METHOD STATEMENT

Determinand:
Biochemical Oxygen Demand (BOD) 20 Day

Matrix:
Leachates, effluents and waste waters

Principle of Method:
The BOD is defined as the mass of dissolved oxygen required by a specific volume of liquid for the process of biochemical oxidation over a 20 day period at 20°C in the dark. The result is expressed as milligrams of oxygen per litre of sample. Allyl thiourea (ATU) may be added to suppress nitrification during the course of the test. In this case the result is referred to as BOD (ATU).

Biochemical oxidation of organic matter is primarily brought about by the action of heterotrophic bacteria (bacteria which use the organic matter present to produce energy and for growth). These processes can be shown by the simplified equations:

(1) $C_xH_yO_z + O_2 \xrightarrow[\text{Energy Liberation}]{\text{Oxidation}} CO_2 + H_2O$

(2) $C_xH_yO_z + NH_3 + O_2 \xrightarrow[\text{by cells}]{\text{Synthesis}} CO_2 + H_2O + \text{more cells}$

The first phase of biochemical oxidation results in cell growth by depletion of the available organic matter. This is followed by a slower oxygen uptake known as endogenous respiration. During this the cells produce energy by self-oxidation. This process can be shown by the simplified equation:

(3) $CELLS + O_2 \xrightarrow[\text{Respiration}]{\text{Endogenous}} CO_2 + H_2O$

Sampling and Sample Preparation:
There is no sample preservative used.
Samples requiring settled or filtered BOD are pre-treated prior to incubation.
Samples are stable for 2 days (EPA-600/4-79-020) from sampling.

Interferences:
Free chlorine. Substances toxic to aerobic or to nitrifying bacteria. Ammonia and organic nitrogen compounds may enhance oxygen uptake, by nitrification. Nitrification may be suppressed by specifically inhibiting the action of Nitromonas by addition of allyl thiourea. Ferrous iron, sulphite, sulphide or aldehydes may exert an immediate oxygen demand.

Performance of Method:
Performance characteristics have not been determined for this method

References:
5 Day Biochemical Oxygen Demand (BOD_5), Second Edition 1988 (with amendments to Dissolved Oxygen in Waters). HMSO, Methods for the Examination of Waters and Associated Materials ISBN 011 7522120.