Data Dictionary

1. **Natural organic matter**:
Natural Organic Matter (NOM) is the organic material present in surface or ground water. NOM includes both humic and non-humic fractions. The humic fraction includes high molecular weight organic molecules such as humic and fulvic acids. These substances plus tannic acid are the major fraction of Dissolved Organic Matter (DOM) in water. These substances are oxidized very slowly and their solubility in water may vary with pH. The dissolved fraction of NOM may not be fully removed using conventional water treatment practices and have been shown to produce by-products such as trihalomethane during disinfection. On-line analysis of dissolved NOM is important for proper monitoring and control of enhanced or special treatment processes designed to remove NOM prior to disinfection.

2. **Seasonal variation in Natural Organic Matter**:
A number of US water utilities have been experiencing operational difficulties connected with the increased dissolved organic carbon (DOC) levels during the autumn and winter periods. This has been observed as an increase in the production of disinfection-by-products (DBP), and a greater coagulant demand. Resin adsorption techniques were used to fractionate raw water and investigate the variation in surface charge and coagulant–humic interactions over a 36-month period. A change in the natural organic matter (NOM) composition throughout the year was observed

3. **Nanomaterials**

Nano-sized particles exist in nature and can be created from a variety of products, such as carbon or minerals like silver, but nanomaterials by definition must have at least one dimension that is less than approximately 100 nanometers. Most nanoscale materials are too small to be seen with the naked eye and even with conventional lab microscopes.Materials engineered to such a small scale are often referred to as engineered nanomaterials (ENMs), which can take on unique optical, magnetic, electrical, and other properties. These emergent properties have the potential for great impacts in electronics, medicine, and other fields. For example,

4. **Ceria CeO2**
A white-to-yellow, heavy powder, cerium, CeO_2, usually derived from cerium nitrate by decomposition with heat: used chiefly in ceramics, glass polishing, and decolorizing.

5. **Fate and Transport**
Fate and transport models simulate the movement and chemical alteration of contaminants as they move through the subsurface. They may be used to model contaminants in both the ground water and vadose (unsaturated) zone. Fate and transport models used to model transport within a ground water zone require the development of a calibrated flow model or, at a minimum, an accurate determination of the flow velocity, which has been based on field data. Ground water flow and

contaminant fate and transport models are used to help understand and evaluate hydrogeologic systems. Models are simplified representations or approximations of real hydrogeologic systems and may incorporate a number of processes operating within ground water and/or unsaturated zones. The purpose of modeling can vary widely, and the approach used may depend on site-specific needs, current understanding of the hydrogeologic system, availability of input data, and expectation and use of the model results.

6. Transport through Packed column

Transfer of nanoparticles in packed columns are investigated for a variety of column and packing sizes but at flow rates restricted to fully developed turbulent conditions. The present work was undertaken to investigate mass transfer at flow-rate conditions in the transition and laminar regions. A dual treatment of experimental data required a knowledge of the variation of concentration and velocity with radial position. A tracer-injection technique was employed which consisted in the introduction of a tracer gas into the center of a bulk gas stream and the measurement of the tracer-gas concentration at various radial positions downstream.

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