

The Impact of Flash Floods on Waste Water Disposal Sites within the Wadi Systems in the Eastern Desert of Egypt: Case Study for Wadi Al Saaf

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The hydrology of Wadi Al Saaf was investigated to estimate the quantitative parameters of flash flood and its interaction with the landuse using multitude of remote sensing data, digital elevation models (DEM), field work and topographic survey. The waste water is being conveyed into the lower part of this catchment through a transient drain "Al Saaf Drain" and the newly constructed treatment plant for "Al Saaf City". The flash flood of May 2014 was completely trapped into the oxidation pools of the treatment plant and its surrounding low areas in the wadi floor. The active channels and accumulated water bodies of this flash flood were traced from the satellite images acquired shortly after the event. The DEM was analyzed into geographic information system (GIS) to estimate the distributed unit hydrograph given the application of Manning's formula for the open channel flow equation. The surveyed cross-sectional areas of the active channels and their equivalent hydraulic radii gave a mean peak discharge of 110 m³ per second. The estimated net discharge was 1.9 million cubic meters as calculated from the surveyed topography for the pools and depressions areas, which trapped that flash flood. The wadi is dominated by surface runoff as the percolation into the underlying alluvium is very limited due to the occurrence of thick Pliocene clays few meters below the surface. Furthermore, the seepage of waste water from "Al Saaf Drain" into the artificial depressions of the clay quarries has created massive ponds which are susceptible to breaching by the flash floods. Therefore, the interaction of flash floods with the water bodies in the catchment must be prevented in order to advert any negative environmental consequences. Moreover, the cultivation of edible crops with the waste water is being practiced; this research has suggested specific mitigation measures to be taken to achieve sustainability for the water resources management.