Technical Investigation in GW Contamination Assessment (Pak Chong Case Study)

presented at
International Workshop on Safe Soil
and Groundwater Resources in Asia

By
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Presentation Topics

- Background
- Objectives
- Research done
  - Preliminary Site Characterization
  - Contamination Identification
  - Contamination Simulation
- Findings
- Recommendations

Main Team Members

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- Dr. Aksara Pruttiwittaya
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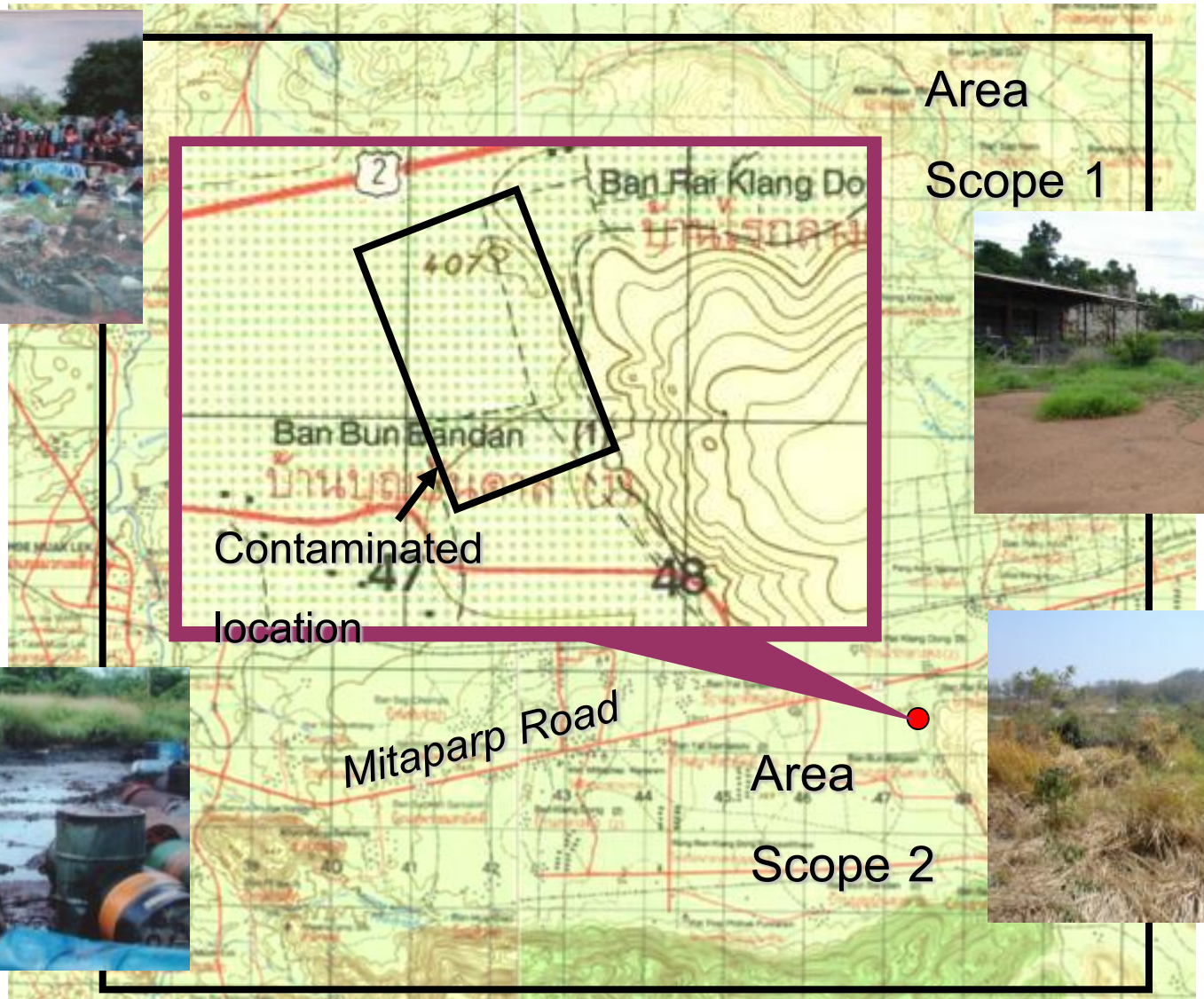
- Assis. Prof. Dr. Weerasak Likitruangsilp
- Dr. Kanchit Likitdecharoj
- Mr. Chokchai Sithithamchit

Background

- **Night dumping in Pakchong area, Nakornratchasima Province (2004)**
- **Soil removal for the 1 – 2 meter top soil with new soil substituted about 1 m based on contamination level**
- **PCD and DGR set monitoring wells and found TCE and Benzene exceeded than standards**

Study Area


Area
Scope 1
Ban Rai Klang Do
Ban Bun Bandan
Contaminated
location
Mitaparp Road
Area
Scope 2

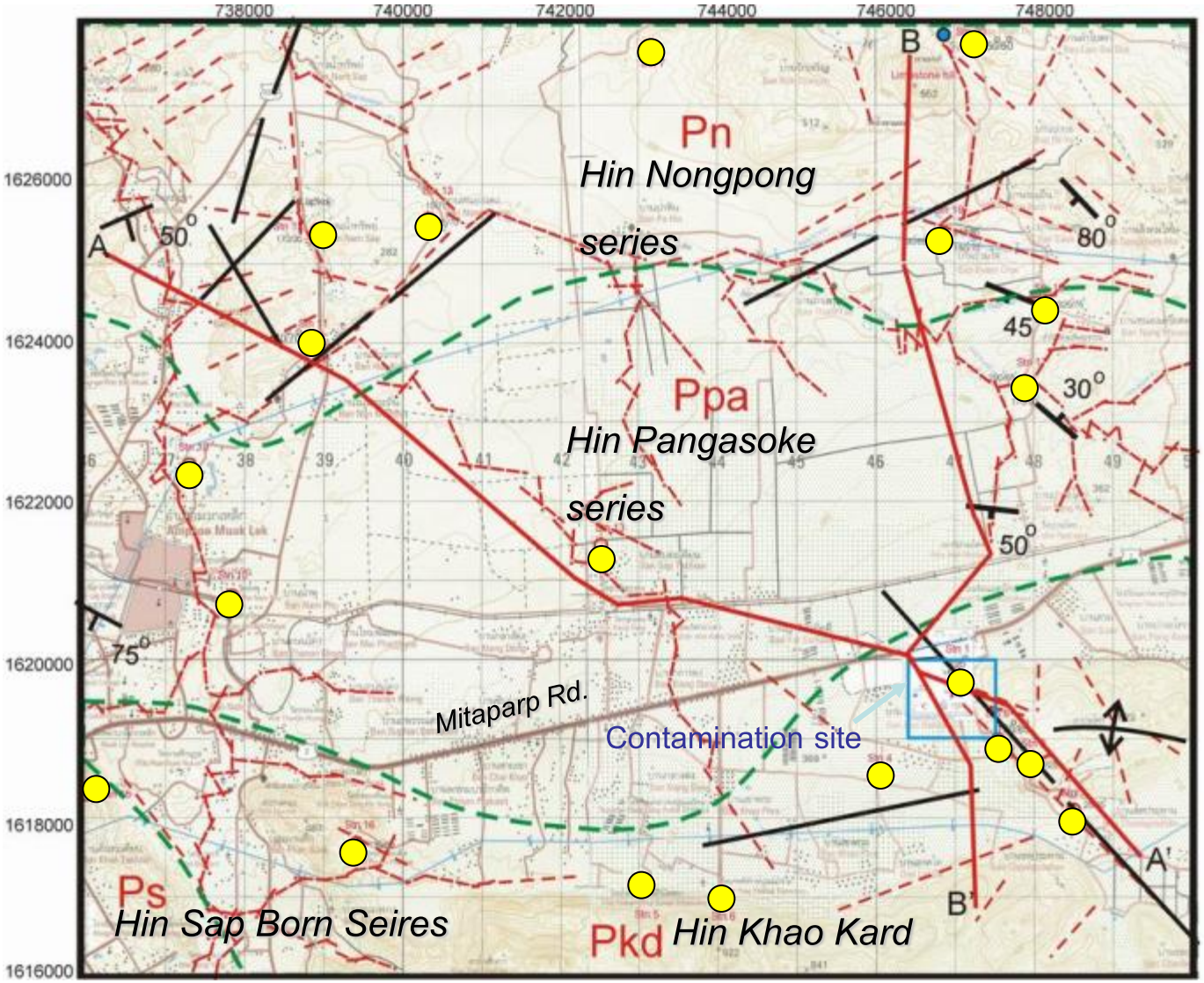
Objectives

- Gather previous study results
- Site investigate for geo/hydrogeological conditions
- Confirm the presence of VOC
- Recommend for further actions

Preliminary Site Characterization

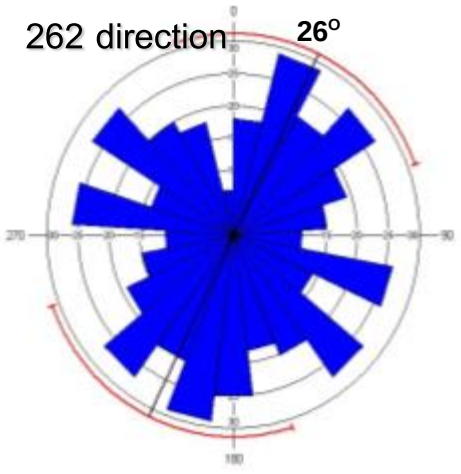
Fractures alignment

2 main routes
- SE - NW
- NE - SW



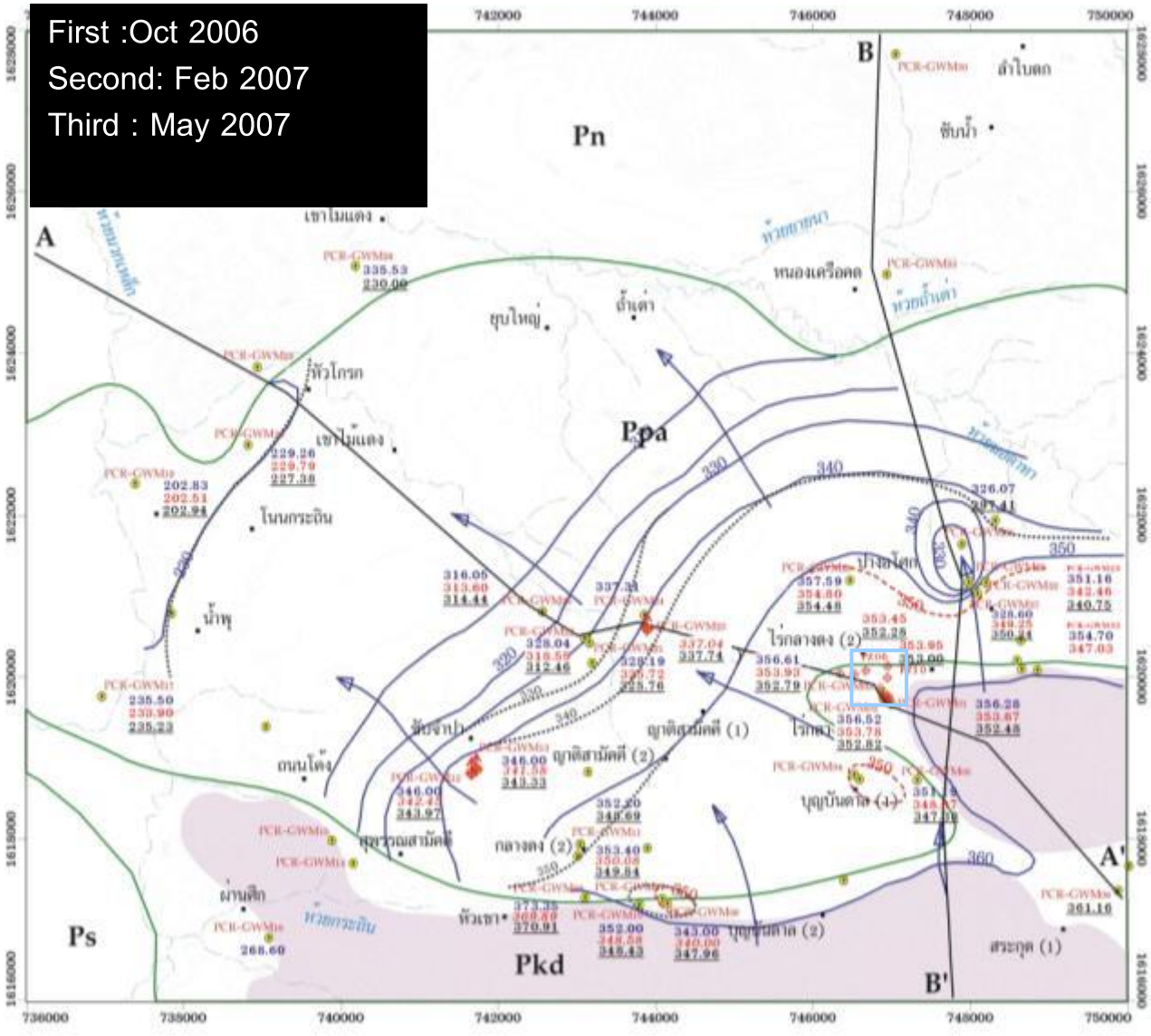
Fractures
- General Fractures
- Cleavage
- Joint

- Observation (21 pts.)
- Geological cross section
- Rock type zone

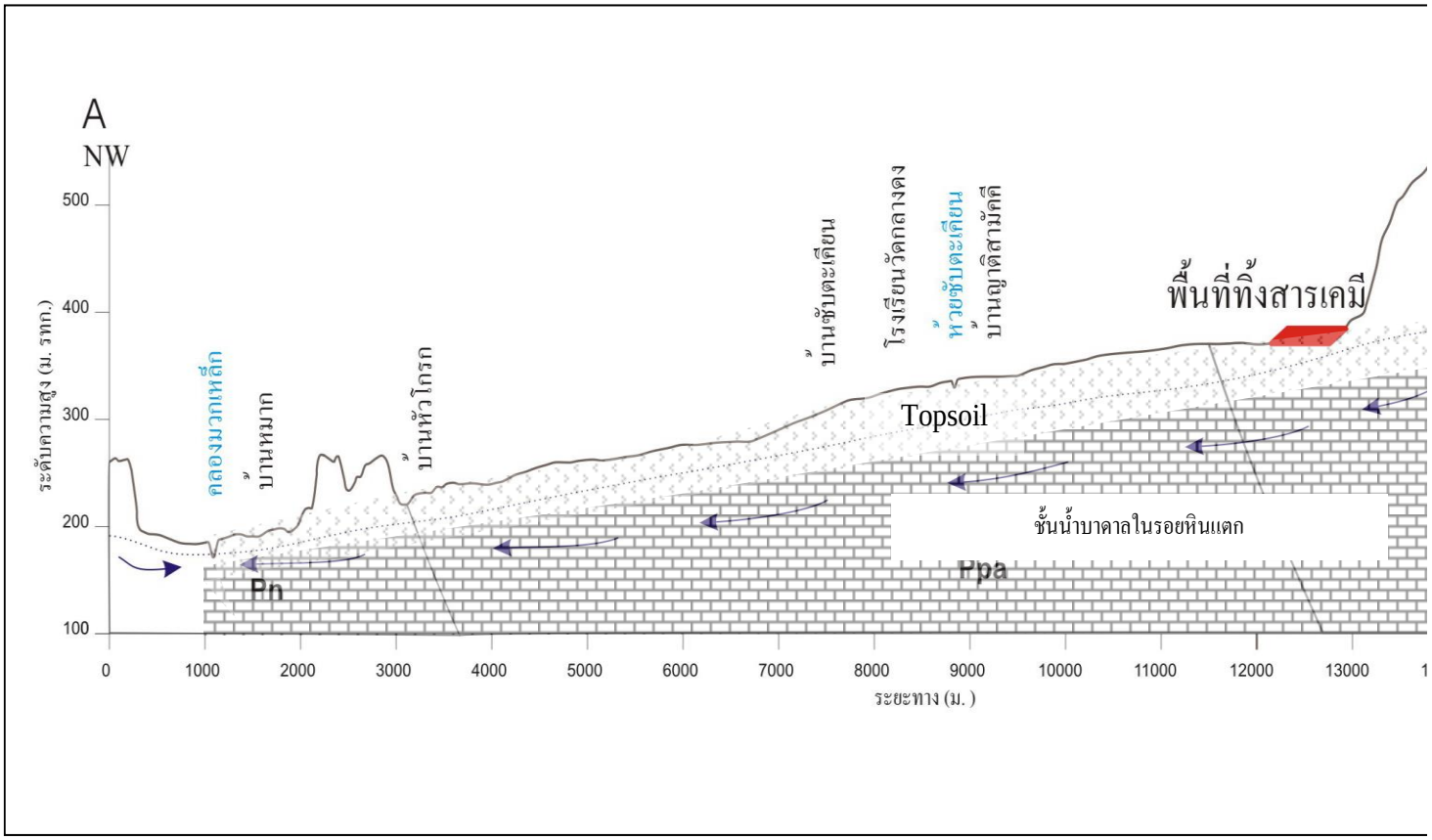


Hydrogeological Conditions of Subtakian subbasin

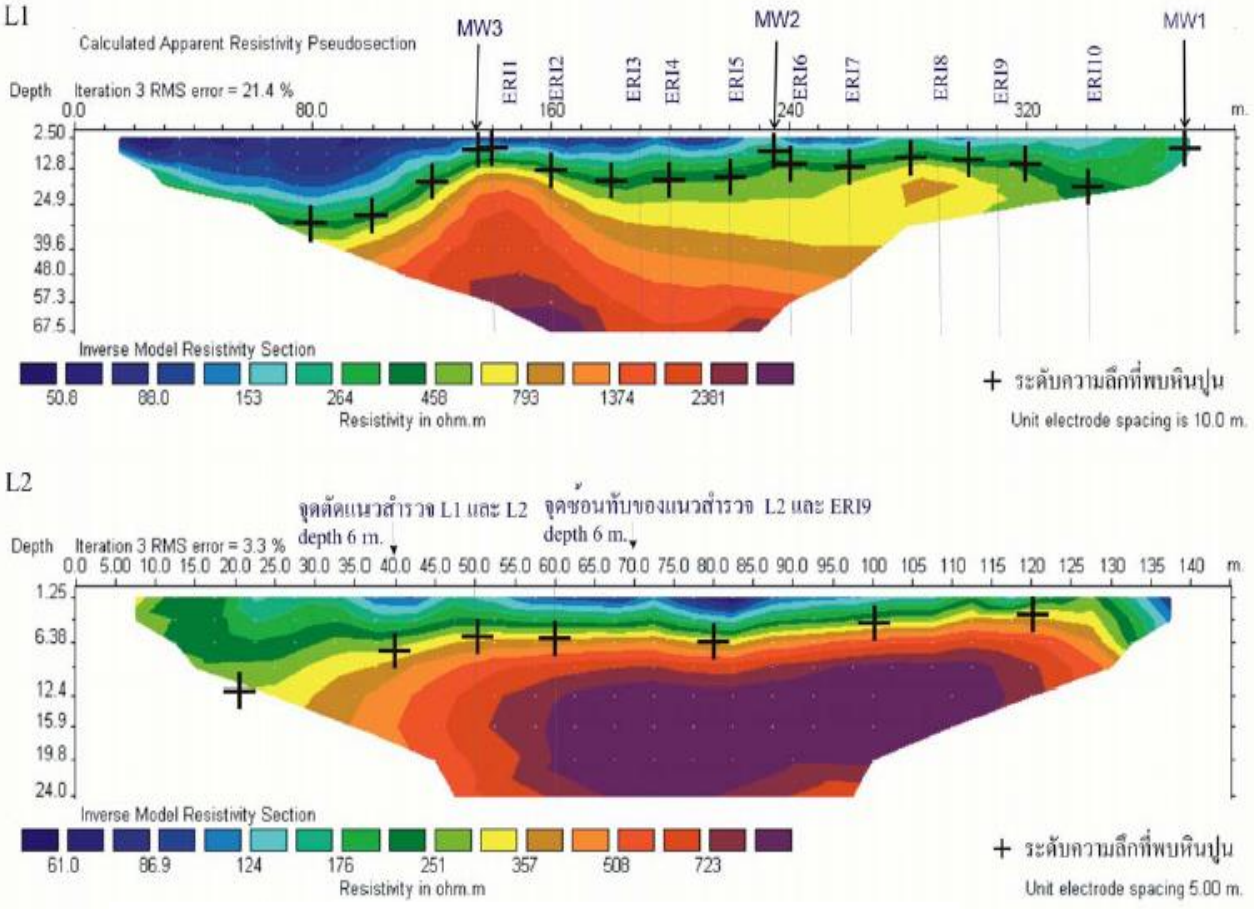
First :Oct 2006
Second: Feb 2007
Third : May 2007



Conceptual groundwater flow in the study area

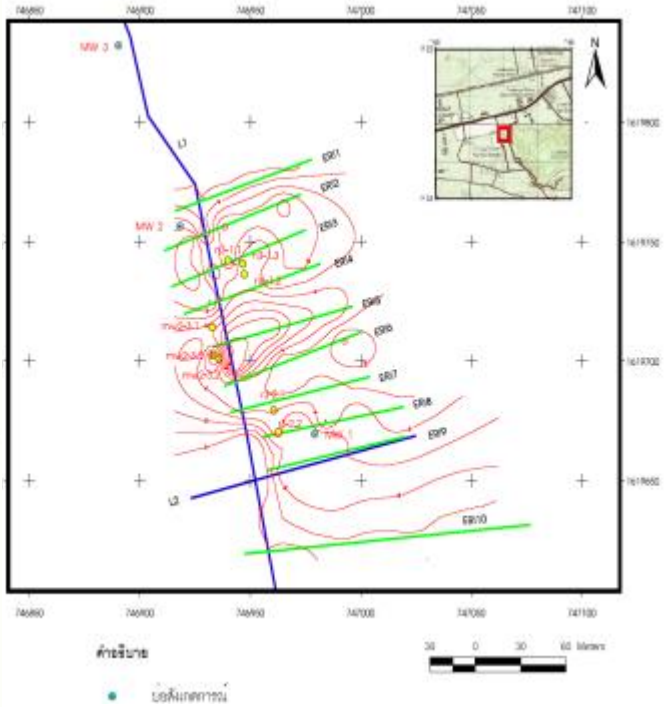


Cross sectional Resistivity of Soil Surface



Cross sectional distribution from RES2DDINV program

(Wenner Pole Type)

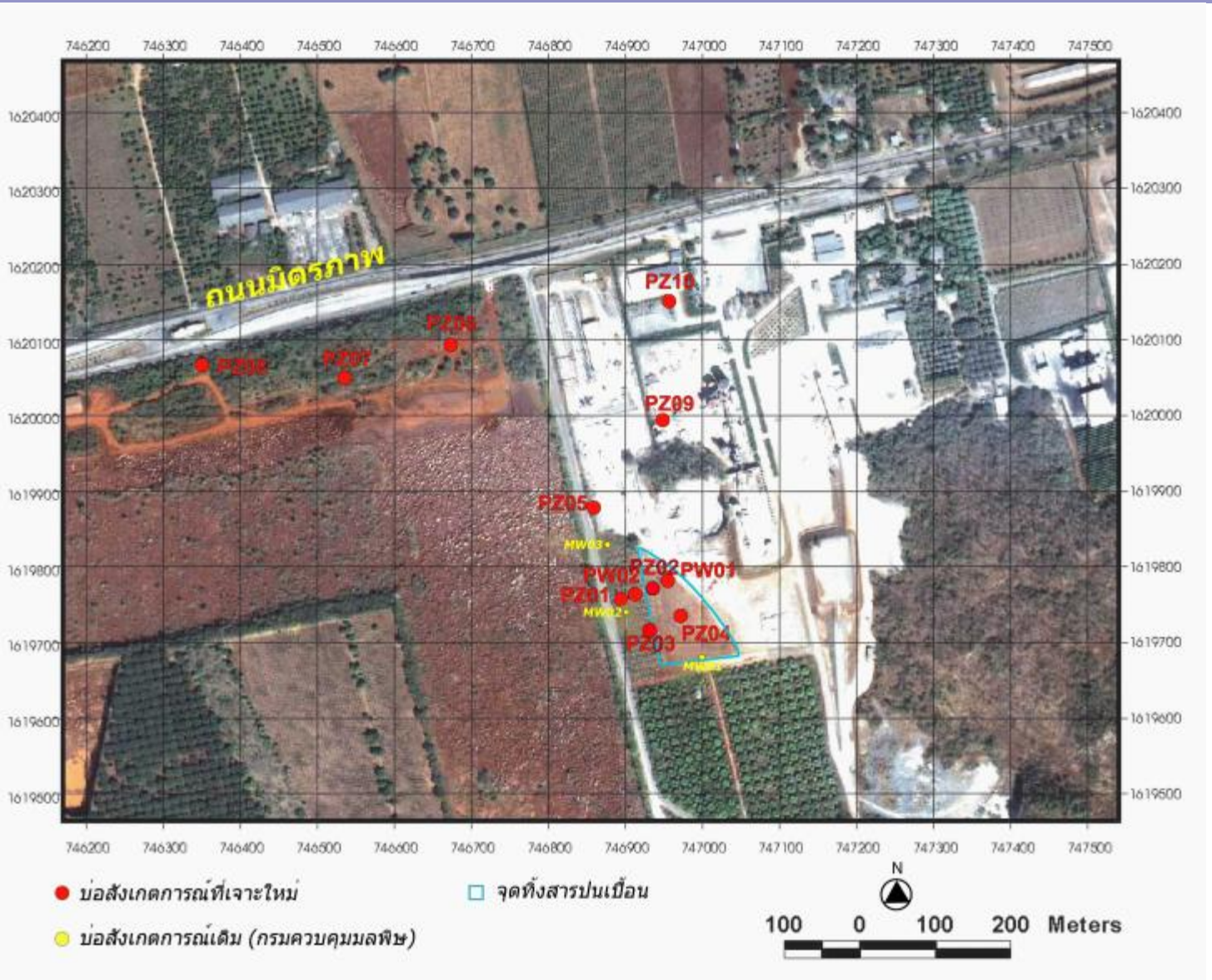


Resistivity interpretation in each

sections

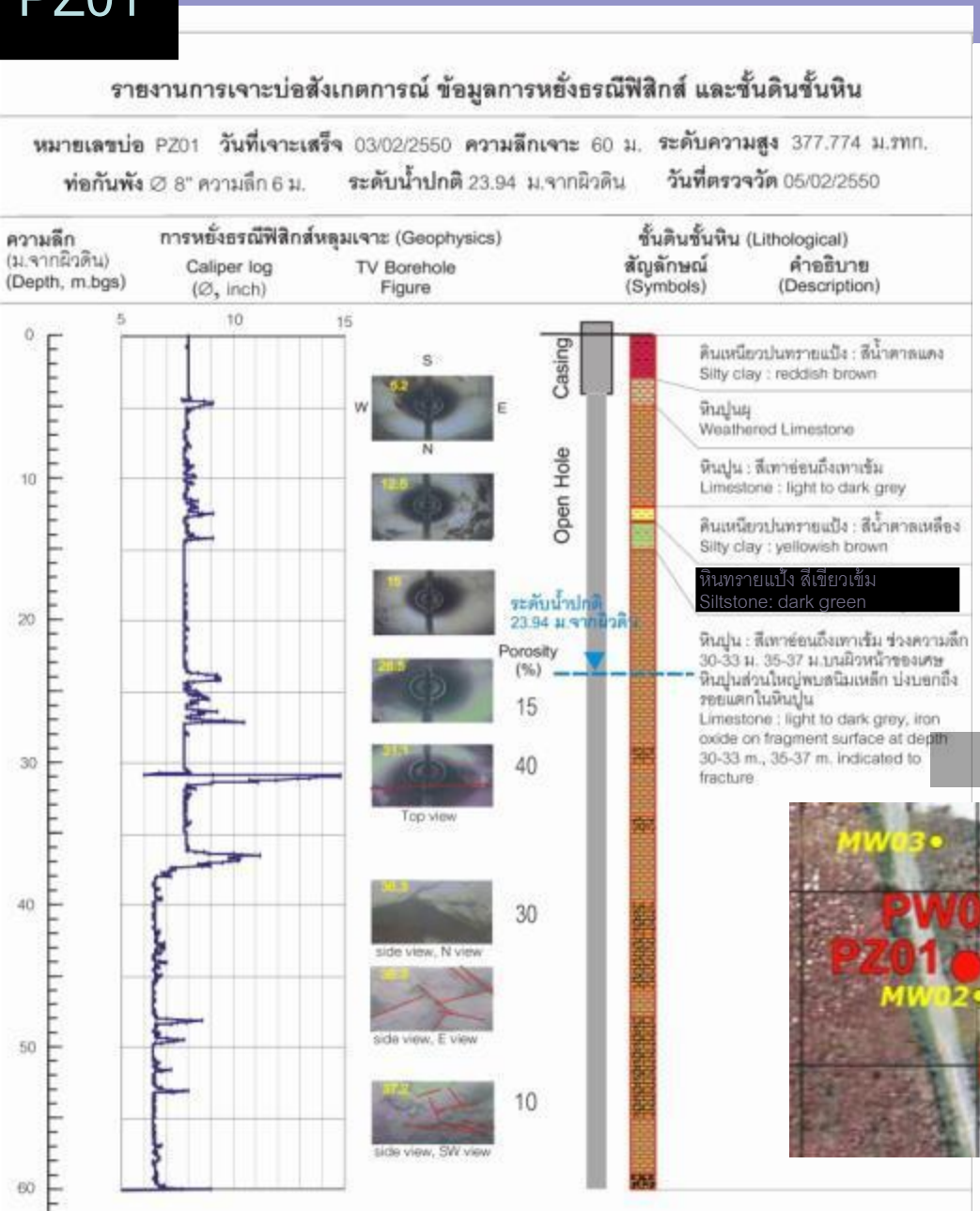
New Bore holes (open 12 holes)

- geophysical investigation
- Hydraulic properties (T, K)
- Water level and quality investigations



Cross sectional geophysical conditions of subsoil layer

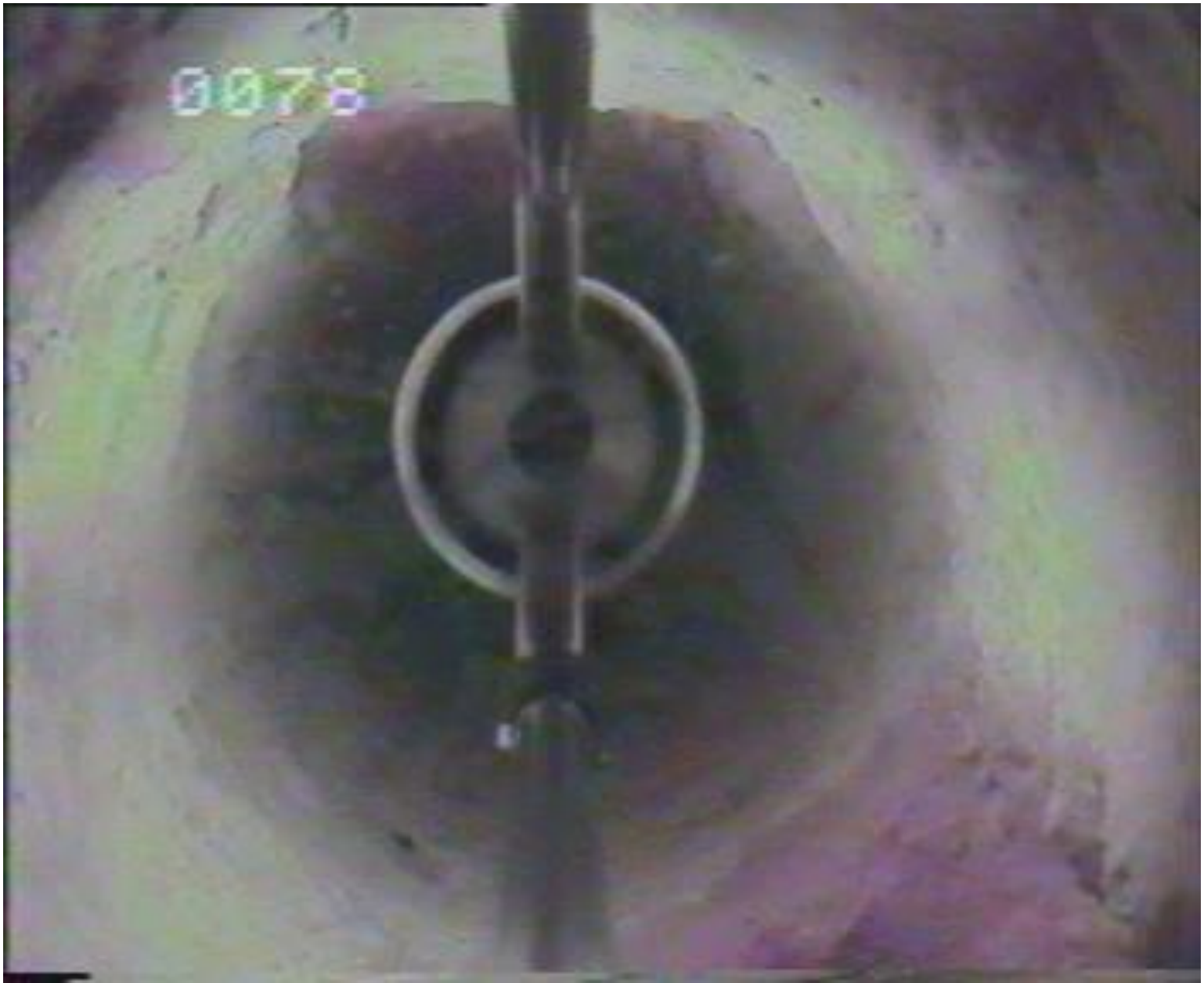
PZ01



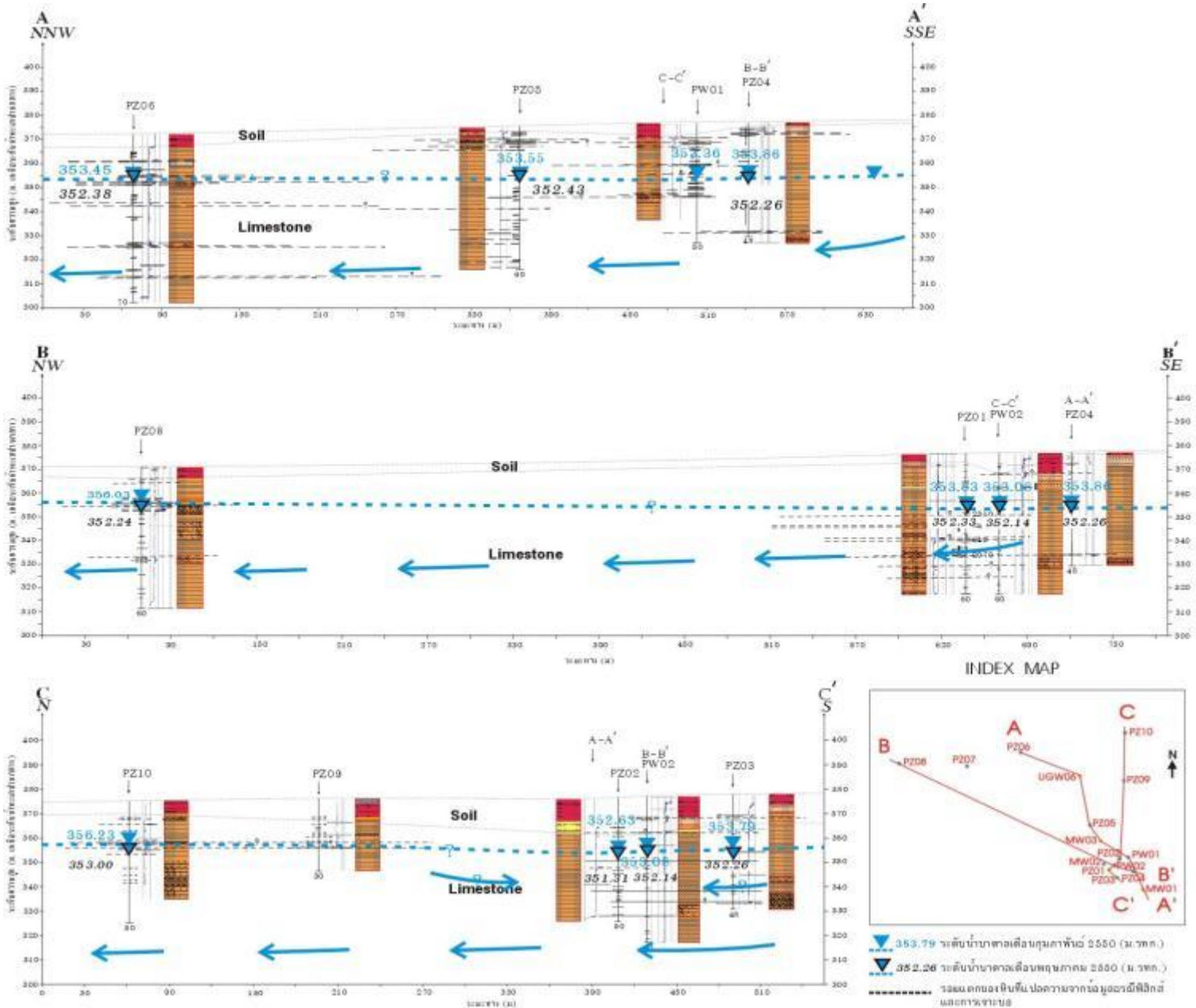
TV log 10 holes

Caliper log 12 holes

TV-borehole at 78 m. below ground surface



Cross sectional fracture alignment and hydrogeological conditions of the area



Contamination Identification

Contamination identification

- VOCs Past records (PCD)
- VOCs present records (included Pesticides และ Heavy Metals)

- soil (2-5 m; Nov 2006) : VOCs, Pesticides not found
  : Heavy Metals found (within standards)
- GW (26-70 m; Feb & June 2007) : Pesticides not found
  : Heavy Metals found (within standards)
  : VOCs (7 types exceeded standards)

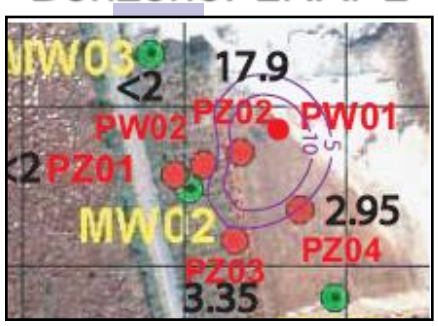
Benzene 1,1-dichloroethylene Tetrachloroethylene (PCE) 1,1,2-dichloroethylene
1,2-dichloroethane Cis-1,2-dichloroethylene Trichloroethylene (TCE)

Based on soil and ground water quality standards by ONEP (2000, 2003)

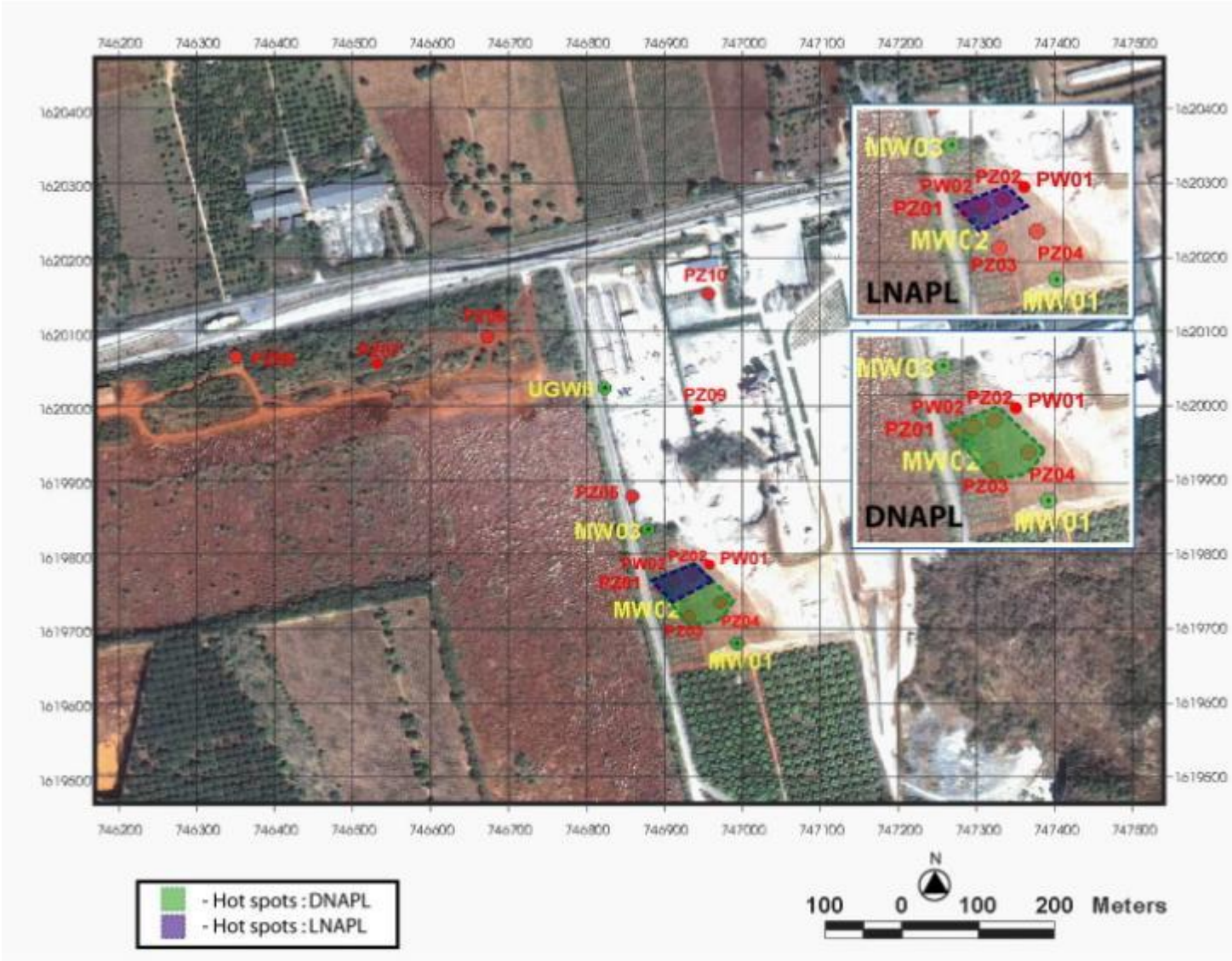



Hot Spots: LNAPL, DNAPL

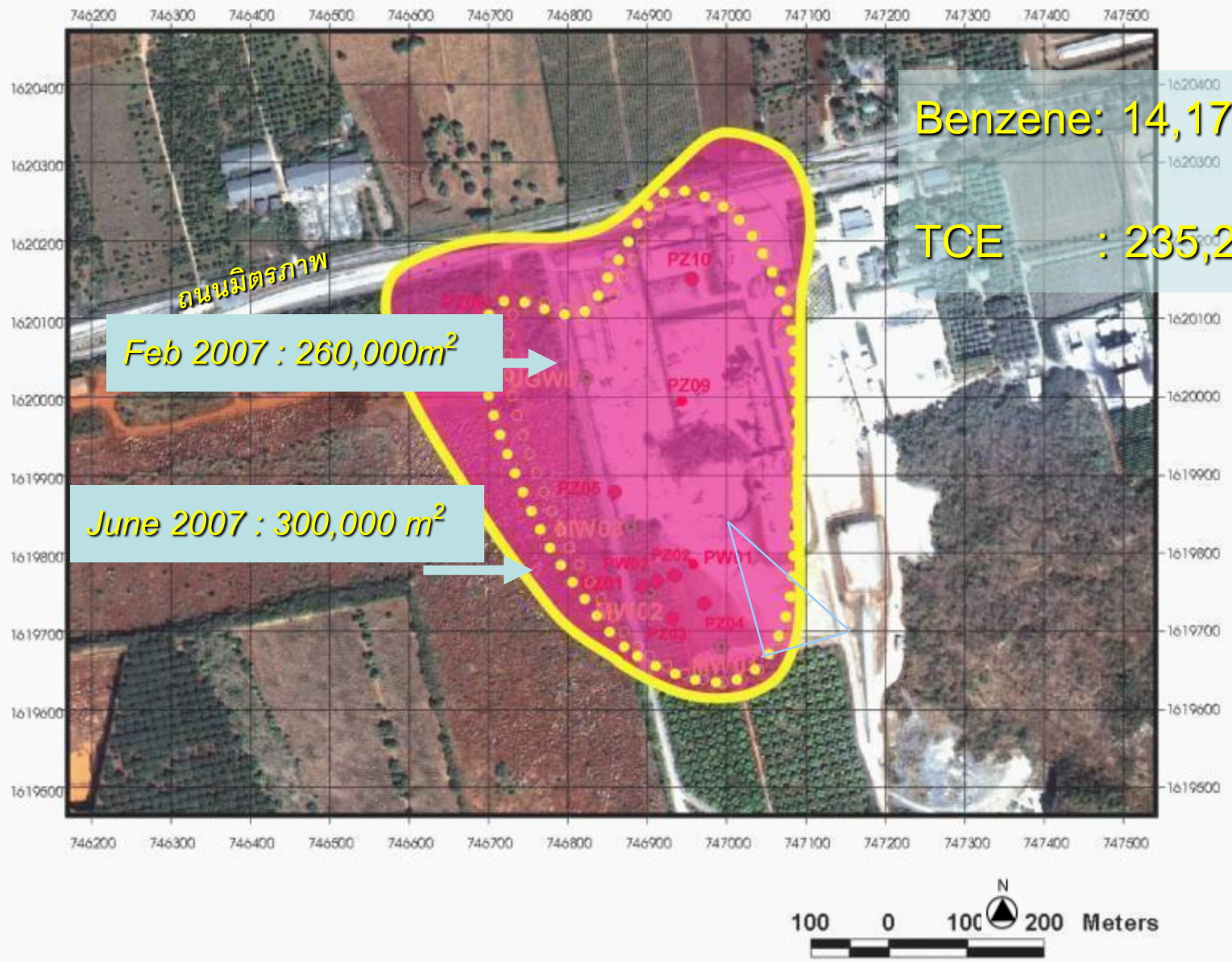
Benzene: LNAPL



TCE: DNAPL

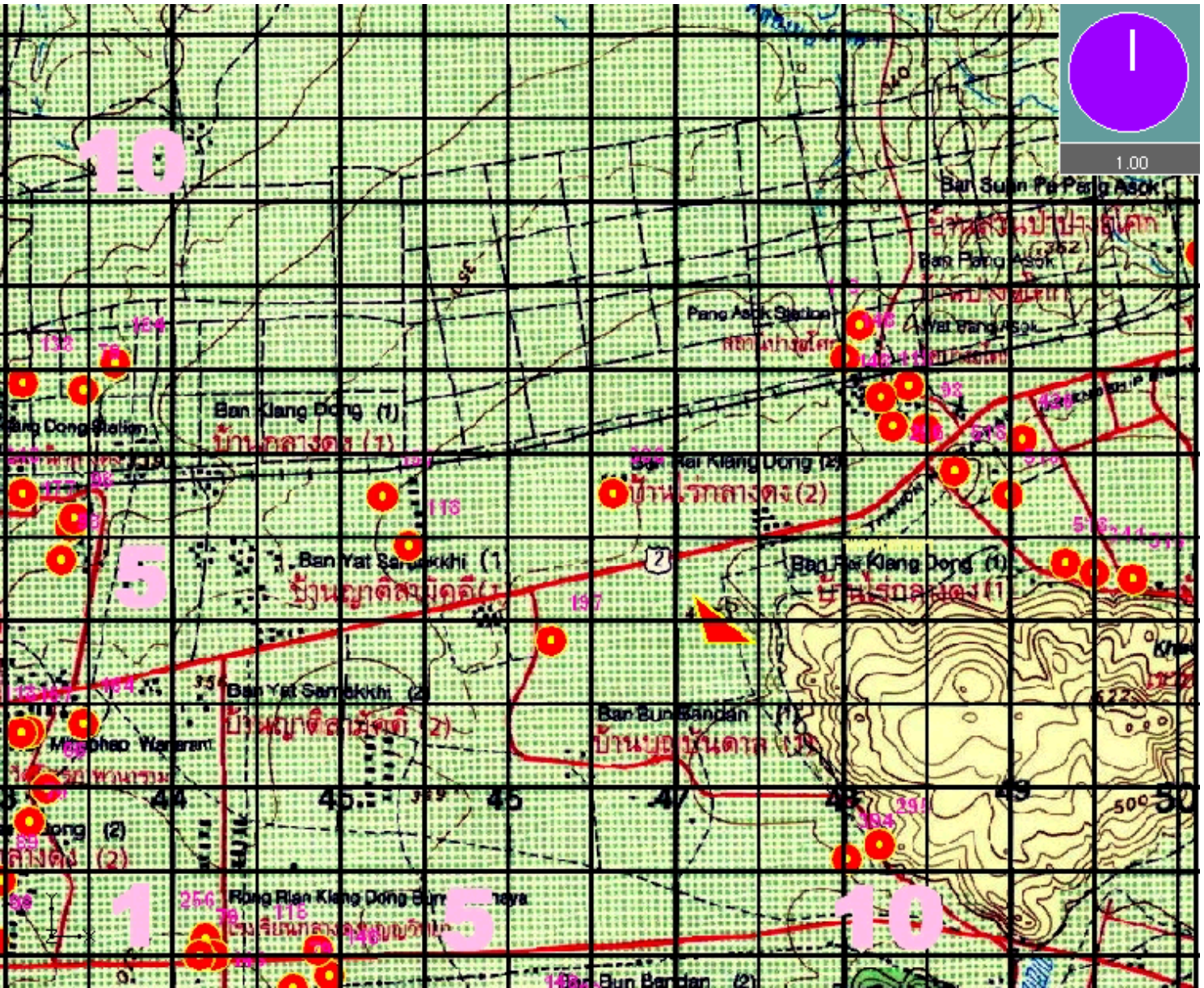


Contamination coverage



Contamination Simulation

Contamination Simulation

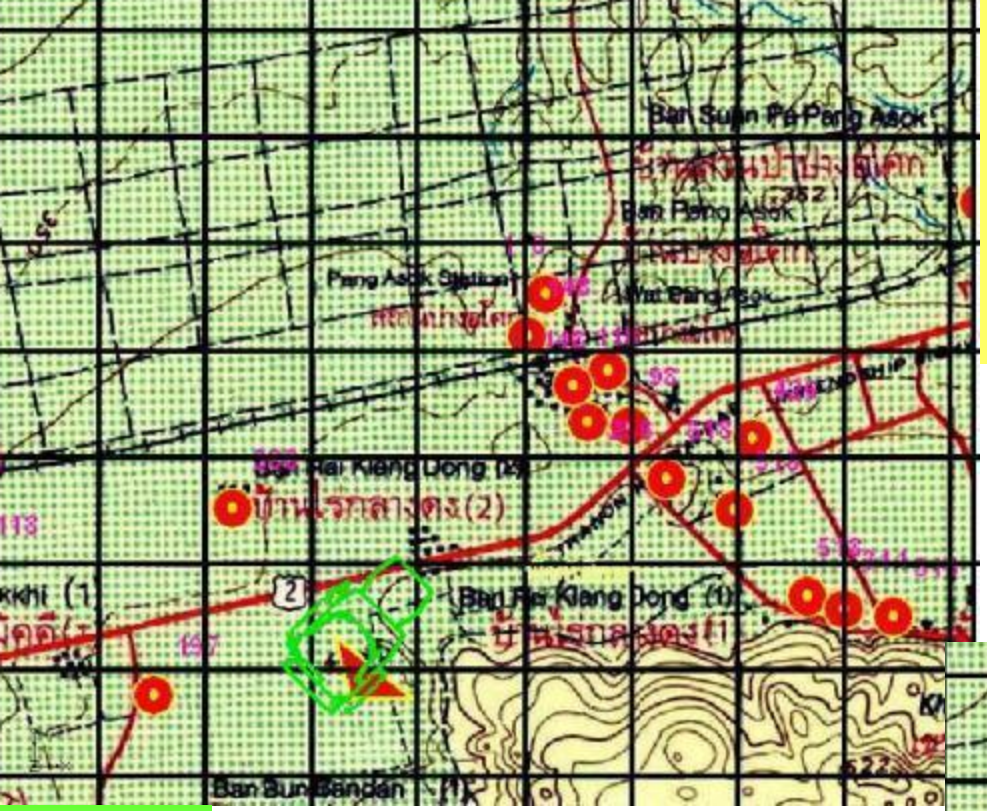


Since July 2005 (days)

TCE transport

Contamination Simulation

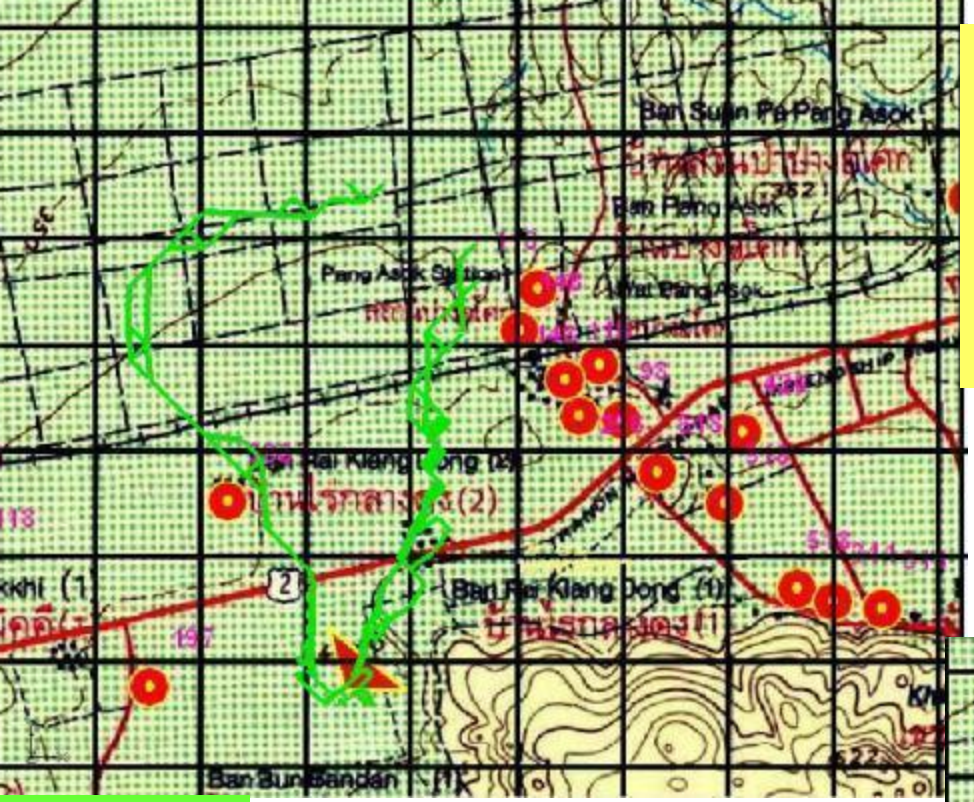
Distribution of TCE concentration in groundwater



Year = 2

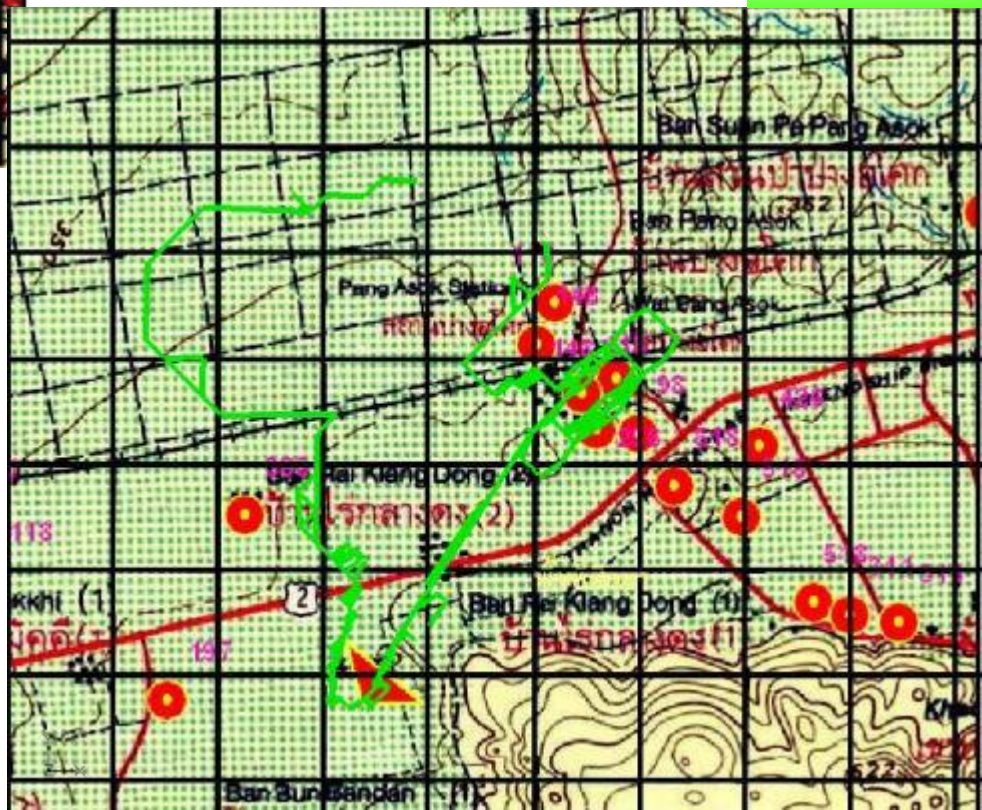
Year = 10

Distribution of TCE Concentration in groundwater

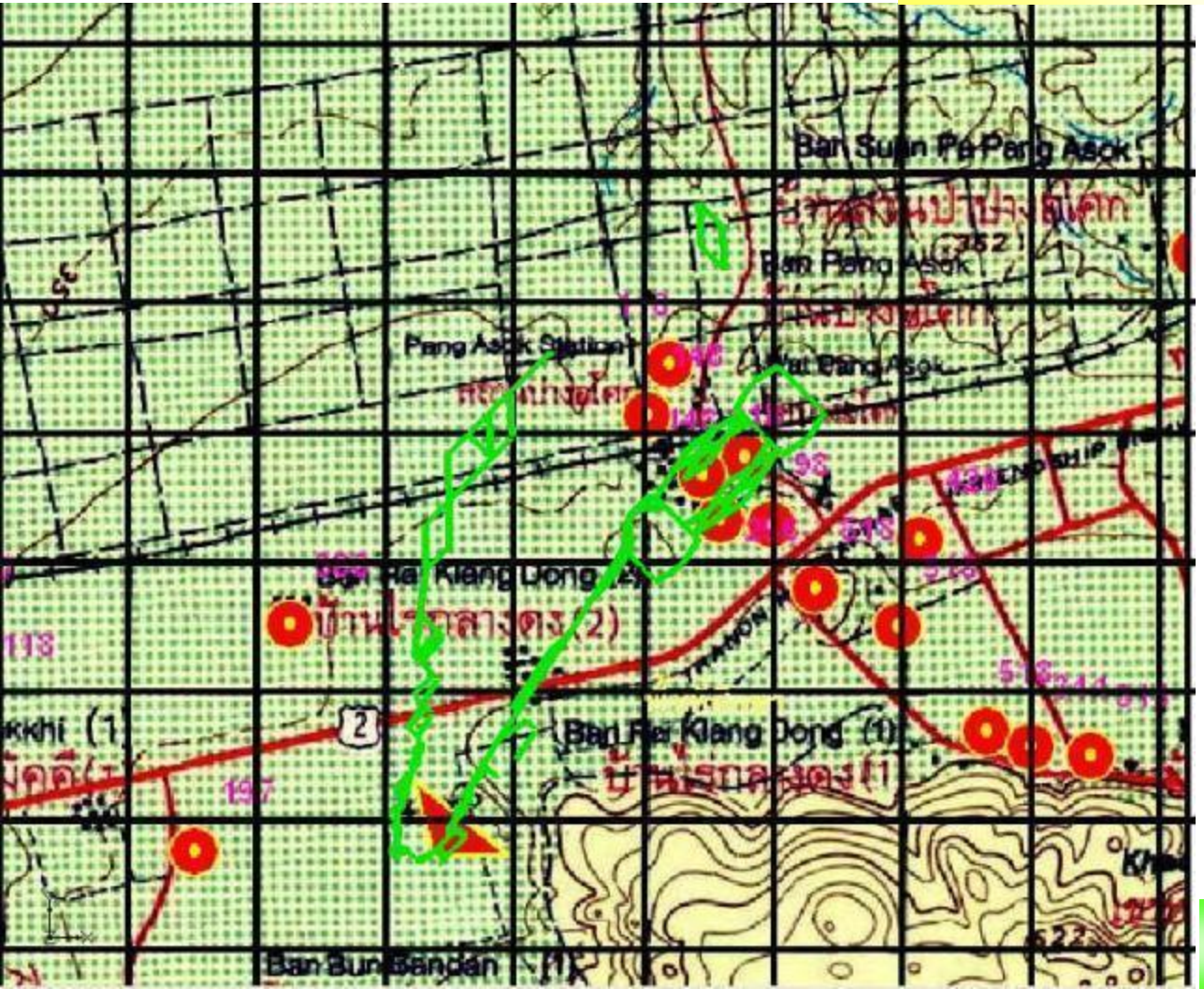


Year = 20

Year = 25



Distribution of TCE Concentration in groundwater



Year = 50

Findings

- VOC found in the fractured rocks
- Hot spot still in the dumped area
- Propagation based on seasonal effect
- More propagation based on simulation

Recommendations

- More detailed site characterization
- Regular monitoring system needed
- Proper planning for clean up action

References

- Chulalongkorn University (2007) Final Report : Risk Assessment of Groundwater Contamination from Hazardous Wastes at Tambon Klang Dong, Amphoe Pak Chong, Nakhon Ratchasima.
- Chulalongkorn University (2007) Presentation : Seminar on Risk Assessment of Groundwater Contamination from Hazardous Wastes at Tambon Klang Dong, Amphoe Pak Chong, Nakhon Ratchasima, July 13, 2007.
- Office of Natural Resources and Environmental Policy and Planning (2003) Soil and groundwater quality standards.
- Pollution Control Department (2005) Industrial waste dumping at Klangdong, Pakchong, Nakornratchasima

Acknowledgement

- Department of Groundwater Resources
- Department of Pollution Control
- Pang Asoke Community

Further Information

Website of DGR and CUwater