FORM TITLE – Project Scope Development (PSD)

	Description	Provide Comments
Title	**Advanced oxidation technologies**	
Project Type	☒State-of-knowledge ☐Problem Definition ☒Knowledge Generation ☒Knowledge Transfer ☒ Knowledge Adoption ☐Benefit Realisation	
Problem	While advanced oxidation processes (AOP) - including but not limited to ozonation, UV photolysis and combination UV and other oxidant agents, offer many benefits for the treatment of contaminants, there are challenges that need to be addressed to better understand, implement, and control these systems. In particular, understanding AOP mechanisms and disinfection by-product (DBP) formation under varying water quality conditions requires further investigation in order to provide guidance for utilities and regulatory agencies to validate these systems.	
Background/ Description:	AOPs are used extensively overseas to treat a range of trace contaminants during water treatment and potable reuse processes. Advanced water treatment systems including UV technologies can provid up to 6-log inactivation of adenovirus and other pathogens, photolysis of NDMA and other nitrosamines, and advanced oxidation of 1,4-dioxane and other chemical pollutants. AOP is also used to reduce 1,4-dioxane and other chemical pollutants in contaminated groundwaters, and algal toxins, and taste and odour (T&O) compounds within surface water supplies. This project will start with a state of knowledge of available technologies and the context in which they are used globally. Operational conditions will be described, along with indicative cost for CAPEX and OPEX for AOP systems. This will include, a review of the Australian context and how well overseas examples translate to Australian conditions, or what adjustments or further work is needed. WaterRA is joining forces with The Water Research Foundation (Denver, USA) in developing a project to bring to Australia state-of-the-art AOP technologies and test these systems in laboratory and pilot scale set-ups using varying water qualities from several field testing sites at Australian utilities.	
Objectives:	This project aims to identify cost effective approaches to integration of advanced oxidation processes to allow for effective risk management and treatment of: • Contaminants of emerging concern • Disinfection by-products • Taste and odour compounds • Algal toxins	

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Scope/ Deliverables:	Stage 1: This project starts with a review of available information and leading to publication of a literature review report and paper Stage 2: Bench, pilot and/or full-scale testing protocols will be prepared to test the AOP technologies. A number of field-testing sites will be identified in close collaboration with participating Australian utilities to: • Evaluate of AOP performance for varying water qualities focusing on sites where utilities would be looking to make decisions about advanced oxidation. • Assess DBP formation and mitigation specifically for these sites. Stage 3: WaterRA team will participate in AOP model validation associated with the testing in collaboration with world leading experts from EAWAG (Switzerland), University of Colorado Boulder (USA), and UNSW (Australia). The outcome of this phase would provide Australian utilities with a validated AOP model that can be used to identify and optimize design and operating AOP and oxidant doses. Stage 4: The project team will Participate on the panel for guideline development and knowledge transfer activities. WaterRA will organise local workshops intended to demonstrate the triple benefits of AOP. Stage 5: Potential for a second project: • WaterRA will convene a WaterVal protocol development group to create an AOP protocol, based on the 9 principles of WaterVal and the validation protocol template including the new knowledge generated from the joint WaterRA-WRF project (stage 1 to 4) into the AOP protocol. • Following the outcome of stage 1 to 4 WaterRA will identify test sites to undertake validation performance trials for existing and new AOPs, against the newly developed AOP protocol • Compare the performance of the new AOPs against currently available technologies, as well as the specified/predicted performance as set out in the validation protocol.	

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Stakeholders	Australia: Seqwater, Sydney Water, Melbourne Water USA: Carollo Engineers, Black & Veatch, The National Water Research Institute (NWRI)	
Investigative or Research approach	• The research is a desk top study involving investigation and collation of international literature. • Laboratory and field investigations to validate AOP technologies at testing sits around Australia. • Modelling development, guidance document and validation protocol preparation.	
Indicative Funding required:	☐Small (<$100k) ☒Medium ($100-$500k) ☐Large (>$500k)	
Duration/Start	☐Short (<6 months) ☐Medium (6-18 months) ☒Long (>18 months) Start: July 2020	

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