21 March 2019

Dara White

(Wastewater Treatment Specialist, Irish Water)

Witness Statement for Greater Dublin Drainage Oral Hearing

1 INTRODUCTION

1.1 My name is Dara White and I hold a degree in Civil Engineering from Trinity College Dublin (BABAI TCD 1983) and a MSc in Water and Wastewater from Birmingham University (1989). I am a Chartered Engineer with Engineers Ireland.

1.2 I am a Wastewater Treatment Specialist with Irish Water and I have held that position since 2014. I am responsible for developing policies and specifications for Irish Water for the management of wastewater and sludge. I have over 30 years' experience in the Water and Environmental Sector working with a consultancy, a contractor, water services company and a water utility company. I have carried out design, specification preparation and project management for all aspects of water and wastewater projects from small wastewater treatment plants and water treatment plants to very large projects, including the Ringsend WwTP Upgrade project and Mutton Island WwTP in Galway. I have been involved in detailed design required at contractor level as well as procurement and site management for process, civil, M&E and instrumentation elements of projects. I have worked with traditional, Design Build(DB) and Design Build Operate(DBO) type contracts.

2 DISINFECTION OF FINAL EFFLUENT

2.1 Secondary wastewater treatment typically treats the levels of faecal coliforms in final effluent and provides a 2 log reduction(99%) in the coliform concentrations. Final effluent discharges of E coli(an indicator coliform in wastewater) in secondary effluent vary from about 10,000 up to 300,000 E Coli/100ml.

2.2 Where further treatment to reduce the concentrations of E Coli is required to meet water quality standards, this can be provided by two broad types of treatment:

- Chemical; or
- Ultra Violet(UV) light

2.3 Chemical treatment involves disinfection chemicals such as chlorine and ozone. Because of the associated formation of unwanted compounds by the action of these chemicals on the organic compounds in final effluent, these chemicals require very careful management. Accordingly UV light is preferred for wastewater treatment of faecal coliforms in Ireland.

2.4 UV light technology has been developed over the last 30 years to provide UV disinfection for both water and wastewater. In wastewater treatment plants banks of UV emitting bulbs are provided in modules within concrete channels. These channels are designed to provide residence time for the effluent to be irradiated by UV light of the particular wavelength specified, and to achieve a design reduction in bacteria numbers.

2.5 UV light inactivates bacteria and viruses and the 2016 EPA research paper titled "**The Effect of Wastewater Treatment Processes, in Particular Ultraviolet Light Treatment, on Pathogenic Virus Removal".** Section 2 notes that:

> "Ultraviolet light disinfection has proven successful in inactivating most viruses, spores and cysts and its application in the treatment of wastewater has been well recorded (Qualls et al., 1984; USEPA, 1986; Darby et al., 1993; Emerick et al., 1999; Table 2.4). Disinfection with UV light has proven effective for a broad range of microbial species when typically employed at the germicidal monochromatic wavelength of 253.7 nm in the UV-C range. As such, UV light disinfection is now considered an acceptable process for inactivation of pathogens in drinking water. LP and/or MP UV light is the current method used in water and WWTPs (Bohrerova et al., 2008). Flash or PUV light lamps are a relatively new technology that generate a broadband spectrum generally in the 100–1100-nm wavelength in short, high-intensity pulses. PUV light lamps (usually generated from xenon or krypton) differ from the LP/MP continuous mercury lamp as the high-energy pulse results in the output of a broad and powerful polychromatic spectrum of UV light, visible and infrared light (Lee et al., 2009). The high energy intensity of the PUVlight is theorised to be highly germicidal with the added benefit of inhibiting the photorepair ability of pathogens usually associated with LP/MP UV light treatment."

And

> "The degree to which microbes are inactivated by UV light is related to the UV dose (mJ/cm2), which is calculated as outlined by Metcalf & Eddy (2004). The UV dose applied is site specific and is determined by the type of wastewater to be treated, the volume and the contact time. Wastewater characteristics such as SS, metals (iron and manganese) and organic carbon are all factors that may impact on UV light disinfection performance. Batch tests on the wastewater are recommended at the design and commissioning stage of the on-site UV light system. The recommended UV dose for the inactivation of microbes (mJ/cm2; EPA, 2011) is outlined in Table 2.4."

2.6 Irish Water has installed and operated UV disinfection systems on a number of Wastewater Treatment Plants, where required for designated shellfish water and/or designated bathing water protection. For designated shellfish waters, the systems are operated all year round.

2.7 As outlined to the oral hearing yesterday, and from an abundance of caution, Irish Water has decided to provide UV treatment of the final effluent to provide a further 90% reduction in the E Coli to further protect the designated shell fish waters. This would mean a typical reduction from 100,000 E coli/100ml to 10,000 E coli/100ml. UV treatment will also reduce and control the spikes and variability of the concentrations of E Coli discharged from the proposed wastewater treatment plant thus providing greater protection to the receiving waters.

The proposed UV treatment system will be installed on the final effluent line on the north east corner of the wastewater treatment plant site prior to the discharge to the outfall. This is shown on the figure in Appendix 1.

2.8 For further information figures 1 and 2 show a typical wastewater UV installation.

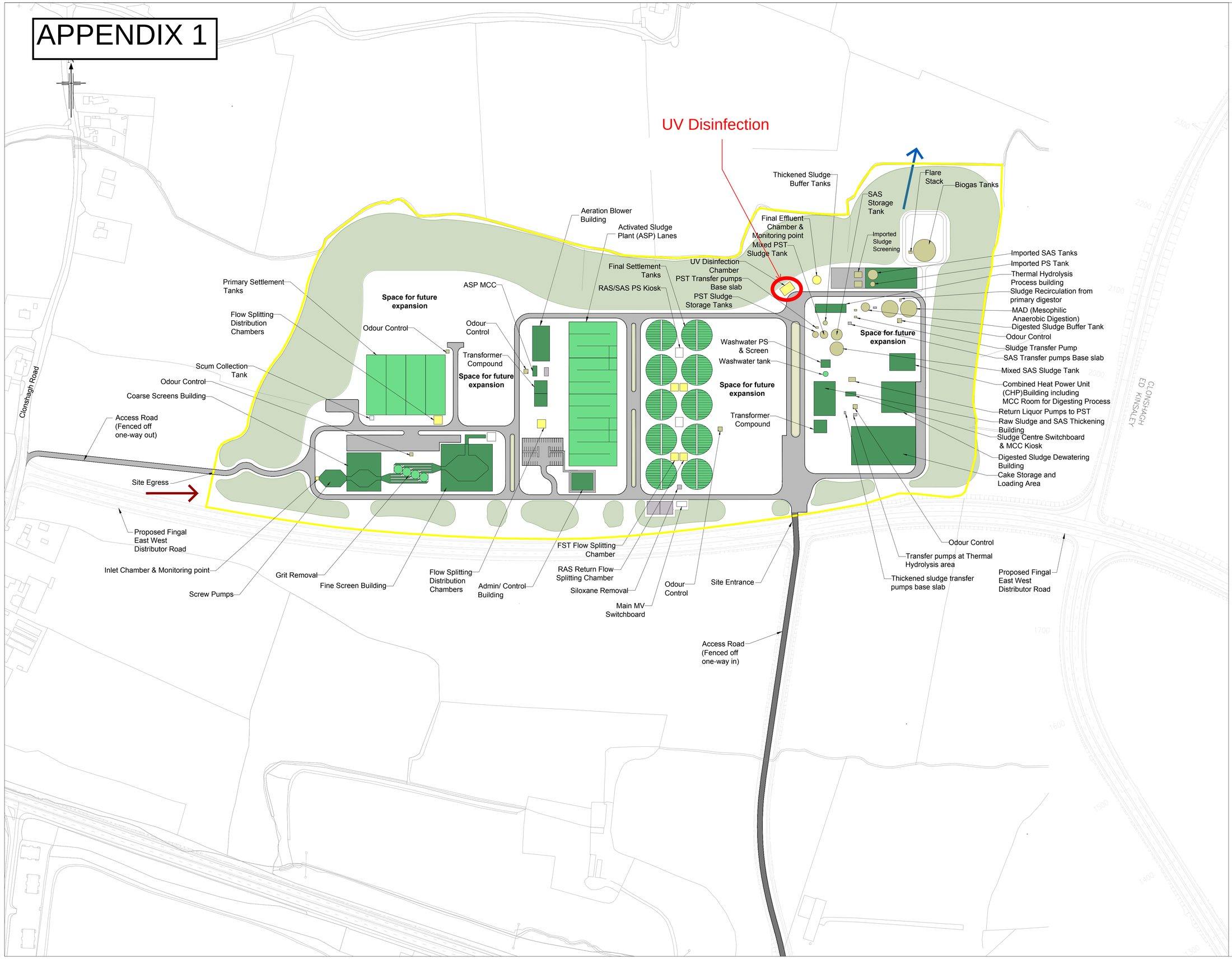
Figure 1 Photograph showing Irish Water UV disinfection system at a WWTP

Figure 2 Photograph of module of UV lights installed in a channel at Irish Water WwTp

3 Conclusion

3.1 In conclusion, the provision of UV treatment at the proposed wastewater treatment plant, as a precautionary measure, will ensure that the coliform concentrations in the effluent discharge will not impact on the designated status of the shellfish waters of Malahide.

APPENDIX 1



Notes:

1. This drawing is not to be scaled. Figured dimensions only to be taken.
2. This drawing is for indicative use only. The Process type and arrangement shown requires confirmation by outline design.
3. 38kV Power line passes through the proposed land boundary. It is assumed that the power line to be re-routed around site boundary.
4. All earthworks shall be at a maximum slope of 1V : 2H.
5. All tanks shall be covered with GRP clam shell covers.
6. All drawings to be checked by the Contractor on Site.
7. Engineer to be informed by the Contractor of any discrepancies before any work commences.
8. All levels shown relate to Ordnance Survey datum at Malin Head, the geographic coordinate system is to Irish Transverse Mercator (ITM).

Legend:

- Proposed Landtake
- Original Proposed Land Boundary
- Proposed Incoming Raw Sewage Main
- Proposed Outgoing Final Effluent Main
- Proposed Chamber
- Proposed Tank
- Proposed Building
- Proposed Sludge Plant
- Proposed Handstanding and Plant
- Proposed Access (within site perimeter)

Rev	Date	Description	By	Chkd.
P02	March 2019	UV DISINFECTION CHAMBER ADDED	SM	CO'K
P01	June 2018	ISSUED FOR PLANNING	SM	CO'K

Greater Dublin Drainage

Client: IRISH WATER

Project: GREATER DUBLIN DRAINAGE SCHEME

Drawing Title: REGIONAL WwTP
INDICATIVE PLAN
ASP OPTION (ROUND)

Scale @ A1 (DO NOT SCALE): 1:2000 @ A1

Prepared by:	Checked:	Date:
S.Murphy	C.O'Keefe	21-12-2017

Project Manager: C. O'Keefe

Jacobs Number: 32102902

Drawing Status: FOR INFORMATION

JACOBS TOBIN Patrick J. Tobin & Co. Ltd.

Drawing No.: 32102902-2120

Revision: P01