

An Bord Pleanála Oral Hearing

Irish Water

Greater Dublin Drainage

Brief of Evidence

Air Quality, Odour and Climate

Dr. Imelda Shanahan

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

Qualifications and Role on the Proposed Project

- (1) My name is Imelda Shanahan. I have a Bachelor of Science (BSc) Honours degree in Chemistry and a PhD in Physical Chemistry (Atmospheric Chemistry) from University College Dublin. I am a Fellow of the Institute of Chemistry of Ireland and I am a Chartered Chemist and Fellow of the Royal Society of Chemistry.
- (2) I am founder and Managing Director of TMS Environment Ltd, a company that specialises, since 1994, in the provision of environmental consultancy and monitoring services. I have extensive professional experience of providing specialist research and consultancy services in environmental monitoring, analysis and impact assessment, and in the preparation and evaluation of Environmental Impact Statements and Environmental Impact Assessment Reports (EIARs) for clients in the public and private sector, in Ireland, Europe, the UK and the Middle East. My particular specialisations are air quality, odour and climate impact assessment and noise and vibration impact assessment.
- (3) I have over 25 years of experience of carrying out odour and air quality impact assessments and odour monitoring, control and management projects. One of my particular interests and specialisations has been and will continue to be dedication to the pursuit of an exceptionally high standard of performance, generally achieved through attention to detail with the design and construction teams, and in the setting of high performance targets. An extensive and wide-ranging experience, together with a strong commitment to achieving the highest possible performance standards, provides a solid foundation for a robust assessment and lends confidence to the assurances provided in the assessment conclusions.
- (4) I am the principal author of Chapter 14 Air Quality, Odour and Climate in Volume 3 Part A of the EIAR. I was the lead consultant for the assessment and I was supported in this work by a team of colleagues from the Laboratory and Monitoring Divisions of TMS Environment Limited. The potential odour and air quality impacts associated with the Proposed Project are well known and understood and have been fully considered in the extensive studies reported on in the EIAR. The assessment team draws on very extensive experience in carrying out assessments of this type and a very thorough assessment of potential impacts has been carried out and reported in the EIAR.
- (5) I am addressing also in this Statement Odour issues raised in respect of the Regional Biosolids Storage Facility [RBSF] element of the Proposed Project. Section 10 in Volume 4 Part A of the EIAR considers the potential odour impacts associated with the RBSF element of the Proposed Project. This Section of the EIAR was prepared by a team led by Principal Author Matthew Edwards of Royal Haskoning DHV. Matthew has over 13 years of specialist experience which includes extensive experience in the assessment of odour and air quality impacts associated with water and waste water facilities. The two Project Teams collaborated during the preparation of the EIAR and I am familiar with the methodologies adopted and the conclusions drawn from the assessments.

Summary of the Air/Odour Impacts

- (6) Chapter 14 in Volume 3 Part A, Section 8 and Section 10 in Volume 4 Part A of the EIAR considers the potential air quality, odour and climate impacts associated with the Proposed Project. Impacts are considered by taking account of the existing baseline, the nature and magnitude of the projected impacts and compliance with relevant standards.
- (7) The assessment focuses on the key pollutants which may be emitted from the activities associated with the Construction Phase and Operational Phase of the Proposed Project. The pollutants potentially emitted during construction activity are dust and particulate matter (PM) and gases such as nitrogen oxides (NO_x), carbon dioxide (CO₂) and benzene from traffic associated with the Construction Phase.
- (8) The principal pollutants of concern in relation to the Proposed Project during the Operational Phase are:

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

- odour, in respect of the proposed Abbotstown pumping station, the rising main connection to the gravity sewer along the proposed orbital sewer route, the proposed Wastewater Treatment Plant (WwTP), and the Regional Biosolids Storage Facility (RBSF); and
 - fine PM (PM₁₀ and PM_{2.5}), and carbon monoxide (CO), NO_x; methane (CH₄), and sulfur dioxide (SO₂) potentially released from transport and the various energy systems associated with the activity.
- (9) The study area for this assessment includes all areas that could potentially be affected by the emissions from the Proposed Project. The study area for the Construction Phase air quality impact assessment was defined according to the Institute of Air Quality Management's Guidance on the Assessment of Dust from Demolition and Construction, and includes sensitive receptors (e.g. houses, schools and hospitals) that are located within 350m of construction activities. This study area is shown in Figure 4.1 Volume 4 Part A, Figure 14.1 Study Area for the Construction Phase Air Quality Impact Assessment in Volume 5 Part A, and is described in more detail in Appendix A14.1 in Volume 3 Part B of the EIAR.
- (10) The study area for the Operational Phase air quality assessment includes receptors and ecological designated sites that could be affected by the Proposed Project. The study area for the Operational Phase air quality assessment was determined using professional judgement and from a consideration of the **potential** impacts on receptors located near the Proposed Project. The area extends to the Rye Water Valley in the west, north of Malahide Estuary and south Dublin Bay and covers an area of approximately 1,500km². Although potential impacts are not significant across the entire study area, the assessment considers all of these areas in order to demonstrate that sensitive ecological areas in particular will not be adversely affected by the emissions to atmosphere from the Proposed Project. The **potential** impact on human receptors does not extend beyond a distance of a few kilometres from the emission sources. The Operational Phase study area is shown in Diagram 14.1 in Chapter 14 in Volume 3 Part A and in Figure 14.2 Study Area for the Operational Phase Air Quality Impact Assessment in Volume 5 Part A of the EIAR, and in Figure 4.1 Volume 4 Part A. Diagram 14.1 and Figures 14.1 and 14.2 are attached to this Witness Statement for ease of reference.
- (11) The detailed methodology adopted for the air quality impact assessment is described in Section 14.2 in Chapter 14 in Volume 3 Part A of the EIAR and the general approach adopted for the assessment is summarised as follows:
- the existing baseline air quality at the Proposed Project site and in the vicinity of receptors is described;
 - the potential impacts of the Proposed Project on air quality are identified;
 - the appropriate criteria against which to assess the significance of the impacts associated with the Proposed Project are set out;
 - avoidance and mitigation measures where required are identified; and
 - all cumulative impacts with potential to impact upon the baseline environment are identified and assessed.
- (12) The principal Construction Phase air quality impacts will be associated with dust emissions due to construction activities. Transport associated with the Proposed Project Construction Phase also potentially contributes to air quality impacts (dust and vehicle emissions). The assessment as presented in Section 14.5 in Chapter 14 in Volume 3 Part A of the EIAR concluded that impacts will be effectively managed and controlled through the Construction Environmental Management Plan and that no long term or significant adverse impacts will occur.
- (13) The potential air quality impacts associated with the Operational Phase of the Proposed Project will arise primarily as a result of the treatment of the air and gases collected at each stage of the operations and treated

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

by way of abatement plant before discharge to atmosphere. Air quality impacts may also arise as a result of emissions of combustion gases from the energy sources associated with the Proposed Project.

- (14) An air dispersion modelling assessment was carried out to determine the potential impacts of the Proposed Project on air quality, particularly from the Odour Control Units, the Combined Heat and Power system and the backup generators. The air dispersion modelling assessment concluded that there would be no exceedances of the Air Quality Standards caused by the operation of the Proposed Project. During the Operational Phase of the Proposed Project, odour emissions will be contained and treated in Odour Control Units and the treated air will be dispersed in the atmosphere beyond the boundaries of the sites. The results of the modelling undertaken for this impact assessment have shown that no nuisance odours will be detectable by sensitive receptors as a result of emissions to atmosphere during the Operational Phase.

Submissions/Objections Received and Responses

Response to General Issues Raised

- (15) In preparing this Witness Statement, I considered the various submissions that were made to An Bord Pleanála. I addressed each of the submissions in Section 15 in Irish Water's Response to Submissions January 2019 document and summarise the responses below. The following general themes were raised in submissions in relation to air quality and odour:
- Odour impacts to local residents, businesses and tourism;
 - Potential for similar issues as experienced at Ringsend;
 - Release of gases;
 - Potential odour impacts in the event of a malfunction;
 - Impact on air quality
 - Construction dust;
 - Impact on Dublin Airport and aircraft;
 - Recreational impact; and
 - Climate change and rising sea levels.
- (16) These issues were addressed in Chapter 14 Air Quality, Odour and Climate in Volume 3 Part A of the EIAR, particularly in Section 14.4 which identified potential impacts, Section 14.5 which identified construction impacts and Section 14.6 which identified operational impacts to ensure that impacts remain well within acceptable thresholds.
- (17) Odour impacts to local residents, businesses, tourism and recreational impacts were addressed in Chapter 14 in Volume 3 Part A of the EIAR. The performance standards, expressed as the air quality standards that must be achieved are the most stringent available and are applied at the site boundary which means that the highest possible levels of protection, including a margin of safety, have been factored into the design of the facility.
- (18) Section 14.2.3 of Volume 3 Part A of the EIAR sets out the approach that was followed in the selection of the appropriate standards for the Proposed Project. This section of the EIAR lists the Guidance relied on for

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

the assessment which includes Guidance from the EPA and from the UK Environment Agency and which are also comparable to guidance from other countries.

- (19) The EPA's (2010) *Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)*, which includes guidance on appropriate odour standards against which odour emissions may be evaluated, is the most widely used Guidance in Ireland for odour assessments of the type reported in the EIAR. This Guidance, as well as the international guidance referenced in the EPA publication, recognises that the exposure of the population to odour is assessed based on the odour concentration as well as the length of time that the population may perceive the odour. By definition, one odour unit per cubic metre (OU_E/m^3) is the detection threshold of 50% of a qualified panel of observers working in an odour-free laboratory using odour-free air as the zero reference, and standards are defined relative to this benchmark.
- (20) Guidance from the United Kingdom (UK) Environmental Permitting Regulations as defined in the Environment Agency's H4 Odour Management guidance document (H4 Guidance), recommends that odour standards should vary from 1.5 to $6.0\text{OU}_E/\text{m}^3$ as a 98th percentile of one hour averaging periods at the site boundary based on the offensiveness of the odour and with adjustments for local factors such as population density. The benchmarks vary depending on the relative offensiveness of odours with a target benchmark of $1.5\text{OU}_E/\text{m}^3$ for the most offensive odours, $3\text{OU}_E/\text{m}^3$ for moderately offensive odours and $6\text{OU}_E/\text{m}^3$ for less offensive odours. The most offensive odour category includes raw sewage and septic sludge, while the moderately offensive odours include such sources as the aeration tanks and clarifiers at the proposed WwTP.
- (21) At both Abbottstown Pumping Station and the proposed WwTP, raw sewage and sludge will be handled which fall into the most offensive odour category and therefore the most stringent assessment target of $1.5\text{OU}_E/\text{m}^3$ as a 98th percentile of one hour averaging periods is selected as the most appropriate assessment criterion for these locations. While other sources of odour at the proposed WwTP fall into the moderately offensive odour category, the assessment criterion that was selected for all of the potential odour sources at the proposed WwTP is the most stringent criterion rather than selecting a less stringent criterion for the less offensive odour sources. This conservative approach builds a further safety margin in to the assessment since the impact predictions are evaluated by comparison to a more stringent assessment criterion than that recommended in the relevant Guidance.
- (22) I am confident that implementation of the very robust mitigation measures proposed for the facility will ensure that the facility does not cause odour nuisance beyond the site boundary. In practice, this means that residents, businesses, and those pursuing leisure activities beyond the site boundary will not experience nuisance odours because the performance standard of no nuisance odour is applied at the site boundary and as distance increases, impacts are further reduced.
- (23) Potential for similar issues as experienced at Ringsend was raised in some submissions. The proposed WwTP is very different in terms of design and location from Ringsend and there is no potential for issues of that type to occur. In particular, the significant distance from the boundary of the proposed WwTP to sensitive receptors, the large area available for selection of design options and the complete containment options appropriate for the Proposed Project are unique features which differentiate the site of the proposed WwTP from the Ringsend location. The combination of location and design factors means that there is no direct comparison to the Ringsend location and design, and similar issues to those historically associated with Ringsend could not arise for the Proposed Project. This is discussed in greater detail elsewhere in this Statement.
- (24) Release of gases and potential impacts on air quality were identified as concerns in some submissions. These potential impacts were thoroughly assessed in Section 14.6 in Chapter 14 in Volume 3 Part A of the EIAR where it was demonstrated that all relevant Air Quality Standards would be complied with, and with a comfortable margin of safety.

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

- (25) Potential odour impacts in the event of a malfunction were investigated in Section 14.6.4 in Chapter 14 in Volume 3 Part A of the EIAR. Various scenarios were considered including variable operating conditions and higher than normal odour emissions and even under those unlikely conditions it was demonstrated that there would be no odour nuisance beyond the site boundary.
- (26) Construction dust impacts were addressed very thoroughly in Section 14.5 in Chapter 14 in Volume 3 Part A of the EIAR. The *Institute of Air Quality Management Guidance on the Assessment of Dust from Demolition and Construction* was used for this element of the assessment. There is predicted to be a short-term Slight adverse impact on the closest receptors during the Construction Phase with potential short-term impacts from traffic on the surrounding roads within about 50m of the proposed Abbotstown pumping station site. There will be no lasting impact and the short-term impact will be managed by means of an effective Construction Environmental Management Plan incorporating the mitigation measures outlined in Section 14.8 in Chapter 14 in Volume 3 Part A of the EIAR. The Construction Environmental Management Plan will include a specific Dust Minimisation Plan which will ensure that dust impacts are prevented or minimised during the Construction Phase of the Proposed Project.
- (27) Some submissions stated that there was potential for impacts on Dublin Airport and aircraft associated with the Proposed Project. The specific concerns of the daa are addressed below and were already addressed in the EIAR.
- (28) Concern was expressed by some Observers about climate change and rising sea levels. Potential Greenhouse Gas Emissions from the Proposed Project were identified in Section 14.4 and the assessment is described in Section 14.6.5 in Chapter 14 in Volume 3 Part A of the EIAR.
- (29) The operation of biological WwTPs results in direct emissions of Greenhouse Gases such as CO₂, CH₄ and N₂O, as well as indirect emissions of CO₂ resulting from energy generation to run the plant. The N₂O emitted is generated by nitrification and denitrification processes used to remove nitrogenous compounds from wastewater, and most of the CO₂ and CH₄, is generated as a result of the sludge processes with some dissolved CH₄ potentially present in the wastewater throughout the treatment stages. The most significant contributions to GHG emissions are CH₄ and CO₂.
- (30) There are three possible ways to reduce Greenhouse Gas emissions from the proposed WwTP: minimisation through design, treatment of the gas streams, and prevention and minimisation of the emissions by optimising the operating conditions. The treatment of the gas streams containing the Greenhouse Gases is not considered a sustainable option due to limitations in current technologies, so the opportunities for minimising Greenhouse Gases emissions from wastewater treatment are focused on optimisation of design and operations processes. This has been considered in the overall design and discussion of the alternatives considered and these are presented in Chapter 4 Description of the Proposed Project and Chapter 5 Consideration of Alternatives in Volume 2 Part A of the EIAR.
- (31) The CO₂ released due to energy usage is directly reduced by enhancing the energy efficiency of the proposed WwTP. In this respect, the selection of a system to utilise gas produced in the process is the optimum strategy. In order to maximise the amount of CH₄ captured and utilised in the Combined Heat and Power system, fugitive emissions will be minimised by ensuring effective containment through design. N₂O and CO₂ emissions can be minimised by good control of the operational conditions of the activated sludge system, and N₂O emissions will depend mainly on the operational conditions (and O₂ concentrations) of the reactor systems. The proposed design considers these factors and contributes to the overall objective of minimising Greenhouse Gas emissions.

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

Response to Specific Issues Raised by Observers

- (32) There were a number of specific issues raised in submissions to An Bord Pleanála which are considered under the following headings:
- a) The adequacy of the buffer zone around the facility;
 - b) The effectiveness of the Odour Control Units;
 - c) The adequacy of the height of the Dubber Odour Control Unit;
 - d) Potential odour impacts from RBSF;
 - e) Comparison with other facilities such as Ringsend;
 - f) The potential impacts on Connolly Hospital.

Adequacy of the Buffer Zone

- (33) While there is a buffer zone of 300m between the boundary of the proposed WwTP and existing residences, dissipation of odours across the buffer zone is not required as part of the design of the proposed WwTP. Instead, any odours from the facility will be contained and treated to a very high degree to achieve the required performance standard of no detectable odour at the site boundary. In this regard, it is noted that following consultation with the DAA, the design of the proposed project was modified so that all of the tanks and structures which would normally be open to atmosphere at a WwTP are covered. Although it is not necessary to meet the design objectives, the existence of a significant buffer zone is an added feature of the Proposed Project that adds confidence to the conclusion of the assessment that there will be no nuisance odours detected by sensitive receptors outside the site boundary.
- (34) Conroy Crowe Kelly Architects, on behalf of Gannon Properties who own development lands adjacent to the proposed WwTP, questioned the adequacy of the buffer distance in terms of protecting the development potential of these lands. There will be no adverse impact from odour on the development potential of the Belcamp development lands which are located at least 197m from the nearest boundary of the proposed WwTP. Although the EIAR refers to a buffer distance of 300m between the site boundary and existing residential units, the absence of detectable odour at the site boundary means that the buffer is not required to avoid impacts on future residential development on the development lands.
- (35) Chapter 14 in Volume 3 Part A of the EIAR also clearly states that for assessment purposes all of the assessments are based on the impact at the site boundary and not at the extremities of the buffer distance. Since the EIAR demonstrates that there will be no detectable odour from the odour-producing units and no significant adverse impact at the site boundary, the precise extent of the buffer distance is not relevant to the determination of odour impact.
- (36) In her submission, Councillor Alison Gilliland notes that the key concern of local communities is the potential for emitting unpleasant and unwelcome odours into the community, and that these concerns apply in particular to residents living within approximately 2km of the facility. As set out in the EIAR and in this statement, a suite of very robust mitigation measures is proposed to achieve the most stringent performance standard of no odour nuisance at the site boundary. This means that residents living beyond the site boundary will not experience nuisance odours because the performance standard of no nuisance odour is applied at the site boundary and as distance increases, impacts are further reduced.

Operation and Effectiveness of Odour Control Units

- (37) Odorous gases generated at the various stages in the wastewater collection, transport and treatment processes will be captured and vented for odour abatement in Odour Control Units. A detailed description of where these units will be located is given in Section 14.4.3 of Chapter 14 in Volume 3 Part A of the EIAR. The assessment considered the maximum potential odour emissions from each source, and using this information, the odour abatement systems were designed to ensure that the odour emissions do not reach a level that could cause odour nuisance at or outside the Proposed Project site boundary.
- (38) In order to reach this conclusion that there will be no odour nuisance at or beyond the site boundary, a number of factors must be considered as follows:
- (a) The target performance criterion for odour;
 - (b) Effective containment and capture of odours;
 - (c) The selection of appropriate odour control systems; and
 - (d) Monitoring and maintenance to ensure ongoing effective operation and achievement of the specified performance targets.
- (39) The adopted target performance criterion, and the rationale for the selection of this target, has been specified in Section 14.2.3 in Chapter 14 in Volume 3 Part A of the EIAR and is summarised in this Statement in Paragraphs 18 - 21. The target criterion is based on ensuring that odours that would be classified as a nuisance should not occur for more than 2% of the time in any one year or 175 hours spread across a year. This is referred to as the 98-percentile since 175 hours represents 2% of a calendar year.
- (40) As noted in the EIAR, the adopted performance target is the most stringent performance standard that is applied for this type of facility and represents a level of performance which would mean there would be no odour nuisance at the site boundary or, by extension, at any sensitive receptor in the vicinity of the Proposed Project. Since there is a considerable distance between the site boundary and the nearest sensitive receptors, and odour is diminished with distance from the source, this means that there is also a significant margin of safety in terms of meeting this adopted target, although such a margin has not been relied on in the assessment.
- (41) Effective containment and capture of odours is the first step in an effective and efficient odour control strategy. Because of the location of the Proposed Project site close to Dublin Airport, it is required that the tanks and basins which would normally be open at a WwTP are covered and the available space allows this to be considered in the design for the Proposed Project. Since every potential odour source at the site of the Proposed Project is fully covered and contained, this prevents the release of odours and allows for efficient capture of any odorous gases which can then be diverted into the Odour Control Units. The design of the Odour Control Units has considered the levels of odour which can be generated at each potential odour source and the required level of extraction that must be applied to prevent any fugitive losses or leaks as reported in Section 14.4.3 in Chapter 14 in Volume 3 Part A of the EIAR. As noted in the EIAR, the maximum potential emissions associated with the worst-case design scenario were chosen for the assessments and this ensures that even under maximum adverse conditions the optimum design has been chosen to meet the required odour performance target. This approach also demonstrates that the required performance target is readily achieved by optimising the design approach.
- (42) The captured odorous gases from odour sources are diverted into Odour Control Units. An Odour Control Unit is essentially a sophisticated filtration device that removes the components of the gas that can cause odour and releases clean gas into the atmosphere. This gas cleaning can be achieved in many different ways as outlined in Appendix A14.6 in Volume 3 Part B of the EIAR. Where required, as outlined in Sections

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

14.4.3 and 14.6.1 in Chapter 14 in Volume 3 Part A of the EIAR, two or three stages of treatment can be applied to ensure that the required performance target is achieved.

- (43) Selection of the most appropriate Odour Control Units will be a decision made by the contractor(s) appointed to design and operate the Proposed Project. The purpose of the assessment reported in the EIAR was to choose the worst-case scenario in terms of potential odour emissions and to demonstrate that it is possible to design a system and solution that meets the required performance target. The assessment presented in the EIAR clearly demonstrated that the currently available odour control technologies can be applied to meet the required performance targets, with a safety margin, so that we can state with confidence that the design of an appropriate strategy ensures that there will be no odour nuisance at or beyond the site boundaries.
- (44) The assessment of odour impact considers the level of odour in the cleaned gas that might be present in the air released from the Odour Control Units and selects the optimum conditions to ensure that the target performance standard is achieved. Stack height is a particularly important factor in ensuring effective and efficient performance of the Odour Control Units. The optimum stack height was determined in this assessment for all Odour Control Units and has been discussed in Section 14.6.4 in Chapter 14 in Volume 3 Part A and in Appendix A14.5 in Volume 3 Part B of the EIAR. Selecting the optimum stack height, and the critical operating conditions, for each Odour Control Unit ensures that the target of no odour nuisance at or beyond the site boundaries is achieved.
- (45) The most important factor that allows for verification of performance, and acts as a check on the effectiveness of the procedures and controls in place, is the odour emission rate from the Odour Control Units at the facility. This has been determined from the dispersion model as the odour emission rate that will not cause odour nuisance at or beyond the site boundary. During operation, measurements of the odour level in the outlets from the Odour Control Units will be carried out to ensure that the performance of the odour abatement systems meets the design specifications and ensures that odour is not detectable at nuisance levels beyond the site boundary.
- (46) While the facility will not be formally regulated by the EPA, the same rigorous controls that would be applied by the EPA if an EPA Licence were in place, and which would be considered best practice, will be implemented at the facility. In particular, the performance of the Odour Control Units will be monitored during a comprehensive Process Proving Phase at commissioning and at regular intervals throughout the lifetime of the facility. Continuous monitors will be installed which monitor key elements of performance for the abatement systems, such as H₂S levels in the exit gases. Independent performance checks will be carried out by an ISO17025 accredited testing laboratory at regular intervals to verify the effectiveness of control measures and ongoing compliance with the required performance standards.
- (47) A submission from Fingal County Council to An Bord Pleanála found that the assessments undertaken in the EIAR were robust, and that the proposed mitigation and management measures would ensure that air quality standards will be achieved.

Height of the Dubber Odour Control Unit

- (48) The height of the Dubber Odour Control Unit was selected based on site specific considerations as presented in Section 14.6.2 in Chapter 14 in Volume 3 Part A of the EIAR. Specifically, the optimum height for the system was determined from dispersion modelling and the height selected is optimum for this application. Further increases in height would have no benefit due to the specific characteristics of the odours and the odour sources. As detailed in Section 14.8 in Chapter 14 in Volume 3 Part A of the EIAR, a comprehensive programme of continuous as well as random independent monitoring will be undertaken to demonstrate and assure the ongoing effective performance of the facility. The assessments reported in the EIAR, and especially in Section 14.6.2 in Chapter 14 in Volume 3 Part A of the EIAR, took account of the local circumstances and topography and determined the optimum or correct stack height for the Odour Control Unit at this location as well as for all of the proposed Odour Control Units.

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

- (49) Submissions from Meakstown Community Council and from Councillor Duncan Stewart queried the management of emissions from the Dubber Odour Control Unit. This subject was comprehensively discussed in Section 14.4.3 and Table 14.10 in Volume 3 Part A of the EIAR. As noted above, the height of the odour control unit has been shown to be optimum for the purpose of odour control. Potential for malfunction was also considered and the assessment showed that there was no meaningful potential for adverse impact on the local community arising from malfunctions.

Potential odour impact from RBSF

- (50) Councillor Alison Gilliland's submission, as outlined in Section 25.3.1 in Irish Water's Response to Submissions January 2019 document raised a concern in relation to odours that could potentially be emitted from the storage and transport of biosolids, and the associated impact on the health and wellbeing of the surrounding community.
- (51) In response, I refer to Section 10 Odour in Volume 4 Part A of the EIAR. Section 10.4 describes the operation of the proposed RBSF. It is explained that haulage vehicles bringing biosolids to and from the storage facility will be covered. They will enter and exit the buildings at separate points. Fast closing entry and exit doors for vehicles will be located at each end of each building. Separate doors will be provided for pedestrian access. All waste operations will take place indoors: the vehicles will tip biosolids inside the buildings during operation, and a loader will move the biosolids to the nearest storage bay, also inside.
- (52) An odour control system will be provided to ensure that odour does not give rise to any nuisance beyond the boundary of the proposed RBSF.
- (53) Section 10.6 in Volume 4 Part A of the EIAR describes the mitigation for potential odour impacts. The proposed physical measures to ensure adequate odour control will incorporate:
- Duty and standby fans for each odour control unit to protect against any individual fan failures or planned maintenance (see drawing Y17702-PL-022);
 - A variable fan motor will be fitted to allow increased air extraction in the event of an elevated build-up of odour within the building;
 - A modern building fabric with no passive louvers or vents into the storage areas to prevent fugitive emissions;
 - A traffic light vehicle entry system which prevents the doors being open during material disturbance activities; and
 - All worker access points to the storage areas will be fitted with separate self-closing doors with an audible alarm if doors are open.
- (54) An important part of controlling odour is the odour management regime. This will be a requirement of the Certificate of Registration that will be required from Fingal County Council. An Odour Management Plan will be prepared in accordance with this requirement which, as stated in Section 10.6 in Volume 4 Part A of the EIAR, will detail best operational practices, identification of all odour sources, specified mitigation measures, good housekeeping principles and guidance on effective operation of the odour control system. The objective of the management system will be to reduce odour to an imperceptible level at the proposed RBSF site, to ensure no nuisance is caused beyond the boundary. The Odour Management Plan is described in greater details in Appendix 17B Outline Construction Environmental Management Plan in Volume 5 Part B of the EIAR.
- (55) As stated in Section 10.5.4 in Volume 4 Part A of the EIAR, with effective implementation of the proposed odour mitigation infrastructure, it is considered unlikely that a significant odour impact (such as to give rise to nuisance at the boundary of the proposed RBSF) will occur.

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

Comparison with Other Facilities such as Ringsend

- (56) A number of observers including some Fingal County Councillors raised issues about the ability to deal with odours, partly due to past experiences with plants in Skerries, Ringsend and Co Meath. The proposed WwTP is very different from other plants largely due to technological advances and the use of state-of-the-art design approaches and we are confident that the proposed works are well capable of meeting the required standards to ensure protection of the community from malodours. In addition, the location and the size of the site for the Proposed Project allows selection of approaches which are not necessarily appropriate for other locations.
- (57) There has been specific concern expressed about the potential for odour issues associated with the Proposed Project which might be similar to the historic odour issues experienced at Ringsend. Section 10: Odour of the 2018 EIAR submitted for the proposed upgrade works at Ringsend addressed the question of historic odour issues at Ringsend. It was noted in the Ringsend EIAR, and in the earlier EIS which accompanied the original application for permission to carry out upgrade works, *“that the Ringsend facility caused significant odour nuisance when it first commenced operation”*. Section 10 of the Ringsend Upgrade EIAR describes in detail monitoring of odour emissions undertaken in 2009 – 2018 and also considers detailed information reported about investigations into odour complaints received during this time period. It was concluded that elevated odour emission rates were likely to be attributable to the *“overloaded nature of the WwTP, which is treating incoming loads exceeding its design.”* A review of complaint data and operational information for 2016 and 2017 determined that both site-related and non-site related factors affect the detection of odours in the area. It was found that for infrequent short periods, odours may be elevated due to enforced process issues which are managed in accordance with the Ringsend Odour Management Plan to minimise odour emissions and to rectify any operational issues in the shortest time possible.
- (58) Having reviewed the available information for the Ringsend WwTP, and specifically the original application documentation, the 2012 Ringsend Upgrade EIS, the 2016 Ringsend Upgrade Works EIS and the 2018 Ringsend Upgrade Works EIAR, I concur with the assessment conclusion that the historic odour issues at Ringsend were a symptom of the fact that the Ringsend works was treating loads in excess of the design capacity.
- (59) The Proposed Project, and specifically the proposed WwTP at Clonshagh, is being designed for the required treatment capacity and therefore the primary causative factor for historical odour issues at Ringsend will not arise. The design of the Proposed Project takes account of the projected treatment capacity required for the proposed WwTP and also considers the feasibility of extending the works to meet future treatment capacity needs to at least 2050.
- (60) It is also noted that spare capacity has been factored into the design in terms of the target odour performance. The size and location of the site allow for selection of the optimum design approaches for the proposed WwTP, and the size in particular allows unrestricted selection of design approaches.
- (61) As noted above, the significant buffer distance between the boundary of the proposed WwTP and the most sensitive receptors is an added mitigating factor relative to Ringsend. As the distance from an odour source increases, natural dispersion and dilution leads to a reduction in the odour concentrations which reduces the potential for any odour issues to arise, thereby ensuring that odour levels are further reduced as the distance increases.

Potential Impact on Connolly Hospital

- (62) Some observers raised issues about the adverse impact of odours on the patients and staff at Connolly Hospital as well as on the surrounding population. The proposed Abbottstown pumping station will only ventilate gases to the atmosphere through Odour Control Units, which as discussed above have been

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

optimised to ensure effective treatment of odour to meet the required performance standard of no odour nuisance at or beyond the site boundary.

- (63) The Health Service Executive (HSE) Estates Office made a submission which was prepared by consultants Roughan & O'Donovan acting on their behalf which specifically addressed concerns relating to the sections of the works that impact on Connolly Hospital in Blanchardstown. The submission expressed concern that the EIAR does not consider potential impacts on the proposed Community Nursing Unit on the site of Unit 8 at Connolly Hospital. As noted in Irish Water's Response to Submissions January 2019 document, the Community Nursing Unit will be approximately overlaying the existing out-patient unit. The out-patient unit was considered in the EIAR, and I am satisfied that the potential impact on the Community Nursing Unit has therefore been considered and will be effectively and satisfactorily controlled.
- (64) The HSE submission specifically recommends that active dust suppression measures and aspergillus protection measures shall be included within the Works Requirements at all construction compounds and this will form part of the Construction Environmental Management Plan. As noted in Chapter 14 in Volume 3 Part A of the EIAR, all works will be carried out in accordance with the National Guidelines for the Prevention of Nosocomial Invasive Aspergillosis During Construction/Renovation Activities (Health Protection Surveillance Centre 2018) which deals specifically with construction works occurring within or adjacent to hospitals. Section 14.8 in Chapter 14 in Volume 3 Part A of the EIAR specifically addresses mitigation measures where active dust suppression measures have been specified.

Odour Assessment Approaches in Volume 3 and Volume 4 of the EIAR

- (65) The approach adopted for the assessment of odour in each Volume of the EIAR followed the same Guidance and the assessment approaches and methodologies followed the same principles. In summary, the two Volumes of the EIAR took the following general approach:
- The EPA AG4 and UK H4 Guidance Note recommendations on methodology were adopted;
 - The same dispersion modelling approach and US EPA approved Dispersion Model was utilised for the assessment;
 - The same meteorological data was considered in the modelling assessment, and alternative data sets were considered to test the sensitivity of the Model to varying the input data;
 - The sensitivity of the Model predictions to varying terrain, building dimensions, stack height and surface characteristics was tested in both assessments;
 - The potential odour impact was modelled at the closest representative sensitive receptors as well as at the site boundary in both assessments;
 - Effective containment, capture and treatment of odorous gases in Odour Control Units was considered in both assessments.
- (66) The selection of assessment criteria for the odour impact assessment is described in Section 14.2.3 of Volume 3 of the EIAR and Section 10.2.3 of Volume 4 of the EIAR. In both assessments, the EPA and UK Environment Agency Guidance was followed and the most appropriate assessment criterion for the various different odour sources was selected.
- (67) As outlined at Paragraphs 18 – 21 of this Statement, the assessment criterion is selected based on the relative offensiveness of the odours. For the Abbottstown Pumping Station and the proposed WwTP, raw sewage and sludge are handled, which fall into the category of the most offensive odours and, therefore, an assessment criterion of 1.5OU_E/m³ as a 98th percentile of one hour averaging periods is selected as the most appropriate assessment criterion for these locations.

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

- (68) On the basis of the H4 Guidance, odours from the RBSF are considered in the “Moderately Offensive” category. The material to be stored at the RBSF is a treated, de-watered and stable fertiliser product which is distinct from raw, unprocessed and potentially septic sludges that are classified as “Most Offensive” in the H4 Guidance, such that “Moderately Offensive” is a reasonable classification, and $3.0 \text{ ou}_E\text{.m}^{-3}$ is the appropriate benchmark criterion for the assessment.
- (69) It is therefore concluded that there is no difference in the approaches adopted in Volume 3 and Volume 4 of the EIAR with the same Guidance followed and the selection of the most appropriate assessment criteria for different odour sources consistent with the Guidance.
- (70) An Odour Management Plan is described for all elements of the proposed Project in Chapter 14 Volume 3 Part A and in Section 10 Volume 4 Part A of the EIAR. Details are presented in each Volume of the proposed approaches and further information is also given in Appendix 17B Outline Construction Environmental Management Volume 4 Part A of the EIAR. The various plans, commitments and proposals are collated and presented in the attached Schedule 1 detailing the format and content of the Odour Management Plan for all elements of the proposed Project.

Conclusion

- (71) A comprehensive assessment of Construction and Operational Phase odour, air quality and climate impacts was carried out and documented in the EIAR. That assessment clearly showed that impacts will be within the specified criteria, and that with the implementation of the robust mitigation measures proposed, as well as the application of stringent performance standards, there will be no significant adverse impacts.
- (72) I consider that all of the issues raised in the various submissions were identified and addressed more than adequately in the EIAR. A summary of how those issues were addressed has been set out in this statement, and I welcome the opportunity to clarify how the matters were addressed.

SCHEDULE 1 – ODOUR MANAGEMENT PLAN (OMP)

Purpose and Scope

Prior to the commencement of any works, the appointed contractor(s) will prepare an Odour Management Plan (OMP). The OMP will be developed as part of the overall Construction and Environmental Management Plan (CEMP) developed by the appointed contractor(s) and approved by Irish Water. The OMP will detail how the appointed contractor(s) will comply with the criteria set out in the EIAR and will deal specifically with Operational Phase activities in a strategic manner to remove or reduce significant potential impacts associated with the proposed Project.

The following summarises the key elements of the Plan:

- Specification from the EIAR of the key limits to be met at all specified locations;
- Identification and specification of the best practice containment, minimization and abatement techniques to be employed;
- Definition of the detailed monitoring programme which will be applied, to include methodologies and monitoring locations; and
- Details of the required mitigation measures as identified in the EIAR and any modifications required based on the findings of ongoing monitoring and management.

The OMP will be a living document which is reviewed and revised as needed to reflect lessons learned during the Programme and to ensure that up-to-date information is available and factored into the management of odour impacts associated with the proposed Project. Separate site-specific OMPs will be formulated for each element of the proposed Project and each OMP shall include the specific recommendations and commitments made in the EIAR.

OMP Overview

The OMP will consider every element of the proposed project and in particular will include all of the relevant specifications and proposals outlined in the relevant Volumes of the EIAR. The principal headings addressed in the OMP are as follows:

- Summary of Sites and Surrounding Areas
- Odour sources and location of sensitive receptors
- Odour Management Procedures
- Odour Mitigation Measures
- Monitoring
- Site procedures for dealing with Odour Complaints
- Operative Training
- Record keeping
- Housekeeping
- Maintenance and inspection of odour controlling plant and material
- Spillage/contaminated material management procedures
- Emergency/incident response planning
- Community relations

Outline OMP

1. Sites and Surrounding Areas, Odour sources and location of sensitive receptors

Maps of the Sites and surrounding areas have been included in Volume 3 Part A and Volume 4 Part A of the EIAR. Maps are also included showing the locations of all sensitive receptors and marking the locations of odour sources at each site.

2. Odour Management Procedures and Odour Mitigation Measures

Odour Management procedures will be developed which deal specifically with the precise systems and procedures operating at each site. These procedures will detail best operational practices identify all odour sources, specify the required good housekeeping principles and guidance on effective operation of the odour control system, set out operator instructions for planned odour control maintenance and emergency situations with the potential to generate off site odour, provide maintenance and renewal timetables for the OCU and ventilation components, detail handling procedure for material with an unusually high odour, provide instructions for OCU failure and contingencies to deal with a loss of power, and integrate the requirements of the EIAR into the day-to-day operating instructions for each element of the proposed Project.

3. Monitoring

Continuous monitoring shall be carried out at the sensitive receptor locations in the vicinity of each element of the proposed Project. The number of monitoring locations required at each location shall be agreed by the appointed contractor(s) with Irish Water. Ambient odour measurements shall be completed at least once a day in accordance with best practice.

Odour audits shall be carried out by a suitably qualified independent auditor, appointed by Irish Water in advance, at routine intervals to ensure that the mitigation measures are being correctly implemented at the various sites, including use of appropriate mitigation measures, communications with stakeholders and odour control measures.

Odour Control Units shall be monitored as specified in the respective volumes of the EIAR. The most important factor that allows for verification of performance, and acts as a check on the effectiveness of the procedures and controls in place, is the odour emission rate from the Odour Control Units at the facility. This has been determined from the dispersion model as the odour emission rate that will not cause odour nuisance at or beyond the site boundary. During operation, measurements of the odour level in the outlets from the Odour Control Units will be carried out to ensure that the performance of the odour abatement systems meets the design specifications and ensures that odour is not detectable at nuisance levels beyond the site boundary.

The performance of the Odour Control Units will be monitored during a comprehensive Process Proving Phase at commissioning and at regular intervals throughout the lifetime of the facility. Continuous monitors will be installed which monitor key elements of performance for the abatement systems, such as H₂S levels in the exit gases. Independent performance checks will be carried out by an ISO17025 accredited testing laboratory at regular intervals to verify the effectiveness of control measures and ongoing compliance with the required performance standards.

GDD Oral Hearing
Air Quality, Odour and Climate – Dr. Imelda Shanahan Brief of Evidence

4. Site procedures for dealing with Odour Complaints, Communications and Community relations

A dedicated contact shall be appointed by the appointed contractor(s), in agreement with Irish Water, for all communications in relation to Odour Management and any queries, complaints or other formal correspondence regarding odour.

The appointed contractor(s) shall ensure good communication and engagement with local residents and stakeholders and will keep them informed about the monitoring and mitigation measures that are being implemented.

Any complaints relating to the Proposed Project from local residents or other stakeholders shall be recorded, immediately addressed and notified to Irish Water. A record of how the complaint was addressed, the follow-up actions and outcome shall be maintained.