
Appendix A1.1

**First Field
Sampling Report**



FIELD SAMPLING IN LAO PDR AND CAMBODIA AND HOTSPOT RECONNAISSANCE VISIT IN THAILAND, MAY 2008

Prepared for:

THE WORLD BANK GROUP
1818 H STREET, NW, WASHINGTON DC
20433, USA

Prepared by:

HATFIELD CONSULTANTS
SUITE 201 - 1571 BELLEVUE AVENUE
WEST VANCOUVER, BC
V7V 1A6

JUNE 2008

POP1406



TABLE OF CONTENTS

LIST OF TABLES	ii
LIST OF FIGURES.....	ii
LIST OF APPENDICES	ii
DISTRIBUTION LIST	ii
1.0 INTRODUCTION.....	1
2.0 FIELD SAMPLING IN LAO PDR	3
2.1 BACKGROUND	3
2.2 TRAINING SEMINAR (DAY 1).....	3
2.3 HANDS-ON TRAINING AND FIELD SAMPLING (MAY 13 – 16, 2008).....	4
2.3.1 Samples Management.....	8
2.4 SOCIAL AND HUMAN EXPOSURE QUESTIONNAIRES.....	8
2.5 NEXT STEPS	9
3.0 FIELD SAMPLING IN PHNOM PENH CAMBODIA	10
3.1 BACKGROUND	10
3.2 TRAINING SEMINAR.....	10
3.3 HANDS-ON TRAINING AND FIELD SAMPLING (MAY 20 TH TO 24 TH , 2008).....	10
3.3.1 Environmental Sample Collection and Handling.....	12
3.3.2 Sample Management	14
3.3.3 Social and Human Exposure Questionnaires.....	15
3.4 NEXT STEPS	16
4.0 SITE RECONNAISSANCE NEAR BANGKOK THAILAND	17
4.1 MEETING WITH POLLUTION CONTROL DEPARTMENT	17
4.2 VISIT TO THE SELECTED SITE - SAMUT PRAKAN, SOUTH BANGKOK.....	17
4.3 DATA COLLECTION AND ANALYSIS	19
4.3.1 Existing data for analysis of POPs Health Risk	19
4.4 DATA NEEDS AND PROPOSED SCOPE FOR FIELD DATA COLLECTION AT SELECTED HOT SPOT	21
4.5 FOLLOW-UP ACTIVITIES IN THAILAND	21
5.0 CLOSURE.....	23

LIST OF TABLES

Table 1	List of Samples Collected in Sok Pa Luang, Vientiane, Lao PDR.	6
Table 2	List of Samples Collected at Sambour EDC Site, Cambodia	12

LIST OF FIGURES

Figure 1	Location Map of Sok Pa Luang Study Site	5
Figure 2	Sample Collection Sites, Sok Pa Luang, Vientiane, Lao PDR.....	7
Figure 3	Location Map of Selected Sites in Sambour EDC Warehouse and EDC Training Center.	11
Figure 4	Sample Collection Sites Map, Sambour, Phnom Penh, Cambodia.	14
Figure 5	MEA Facility, Suk Sawat 53.....	17
Figure 6	Site photos of Suk Sawat 53, Thailand.....	20

LIST OF APPENDICES

Appendix A1	Field Sample Mission Schedule
Appendix A2	List of Participants in Training Seminar
Appendix A3	List of Field Crews
Appendix A4	Field Work Instructions
Appendix A5	Preliminary Analysis of Human Exposure

DISTRIBUTION LIST

The following individuals/firms have received this document:

Name	Firm	Hardcopies	CDs	FTP
		√	√	√

1.0 INTRODUCTION

The enclosed report provides detailed information about field sampling conducted in Lao PDR and Cambodia, as well as a field reconnaissance visit to a proposed study site in Thailand. All activities took place between the 12th and the 24th of May 2008.

The field sampling activities presented in this report were conducted under the “Regional Capacity Building Program for Health Risk Management of Persistent Organic Pollutants (POPs) in South East Asia” Project (hereafter referred to as the “POPs Project”). The POPs Project is funded by the Canadian International Development Agency (CIDA) POPs Fund, and is implemented by the World Bank. Hatfield Consultants Partnership is contracted to provide technical inputs to the POPs project.

Prior to the field sampling activities, the Hatfield Project Team (HPT) proposed a field sampling program for all four participating countries. The sampling program proposed was consistent with the Project Implementation Plan approved by the World Bank and the participating countries at the Regional Launch Workshop held in Luang Prabang, Lao PDR, from April 3rd to 5th, 2008. It was hoped that field sampling would occur in all four participating countries (Cambodia, Lao PDR, Malaysia and Thailand), during the May visit. However, due to the delay in the selection of hot spots by two of the participating countries, the HPT secured approval from the World Bank to split the field sampling into two separate missions, as follows:

1. May 12 to 24: sampling in Lao PDR and Cambodia (confirmed); and
2. Tentatively July 16 to 27: sampling in Thailand and Malaysia, subject to final selection of hot spot sites).

The field sampling mission from May 12 to 24 was conducted by Grant Bruce (Environment Specialist), Sokhem Pech (Assistant Project Manager and Communication Specialist) and John Wilcockson (Risk Assessor and Field Sampling Specialist). Dr. Andy Dean (GIS and Remote Sensing Specialist) also assisted with mapping the sites.

Field sampling was designed to provide both technical capacity building, and on-the-job training to local stakeholders. The following was the proposed general schedule of training and sampling activities in both Lao PDR and Cambodia:

- **Day 1:** Training Seminar;
- **Days 2-4:** Fieldwork (collect environmental and biological samples, and socio/economic information);
- **Day 5:** Work with the national POPs team to transport samples (packing, labeling, storage, shipping, completion of export formalities, chain of

custody forms, review of survey and field forms, and any follow-up issues).

Due to national holidays and an upcoming general election, the training seminar could not be held in Cambodia. However, the HPT and the national POPs team of Cambodia were still able to complete the field sampling program successfully.

Between May 15th and 17th, a member of the HPT visited Thailand and conducted a field reconnaissance at the case study site selected by the Thailand POPs team.

The following section (2.0), summarizes the field sampling work in Vientiane, Lao PDR between May 12th and 16th, 2008. Section 3 provides a summary of the field sampling activities in Phnom Penh, Cambodia between May 19th and 24th, 2008. Section 4, provides a brief report on the field reconnaissance at the selected site near Bangkok, Thailand.

2.0 FIELD SAMPLING IN LAO PDR

2.1 BACKGROUND

The Field Sampling mission was carried out in Vientiane between May 12th and 17th, 2008. The Field Sample Mission schedule is provided in *Appendix A1-1*. The HPT included Grant Bruce, Sokhem Pech, and John Wilcockson. The National Consultant and the Lao PDR POPs team were actively involved in the field sample mission.

The HPT expresses its appreciation to all Lao PDR government officials concerned for their active support and involvement. Special thanks are due to Mme. Monemany Nhoibouakong, Director General of ERI, WREA, for her guidance and warmest hospitality. The Team also expresses its appreciation to Mr. Khonkeo (Keo) Kingkhambang, and his staff from the Environment Quality Monitoring Center (EQMC), ERI, for their effective coordination and for arranging logistics. The Laos' staff members from Electricite Du Lao PDR (EDL), Environmental Research Institute (ERI, WREA), and Chemical Department of Ministry of Defence (MOD) actively contribute to the successful completion of the Field Sampling Mission. The HPT's appreciation also extends to the family members of the EDL staff concerned for providing valuable information and allowing the field crew to visit their homes; and to the local residents for helping the field crew collect fish samples.

2.2 TRAINING SEMINAR (DAY 1)

The Training Seminar was conducted in the meeting room of the National Science and Technology Authority (NSTA). The Training Seminar was opened and chaired by Mme. Monemany Nhoibouakong, Director General, ERI/WREA.

17 participants from key agencies including ERI/WREA, Department of Agriculture, the Chemical Department of the Ministry of Defence, Ministry of Trade and Industry, Electricite Du Lao PDR (Ministry of Mines and Energy), and the Public Health Ministry, took part in the training seminar. A full list of Participants is provided in *Appendix A2*. ERI provided a high-quality interpreter that facilitated a very effective exchange of expertise between the HPT and the participants. In addition, the chairperson provided a concise (and highly useful) summary of key concepts at the end of each presentation.

The HPT provided the following presentations:

- A brief introduction of the POPs Project objectives and a tentative sampling plan (Sokhem Pech);
- Introduction to the standard operating procedures (SOP) - objectives, general principles, and field sampling organization, general sample collection and analysis, and Quality Assurance/Quality Control (QA/QC) (Grant Bruce).

- Sampling Methodologies: soil, sediments, biological sampling (theory), labelling, use of GPS and field data sheets (John Wilcockson);
- Presentation on the socio-economic exposure survey and risk communication (Sokhem Pech);
- Overview of Agent Orange in Lao PDR (Grant Bruce).

The HPT was impressed by the high level of interactive discussion by the Lao PDR participants. The comments and feedback received were greatly appreciated. The HPT took note of all comments and suggestions for the associated field work. Mme. Monemany in her closing statement expressed her appreciation to the Canadian Government and CIDA for their financial support, and to the World Bank and the HPT for project implementation. The chairperson considered the training seminar “very timely and useful”.

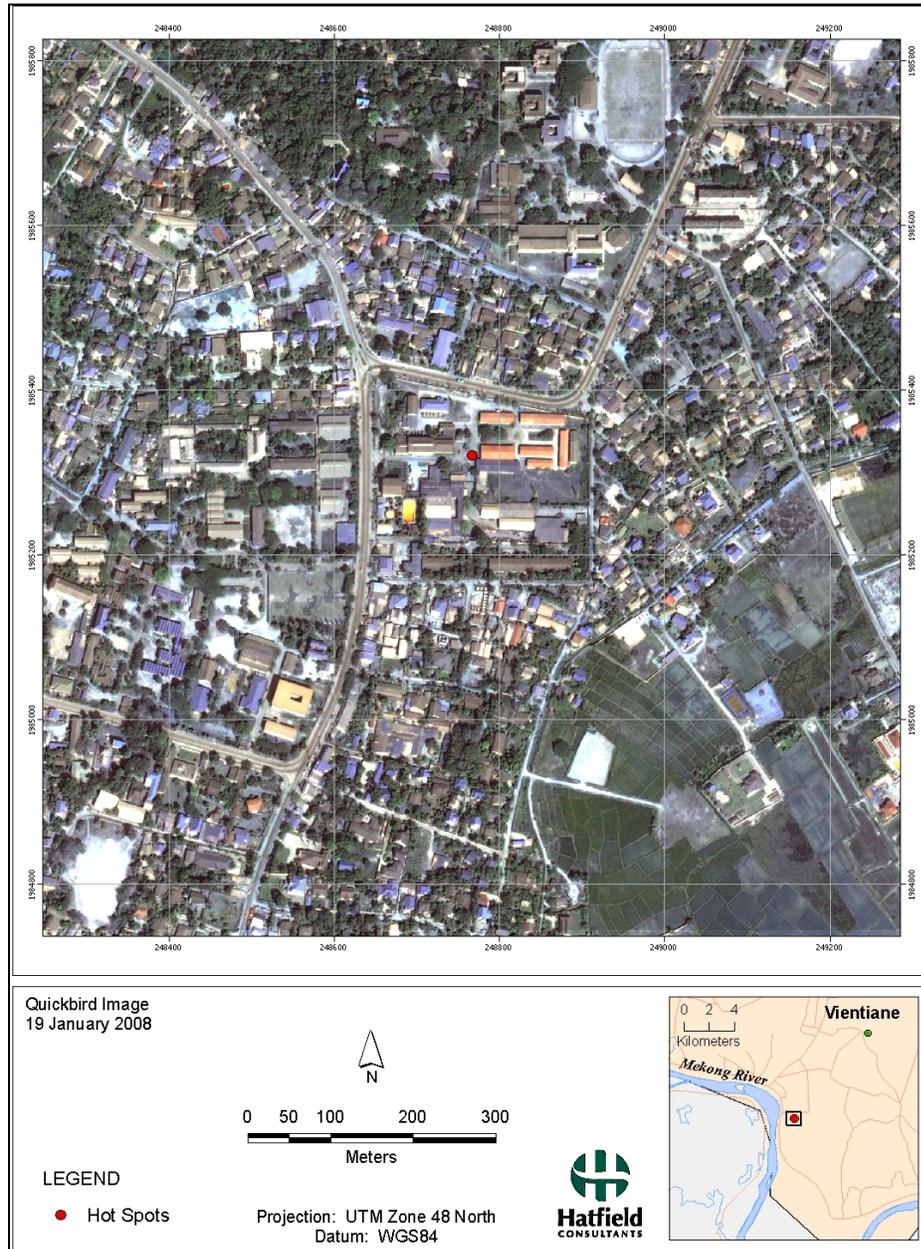
2.3 HANDS-ON TRAINING AND FIELD SAMPLING (MAY 13 – 16, 2008)

Field sampling took place at Sok Pa Luang EDL Center and included the transformer and capacitor repair workshop area from 13 – 16 May, 2008. Six staff members from ERI, EDL and MOD actively participated in the field work. Work included the collection of environment samples, as well as human exposure and socio-economic information. The list of the field crew members is provided in *Appendix A3-1*.

Before the start of field sampling, John Wilcockson discussed the Field Work instructions (FWI) with the field crew members. The discussion included an overview of the sampling approach, QAQC procedures and field safety. The FWI is provided in *Appendix A4*.

The national participants were engaged and actively participated in the field sampling. In addition, staff members from the EDL Center at Sok Pa Luang, and their family members, were very cooperative during the exposure survey questionnaire.

Figure 1 Location Map of Sok Pa Luang Study Site



The Lao PDR participants demonstrated a strong capacity for assimilating new information during field sampling. After the first day, they were capable of conducting field sampling, and sample and equipment handling with little supervision from the HPT. A total of 32 samples were collected in triplicate.

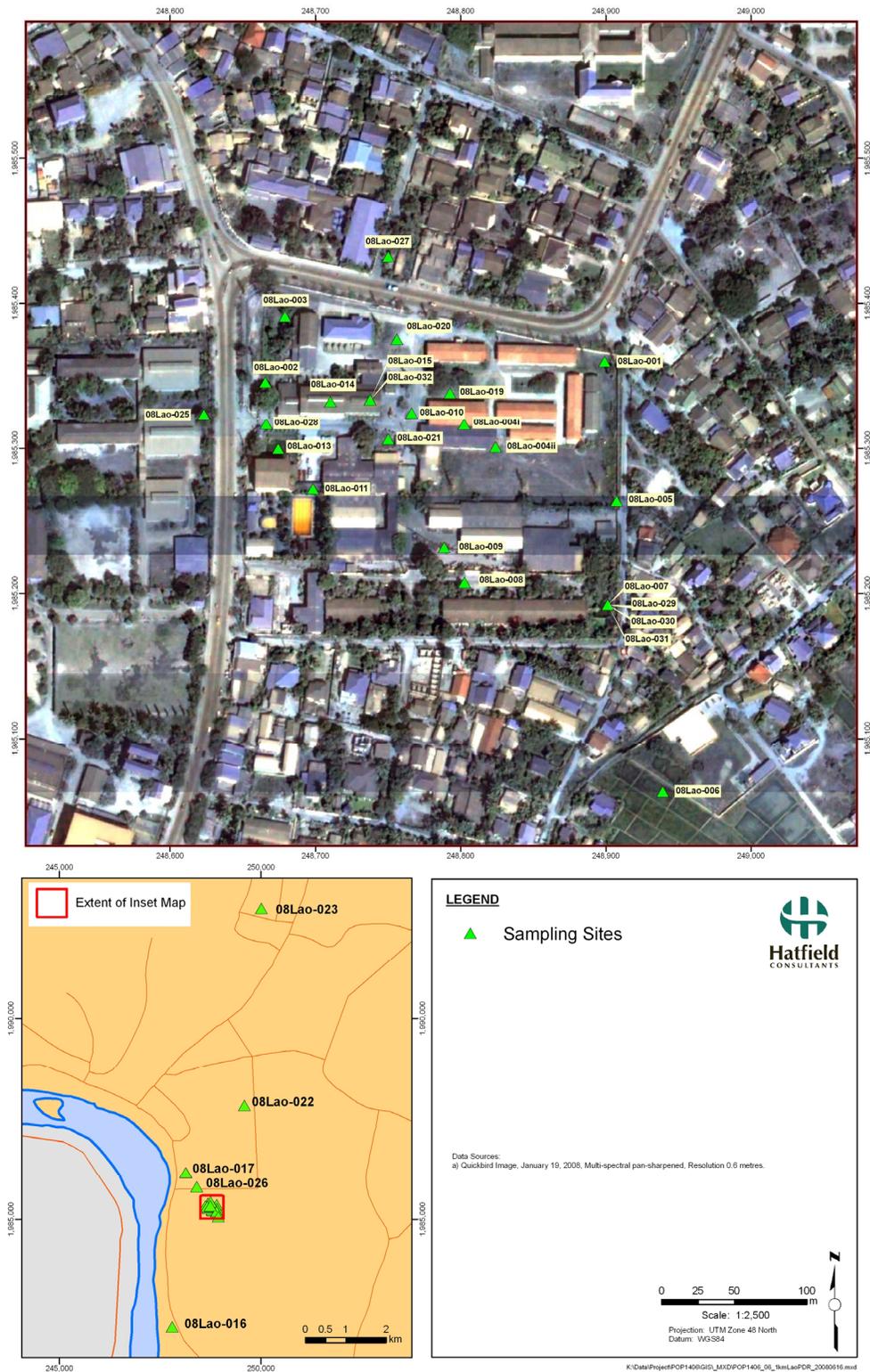
At each sampling location, the field crew was diligent at completing field data sheets and field survey waypoint logs according to the SOP. The list of samples collected, their matrices and GPS coordinates is provided in Table 1 and Figure 1.

Table 1 List of Samples Collected in Sok Pa Luang, Vientiane, Lao PDR.

Samples ID	Matrix	GPS Coordinates WGS 84	Comments¹
08Lao001	Soil	N17.94191 E102.62944	NE corner
08Lao002	Soil	N17.94171 E102.62724	W wall
08Lao003	Soil/Sediment	N17.94209 E102.62738	Depression
08Lao004	Soil/Sediment	N17.94151 E102.62847	Drainage between buildings
08Lao005	Soil	N17.94100 E102.62963	Drainage from site
08Lao006	Soil	N17.93932 E102.62967	Rice paddy
08Lao007	Sediment	N17.94040 E102.62948	Pond by EDL residences
08Lao008	Soil	N17.94047 E102.62849	Near EDL residence
08Lao009	Soil	N17.94074 E102.62835	Stained soil next to transformer
08Lao010	Soil/Sediment	N17.94158 E102.62823	Ditch in front of workshop
08Lao011	Soil	N17.94109 E102.62760	Near swimming pool
08Lao012	Soil	N17.94109 E102.62760	Duplicate of -011
08Lao013	Sediment	N17.94122 E102.62743	Pond located to front entrance
08Lao014	Soil/Sediment	N17.94152 E102.62764	From basement
08Lao015	Floor dust	N17.94157 E102.62790	Workshop
08Lao016	Soil/ash	N17.91442 E102.61935	Worker's home, A&B replicates only
08Lao017	Soil	N17.94899 E102.62215	Worker's house, A&B replicates only
08Lao018	Water		Rinsate sample (QA/QC)
08Lao019	Soil	N17.94167 E102.62840	
08Lao020	Soil	N17.94199 E102.62806	
08Lao021	Soil	N17.94137 E102.62802	
08Lao022	Soil/ash from garden	N17.96425 E102.63558	Worker's house
08Lao023	Soil/ash from garden	N18.00864 E102.63893	Worker's house
08Lao024	Water		Blank
08Lao025	Soil	N17.94155 E102.62689	Faculty of engineering
08Lao026	Sediment	N17.94588 E102.62465	Pond, Far-field
08Lao027	Soil	N17.94246 E102.62804	Near-field off-site
08Lao028	Soil	N17.94145 E102.62726	Road dust
08Lao029	Fish muscle	N17.94040 E102.62948	Catfish
08Lao030	Fish liver	N17.94040 E102.62948	Catfish
08Lao031	Fish eggs	N17.94040 E102.62948	Catfish
08Lao032	Indoor dust	N17.94157 E102.62790	Workshop

¹ Samples generally collected in triplicate – A for Canada, B for Japan, and C for Laos. Only 08Lao016 and 08Lao016 were collected in duplicate (A and B only).

Figure 2 Sample Collection Sites, Sok Pa Luang, Vientiane, Lao PDR.



2.3.1 Samples Management

The HPT collected triplicate samples (for Canada, Japan-Hiyoshi and Lao PDR). The samples for analysis by AXYS were transported to Canada through commercial courier. The samples for Hiyoshi were kept with the ERI while waiting for the Japanese import permit from Hiyoshi. The samples were carefully stored and the chain of custody forms properly documented before handing them over to ERI for Shipment to Japan.

2.4 SOCIAL AND HUMAN EXPOSURE QUESTIONNAIRES

The participants were also trained to collect social and human health data using a questionnaire survey. The POPs team interviewed eight EDL staff who work at the workshop (one staff member was absent). The HPT also visited homes of selected EDL staff and interviewed four family members. Staff targeted people who stated they brought home between 1.5 to 5 litres of transformer oil per month for burning in cooking stoves, for use as a termite deterrent on wooden structures, and for sharing with their friends and extended families. The POPs team also interviewed 4 staff members from other offices located within the EDL compound, close to the transformer workshop. The preliminary results of the exposure survey are provided in *Appendix A5-1*.

The main findings from the social and human survey can be summarized as follows:

- All interviewees earn less than US\$150 per month (just above the 1\$/day poverty line in Lao PDR);
- 80% of the respondents have been in contact with the transformers and/or their oil for the past 10 years or longer, due to a lack of knowledge of health risk impacts;
- At least 70% of the interviewees brought home the transformer oils for domestic use and for sharing with their close relatives and friends (for starting fires, as an insect repellent against termites, etc.);
- 50 respondents stated they collected snails, crabs, fish and vegetables (morning glory, water lily, lotus, etc.) within the EDL compound, and/or the rice paddy fields and ponds adjacent to the EDL, for their personal consumption and for use in their homes;
- All workers at the repair workshop have been in contact with transformers, transformer oils, dust and waste materials on a regular basis;
- Less than 2% of the interviewees had heard about PCBs, dioxins or other POPs from TV, radio or newspaper. None of them had ever heard about POPs through the internet;

- The main suspected exposure pathways for most of the interviewees include: 1) dermal contact; 2) inhalation of indoor and outdoor dust; and 3) ingestion of contaminant fish; and
- All interviewees are keen to have their blood tested, since blood analysis is either unavailable or extremely expensive in Lao PDR.

2.5 NEXT STEPS

In the coming months, follow-up actions will be undertaken. These will include:

- Finalizing the field sampling report by incorporating all feedback from the Lao PDR POPs team;
- Posting training seminar materials on the POPs Toolkit at www.popstoolkit.com. The Standard Operation Procedures (SOPs) and other relevant documents should ideally be translated into national languages. The World Bank Task Team's assistance and guidance will be required;
- Adding a section on how to handle potentially contaminated clothing after the field in the SOPs and training material (field crew demobilization);
- Returning to Vientiane in July to collect biological samples (human blood, human breast milk and perhaps animal tissue). This will likely be undertaken during field programs in Thailand and perhaps Malaysia;
- Submitting a request (by the Lao PDR POPs team) to the World Bank for additional budget for blood testing and for translation and production of training materials into Lao language;
- Lao PDR POPs team requested that the Hatfield Project Team provide more training; and
- Supplying the Lao PDR POPs team with office equipment based on the agreed list to be submitted by ERI.

3.0 FIELD SAMPLING IN PHNOM PENH CAMBODIA

3.1 BACKGROUND

The Cambodian field sampling program was carried out in Phnom Penh between May 19th and 23rd, 2008. The Field Sampling Mission schedule is provided in *Appendix A1-2*. The HPT included Grant Bruce, Sokhem Pech, and John Wilcockson. Dr. Andy Dean, Senior GIS/RS specialist, also joined the field crew between May 20th and 22nd, 2008 for training related to field mapping and the collection of GPS coordinates.

The National Consultant and Cambodia POPs team members from the Ministry of Environment (MOE) and Electricite du Cambodge (EDC) were actively involved in the field sample mission. The HPT expresses its appreciation to all officials concerned, from the MOE and EDC, for their active involvement in the fieldwork. Special thanks are due to Mr. Heng Nareth, Director of Pollution Control and Management and Mr. Ken Choviran, the National Focal Point for POPs, for their guidance and hospitality.

The HPT also expresses its appreciation to Mr. Chen Sophanna, Deputy Head of Office for Social, Environmental, and Public Relations of EDC, for his effective coordination and for arranging logistics. The HPT also extends its thanks to the management and staff at the EDC Sambour Warehouse, and EDC Training Center, for their facilitation and active participation in field sampling work and for responding to the social and human exposure questionnaires. Deepest appreciation also goes to the villagers of Sambour for providing valuable information and for helping the HPT collect fish, snails and crab samples.

3.2 TRAINING SEMINAR

The Training Seminar could not be conducted on Monday 19 May 2008 as scheduled, due to National Holidays in Cambodia. The Project Team, however, provided the National POPs Team training materials and the Standard Operation Procedures (SOPs) in advance of the HPT visit.

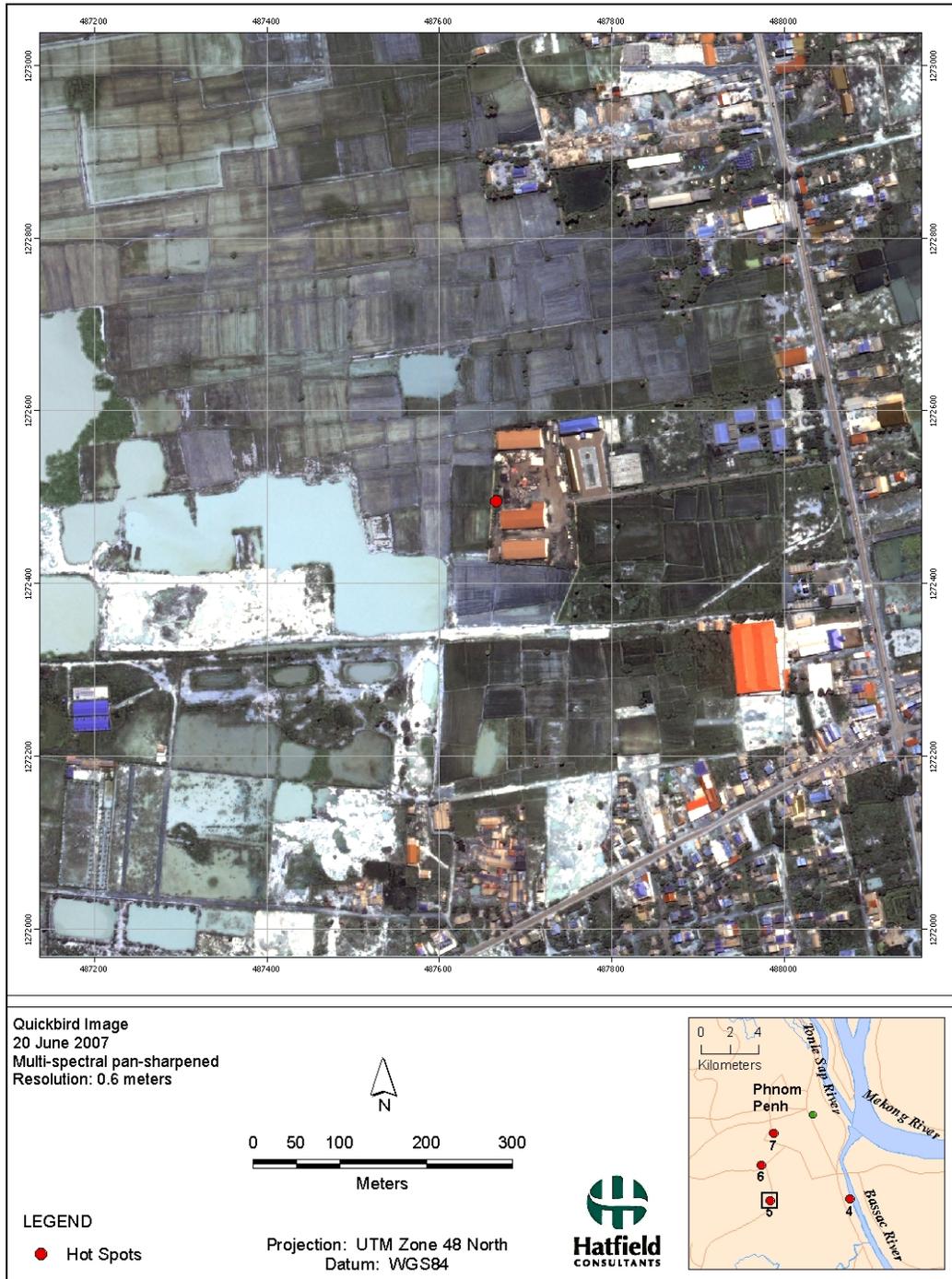
The National Consultants suggested that both documents should be translated into Khmer to facilitate more efficient assimilation of information by the intended technical and general staff audience. During the May visit, it was agreed that the classroom training seminar should be organized tentatively after the July 27 General Election in Cambodia.

3.3 HANDS-ON TRAINING AND FIELD SAMPLING (MAY 20TH TO 24TH, 2008)

All field sampling was conducted at Sambour EDC Warehouse and EDC Training Center. The site is located in Sambour Village, Dang Kor Commune, Dang Kor District, Phnom Penh (Figure 3). Seven Cambodian staff members from MOE, EDC Head Office, and the EDC Warehouse actively joined the Project

Team to collect the required data (environment samples for chemical analysis and human exposure and socio-economic information). The list of the Field Crew provided in *Appendix A3-2*.

Figure 3 Location Map of Selected Sites in Sambour EDC Warehouse and EDC Training Center.



3.3.1 Environmental Sample Collection and Handling

The Project Team kicked off the field program by providing an overview of key field requirements as provided in the SOPs and Field Work Instructions (FWI; *Appendix A4-2*).

The national participants were actively involved in the field sampling. EDC Warehouse and EDC Training Center staff members and local residents were very cooperative. The Cambodian participants demonstrated an ability to assimilate the sampling information. After the first day, they were capable of conducting soil sampling, including sample and equipment handling, with little supervision from the HPT. The list of the samples collected is provided in Table 2 below. Before the start of the field sampling, the Project Team members presented the FWI to the field crew, including the information and steps necessary for field work safety.

Table 2 List of Samples Collected at Sambour EDC Site, Cambodia

Samples ID	Matrix	GPS Coordinates WGS 84 – Jakarta/Bangkok Time Zone	Comments
08CAM001	Soil	N11.51047 E104.88777	soil, SE corner
08CAM002	Soil	N11.51045 E104.88732	soil, S wall
08CAM003	Soil	N11.51050 E104.88686	soil, SW corner
08CAM004	Soil	N11.51130 E104.88698	soil, W wall
08CAM005	Soil	N11.51174 E104.88693	soil, NW corner
08CAM006	Soil	N11.51186 E104.88719	soil, N wall
08CAM007	Soil	N11.51189 E104.88759	soil, NE corner
08CAM008	Soil	N11.51116 E104.88778	soil, planted area, just outside gate
08CAM009	Soil	N11.51128 E104.88881	soil, grass north of access road
08CAM010	Soil	N11.51149 E104.89035	soil, dust off entrance road
08CAM011	Soil	N11.51162 E104.89031	sediment, pond at front of compound - E
08CAM012	Soil	N11.51064 E104.88663	soil, west of compound
08CAM013	Soil	N11.51139 E104.88668	soil, west of compound
08CAM014	Soil	N11.51165 E104.88688	soil, west of compound
08CAM015	Soil	N11.51212 E104.88713	soil, north of compound
08CAM016	Soil	N11.51225 E104.88651	sediment, smaller pond-NW
08CAM017	Soil	N11.51062 E104.88556	sediment, large pond-SW
08CAM018	Soil	N11.50997 E104.88726	soil, south of compound
08CAM019	Soil	N11.51085 E104.88750	soil, near chicken coop
08CAM020	Soil	N11.51085 E104.88750	Duplicate Sample
08CAM021	Soil	N11.51077 E104.88681	Inside floor sweeping
08CAM022	Soil	N11.51113 E104.88713	soil, oil stained

Table 2 (Cont'd.)

Samples ID	Matrix	GPS Coordinates WGS 84 – Jakarta/Bangkok Time Zone	Comments
08CAM023	Soil	N11.51104 E104.88702	soil, oil stained
08CAM024	Water	Same	QA/QC rinsate
08CAM025	Fish Muscle	N11.51046 E104.88670	fish muscle (snake head)
08CAM026	Fish Liver	N11.51046 E104.88670	fish liver (snake head)
08CAM027	Fish Muscle	N11.51174 E104.88956	fish muscle (tilapia)
08CAM028	Fish Liver	N11.51174 E104.88956	fish liver (tilapia)
08CAM029	Crab	N11.51046 E104.88670	Crab tissue
08CAM030	Snail	N11.51046 E104.88670	Snail tissue

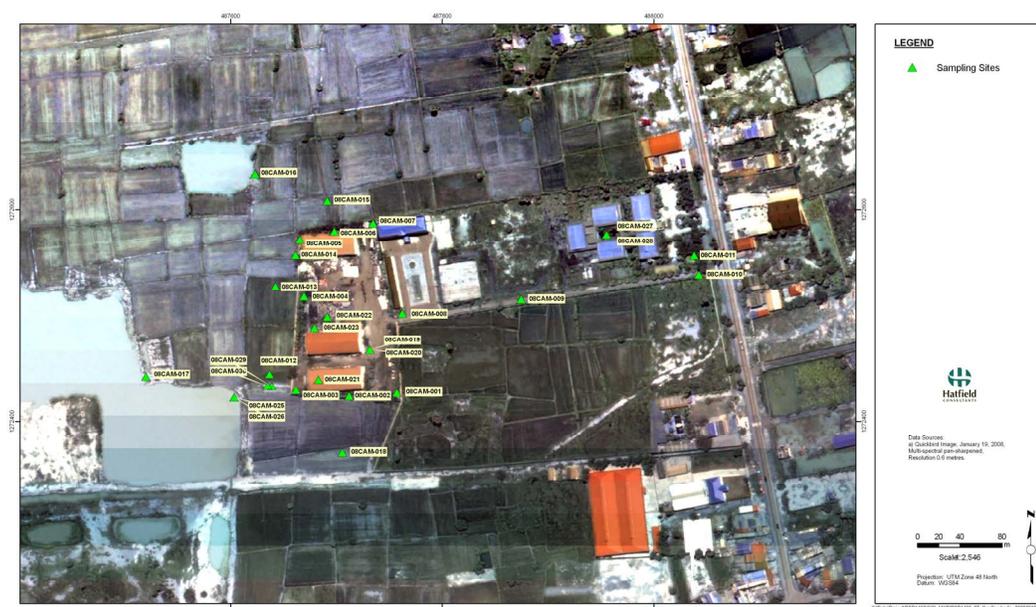
¹ Samples generally collected in triplicate – A for Canada, B for Japan, and C for Laos. Only single sub-samples were collected for 08Cam026 and 08Cam028. While duplicates were collected for 08Cam029.

A total of 30 samples were collected in triplicate. The crew diligently took waypoints and filled in the field data sheets and field survey waypoint log according to the SOP.

The field maps and Quickbird imagery of June 2007 (Figure 4) were used for site reconnaissance and sample collection planning. Visual interpretation was straightforward, but there had been land cover change between the time of image acquisition and the field sampling. One change was a large scale construction project for condominiums at the south end of the Sambour site compound. This was documented in photos and field notes. GPS points were taken to accurately locate the extent of the construction. Land cover changes were included in the GPS log sheet.

Field sampling was successful; Table 2 provides the list of samples collected, their matrices and GPS coordinates.

Figure 4 Sample Collection Sites, Sambour, Phnom Penh, Cambodia.



3.3.2 Sample Management

Field sampling focused on the collection of environmental samples including soil, sediment and food items (fish, crab and snails). All environmental samples were collected in triplicate where possible: “sub-sample A” for export to Canada; “sub-sample B” for CALUX testing in Japan; and “sub-sample C” to be left in-country as a back-up and for archiving. A number of samples had insufficient volume to create triplicates. Samples 08Cam026 and 08Cam028 were fish liver; for these samples, there was sufficient sample only for a single sub-sample. For 08Cam029, crab tissue, there was sufficient sample only for two sub-samples.

The environmental samples are to be screened using CALUX by Hiyoshi Corporation (Japan), with financial support from the World Bank. The results of the CALUX analysis will be used to select samples for HR-GCMS analysis at AXYS Laboratories, Sidney, BC, Canada. AXYS is also one of the only labs in the world capable of accurately analyzing POPs in human tissues, and therefore the lab was highly recommended by the HPT.

Sub-samples “A”, for analysis by AXYS, were transported to Canada with the Project Team (by Grant Bruce on 23 May 2008). Sub-samples “B”, for analysis by Hiyoshi, were also brought to Canada by the Project Team (by John Wilcockson on 25 May 2008) to await the Japanese import permit from Hiyoshi. Sub-samples “C” were provided to the Cambodian MOE through the National Consultant. All samples were well documented (using field data forms and survey waypoints logs) and the chain of custody forms were properly documented before transportation, or before being relinquished to the national consultant.

3.3.3 Social and Human Exposure Questionnaires

The participants were also trained to carry out the human exposure questionnaires. The team interviewed eight staff members from the warehouse, three police officers permanently guarding the warehouse, two heads of village (long-term residents of the area) where the warehouse is located, and eleven long-term staff members from the nearby EDC Training Center. The preliminary results of the exposure survey are provided in *Appendix A5-2*. Copies of the completed questionnaires were provided to the Cambodian MOE and EDC for future reference.

The main findings from the social and human survey can be summarized as follows:

- All interviewees earn less than US\$200 per month (just above \$1/day poverty line);
- All but one of the respondents had come into contact with transformers and/or their oils during the past six years due to the lack of knowledge of potential health risk impacts;
- The warehouse buildings and the compound were flooded at least twice during the last three to four years during the rainy season. The floodwaters drained into the nearby paddy fields;
- Few interviewees brought home transformers oils for domestic use (i.e, to be used as lubricants for sewing machines, starting kitchen fire, etc.);
- All but one of interviewees have collected snakes, snails, crabs, fish and vegetables (morning glory, water lily, lotus, etc.) in either the warehouse compound, training center area, and/or the paddy field adjacent to both sites for their personal consumption;
- 70% of interviewees have eaten chicken and ducks raised within the warehouse compounds on a regular basis;
- 40% of respondents have been in regular contact with transformers, oil, dust and waste materials (e.g., oil soaked wood);
- The security guards at the warehouse and training center tend to be more exposed to PCBs since they spend long working shifts (day and night) at the site, and rely heavily on food raised and grown in both the warehouse and training center compound. They are also in contact with waste materials, oil, and soil/dust from the warehouse (indoor and outdoor).

- Less than 2% of the interviewees have ever heard about PCBs, dioxins or other POPs from TV, radio or newspaper. None had ever heard about POPs through the internet;
- Old transformers were used for training purposes in the Training Center;
- The PCB exposure pathways for interviewees include: 1) ingestion; 2) inhalation of indoor and outdoor dust; and 3) dermal contact.
- All interviewees are keen to have their blood tested, since blood analysis is either unavailable or highly expensive in Cambodia.

3.4 NEXT STEPS

In the coming months, the following actions will be undertaken:

- Finalize the field sampling report by incorporating all feedback from the Cambodia POPs team;
- The training seminar materials and Standard Operation Procedures (SOPs) and other relevant documents may need to be translated into national languages. The World Bank Task Team's assistance and guidance will be required;
- The Project Team may come to Phnom Penh in June or late July during its field sampling in Thailand and Malaysia for collecting human blood samples;
- The Project Team may need to ask the World Bank for more budget for blood collection and analysis; and
- The Project Team will communicate with the National Focal Point on the results of the sample analysis and consult on the next steps.

4.0 SITE RECONNAISSANCE NEAR BANGKOK THAILAND

On May 13th, 2008, Thailand's POPs Team informed the HPT that the Thai Metropolitan Electricity Authority (MEA) had offered their electrical equipment storage site at Samut Prakan for the case study. Grant Bruce, Hatfield Senior Chemist, and POPs Project Environment Specialist, visited Thailand on May 16th and 17th, 2008.

4.1 MEETING WITH POLLUTION CONTROL DEPARTMENT

On May 16th, Grant Bruce met with Dr. Jarupong Boonlong and Khun Pornpimon Chareonsong at the PCD office in Bangkok. Four other PCD technical staff participated in the meeting and site visit. The purpose of the meeting was to discuss the proposed hot spot site, as well as the schedule for project implementation.

4.2 VISIT TO THE SELECTED SITE - SAMUT PRAKAN, SOUTH BANGKOK

The Metropolitan Electricity Authority (MEA) facility is located at the end of Suk Sawat 52, on the banks of the Chao Phraya River which runs through Bangkok. It took approximately 45 minutes to drive from the PCD to the proposed project site, which is in south Bangkok. Directly opposite the site on the other side of the river is Wat Bang Fai and the South Bangkok Power Plant. Immediately to the north of the site is an asphalt manufacturing facility, separated from the site by a stream (Figure 5).

Figure 5 MEA Facility, Suk Sawat 53.



Owner and Years of Operation:

The site has been owned and operated by the Metropolitan Electricity Authority (MEA) for at least 20 years. A detailed site history will be obtained by PCD staff in advance of the field program.

Activities at site:

1. Collect and store old transformers and capacitors;
2. Storage of electrical equipment and poles; and
3. Dismantling of electrical equipment.

GPS Coordinates:

Main parking lot, roughly at the centre of the site:

N 13.61713 ; E 100.54781

Size of site:

Approximately 9 Rai (1 Rai = 1,600 m², or 40 m X 40 m). Total area of the site is therefore 14,400 m².

Volume of Oil recycled:

Not known - PCD staff will research the site history in preparation for the next field program. Official letters from PCD to MEA are required before information on the site history can be obtained.

Potentially exposed population:

According to the site supervisor, many of the MEA workers are shift workers and only work on-site periodically. Interviews will need to be held with MEA management to obtain information about potential exposure. The site is vacant at night, but there is a night guard to prevent access. There are a number of residences to the SE of Suk Sawat 53 (the main access road to the MEA facility) - people living in these houses are potentially exposed and should be interviewed.

Exposure routes:

- Direct exposure of workers and their families to PCB contaminated fluids/soils is the main concern. The site was paved over a few years ago, limiting potential exposure from contaminated soils. However parts of the site are unpaved (see photographs in Figure 6).

- No agriculture, fish ponds, etc. were observed close to the site; however more research is required, particularly downstream of the main drainage area that enters the river.
- A small stream/ drainage canal runs along the northwest boundary of the site into the river (between the MEA facility and the asphalt plant). Another drainage ditch runs along Suk Sawat 53 and past residences – both of these drainages may be contaminated and should be sampled.
- The area is fenced and protected from public access.

4.3 DATA COLLECTION AND ANALYSIS

4.3.1 Existing data for analysis of POPs Health Risk

The MEA facility on Suk Sawat 53 has not been analyzed for PCBs. PCD staff will check with MEA for any other analyses that may have been undertaken at the site. Apparently when MEA purchased the site, some tests were done (due diligence testing as required by Thai law?); however, this needs to be confirmed, and an information request will have to be submitted to MEA. PCD will also check to see what, if any, POPs analyses have been undertaken in sediments along the river.

Figure 6 shows a number of photos taken at the MEA site on Suk Sawat 53 by Grant Bruce on May 11, 2008.

Figure 6 Site photos of Suk Sawat 53, Thailand.



4.4 DATA NEEDS AND PROPOSED SCOPE FOR FIELD DATA COLLECTION AT SELECTED HOT SPOT

Before the proposed sampling program (June 16-20), as much of the following information as possible should be collected by PCD:

- Number of workers potentially exposed;
- Number of households/population in hot spot area;
- List of other major industries within 1 or 2 km of the site;
- Livelihoods and income levels in the area around the hotspot;
- Estimated value of real estate in the hot spot area;
- High-resolution images - to be acquired for the hot spot site (Hatfield will obtain);
- GIS and hard copy maps of roads, bridges, topography; hydrology (streams, ditches, rivers, etc);
- Meteorological data (rainfall, wind velocity and direction); and
- Diet of the population (Project team to collect from household survey - rapid assessment, and from FAO food balance sheet at <http://faostat.fao.org/site/502/default.aspx>).

4.5 FOLLOW-UP ACTIVITIES IN THAILAND

The MEA hot spot site was pre-selected by PCD as the site which should be used for the POPs Project. PCD has agreed to assist with field data collection during the period of July - August, 2008.

Awareness raising activities for MEA Facility workers, and recommendations to reduce risk of PCB exposure to workers and surrounding residents is a key expected positive outcome of this project. During the field program, it is anticipated that approximately 30 samples will be collected for analyses. The majority will consist of soil and sediment samples collected from the site and in the general vicinity of the site. Consideration will also be given to the collection of blood and breast milk samples if suitable candidates can be found. PCD will contact the necessary authorities in Thailand to ensure the proper protocols are followed before interviewing and (potentially) sampling workers or nearby residents. As per World Bank project protocols, consent forms must be obtained in advance of either interviewing or sampling. Consent forms should be translated into Thai. Digital photographs of the PCD sediment grab and soil sampling equipment should be sent to Hatfield. Solvents (approx 4 liters of reagent grade hexane and acetone) should be procured in advance of the sampling program.

It is anticipated that the sampling program will take 4 or 5 days to complete. A tentative agenda would include:

Day 1: Workshops and discussions;

Day 2-3: Sampling and interviews; and

Day 4/5: Debriefing, sample shipping.

A detailed agenda will be developed in advance of the field program.

5.0 CLOSURE

We trust the above information meets your requirements. If you have any questions or comments, please contact the undersigned.

HATFIELD CONSULTANTS:

Approved by:  June, 2008

Sokhem Pech, Project Manager Date

Approved by:  June, 2008

Thomas Boivin, Project Director Date

APPENDICES

Appendix A1

Field Sample Mission Schedule

Available in <http://www.popstoolkit.com/collaboration>, then check folder "Document/Data Library", sub-folder "Field Work Report May 2008".

Appendix A2

List of Participants in Training Seminar

Available in <http://www.popstoolkit.com/collaboration>, then check folder
“Document/Data Library”, sub-folder “Field Work Report May 2008”.

Appendix A3

List of Field Crews

Available in <http://www.popstoolkit.com/collaboration>, then check folder "Document/Data Library", sub-folder "Field Work Report May 2008".

Appendix A4

Field Work Instructions

Available in <http://www.popstoolkit.com/collaboration>, then check folder "Document/Data Library", sub-folder "Field Work Report May 2008".

Appendix A5

Preliminary Analysis of Human Exposure

Available in <http://www.popstoolkit.com/collaboration>, then check folder
“Document/Data Library”, sub-folder “Field Work Report May 2008”.
