

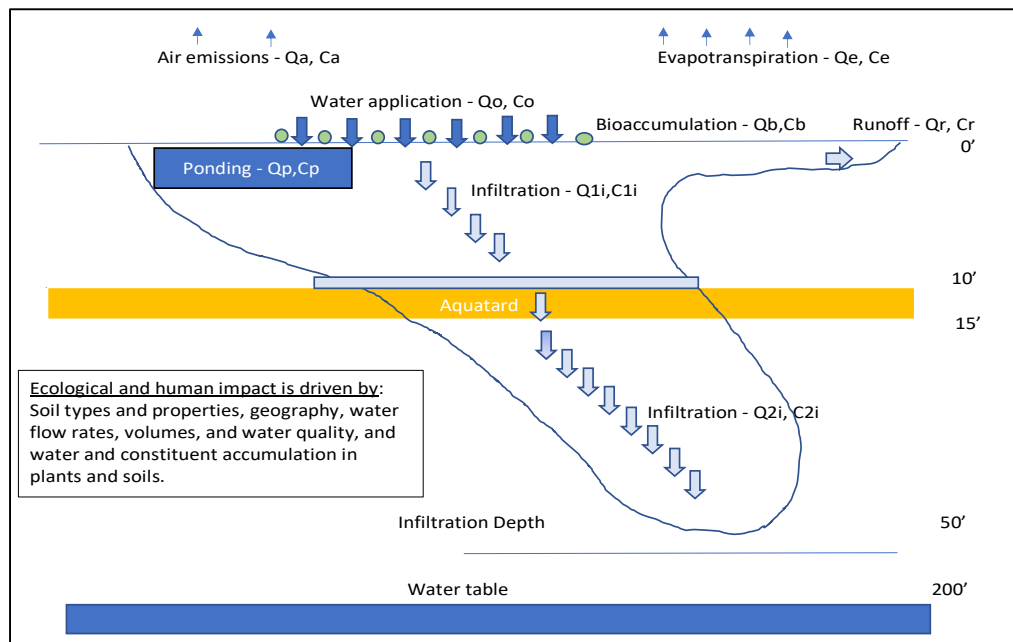
Produced Water Fate, Transport, and Risk Modeling and Analysis

The Consortium is pursuing five distinct strategies to assess human, animal, and plant and soil exposure to discharges of treated produced water and quantify the potential toxicity and risks to the public and the environment for different potential fit-for-purpose applications. One element of that strategy is conducting treated produced water discharge fate, transport, and risk modeling and analysis.

What is fate, transport, and risk modeling and analysis?

- Fate is the persistence and life cycle of a chemical in the environment including its partitioning or uptake into the air, water, soil, plants, or animals.
- Transport is the movement of those chemicals through the environment including their partitioning into, and movement through different media including air, water, soil or the food chain.
- Risk modeling and analysis is the quantification of the chemical concentration hazards and the exposure and of the final chemicals of various receptors.
- Therefore, the final modeling and analysis must include the evaluation of site conditions, specific applications, and the constituents and their concentrations in the produced water, in order to assess the potential impacts and risks of the use of treated produced water to human and/or ecological receptors for each potential application.

Conceptual Site Models are commonly used to help the public and regulatory agencies visualize the general issues and challenges of a specific fit-for-purpose discharge of treated produced water. Below is an example of a land discharge conceptual model of a treated produced water application and potential fate and transport.



- The model suggests that for a land discharge - water infiltration into the soil down to the water table, plant accumulation, air emissions, potential runoff to a stream, local ponding, and soil accumulation, should be analyzed for potential risks to the public and the environment.
- This is one of several conceptual models that would potentially be evaluated for different site specific or treatment fit-for-purpose applications. Other examples include: water supply system augmentation, construction, mineral mining and extraction, and various industrial applications.

Examples of Risk Assessment Modeling and Analysis Tools Available

- A wide range of risk assessment modeling and analysis tools are available for assessing ecological and human risk to treated produced water. These include:
 - Screening tools like the EPA's EFAST model which often provide a rather conservative estimate of risk relative to more detailed and realistic emissions data. Nevertheless, these tools could provide value for some specific applications once compared to more detailed and realistic emission and transport models.
 - General exposure/risk screening tools, such as the Ecologic Risk Classification Tool, which provides a multi-descriptor chemical profiling concept that classifies hazards, exposure, and risks. These tools provide a quality screening approach to identify where more detailed modeling and analysis is warranted.
 - Based on initial screening analysis for various treated produced water, treatment quality, and various reuse applications, more detailed fate, transport, and risk modeling and analysis tools can be assessed and utilized to assure various produced water treatment and applications are protective of human and ecological health and safety.

References and More Information

- New Mexico Produced Water Research Consortium website :<https://nmpwrc.nmsu.edu/>
- Basic Information about Water Reuse - EPA:
<https://www.epa.gov/waterreuse/basic-information-about-water-reuse>
- Contaminant Fate, Transport and Exposure – EPA:
<https://www.epa.gov/emergency-response-research/contaminant-fate-transport-and-exposure>

Questions

- Contact the Consortium at: nmpwrc@nmsu.edu