TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

TOPSOIL

THE CONTAMINATED LAND EXPOSURE ASSESSMENT (CLEA)

The Contaminated Land Exposure Assessment (CLEA) Model 2002 has been developed for the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency by the Centre for Research into the Built Environment at the Nottingham Trent University.

CLEA 2002 is a computer based application that combines information on the toxicity of soil contaminants with estimates of potential exposure by adults and children living, working and/or playing on land affected by contamination over long periods of time. The model focuses on pathways relevant to direct human health risks arising from exposure to contaminated land, consistent with the 'suitable for use' approach. It predicts the amount of contaminant to which they might be exposed based on a given soil contaminant concentration. By comparing predicted exposure with health criteria values on tolerable or acceptable contaminant intakes, the model is used to generate assessment criteria that establish a contaminant concentration in soil that is protective of human health.

The CLEA model aims to assess the risk to human health from contaminated soils. However, the model does not take into consideration the risk soil contaminants pose to plants, animals, buildings and Controlled Waters.

The new Soil Guideline Values (SGV) will help to answer the question 'Does the soil concentration of contaminant 'X' pose a significant risk to human health?' However they do not assess the risk to the environment. They are a tool that can be used to assess the risks posed to human health from exposure to soil contamination resulting form land use. They represent 'intervention values', which indicate to an assessor that soil concentrations above this level could pose an unacceptable risk to the health of site users and that further investigation and/or remediation is required. Soil Guideline Values combine both authoritative science and policy judgement.

The Soil Guideline Values (SGV) determined by the model assess the risk posed to human health from exposure to soil contaminants resulting from land use. Three typical land uses are considered by the CLEA model:

- Residential (with and without vegetable growing)
- Allotments
- Commercial / industrial

The Soil Guideline Values can be used in connection with the formal requirements of Part 11A of the Environmental Protection Act 1990 ('the contaminated land regime'). They allow the determination of contaminated land. However, they will also be relevant to many situations where the effect of land contamination on human health is an issue such as in planning applications when judging the need for action to ensure that a new use of the land does not pose unacceptable risks to health.

Soil Guideline Values have superseded the ICRCL values (Interdepartmental Committee on the Redevelopment of Contaminated Land) in respect of assessing risks to human health.

The following Soil Guideline Values related to the more sensitive end uses covered by Residential and Allotment sites. Where a soil contamination level exceeds the Soil Guideline Value the contaminant may pose a risk to the health of end users and further investigation is required.

Heavy Metal	***Soil Guideline Value (SGV)***
Arsenic	20mg/kg
Chromium	130mg/kg
Cadmium	1mg/kg at pH 6
Cadmium	2mg/kg at pH 7
Cadmium	3mg/kg at pH 8
Mercury	3mg/kg
Lead	450mg/kg
Nickel	50mg/kg
Selenium	35mg/kg

It is important to ensure that any soil imported to site is free from significant contamination and pose no risk to human health. Current SGVs only consider a limited range of parameters. However, it is now widely accepted that Polyaromatic Hydrocarbon (PAHs) and Total Petroleum Hydrocarbon (TPH) analysis should be included when assessing the suitability of a topsoil for use in general landscaping or domestic gardens. It is anticipated that SGVs will be set for these parameters in the near future.

POLYAROMATIC HYDROCARBONS (PAHs)

There are numerous compounds based on multiple aromatic rings (PAHs). It is not possible to analyse each individual compound, therefore, simple screening tests of the more potentially toxic individual PAHs are often used. The most commonly determined PAHs are the United States Environmental Protection Agency list of sixteen priority pollutants (US EPA16).

The sixteen compounds are *naphthalene, acenaphthylene, acenaphthene, fluorine, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, benzo(g,h,i)perylene.*

Of the sixteen compounds *benzo(a)pyrene* has been identified by the Environment Agency as a carcinogenic marker substance. At present the Soil Guideline Value (SGV) for this compound has yet to be set as part of the Contaminated Land Exposure Assessment (CLEA) Model. However, 1mg/kg benzo(a)pyrene and 40mg/kg total PAHs are widely accepted as the maximum target levels for general landscaping and domestic garden topsoil.

TOTAL PETROLEUM HYDROCARBONS (TPH)

Total Petroleum Hydrocarbons (TPH) describes a broad range of organic compounds derived from crude oil. Elevated TPH levels are typically found on brownfield sites where hydrocarbons may be present in the soil due to accidental spillage or as a by product of manufacturing industry or petroleum production. The TOPSOIL Suite 2 analysis determines any hydrocarbons present in the soil which fall into the C6-C40 range, which covers petrol and diesel range compounds. An acceptable level for most landscaping environments is <100mg/kg, although high values may be permissible on certain sites where the risks of potential contamination are deemed to be lower.

Tim O'Hare Associates LLP is an independent soil science consultancy that supports the commercial landscape, sports amenity, waste and construction industries.

The company offers a full site investigation, testing and consultancy service, including fully interpretive reports and practical recommendations. Core expertise is in soil and compost science, topsoil quality assessment, fertilisers, landscaping, sports pitch agronomy and soil restoration.

For further information please contact Tim O'Hare Associates LLP:

Tel: 01491 822653 or Email: info@toha.co.uk