



USDA-CSREES 2005 National Water Quality Conference

Risk Assessment of Onsite Wastewater Treatment Systems in Malibu, California

Abstract:

The City of Malibu California is a coastal community dependent upon onsite wastewater treatment systems (OWTS) for treatment and reuse of valuable water resources. Receiving waters include the lower portion of the Malibu Creek and lagoon and the coastal surfzone. Lower Malibu Creek is included on the 303(d) list of impaired waters for both bacteria and nutrients. The lagoon affects groundwater depths and flow direction, depending upon whether or not it is open (breached) to the ocean. Water quality conditions along the surfzone are negatively impacted, particularly when the lagoon is breached.

Objectives: Objectives included determining the contribution of onsite wastewater treatment systems to surface water quality, and providing a scientific basis for wastewater management program options.

Methods: The project's step-by-step risk assessment process included:

- 1. Define receiving waters and objectives for key water quality constituents (pathogens and nitrogen for Malibu Creek and Lagoon, and pathogens for the surfzone).*
- 2. Identify, locate, and quantify contamination contributed by onsite systems.*
- 3. Evaluate hydrogeologic conditions to determine groundwater flow directions and geographic areas that contribute flow either to Malibu Creek/Lagoon or the surfzone, and determine travel times from the discharge sources to the receiving water bodies.*
- 4. Estimate the assimilative capacity of unsaturated and saturated zones to account for the reduction or assimilation of pathogens and nitrogen during transport within the groundwater.*
- 5. Delineate specific areas with conditions posing risks to the receiving waters relative to pathogens and nitrogen. Highest risks from pathogens appear to be posed by onsite systems that do not provide the combination of unsaturated soil and groundwater travel time needed for pathogen die-off before reaching the Creek/Lagoon or the surfzone. Nitrate-nitrogen risks are a function of the collective contribution from all onsite systems and were evaluated by modeling the cumulative effects from all areas contributing flow to the nitrogen impaired Creek/Lagoon.*
- 6. Identify and evaluate alternative corrective strategies to reduce risks to acceptable levels, including strategies to reduce pathogen and nitrogen*

contributions from onsite systems and determining which ones would effectively reduce risks and achieve water quality objectives.

Partnerships: A stakeholder process was incorporated into this study, including residents and many government and environmental organizations.

Resources: The study included application of a web-based wastewater management database; installation and sampling of groundwater monitoring wells; and use of a three-dimensional groundwater flow computer model (MODFLOW).

Integration of Research, Teaching, and Extension: Many previous studies were utilized in this project. The results of the scientific analysis may be used in conjunction with a TMDL for Malibu Creek. The process can be used as a model for similar communities dependent on OWTS.

Results: Results include an understanding of the groundwater flow directions, times of travel, and OWTS impacts on water quality. Wastewater management options include system inspections, requiring targeted areas to use treatment technologies to reduce nitrogen and pathogens, and implementing municipal management activities.

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