D3.1 INDIVIDUAL TECHNOLOGY DEVELOPMENT

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Deliverable Information Sheet

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Executive summary

This document provides an insight in the development of the individual technologies part of LIFE PRISTINE Integrated Solution. The general objective of this deliverable is to describe the capabilities of each individual technology to remove Contaminants of Emerging Concern (CECs) present in the water streams in the drinking water (DW) and wastewater (WW) demo sites.

Each chapter of the deliverable goes into detail on the development of the individual technologies. In the first chapter the development of the adsorption capsule system is discussed. The conclusion of this development will be used to select the main adsorption system candidates to be demonstrated and mass produced in Task 3.5. The second chapter discusses the development of the low-energy hollow fibre nanofiltration (HF-NF) membrane arrangement. The conclusions of this chapter are used to support the design of the demonstration plant. The third chapter discussed the development of the advanced oxidation process (AOP) UV-LED reactor. The conclusions gathered in this deliverable will contribute to the design of the photo-reactor prototype. In the last chapter the development of the AI Soft Sensors is discussed. The conclusion of this chapter will lead to the development of an AI soft sensor that can be used to predict the concentration of CECs based on water routine on-line and off-line data.

Development performed in this deliverable has led to the following conclusions. Adsorption capsules consisting of highly efficient adsorbents, mixtures of active carbon and β-Cyclodextrin were successfully incorporated into a biodegradable capsule structure. Future work will incorporate low-cost permanent magnets for capsule recovery from the system. With the HF-NF pilot, optimal settings were found for reduction of the fouling rate of the membranes. Additionally, CECs analysis showed promising results for downstream treatment of the permeate and concentrate streams. A UV-LED reactor compatible with different oxidants was designed, constructed, and evaluated for CECs removal. The synergy with HF-NF permeate was tested and showed promising results. For the AI Soft Sensor two modelling approaches were evaluated for the estimation of CECs, namely machine learning using random forest and MCR-ALS.