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ACE Paper 11/2007
For Advice

Risk-Based Remediation Goals as Contaminated Land Standards for Hong Kong

PURPOSE

This paper seeks Members' endorsement of the Risk-Based Remediation Goals (RBRGs) as new contaminated land standards for Hong Kong.

BACKGROUND

2. Land becomes contaminated when there is spillage, leakage or disposal of toxic chemicals to the ground. Soil at or below the ground surface, and sometimes groundwater as well, may be contaminated depending on the subsurface conditions. To determine objectively if a piece of land is contaminated, certain standards would need to be put in place. Historically, Hong Kong has no locally-derived standards for land contamination assessment. The Dutch B levels referenced in ProPECC PN3/94[1] – Contaminated Land Assessment and Remediation have been used up to the present. The Dutch levels were considered comprehensive in terms of coverage of parameters and were the most commonly used reference worldwide at that time. When a site is classified as contaminated based on the Dutch B levels, the contaminated soil and/or groundwater is required to be cleaned up to meet the Dutch B levels unless the affected soil or groundwater will be completely isolated to render it harmless to public health.

3. The Dutch B levels were developed many years ago in the Netherlands to protect humans, local plants and animals under any type of land use (i.e. a "good for all use" principle) and the groundwater for potable purpose. The Dutch government recognized the obsolescence of the Dutch levels in light of the international trend of adopting a risk-based approach to contaminated land assessment and remediation. They had subsequently replaced the Dutch B levels with a new set of risk-based contaminated land

[1] Professional Persons Environmental Consultative Committee - Practice Note for Professional Persons No. 3/94, dated 1994.

standards in 2000. This development has underlined the need to review the continued adoption of the Dutch B levels in Hong Kong.

4. The worldwide trend is for each country to adopt country-specific standards to suit local environmental conditions. These overseas standards are derived using a risk-based methodology, i.e. standards are set such that the decisions on defining a site as contaminated, and hence the level of remediation required, are made based on the potential risk to receptors. The United States (US) Environmental Protection Agency pioneered the application of chemical risk assessment principles and procedures to evaluate contaminated sites under their Superfund Program in the 1980s. Other countries (mainly Canada, Australia and some European countries including the Netherlands) followed the US footsteps and began developing their own risk-based standards in the 1990s by making reference to the US approach. The Environmental Protection Department (EPD) began in 1999 to review the overseas practice and examine the feasibility of updating the contaminated land standards for Hong Kong to keep up with the international trend and scientific advancement. Compared to most Asian countries, and regions, we are relatively advanced in contaminated land standard development.

5. The proposed new standards have been developed specifically for Hong Kong for four different types of post-restoration land uses based on the risk to human receptors under local conditions. Relevant overseas methodologies were used in establishing the RBRGs with input of local data as far as possible, resulting in standards more suitable for the Hong Kong conditions. The risk-based approach means that contaminated land will be managed by considering the nature and extent of the potential risk it poses as a result of the receptors' exposure to chemicals in the soil and/or groundwater. This basically acknowledges that there is an acceptably low level of exposure to contaminants, which poses negligible risk. Choosing the level of negligible risk is a very important decision in the derivation of risk-based standards. The risk levels we have chosen for protection of public health are:

a. an excess lifetime cancer risk of 1 in 10^6 for carcinogens; and
b. actual intake must be less than the safe dose for non-carcinogens

These risk limits are in line with the international practice and are at the conservative end of the range of risk limits adopted worldwide. For example, it is noted that the risk limit of 1 in 10^6 has also been adopted by some overseas countries such as the US and Canada, while the United Kingdom and the Netherlands have used a higher risk of 1 in 10^4 to 10^5.

CONSULTATION

6. The Advisory Council on the Environment was informed of the proposal to replace the Dutch B levels with the RBRGs and the related stakeholder consultation plan at end of August 2006 via circulation of the ACE Paper 18/2006. It was mentioned in the paper that stakeholders in contaminated land management would be consulted on the derivation and practical application of the RBRGs. The stakeholders were consulted from September to December 2006. They included experts in risk-based standards (professional institutions, consultants and academics), the green groups and the private sector users of the RBRGs (e.g. oil and gas companies, shipyard operators and real estate developers). The stakeholders were each given a consultation package for their comments on the derivation methods and the practical application of the RBRGs. The consultation package contained:

a. a Consultation Paper;
b. a draft Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management (August 2006); and
c. a draft Background Document on Development of Risk-Based Remediation Goals for Contaminated Land Management (August 2006).

7. As a part of the consultation exercise, three briefing sessions for the above stakeholders were held from 14 to 16 November 2006 to present the proposed RBRGs and to obtain initial feedback on the RBRG derivation and implementation.

COMMENTS AND RESPONSES

8. All oral comments received during the briefing sessions and written comments received up to the end of the consultation period were compiled and recorded. These comments together with the corresponding EPD responses were presented in full in a Consultation Report which was distributed in February 2007 to the stakeholders for their reference.

9. In general, the concept of risk-based remediation goals was well received as a positive step in advancing contaminated land management in Hong Kong. There was a general consensus that the Dutch B levels were outdated and no longer sustainable. There were a number of comments that were common to many of the stakeholders. These major comments, the corresponding responses and follow-up actions taken by EPD are presented in the Summary Report on Stakeholder Consultation in **Annex A**.

10. EPD has incorporated a number of comments and suggestions from the

stakeholders in revising and fine-tuning the RBRGs as well as the guidance documents. In particular, the RBRGs for polycyclic aromatic hydrocarbons and arsenic were derived using a slightly different approach. The RBRG calculation model was improved and updated to the best practice level. Chemical toxicity data were updated in order to utilize the most current values available internationally. Some RBRGs with high values were capped with ceiling limits to follow the international practice. All these revisions have led to generally more conservative RBRGs.

REVISED GUIDANCE DOCUMENTS

11. Following the consultation, two key stakeholders requested an opportunity to review the revised RBRG values and guidance documents before these are finalized. After sending the revised RBRG values and guidance documents to these stakeholders, EPD presented in detail the major revisions that were made to the revised values and documents, and general support was secured from these key stakeholders on the revised package.

12. The revised RBRG values and guidelines for use are now presented in the Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management of April 2007 (**Annex B**). The derivation rationale is detailed in the Background Document on Development of Risk-based Remediation Goals for Contaminated Land Management of April 2007 (**Annex C**).

OTHER IMPLICATIONS

13. The risk-based contaminated land standards are more rational, scientifically defensible and environmentally-friendly. The change from Dutch B levels to RBRGs is primarily technical in nature and there are no significant implications in other areas. The derivation methodology is in line with techniques used internationally and results in an improved approach to contaminated land assessment and remediation in Hong Kong.

ADVICE SOUGHT

14. Members are invited to advise on and endorse the Guidance Manual and Background Document in Annexes B and C respectively.

Environmental Protection Department
May 2007