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<i>Designation</i>	:	
<i>Title</i>	:	<i>Investigation of Water Quality Variation and Pollution Sources in Pussella Oya Catchment</i>
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#### Background:

Pussella Oya is a small tributary of the Mahaweli River in Sri Lanka, which was identified as one of the sources responsible for the Hepatitis A outbreak recorded in Gampola in May 2007. Faecal contamination due to poor sanitation caused the outbreak. Therefore, an assessment of the spatial and temporal pollution variation within the Pussella Oya catchment area and identification of main pollution sources were the main objectives of this study. The specific objectives were to classify sub catchment area/community wise pollution level in the Pussella Oya catchment area and to investigate critical sub catchments/communities that are prone to pollution, to compare the water-related issues among different communities in the Pussella Oya catchment area assessing the variations in water quality and pollution contribution among different communities, and to study the microbial transport within the saturated soil and its impact on groundwater pollution through existing toilet pits (cesspits) in the Pussella Oya catchment.

#### Research Methodology:

Pussella Oya catchment was identified by using 1:10000 scale topographic maps. Spatial pollution variation in the sub catchments were identified by using preliminary water quality survey and field observations. The findings show that the pollution contribution has a close relationship with the socio-economic status of the communities. Therefore, three communities were selected to represent the three main different community types in the Pussella Oya catchment areas, viz. Rothschild estate, Pussellawa town and Black Forest colony which represent the estate, peri-urban town and village communities, respectively. The water quality variations in the communities were identified using water quality surveys. These were conducted for six months in two weeks' intervals from April to October 2008. Reasons for the water quality variation and water-related issues were examined through a questionnaire survey. Water quality variations between and within communities were compared and the impact of rainfall on water quality variation was examined. Cesspits, the most common excreta disposal mechanism, were found as poor sanitation technology areas in the site. Therefore, a field experiment was conducted to test the pollution probability from the cesspits. Multi-level monitoring wells were installed to measure the groundwater pollution contribution from available cesspits in one of the line house schemes in the Rothschild estate. Water samples were taken once a week for a period of two months along with the records of water table fluctuations. Water samples were tested for E. coli and its spatial variation were assessed.

#### Research findings:

Total Coliform and E. coli levels have exceeded the standards, except in a few branch canals in the Pussella Oya catchment. Pussellawa town is the most critical area contributing to pollution followed by the Black Forest estate. Pussellawa Town represents the peri-urban town situation, and its contribution to pollution is due to disposal of untreated wastewater directly into the city drainage canals owing to unplanned and indiscriminate constructions for commercial and residential purposes. Limited land area available for onsite wastewater treatment and shallow groundwater table in the area has worsened the situation. Weaknesses in manure storage is reflected in the poor water quality in Black Forest estate. Other than that, insufficient or unsuitable sanitation facilities in all the tea estates contribute to this situation.

Of the three communities studied, the highest pollution level of outflow water was found from the Pussellawa town area followed by the Rothschild estate. The outflow water quality in both the places was significantly poor when compared to the inflow and groundwater quality. The highest groundwater pollution was found in the Black Forest colony. Possible reasons for groundwater pollution are polluted surface (inflow) water recharge into groundwater storage and unsuitable latrine pits in the area. Similar water-related issues were faced by the three different communities studied. The most important issue was that all the natural drinking water sources exceeded the maximum permissible levels of total Coliform and E. coli content. Waterborne disease records did not have comparative relationship with drinking water quality and diseases in the communities. The poorest quality of consumptive water was found in the Black Forest colony while the minimum diseases' prevalence were also recorded from the same area due to domestic water treatments prior to drinking and better hygienic practices. Disease burden with respect to water pollution was the highest in the Rothschild estate even though the second highest poor quality consumptive water was found from the area.

The main reason for this was poor hygienic practices prevalent among the community. Other water-related problems in the communities were mosquito problems in the Black Forest Colony and bad odor generated from the drainage canal in the Pussellawa Town area.

Microbial quality varies in the vertical groundwater profile, and a higher E. coli count could be observed in layers parallel to the cesspits. Cesspits contribute to pollution of the groundwater, and the impacts due to this contamination gradually reduces with the distance due to natural attenuation.