

2.0 PRELIMINARY DATA COLLECTION

2.1 SAMPLING PLAN CONSIDERATIONS

Supplementary environmental field data were collected at the site to characterize POPs contaminant concentrations in various environmental media relevant to human exposure pathways (diet, dermal contact and inhalation). Much of the investigation occurred on the site compound. The Project team also investigated potential off-site media and transport routes, including roads, drainage, ditches and water courses.

The first consideration for sampling design is whether the samples adequately represent the site being investigated. This requires that a sample or group of samples collected from a site accurately reflect the concentration of contaminants at the site. Soil, sediment and biota samples are often collected at selected locations because there is visual evidence of pollution (e.g. discolored soil, oily patches, or the presence of drums or other containers in certain areas of the site). This strategy can lead to biased results suggesting higher contaminant levels than actually present; this bias is often tolerated in an effort to over-estimate risk rather than under-estimate risks.

Background samples were also collected at or near the hazardous waste site in areas not influenced by site contamination. Identifying background locations requires knowing which direction is up-gradient/upwind/ upstream. In general, the direction of water flow tends to be relatively constant, whereas the direction of air flow is constantly changing.

During the field program, sample types included soils, sediments, dust, and fish tissue. Human exposure questionnaires were administered to workers, staff and some local residents to identify potential human exposure.

All environmental samples were collected in triplicate where possible: “sub-sample A” for export to Canada; “sub-sample B” for Japan; and “sub-sample C” for host country’s reference.

2.2 ANCILLARY DATA NEEDS FOR EXPOSURE ASSESSMENT

Identification of data needs in the early planning stage helped ensure that appropriate data for the exposure assessment were collected. Examples of ancillary data used in exposure calculations include:

- Concentration of particles in the air;
- Duration of exposure for individuals;
- Frequency of ingesting fish from the site; and
- Number of days (or weeks) without precipitation per year.

2.3 SAMPLING QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

At the MEA Facility Case Study Site, only environmental samples were collected. The Project Team used a single set of Standard Operation Procedures (SOPs) for collection and analysis of samples for all selected study sites. The Field Sampling and Analysis and the Training Seminar were conducted the Field Crew and other PCD Staff on July 28 - August 1, 2008.

The use of standardized SOPs helps ensure that sampling and analysis are done in a consistent and coordinated manner, and ensure quality and comparability of the laboratory analytical results.

The overall objective of the POPs project SOPs was to provide a harmonized organizational framework for the collection of comparable monitoring data on the presence of the POPs in selected case study sites in all participating countries in order to identify trends as well as to provide information for integrated risk assessment and capacity building purpose. They are also for ensuring the safety of the field team and community members concerned, and preventing environmental risk.

In addition to striving for simplicity and clarity of sampling program design and establishing clear expectations for analytical performance and QA/QC, the SOPs is to provide a consistent framework for future sample collections. It is also to ensure inclusiveness and transparency during supplementary data collection through active participation and involvement of the key national stakeholders in the design, implementation, and reporting of field data collection and analysis. It is crucial for developing confidence and interest in the final products of the Project.

The POPs Project SOPs for Field Sampling and Sample Analysis were developed by taking into account experience from past projects, and built upon international best-practices using relevant material from the 2007 UNEP Guide Guidance for Analysis of Persistent Organic Pollutants (POPs) and Hatfield's Standard Operation Procedures Manual. They are also built upon Hatfield's first-hand knowledge and experience with similar field assignments in the South East Asia.

The SOPs provided a consistent organizational framework for the collection of site data in selected "hot spots" or study sites in each participating country in order to identify trends, as well as to provide information for integrated risk assessment and capacity building purposes. In addition to striving for simplicity and clarity of the sampling program design, and establishing clear expectations for analytical performance and QA/QC, the SOPs provide a consistent framework for future sample collections. SOPs also help ensure inclusiveness and transparency during supplementary data collection through active participation and involvement of the key national stakeholders in the design, implementation, and reporting of field data collection and analysis. These aspects

are crucial for developing and maintaining confidence and interest in the final outputs of the POPs Project.

Customized datasheets were created to increase efficiency in the field and reduce the likelihood of potential errors or omissions. All triplicate sample ID labels were applied to datasheets and sample containers to ensure each sample has a unique ID and was not mislabeled. The team leader must ensure that samples are collected and stored/shipped as per conditions specified by the analytical laboratory.

The field maps and Quickbird imagery of January 10, 2005 were used for site reconnaissance and sample collection planning with the key stakeholders. Only minor land cover change occurred between the time of image acquisition and the field sampling. The change was documented in photos and field notes. The GPS point was taken to accurately document the locations.

2.4 TYPES OF SAMPLES COLLECTED

A single field program was conducted at the selected Case Study Site in Samut Prakan on July 28 – August 1, 2008. The field program included the collection of environment samples (soil, sediment, and fish/snail), as well as social and human data using an exposure survey.

In total, 40 samples were collected in triplicate (x3), following homogenization in the field. All samples were collected and handled strictly according to the SOPs.

Table 2.1 List of Samples Collected, MEA Facility, Samut Prakan, Thailand.

Location	Site Name	Types of Samples			
		Soil/dust	Sediment	Biota	QA/QC
Samut Prakan, Thailand	MEA Facility	15	13	10	2 trip blanks

A detailed list of samples collected and analyzed is provided as **Appendix A1**.

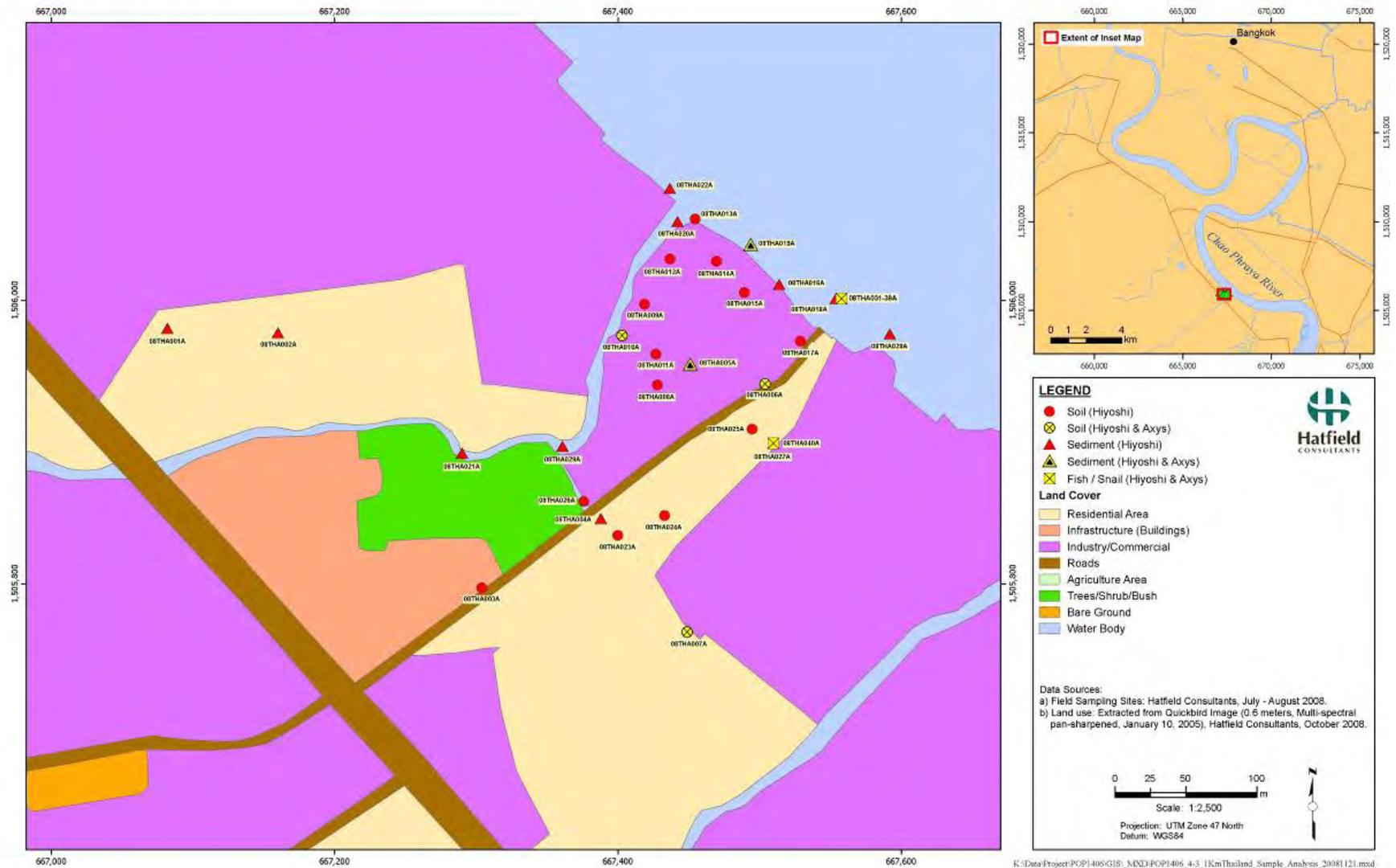
2.5 SAMPLING SITES

The field data collection and technical training seminar on sampling took place on July 27th and August 2nd, 2008. Designated staff members of the Pollution Control Department participated in the field sampling and training. The Hatfield Project Team from Vancouver provided training and hands-on field sampling and analysis to the field crew. Sampling locations were initially selected based on a review of existing topographic maps and satellite data; final sampling locations were determined during the site reconnaissance and consultation with key stakeholders. Ideally greater sample intensity both on site and off site was desired. However, sample intensity for the site was completed to the optimal extent allowed by analytical budget, balancing the need to characterize site contamination for risk assessment and the goal of illustrating the risk assessment process for capacity building.

Sample sites were distributed throughout the MEA site in an attempt to identify potential POPs pesticides and PCBs as well as to characterize potential routes of off-site contaminant migration. Sampling intensity was highest in the near-field area (i.e. within the MEA site perimeter). The sampling sites included the selected site itself, roads/ditches/soils off site (but in the immediate vicinity), and homes of nearby residents (Figure 2.1).

Figure 2.1 Sampling locations at the MEA Facility, Samut Prakan, Thailand.

Thailand field sampling matrix overlaid on land use map.



2.6 LABORATORY ANALYSIS OF ENVIRONMENTAL SAMPLES

All environmental samples were screened for dioxin-like PCBs (DL-PCBs) and dioxins and furans using the CALUX bioassay method by Hiyoshi Corporation (Japan) under separate contract with the World Bank. The CALUX analytical results were then used to guide selection of environmental samples for high resolution gas chromatography/mass spectroscopy (HR-GCMS) analysis at AXYS Laboratories, Sidney, BC, Canada (AXYS). The list of samples and lab analytical parameters are presented in **Appendix A2**, and a summary of analytical methods, laboratory QA/QC and certified laboratory results are provided in **Appendix A3**.

2.6.1 CALUX Analysis

Hiyoshi was instructed by the Project Team to analyze the following two contaminant groups: i) Total PCDDs/PCDFs; and ii) Dioxin-like (DL-) PCBs in all samples collected. CALUX is a USEPA-approved method that directly quantifies dioxin-like chemical concentrations on the basis of 2,3,7,8-TCDD toxicity equivalence without the use of toxicity equivalence factors (TEFs) (USEPA 2008b).

2.6.2 High Resolution Analysis

Following receipt of preliminary CALUX results from Hiyoshi in October 2008, the Hatfield Project Team selected samples for analysis by AXYS using HR-GCMS. The selection of samples submitted for high resolution analysis was guided by the following selection criteria/factors:

- Samples selected should cover the spectrum of possible sample types and be representative of different exposure pathways. In addition to soil samples, tissue samples (i.e. dietary pathway), and dust or ash (i.e., inhalation and dermal pathways) were also analyzed;
- Meet required minimum data requirements for evaluation of human health risk risks from POPs of concern based on time and budget constraints;
- Provide enough information to flag other POPs contaminants of concern if they pose significant risks to humans or the environment; and
- Where there was more than one sample media collected (e.g., soil, sediment, tissue), the highest concentration was selected to represent site conditions. Samples with the highest concentrations are more important during risk assessments, because they have a greater influence on the estimated average daily exposure and also provide an indication of the anticipated maximum estimated daily exposure to people.

A total of 7 environmental samples (1 dust, 3 soils, 1 sediment, 2 fish/snail) were selected and sent to AXYS on October 6, 2008. The analysis covers some or all of the following parameters: i) Extraction/Cleanup; ii) Lipid Analysis; iii) PCBs 1668A; iv) WHO PCBs; v) Dioxin and Furan (PCDDs/PCDFs); vi) Organochlorine Pesticides (OC pesticides); and vii) Toxaphene.

The list of samples and lab analytical parameters is presented in **Appendix A2**.