THE FORT IRWIN STUDY: INVESTIGATION OF SUB-URBAN WET- AND DRY-WEATHER FLOWS AND MANAGED AQUIFER RECHARGE USING DRYWELL SYSTEMS IN AN ARID SETTING (2016-2023)

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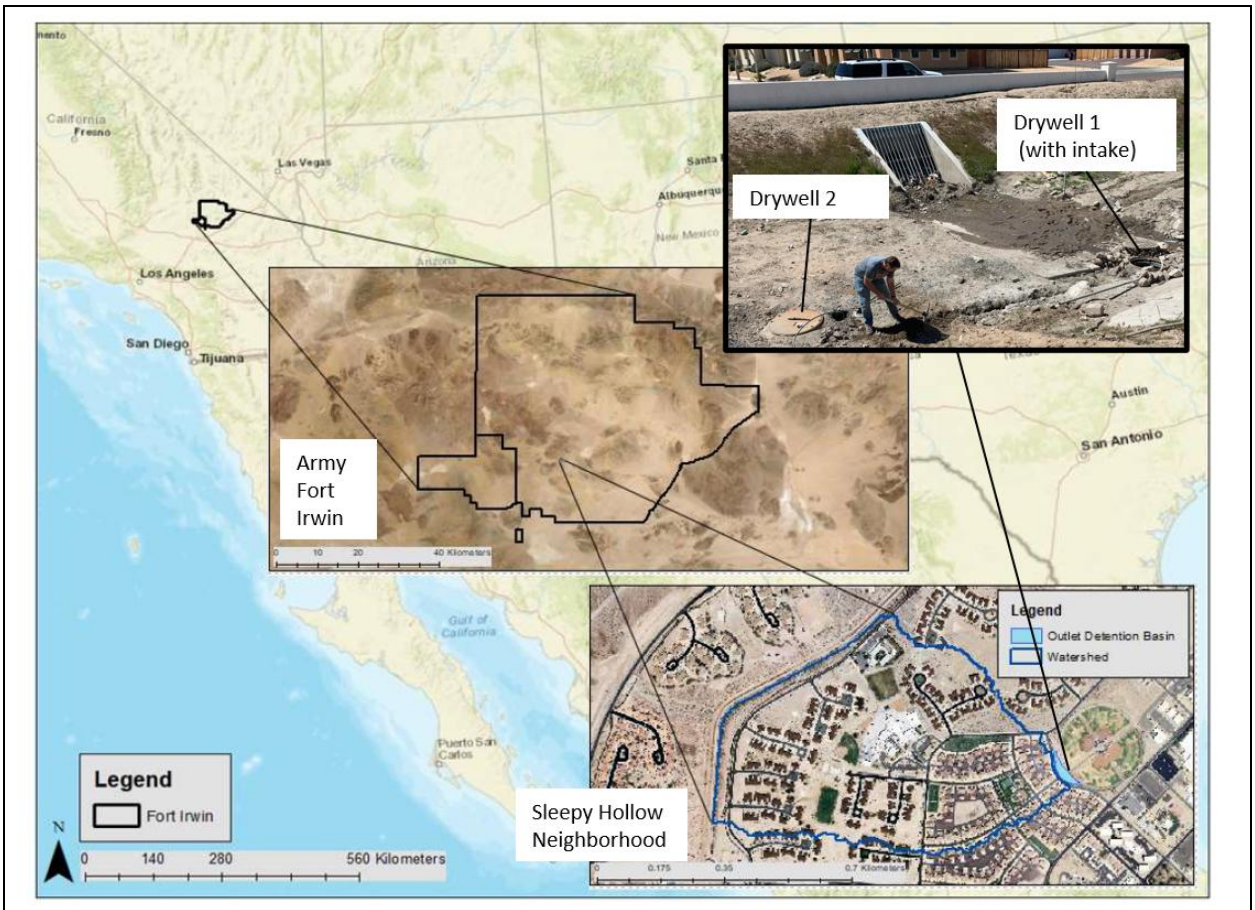
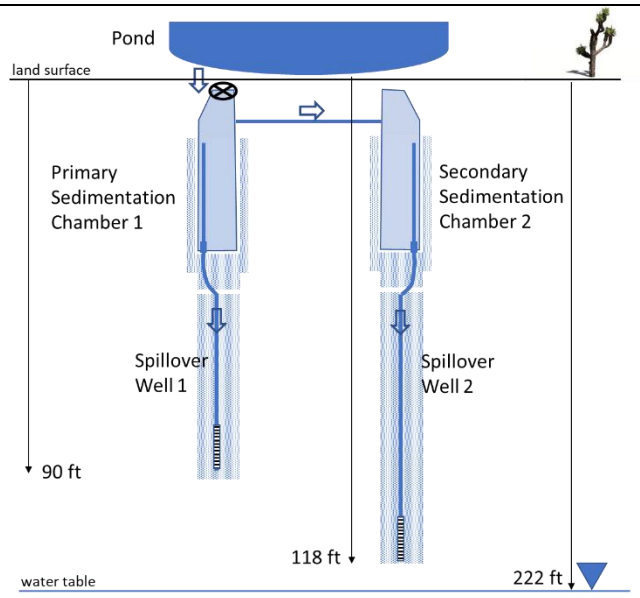


The Sleepy Hollow neighborhood in the cantonment area of Army Fort Irwin. Subsurface storm pipes convey runoff to the Fourplex stormwater infiltration basin. The drywell intake and sedimentation chambers are embedded in the infiltration basin.

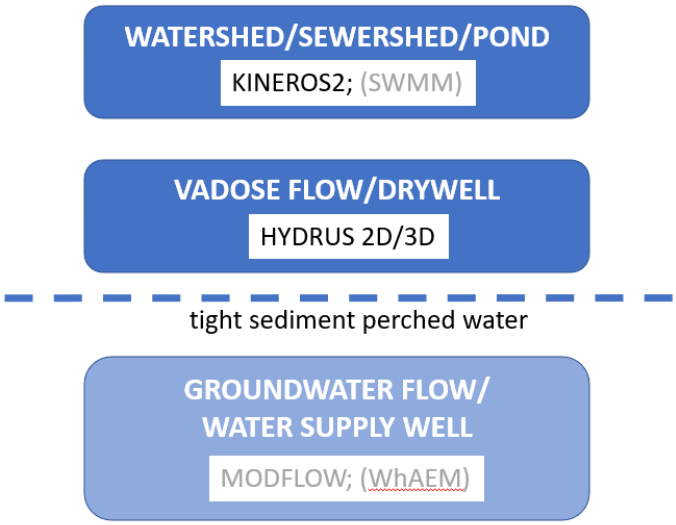
Under the pre-development hydrologic cycle in the Southwest USA, excess stormwater rainfall flows overland toward the ocean (coastal areas) or to playa dry lakes (desert areas). While there is no net loss of water on a global scale hydrologic balance, local fresh water is lost due to mixing with seawater (coastal areas) and evaporation (desert areas). The question is "how might some of the developed land runoff be diverted to surface storage, infiltration, and recharge into subsurface aquifer storage (i.e. Managed Aquifer Recharge or MAR)?" Note: we distinguish winter wet-weather flows from the occasional, summer monsoon floods which due to the volumes and flow rates, are not managed for recharge, but are managed for diversion to prevent

property damage. We also recognize unplanned releases from human activities might contribute to dry-weather flows.

There are many options for gravity-fed infiltration. We focused on two popular ones in combination: (1) infiltration basin (wider than deep); and (2) vadose or drywell (deeper than wide). The Fort Irwin case study investigated dry- and wet-weather management at the Army National Training Center at Fort Irwin in the Mojave desert. The Sleepy Hollow neighborhood of the cantonment area has a dry- and wet-weather conveyance system that uses a storm basin/pond for flow storage and pretreatment, and a drywell system for additional treatment and focused infiltration. There is also a nightly dry-weather flow from neighborhood irrigation and street runoff that is conveyed to the basin and drywell system. The Fort Irwin project used monitoring and modeling to better understand best management practices (BMPs) for stormwater capture and potential aquifer recharge.



The drywell system at Fort Irwin consists of two sedimentation chambers (6 ft diameter, SC1, SC2) and two spillover wells (not to scale, DW1, DW2).



The proposed modeling approach includes overland flow from watershed/storm-sewershed to infiltration flow into the vadose zone to recharge flow to the groundwater aquifer. Note a tight sediment layer at about 120 ft below ground surface perched infiltration and we found no evidence of groundwater recharge.

A monitoring field program was envisioned to characterize water flows and sediment transport through the Fort Irwin dry- and wet-weather system. A computer modeling system was designed to test understanding of system performance and eventually assist water managers in decision support. The groundwater flow modeling of the drywell recharge was not initiated at this time given the discovery of a tight layer that is ponding infiltration (about 120-135 ft below ground surface). The water table is at 225 ft bgs.

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September 30, 2021. The Fort Irwin team is active with putting out research products. A contractor assisted controlled field experiment of the drywell system was conducted summer of 2022. The EPA-USDA/ARS IA extension ended September 30, 2023. This EPA environmental research brief serves as a synthesis and guide to the Fort Irwin Study publication and data record.

Products:

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