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## Evaluation Monitoring as an Alternative to Conventional Stormwater Runoff Monitoring and BMP Development

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There is growing agreement (Urbanos and Torno, 1994; Herricks, 1995; Lee and Jones-Lee, 1994, 1996a;) that conventional stormwater runoff monitoring for a suite of chemicals at the storm sewer outfall or edge-of-the-pavement is of limited value in defining real water quality problems caused by chemicals in stormwater runoff. There is also increasing recognition that conventional best management practices (BMPs) such as detention basins, filters, etc. are not real BMPs for controlling water quality use impairments in waterbodies receiving urban area street and highway stormwater runoff. An alternative monitoring and BMP development approach is "Evaluation Monitoring."

Evaluation Monitoring assesses the impact of stormwater runoff-associated constituents from a water quality use impairment perspective. Conventional monitoring develops chemical data via edge-of-the-pavement sampling and tries, usually with little or no success, to extrapolate to receiving water impacts. Evaluation Monitoring is a watershed-based water quality evaluation and management program in which the stakeholders concerned about water quality in a particular waterbody work together to define the water quality use impairments that are occurring in a waterbody, the cause of the use impairments and develop control programs to limit the amounts of the constituents responsible for the use impairments entering the waterbody of concern.

For example, many heavy metals and organics are of concern in urban area street and highway stormwater runoff because of their potential toxicity to aquatic life. Conventional stormwater runoff monitoring generates data that indicate that potentially significant elevated concentrations of heavy metals are present in urban area street and highway runoff. However, the chemical data developed from such monitoring cannot be used to determine whether the concentrations found in the runoff are in toxic, available forms and whether the toxicity associated with these constituents will be present in the receiving waters at toxic levels for a sufficient time to be significantly toxic to receiving water aquatic life.

Evaluation Monitoring measures the amount of toxicity in the stormwater runoff as it enters the waterbody of concern using US EPA standard ambient water toxicity tests. Where potentially significant toxicity is found in the runoff waters entering a waterbody, site-specific

studies are conducted to determine whether the toxicity in a stormwater runoff event is of sufficient magnitude and duration to be potentially adverse to the receiving water aquatic life. If such conditions are found, then through toxicity investigation evaluations (TIEs) the constituents responsible for the toxicity are determined and through forensic studies the sources of these constituents within the watershed are evaluated.

In the Evaluation Monitoring approach, rather than assuming that conventional BMPs, such as detention basins and filters, are effective in controlling potential water quality use impairments in the receiving waters for stormwater runoff, site-specific BMPs are developed to control real water quality use impairments to the maximum extent practicable (MEP). Typically, these BMPs focus on source control that manages the input of the chemical species of concern using BMPs to the MEP. These BMPs, in most cases, will be significantly different from the conventional stormwater runoff BMPs used today since they will focus on dissolved, toxic/available forms rather than particulate, non-toxic forms.

In order to manage water quality problems due to potential bioaccumulatable chemicals such as the chlorinated hydrocarbons and mercury, the focus of Evaluation Monitoring is on determining whether excessive concentrations of these chemicals are found in receiving water fish. Fish tissue analysis is used to determine whether there is a water quality problem due to excessive bioaccumulation. In contrast, conventional stormwater monitoring tries to extrapolate from the constituents in stormwater runoff to tissue concentrations. This approach is normally of limited reliability since there are a variety of factors that influence whether a chemical constituent in runoff waters bioaccumulates to excessive levels in receiving water aquatic organisms. For example, for mercury, the conventional monitoring approach extrapolates from stormwater runoff mercury concentrations to receiving water concentrations of methylmercury which accumulates in fish tissue to excessive levels. Such approaches have limited reliability because of the complexity of the aqueous environmental chemistry of mercury.

Evaluation Monitoring is a cost-effective, technically valid approach for evaluating whether both regulated heavy metals and organics as well as the unregulated constituents in urban area street and highway stormwater runoff are adverse to the designated beneficial uses of the waters receiving the runoff than the currently used conventional monitoring approach. The various potential water quality use impairments of concern such as aquatic life toxicity, domestic water supply, excessive

hazardous chemical bioaccumulation, excessive fertilization, sanitary quality, petroleum hydrocarbon - oil and grease, litter and excessive sediment accumulation or impacts are evaluated in the Evaluation Monitoring program in terms of their significance in impairing the beneficial uses of the waterbody (Lee and Jones-Lee, 1996b,c).

Where significant receiving water beneficial use impairment occurs, the waterbody stakeholders work together to define through forensic analysis the sources of constituents responsible for impairment and then develop control programs to control the impairment to the MEP. A three-year demonstration project is currently underway in Orange County, California devoted to the implementation of Evaluation Monitoring for stormwater runoff water quality management for Upper Newport Bay. This program is being conducted in cooperation with the Orange County Environmental Management Agency and the Santa Ana Regional Water Quality Control Board as well as other stakeholders within the Upper Newport Bay watershed.

## References

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