0.9%	I	120	160-190	11.7%	2.2%	I	16.2%	3.1%	I
R4	210	265-280	15.8%	4.0%	I	300	265-290	25.9%	7.7%	I	25.9%	7.7%	I
R5	75	025-060	10.2%	7.1%	M	120	345-010	6.5%	3.3%	I	16.7%	10.4%	M
R6	190	025-045	5.2%	3.6%	I	225	005-025	11.7%	6.9%	M	16.9%	10.5%	M
R7	145	320-025	19.7%	10.0%	M	195	320-005	14.5%	6.4%	M	19.7%	10.0%	M
R8	240	005-020	11.7%	6.9%	M	300	350-005	6.5%	3.3%	I	18.2%	10.2%	M
R9	310	305-325	18.1%	6.8%	I	415	305-320	18.1%	6.8%	I	18.1%	6.8%	I
<p>(A) PE = Pathway Effectiveness, I = Ineffective, M = Moderately Effective, H = Highly Effective</p> <p>(B) The closest, most comparable meteorological station to the site is Milford Haven, situated approximately 6km to the west. As such, annual wind speeds have been obtained from this station.</p> <p>(C) Distances are from the source.</p> <p>(D) Low wind speeds <4m/s</p>													

5.2 Magnitude of Effect

The risk of odour exposure has been classified on the basis of the IAQM guidelines using the receptor sensitivity and pathway effectiveness for the baseline scenario and with the proposed additional units (29 and 29A) as shown in Table 5-2.

The predicted baseline Odour Effect is 'negligible' at the majority of considered locations, with the exception of R6 and R7 which predicts a slight adverse effect. It should be noted that locations R6 and R7 were included in Olfactory field survey assessment No.1. On the day of sampling both locations were downwind of the WTS, however, during the odour sampling no waste odours were detected at either location.

The effect of the Proposed Variation is that receptors to the north, predominantly R1, may be exposed to a higher risk of odour exposure on the basis that more odorous material i.e. residual black bag waste will be handled in Units 29 and 29A. As these receptors are situated closer to Units 29 and 29A the pathway effectiveness increases slightly, thus increasing their potential exposure. However, receptors R1 and R2 are considered low sensitivity and therefore a negligible odour effect is predicted. As for the receptors situated to the south, the risk of odour exposure has the potential for improvement due to the increased distance from the more odorous sources located in Units 29 and 29A.

In terms of potential odour effects, Government commissioned research⁶ into WTS states that '*the presence of putrescible/municipal wastes can potentially lead to odours of fresh waste in close proximity to the transfer station, although the generally rapid turnaround of waste onsite usually prevents any serious odour problems*'. This statement generally reflects the baseline situation as evidenced by olfactory surveys. With the continued effective implementation of the odour controls and management measures as defined within the Odour Management Plan, it is considered that potential impacts on amenity can remain at acceptable levels. The overall effect on amenity in the surrounding area is not considered significant and as such, the proposals are not considered to result in a significant change in effect from the baseline.

Table 5-2: Summary of Likely Odour Effects at Proposed Receptors

ID	Receptor Sensitivity	Baseline			Proposed Variation		
		Odour Source Potential ^(A)	Risk of Odour Exposure	Magnitude of Odour Effect	Odour Source Potential ^(B)	Risk of Odour Exposure	Magnitude of Odour Effect
R1	Low	Medium	Negligible	Negligible	Medium	Low Risk	Negligible
R2	Low	Medium	Low Risk	Negligible	Medium	Low Risk	Negligible
R3	Medium	Medium	Negligible	Negligible	Medium	Negligible	Negligible
R4	Low	Medium	Negligible	Negligible	Small	Negligible	Negligible
R5	Low	Medium	Low Risk	Negligible	Medium	Low Risk	Negligible
R6	High	Medium	Negligible	Negligible	Small	Negligible	Negligible
R7	High	Medium	Low Risk	Slight Adverse	Small	Negligible	Negligible

⁶ Enviro Consulting for Office of the Deputy Prime Minister 'Planning for Waste Management Facilities: A Research Study' (August 2004)

I D	Receptor Sensitivity	Baseline			Proposed Variation		
		Odour Source Potential ^(A)	Risk of Odour Exposure	Magnitude of Odour Effect	Odour Source Potential ^(B)	Risk of Odour Exposure	Magnitude of Odour Effect
R8	High	Medium	Low Risk	Slight Adverse	Small	Negligible	Negligible
R9	High	Medium	Negligible	Negligible	Small	Negligible	Negligible
Notes: ^(A) Source odour potential of Unit41 classified as ' <i>medium</i> ' ^(B) Source odour potential of Unit41 classified as ' <i>small</i> ' and Unit29 and 29A classified as ' <i>medium</i> '							

6.0 Conclusions

In line with IAQM guidance, a 'multi-tool' approach was undertaken to assess potential odour from the Proposed Variation of the WTS and potential impacts upon surrounding receptors. A series of odour survey sniff tests in accordance with the IAQM odour guidance methodology were undertaken followed by a qualitative risk assessment.

During the surveys, WTS related odours were only detected at and within the permit boundary, with one exception when odours were detected approximately 15m from the permit boundary. As for other odour sources in the surrounding locale, WwTW related odours were detected on one occasion during north-westerly winds.

Following this, a qualitative odour assessment was undertaken utilising Site information, including waste inputs and processes. The findings of the assessment illustrates the potential for odour exposure may increase slightly for industrial receptors located to the north, due to the location change of residual black and orange bag waste handling operations. However, potential odour exposure for higher sensitivity receptors located to the south may decrease given the increased distance from the more odorous waste material. Moreover, the overall magnitude of effect is not anticipated to change significantly from the baseline. With the continued effective implementation of the odour controls and management measures, as defined within the Odour Management Plan, it is considered that potential impacts on amenity can be minimised to acceptable levels and impacts on amenity are not considered significant.

Appendix AQ1: IAQM Sniff Test Methodology

Sniff Test Sampling Procedure

The sensory test is completed at each test location over a standard observation time, typically five minutes.

Step 1

The assessor breathes normally, inhaling ambient air samples through the nose at regular intervals (typically every 10 seconds to give 30 samples over a 5 minute observation period).

Step 2

For each sample, the odour intensity (VDI Scale, 0-6) is recorded.

Table AQ1-1: VDI Scale 3940⁷ Odour Intensity Scale

Odour Strength	Intensity Level	Comments
No odour / not perceptible	0	No odour when compared to a clean site
Slight / very weak	1	There is probably some doubt as to whether the odour is actually present
Slight / weak	2	The odour is present but cannot be describes using precise words / terms
Distinct	3	The odour character is barely recognisable
Strong	4	The odour character is easily recognisable
Very Strong	5	The odour is offensive. Exposure to this level would be considered undesirable
Extremely Strong	6	The odour is offensive. An instinctive reaction would be to mitigate against further exposure

Step 3

At the end of the observation period at the test location, the odour unpleasantness is noted down by classifying it as unpleasant, neutral or pleasant. This assumes that at least some of the 30 samples were of intensity 3 or more (i.e. the odour is "barely recognisable").

Step 4

The odour descriptor should also be noted: odours can be described using standardised categories and reference vocabulary.

Step 5

Next, the pervasiveness / extent of the odour at this test location is assessed. This can be calculated as the percentage odour time, which is the number of samples where odour was recognisable divided by the total number of samples (i.e. 30). Note that 'recognisable odour' is where the odour strength exceeds the recognition threshold and is definitely recognisable

⁷ VDI 3940: 1993, Determination of Odorants in Ambient Air by Field Inspection, Pub. Verein Deutscher Ingenieure, Dusseldorf. Available from Beuth Verlag GmbH, Berlin.

by the assessor, i.e. the assessor is definitely identifying its quality / character, which corresponds to a VDI of 4 or more.

Step 6

The average odour intensity over the test period is calculated and the maximum intensity observed is noted.

The above procedure is then repeated at the next test location, remembering that the character of an odour mixture can change over distance, as the particular components may become diluted below their individual detection thresholds at different distances.

Table AQ1-2: Matrix to Assess Odour Exposure

Average Intensity	Percentage Odour Time During the Test				
	<10%	11-20%	21-30%	31-40%	>41%
6	Large	Very Large	Very Large	Very Large	Very Large
5	Medium	Large	Large	Very Large	Very Large
4	Small	Medium	Medium	Large	Large
3	Small	Medium	Medium	Medium	Medium
2	Small	Small	Medium	Medium	Medium
1	Small	Small	Small	N/A	N/A
Notes: <ul style="list-style-type: none"> - Average Intensity should be rounded to the nearest whole number; - If the mean is 0 then the odour effect can for practical purposes be considered negligible; and - If the mean is 1 but the percentage odour time is 0, then the odour effect can for practical purposes be considered negligible. 					

Assessment of Odour Effect

The potential effect of the calculated odour exposure is dependent upon the sensitivity of the receptor in question. The proposed receptors surrounding the Site to the south are residential and therefore considered high in sensitivity to odours. Once the overall risk of exposure has been assessed at each sampling location, the IAQM guidance provides a matrix to describe the effect of the assessed exposure level based upon the sensitivity of the receptor.

Table AQ1-3: Matrix to Assess the Odour Effect at Individual Receptors

Overall Odour Exposure	Receptor Sensitivity		
	Low	Medium	High
Very Large	Substantial Adverse	Substantial Adverse	Substantial Adverse
Large	Moderate Adverse	Moderate Adverse	Substantial Adverse
Medium	Slight Adverse	Slight Adverse	Moderate Adverse
Small	Negligible	Negligible	Slight Adverse

Following on from the odour effect, a further application of professional judgement needs to be applied to conclude the significance of odour effect on the development as a whole, taking into account the possibly different magnitudes of effects that occur at different receptors.

Quality Assurance / Quality Control

Due to the subjective approach of the sensory sniff test, general quality assurance / quality control is of high importance. The main QA/QC factors are as follows:

Table AQ1-4: Matrix to Assess the Odour Effect at Individual Receptors

Suitably Qualified Odour Assessor	The field surveyor for the Silver Street odour assessment has more than 8 years in experience of undertaking ambient air quality assessments and is a member of both the Institute of Environmental Science and of the Institute of Air Quality Management.
Objective methods of measuring odours	Use of VDI Scale (see TableAQ1-2)
Standard monitoring practices	Survey transects and sampling locations set out and marked during initial walkover survey and followed during each subsequent assessment using GPS equipment
Standard data collection and reporting forms	Sample of field sample collection form in Appendix AQ3.
Additional safeguards undertaken	Odour assessor shall not: <ul style="list-style-type: none">■ have a cold / sore throat;■ be hungry or thirsty;■ smoke or consume strongly flavoured food or drink within half an hour of each survey;■ consume confectionary or soft drinks for at least half an hour before the survey;■ use scented toiletries on the day of the survey;■ use any vehicles with deodorisers.

Appendix AQ2: Example Field Sample Sheet

Date:		Time:		X Coord	
				Y Coord	
Location Comments					
Wind Speed		Temperature			
Wind Direction		Rainfall			
Pressure					
Sample	VDI (0-6)	Sample	VDI (0-6)	Sample	VDI (0-6)
1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	
If >1 VDI > 3 Intensity		Pleasant	Neutral	Unpleasant	
Other Comments					
Odour Strength		Intensity Level	Comments		
No odour / not perceptible		0	No odour when compared to a clean site		
Slight / very weak		1	Probably doubt over presence of odour		
Slight / weak		2	Odour present but cannot be described		
Distinct		3	Odour character is barely recognisable		
Strong		4	Odour character is easily recognisable		
Very Strong		5	Odour is offensive, exposure undesirable		
Extremely Strong		6	Odour is offensive, instinct to mitigate against further exposure		

Appendix AQ3: Full Odour Sniff Test Monitoring Results

Sensory Sniff Test Results – 23rd January 2019

The survey was undertaken with north-westerly winds during assessment No.1. Weather conditions were stable; average temperatures recorded 7.2°C, with a maximum temperature of 8.3°C. Average wind speeds during the survey were 3.1mph, with the maximum wind speed recorded as 5.3mph at location 3. The average wind speeds during the survey equated to a Beaufort Scale factor of 2, corresponding to a 'Light Breeze'.

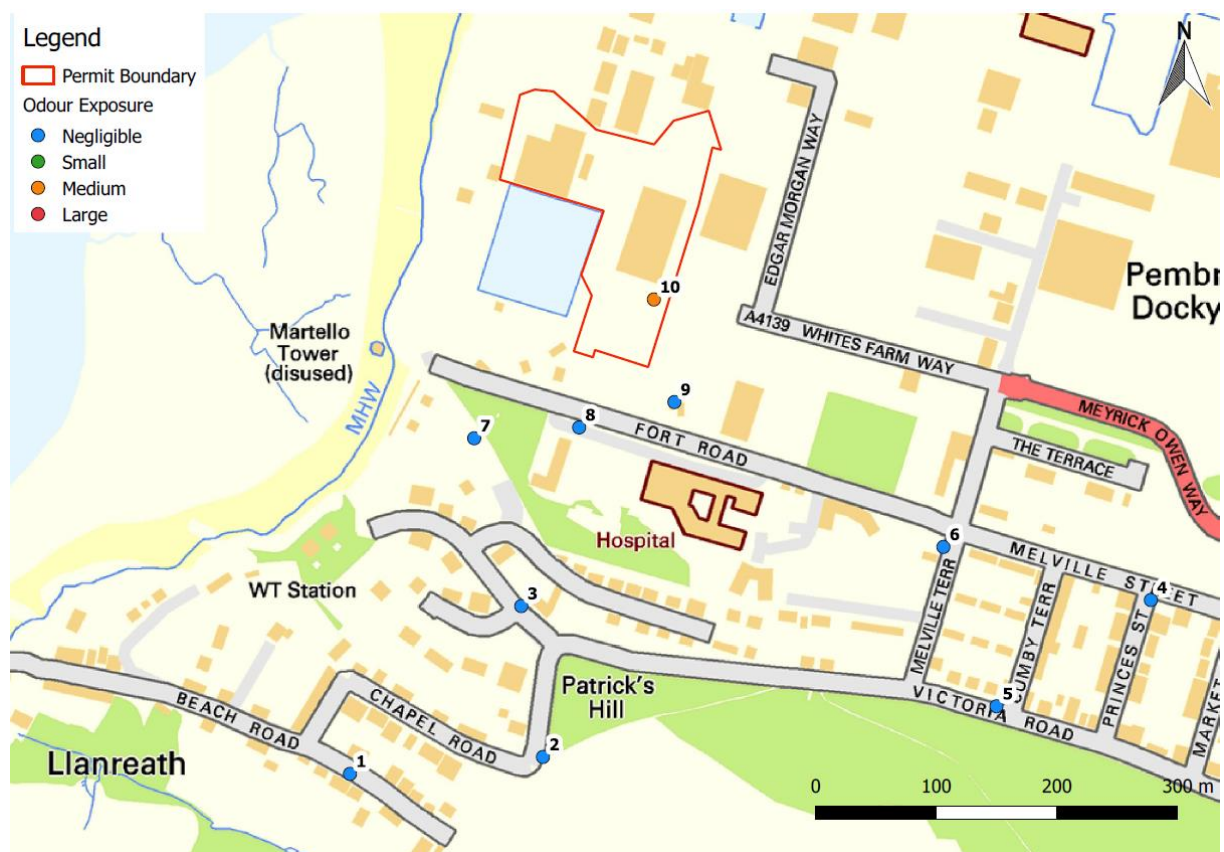
WTS related odours were only detected when located within the permit boundary and situated within 5m of Unit 41 to the south-east (location 10).

Table AQ3-1 provides a summary of the sniff-test surveys including the overall risk of exposure and the associated risk of effect based upon the receptor sensitivity. Figure AQ3-1 illustrates the odour exposure in relation to the Site.

Table AQ3-1: Summary of Sniff Test – 23rd January 2019

Assessment Location	Time	Average VDI	Odour Exposure	Risk of Exposure	Odour Effect
1	11:25	1	0%	Negligible	Negligible ^(A)
2	11:42	1	0%	Negligible	Negligible ^(A)
3	11:52	2	0%	Negligible	Negligible ^(A)
4	12:10	1	0%	Negligible	Negligible ^(A)
5	12:21	2	0%	Negligible	Negligible ^(A)
6	12:38	1	0%	Negligible	Negligible ^(A)
7	12:55	1	0%	Negligible	Negligible ^(A)
8	13:05	2	0%	Negligible	Negligible ^(A)
9	13:19	3	0%	Negligible	Negligible ^(B)
10	13:28	3	33%	Medium	N/A ^(B)
Notes: VDI: Scale used to define odour intensity, see Table AQ1-1 in Appendix AQ1. ^(A) Based upon a 'high' sensitivity, corresponding to residential dwelling. ^(B) Effect not classified on the basis location not representative of exposure location.					

Figure AQ3-1: Summary of Odour Exposure Assessment No.1



Sensory Sniff Test Results – 26th February 2019

WTS related odours were detected during this survey period at and within the permit boundary only. The weather conditions remaining stable throughout the monitoring, with an average temperature of 14.2°C and average wind speeds of 3.5mph during the first survey. Again, average wind speeds during the survey equated to a Beaufort Scale factor of 2, corresponding to a 'Light Breeze'.

During the second survey, temperatures remained the same with an average of 14.1°C. However, wind speed picked up during the afternoon with average speeds recorded at 6.0mph. This still equates to a Beaufort Scale of 2, corresponding to a 'Light Breeze'.

The main wind direction during both the survey periods was south easterly moving wind over the WTS towards receptors in located north-west of the WTS.

Table AQ3-2 and Table AQ3-3 provides a summary of the sniff-test surveys including the overall risk of exposure and the associated risk of effect based upon the receptor sensitivity. Figures AQ3-2 and AQ-3 illustrates the odour exposure in relation to the Site.

Table AQ3-2: Summary of Sniff Test – 26th February First Test

Assessment Location	Time	Average VDI	Odour Exposure	Risk of Exposure	Odour Effect
1	11:04	0	0%	Negligible	Negligible ^(A)
2	11:20	0	0%	Negligible	Negligible ^(B)
3	11:33	0	0%	Negligible	Negligible ^(C)
4	11:43	0	0%	Negligible	Negligible ^(C)
5	11:52	1	0%	Negligible	Negligible ^(C)
6	12:12	0	0%	Negligible	Negligible ^(C)
7	12:23	0	0%	Negligible	Negligible ^(D)
8	12:33	3	27%	Medium	N/A ^(E)
9	12:41	4	70%	Large	N/A ^(E)
Notes: VDI: Scale used to define odour intensity, see Table AQ1-1 in Appendix AQ1. (A) Based upon a 'low' sensitivity, corresponding to car park (B) Based upon a 'high' sensitivity, corresponding to a hospital (C) Based upon a 'low' sensitivity, corresponding to an industrial unit (D) Based upon a 'medium' sensitivity corresponding to an office (E) Effect not classified on the basis location not representative of exposure location					

Figure AQ3-2: Summary of Odour Exposure Assessment No.2 Test 1



Table AQ3-3: Summary of Sniff Test – 26th February 2019 Second Test

Assessment Location	Time	Average VDI	Odour Exposure	Risk of Exposure	Odour Effect
1	14:09	0	0%	Negligible	Negligible ^(A)
2	11:26	0	0%	Negligible	Negligible ^(B)
3	11:40	1	0%	Negligible	Negligible ^(C)
4	14:48	0	0%	Negligible	Negligible ^(C)
5	14:55	1	0%	Negligible	Negligible ^(C)
6	15:10	0	0%	Negligible	Negligible ^(C)
7	15:18	1	0%	Negligible	Negligible ^(D)
8	15:24	3	47%	Medium	N/A ^(E)
9	15:30	3	27%	Medium	N/A ^(E)

Notes:
 VDI: Scale used to define odour intensity, see Table AQ1-1 in Appendix AQ1.

(A) Based upon a 'low' sensitivity, corresponding to car park
 (B) Based upon a 'high' sensitivity, corresponding to a hospital
 (C) Based upon a 'low' sensitivity, corresponding to an industrial unit
 (D) Based upon a 'medium' sensitivity corresponding to an office
 (E) Effect not classified on the basis location not representative of exposure location

Figure AQ3-3: Summary of Odour Exposure Assessment No.2 Test 2



Sensory Sniff Test Results – 27th February 2019

WTS related odours were detected during this survey period at and within the permit boundary only. The weather conditions remaining stable throughout the monitoring, with an average temperature of 11.2°C and average wind speeds of 1.3mph during the first survey. These wind speeds equate to a Beaufort Scale factor of 1, corresponding to a 'Light Air'.

During the second survey, temperatures increased to an average of 14.8°C with wind speed also increasing slightly recording an average 2.9mph. Again, these wind speeds equate to a Beaufort Scale factor of 1, corresponding to a 'Light Air'.

The main wind direction during both the survey periods was south easterly moving wind over the WTS towards receptors in located north-west of the WTS.

Table AQ3-4 and Table AQ3-5 provides a summary of the sniff-test surveys including the overall risk of exposure and the associated risk of effect based upon the receptor sensitivity.

Table AQ3-4: Summary of Sniff Test – 27th February 2019 First Test

Assessment Location	Time	Average VDI	Odour Exposure	Risk of Exposure	Odour Effect
1	08:47	0	0%	Negligible	Negligible ^(A)
2	08:56	0	0%	Negligible	Negligible ^(B)
3	09:08	0	0%	Negligible	Negligible ^(C)
4	09:16	0	0%	Negligible	Negligible ^(C)
5	09:24	0	0%	Negligible	Negligible ^(C)
6	09:42	0	0%	Negligible	Negligible ^(C)
7	09:49	0	0%	Negligible	Negligible ^(D)
8	09:56	3	30%	Medium	N/A ^(E)
9	10:02	4	73%	Large	N/A ^(E)
Notes: VDI: Scale used to define odour intensity, see Table AQ1-1 in Appendix AQ1. (A) Based upon a 'low' sensitivity, corresponding to car park (B) Based upon a 'high' sensitivity, corresponding to a hospital (C) Based upon a 'low' sensitivity, corresponding to an industrial unit (D) Based upon a 'medium' sensitivity corresponding to an office (E) Effect not classified on the basis location not representative of exposure location					

Figure AQ3-4: Summary of Odour Exposure Assessment No.3 Test 1



An additional location was added during the second test as WTS odour was detected at a further distance than during previous surveys. As such, a sniff test was undertaken at location 10 situated between locations 7 and 8. This location is approximately 15m from the permit boundary.

Table AQ3-5: Summary of Sniff Test – 27th February 2019 Second Test

Assessment Location	Time	Average VDI	Odour Exposure	Risk of Exposure	Odour Effect
1	10:38	0	0%	Negligible	Negligible ^(A)
2	10:46	0	0%	Negligible	Negligible ^(B)
3	10:57	0	0%	Negligible	Negligible ^(C)
4	11:05	0	0%	Negligible	Negligible ^(C)
5	11:12	0	0%	Negligible	Negligible ^(C)
6	11:34	0	0%	Negligible	Negligible ^(C)
7	11:42	0	0%	Negligible	Negligible ^(D)
8	11:57	4	80%	Large	N/A ^(E)
9	12:03	4	57%	Large	N/A ^(E)
10	11:49	2	23%	Medium	N/A ^(E)

Notes:

VDI: Scale used to define odour intensity, see Table AQ1-1 in Appendix AQ1.

^(A) Based upon a 'low' sensitivity, corresponding to car park

^(B) Based upon a 'high' sensitivity, corresponding to a hospital

Assessment Location	Time	Average VDI	Odour Exposure	Risk of Exposure	Odour Effect
(C) Based upon a 'low' sensitivity, corresponding to an industrial unit					
(D) Based upon a 'medium' sensitivity corresponding to an office					
(E) Effect not classified on the basis location not representative of exposure location					

Figure AQ3-5: Summary of Odour Exposure Assessment No.3 Test 2



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