Technical Note

To	Client	Subject	Date
Environment Agency	bp	H2Teesside Water Quality Impact Assessment	25 September 2024
Issued by	**Reason for issue**	**Prepared by**	**Checked by**
AECOM	Responses to Outstanding Questions	Sarah Waite	Caroline Braithwaite
Approved by	**Revision No.**		
Tamara Percy	2		

Background

An application for consent to discharge effluent from the proposed H2Teesside development (the "Main Site") was submitted to the Environment Agency under Environmental Permitting Regulations by AECOM and bp. The application was supported by a Water Quality Impact Assessment (Appendix L Water Quality Assessment – H2Teesside ES Chapter 9 Surface Water, Flood Risk And Water Resources) which included dispersion modelling of dissolved pollutants in effluent proposed for discharge from the H2Teesside site to Tees Bay. The Agency reviewed the documents and had the following outstanding queries:

1. The Agency requested that the dispersion modelling and impact assessment should be representative of the site in its operation phase only. Since the Water Quality Impact Assessment does only represent the operational phase of the development and does not reflect the construction or decommissioning phase, this comment will not be addressed further in this note.
2. The Agency requested further information on how the values used to calculate the effluent flow rate and pollutant load have been derived. The available information is set out below under "Calculation of Effluent Profiles."
3. The Agency requested the raw data, process unit's effluent profiles, effluent treatment unit's design specifications, list of assumptions and supporting narrative to understand how the final effluent quality and compositions have been calculated. The available information is set out below under "Calculation of Effluent Profiles."
4. The Agency requested confirmation that none of the processes, raw materials, additives or chemicals used in the installation would contribute hazardous addition substances or potentially hazardous substances for which Predicted No Effects Concentrations would be needed above those already considered in the Water Quality Impact Assessment. It can be confirmed that no additional hazardous or potentially hazardous substances are anticipated to be present in the H2Teesside effluent beyond those already considered in the Water Quality Impact Assessment.
5. The Agency requested additional clarification concerning the management and disposals of process effluents contaminated or potentially contaminated with amines associated with carbon capture solvent. Amines are collected in separate closed drainage and either regenerated for reuse on site or removed by road tanker for offsite treatment so there is no onsite treatment or release of amines in effluent from the H2Teesside site to Tees Bay. For further detail please see the response to Question 9 on the Drainage Philosophy.
6. The Agency requested the water quality modelling input files. These are provided with this note and this comment is therefore not addressed further.

This note has been prepared to provide the additional information in points 2 and 3 above.

Calculation of Effluent Profiles

The H2Teesside site remains at an early stage of design and full details of process unit's effluent profiles and design specifications were not available at the time of the dispersion modelling. The information available at the time of the dispersion modelling carried out for this site allowed for the construction of the site water flow diagram and site water balance in Figure 1. The assumptions concerning water use and effluent generation from each unit are outlined below.

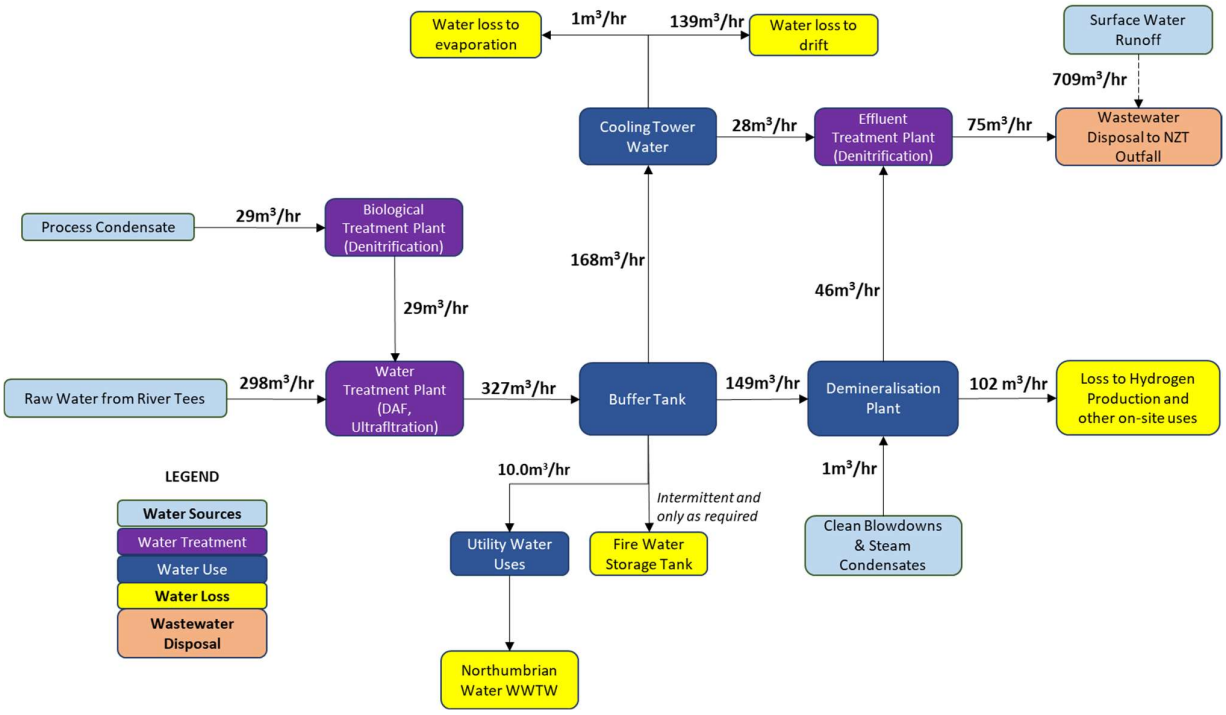

Figure 1: H2Teesside Site Water Flow Diagram and Balance

- Process condensate is generated through condensation of steam in the carbon capture process and may contain dissolved nitrogen from the carbon capture process. The contribution of the process effluent to the site nitrogen balance and eventual effluent nitrogen load has been accounted for in the dispersion modelling outlined in the Water Quality Impact Assessment. Since the process effluent mainly consists of steam condensate, it is assumed not to contain any other contaminants.
- Prior to entering the main site water supply system, the process condensate will be treated via a biological denitrification plant which will convert some of the nitrogen load to nitrogen gas for atmospheric release. Full details of this treatment plant were not available at the time of the Water Quality Impact Assessment but a final effluent nitrogen load of 15mg/l was specified in the information provided by bp to inform that assessment. This is assumed to be present in the form of nitrite, nitrate and/or ammonia, all limited under the Dissolved Inorganic Nitrogen (DIN) standard in coastal waters under the Water Framework Directive.
- The effluent from the biological treatment plant will be combined with raw water from the non-tidal River Tees within an additional water treatment (filtration) plant. The quality of the River Tees water has been characterised with reference to information supplied by Northumbrian Water and the Environment Agency and included with this note. The data are obtained via analysis of samples taken from the non-tidal River Tees at the three Northumbrian Water abstraction points at Low Worsall, Blackwell and Broken Scar and from Environment Agency sampling locations (https://environment.data.gov.uk/water-quality/view/explore). A full specification of the water treatment plant used to treat the combined River Tees and treated process condensate streams was not available to support the discharge modelling but the information available showed that the plant would include dissolved air filtration (DAF) and ultrafiltration. For the purposes of the water quality modelling, as a worst-case scenario it was assumed that the treatment plant removed particulate matter only and did not impact on concentrations of dissolved substances. No water loss was allowed for at this water treatment stage.
- Following treatment by DAF and ultrafiltration, water is stored in a buffer tank on site. The dispersion modelling assumes that the purpose of this tank is to account for changes in water demand on the site and the storage does not result in any change to water chemistry. A small amount of water from this tank is taken to meet on-site utility water requirements and top up a fire water storage tank. The effluent from the utilities is disposed of to the public sewer system and the fire water is only required in an emergency. This water use only acts to reduce the amount of water reaching the NZT outfall and does not change the effluent chemistry.
- The majority of the water stored in the buffer tank is required for use in cooling towers. The water is heated at the cooling tower stage which results in a significant water loss through evaporation and drift. For the purposes of the

water quality impact assessment, as a worst-case scenario it was assumed that all water lost at this stage was pure water only and all dissolved contaminants in the water supplying the cooling towers were retained and concentrated within the cooling tower effluent. Since the main process at this stage is heating only, it was also assumed that no additional dissolved contaminants would be added to the cooling tower effluent.

- The buffer tank water is also to be used to supply a demineralisation plant which is used to generate pure H_2O for the purposes of supporting hydrogen production. All H_2O generated by demineralisation plant is considered to be lost from the on-site water balance. All contaminants in water supplied to the demineralisation plant will be passed into the demineralisation plant effluent. A full technical specification of the demineralisation plant was not available to inform the dispersion modelling, so for the purposes of the water quality assessment it was assumed that no additional contaminants would be added to the wastewater streams at this point.
- The combined wastewater from the cooling towers and demineralisation plant is conveyed to an additional biological denitrification plant with the aim of reducing the DIN concentrations in the final effluent discharged from the site. A full technical specification for the denitrification plant was not available at the time of the dispersion modelling but a final effluent nitrogen load of 15mg/l was specified in the information provided by bp to inform that assessment. The treatment plant was assumed to impact on dissolved forms of nitrogen only because the impact on other dissolved substances is not known. The plant is assumed not to add any additional substances to the final effluent discharged to Tees Bay.

The raw data and calculated effluent flow rate and pollutant loads is provided in the attached excel workbook.

The design of the on-site treatment processes for the H2Teesside site is still in progress and additional dispersion modelling will be carried out to reflect the final site design and is expected by 31/01/2025.