7.0 SUMMARY

This report presents the results of a screening level risk assessment for human health associated with exposure of persistent organic pollutants. The report is part of the *Regional Capacity Building Program for Health Risk Management of Persistent Organic Pollutants (POPs) in South East Asia* (POPs Project). The risk assessment has been performed on a case study site, the Sok Pa Loung (SPL) Case Study Site, Vientiane, Lao. In support of the capacity building program and the present risk assessment, the following major activities were performed:

A. A Launch Workshop in Luang Prabang, Lao PDR between April 3rd and 6th.

B. Selection by the National Focal Point in consultation with the Project Team of the SPL site as the POPs case study site. The site selection was based on concern for (i) potential PCB contaminated oils which may have been inadvertently deposited in site soils, and (ii) the proximity of residential developments adjacent to the site.

C. Technical seminar and environmental sample collection at the SPL site from May 12th to 17th, 2008 **:**

   - **A Stakeholders Meeting**: National Focal Points, Senior Management of Key Government Agencies, and National Consultants to discuss the POPs project, including the training program and stakeholder identification and the goal of the field program;

   - **A Training Seminar** on sample collection, sample handling and analysis followed by the hands-on demonstration at the study sites for the government officials;

   - **A Site Reconnaissance**: to select and map potential sampling locations, to discuss the sampling plan and to liaise with local stakeholders (site management and local community members);

   - **Fieldwork**: to collect environmental and biological samples with the support of the national consultant;

   - **Fieldwork Demobilization**: to (a) prepare samples for shipping (i.e., sample labeling, storage, shipping and the completion of export formalities), (b) complete and archive important documents (i.e., chain of custody forms, survey and field forms, and (c) properly clean/decontaminate and store field equipment; and

D. Chemical analyses of environmental samples was subsequently provided by Hiyoshi on October 4th, 2008 and Axys on January 13th, 2009

E. Blood sampling on August 5th and 6th, 2008. Chemical analyses of samples was subsequently provided by Axys on January 13th, 2009.

F. Completion by Hatfield of initial draft screening human health risk assessment was presented and discussed at the POPs Toolkit consultation/training meeting on December 4th and 5th , 2008, and further rounds of consultation/collaboration with the National Focal Point and National Consultants thereafter, to incorporate site-specific information on various exposure assumptions and site practices.

G. Provision of a risk assessment training workshop (January 28th to 31st, 2009) given by Hatfield and WB, with specific discussion of the present SPL case study.

Key results from the risk assessment of SPL case study are:

Problem Formulation

- The problem formulation indicated that all the components required for a human health risk were present: chemical hazards, receptors and pathways linking the hazards and receptors;
- The chemical hazards identified were PCBs and Dioxin/Furans. Dieldrin levels also exceeded the guideline; however, it was not considered a chemical hazard associated with the SPL case study site. There is no record of dieldrin use or storage at the SPL case study site. Dieldrin was only assessed in a single fish caught in a pond down gradient from the workshop. The pond also receives surface run-off water from neigbouring properties, therefore it is possible that it originated from a separate location;
- The receptors identified at the site were both ecological receptors (fish and terrestrial animals) and humans (workers and residents of local homes); and
- Exposure pathways identified were split into onsite exposures, exposures related to oils being transported off site to family homes, and exposures related to off-site migration of contaminants via wind erosion or surface water run-off.

Exposure Assessment

- The exposure assessment used a computer-based model to estimate the total daily exposure of people (workers, family members of worker, local residents and school children) to PCB + dioxin/furan TEQs. The results suggest that dermal exposure to PCB and dioxin/furan contaminated transformer oils is likely the predominant route of exposure, followed by the ingestion of contaminated fish.

Hazard Assessment

- Toxicity reference values (TRVs) were selected in order to calculate a numerical expression of potential human health risk. The chemicals of potential concern (PCB + dioxin/furan TEQs) were assessed both as carcinogens and non-carcinogens.

Risk Characterization

- Results of the Risk Characterization suggest that there is a potential human health risk associated with exposure to PCBs and dioxin/furans in transformer oils, contaminated soil/sediments and fish tissue. The PCB exposure calculated using the computer-based model was supported with measured concentrations of PCBs in the blood of workers and wives of workers. However, this potential risk was placed into the context of uncertainties and assumptions made during the risk assessment. Two options were discussed: (1) conducting a refined risk assessment to determine if potential risks are over estimated; or, (2) conduct risk management activities at the site to mitigate potential risks.

The following are the key risk management alternatives recommended by the participants of the National Training Workshop (Vientiane, Laos PDR, 28-31 January 2009):

- Develop and enforce an occupational health and safety plan;
- Monitor and verify effectiveness of mitigation strategies;
- Conduct Risk Communication and Training;
- Undertake measures for controlling and containing PCB Hazards;
- Cap the hot spot surface to control erosion of soil surfaces in the hot spot by rain and wind erosion and off-site transport; and
- Governance – adopting and enforcing law and regulation controlling POPs.

Given the limited resources and competing priorities, the risk management for the site should focus primarily on clusters of simple and implementable risk management options for the site and more detailed clean-up operations follow later. The emphasis of the risk management should be on capacity building, public awareness and putting in place and enforcing health and safety plan and other emergence prevention and control procedures.