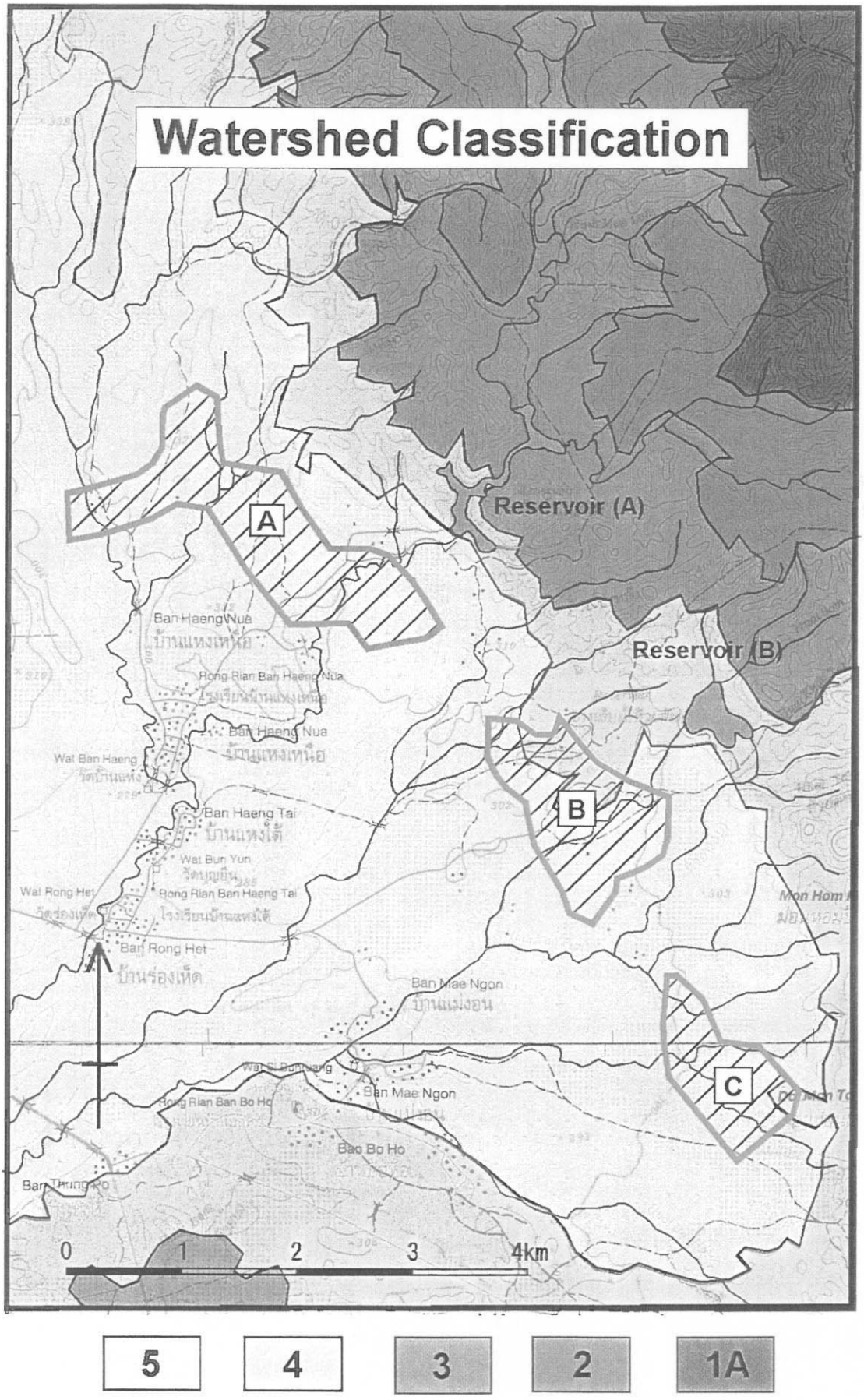
Watershed Classification
Reservoir (A)
Reservoir (B)
A
B
C
Ban HaengNua
Rong Rian Ban Haeng Nua
Ban Haeng Nua
Wat Ban Haeng
Ban Haeng Tai
Wat Bun Yun
Wat Rong Het
Rong Rian Ban Haeng Tai
Ban Rong Het
Ban Mae Ngon
Wat Si Bun Ruang
Rong Rian Ban Bo Ho
Bao Bo Ho
Ban Thung Ko
0
1
2
3
4km
5
4
3
2
1A

Figure6-3

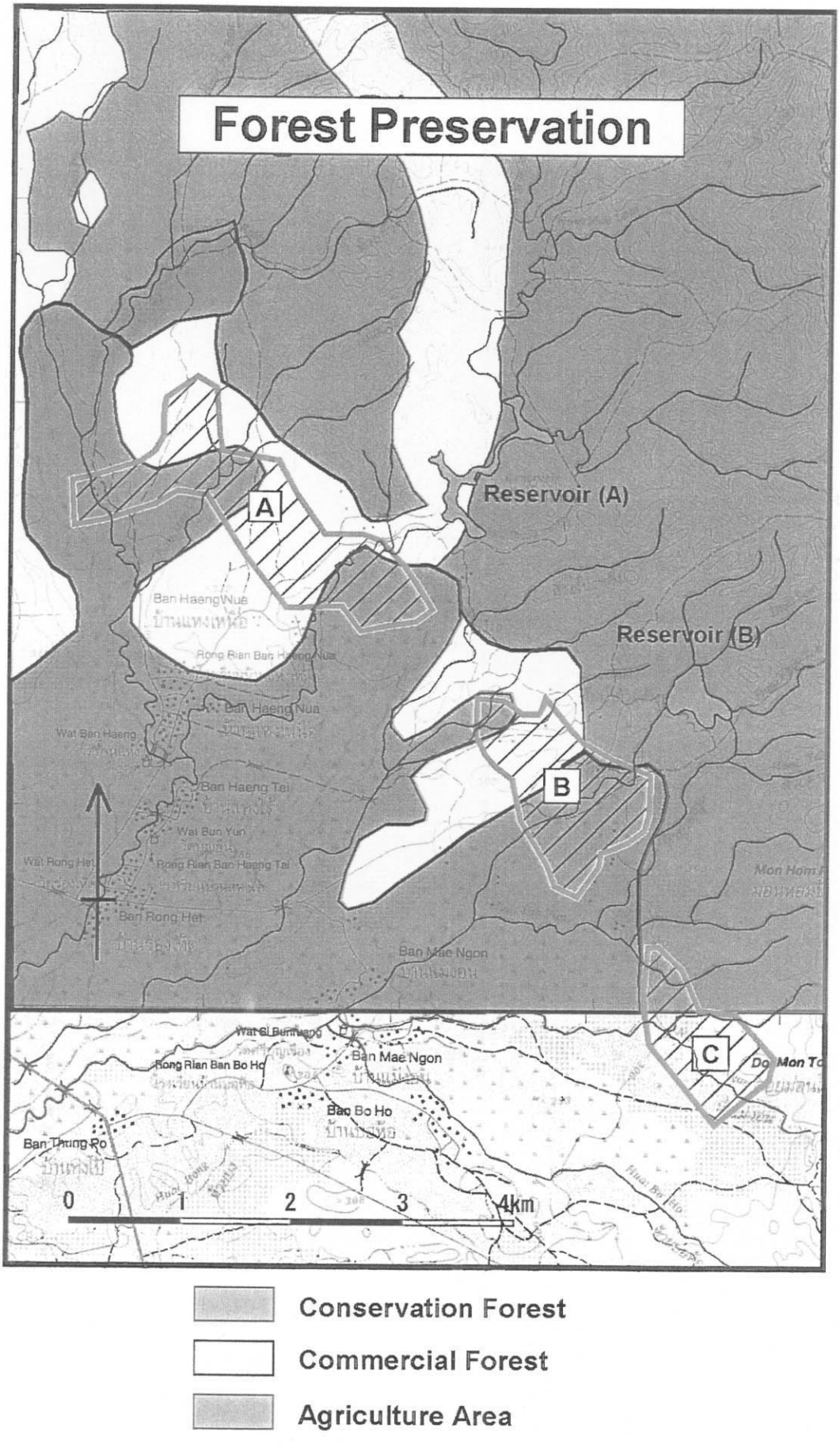
Forest Preservation
Reservoir (A)
Reservoir (B)
A
B
C
Ban Haeng Nua
Wat Ban Haeng
Ban Haeng Tai
Wat Bun Yun
Wat Rong Het
Ban Rong Het
Ban Mae Ngon
Rong Rian Ban Bo Ho
Ban Bo Ho
Ban Thung Ro
0
1
2
3
4km
Conservation Forest
Commercial Forest
Agriculture Area

Figure6-4

7． Conclusion

7.1 Feasibility for Development in Ngao Coal Basin

As a result of this Study, we could select the Area-A, of which development is expected to be promising. This area bears comparison with the neighboring coal mine in coal reserves for mining (about 30 MT) and Average strip ratio（6.3 Bank m^3／ton）.

Indeed, this area is inferior to those coal mine in coal quality, especially heating value and Sulfur content. But, we acquired a prospect to resolve mostly these problems, by applying conventional coal preparation method and coal upgrading technique (low temperature distillation method).

Further, we could make clear that the low temperature distillation method is technically effective for the removal of Sulfur in coal. But, judging from the comparison of imported coal, we have to conclude in the present stage of the study that upgrading technique is not yet so economical.

Therefore, we primarily mention the possibility to develop only using conventional coal preparation. Then, the discussion on the application of upgrading technique is mentioned for your future reference.

Case by Conventional Coal Preparation

If we expect to develop the whole of Area-A, we will get the followings using the method of selective mining and conventional coal preparation.

Average strip ratio : 6.3 bank m^3/ ton-clean coal

Coal reserves : 30 million ton

Average heating value : 3,600 Kcal/ Kg (A.R)

Average Sulfur content: 4.27 % (A.R)

But, based on the data of iso-value contour map, we considered that there is some

possibility to select the zone in Area-A, having 10 million tons of minable reserves with around 6.0 of strip ratio and less than 3%(A.R) of sulfur content. And, we think that we can get clean coal of around 3,600 kcal/kg (A.R) by using selective mining in the zone and conventional coal preparation. The clean coal shall be mainly used for the cement industry by the reason of relatively high sulfur content.

The coal production cost is roughly estimated at 315 Baths. Then, we consider that the economical development of this zone will be promising, even if the price of coal is discounted for the penalty of high sulfur.

Reference: Case by Upgrading Techniques

The zone having 10 million tons of mining reserves will be selected in Area-A, considering coal quality and mining condition. We think that we can get the clean coal having almost same quality to the bulk sample, by using the method of selective mining and conventional coal preparation.

By using this clean coal for the row materials, we will be able to get upgraded coal with around 5,800 kcal/kg and 3.4 % of Sulfur content (A.R) and high Sulfur-heavy oil with around 8,100 kcal/kg (A.R). The yield of products is respectively 50 % (for the former) and 10 % (for the latter). Upgraded coal shall be mainly used for the cement industry by the reason of relatively high sulfur content.

If we can select the definite area in Area-A, where the Sulfur content of raw coal is less than 5 % (D.B), we will finally get the upgraded coal less than 3 % (A.R) of Sulfur content.

The total production cost for upgraded coal was very roughly estimated at around 1,000 Baths, with reference to the estimation in USA. The price of upgraded coal is fairly high compared with domestic coal, even in consideration of its high calorific value. It depends on further study that upgraded coal maybe competes with imported coal in future, or not.

7.2 Remained Works

It is supposed that the following additional study is mainly necessary in order to estimate more precisely the possibility of development in Ngao coal field.

(1) Detailed Exploration in Area-A

In order to select the zone meeting to the above-mentioned condition in Area-A, it is necessary to hold of the coal seam condition by additional drillings and coal quality condition by analysis and tests on drilling core samples.

(2) Preparation of Detailed Topographic Map

The preparation of around 1/5,000 scale of topographic map is absolutely necessary in order to make a mine development plan in the most advantageous area, considering the topographic and environmental condition.

(3) Preliminary Cost Study for Coal Upgrading

The upgrading cost is greatly influenced by the scale of production, quality and yield of the products, price of the liquid products (high Sulfur-heavy oil) and construction cost of the plant in Thailand.

Therefore, the study on these matters will be necessary in future, to know the economics.

Especially, as the scale of production has a big effect on the construction cost of upgrading plant. It should be decided reasonably based on the result of further study. And, the quality and yield of the products is greatly influenced by the coal quality of clean coal, which becomes raw material for upgrading. Therefore, we have to prepare typical coal samples in the proposed development area, and confirm the quality and yield of the products using those samples.

(4) Applicability Study on Upgrading Technique

Thailand has a great deal of coal resources besides Ngao area, which still remains to be undeveloped by reason of the high Sulfur content. In case that we study about the commercialization of upgrading techniques in Thailand, we consider that the applicability of upgrading technique should be studied also for these coal resources.

7.3 Conclusion and Recommendation

(1) We concluded in the present stage of the study that upgrading technique was effective to improve the coal quality, but judging from the comparison of imported coal, the development of Ngao coal using upgrading technique is not yet so economical.

(2) In case that we do not use upgrading technique for the development of Ngao coal, we recommend the development by selective mining and conventional coal preparation, setting a target to cement industry.

Based on the data of iso-value contour map of sulfur content, we consider that there is some possibility to select the following zone in Area-A.

Average strip ratio : 6.0 bank m^3/ ton-clean coal

Coal reserves : 10 million ton

Average heating value : 3,600 Kcal/ Kg (A.R)

Average Sulfur content: less than 3.0 % (A.R)

Ⅲ. TECHNOLOGY TRANSFER

Technology and know-how related to coal exploration, assessment, quality upgrading and mine planning have been transferred to the counterpart geologists in the course of cooperative study during the Study works.

1. Training during the Study in Thailand

Technology transfer on geological works was done about the method of geological mapping, decision of drill hole location, core logging, sampling, data arrangement by computer and geological interpretation during the fieldwork. In DMR office at Bangkok, we explained and discussed on the exploration results and interpretation on the geological condition through the presentations.

We also explained and discussed on float-sink and upgrading test, namely the method, result, interpretation and assessment through the presentations in DMR office at Bangkok.

2. Counterpart Training

DMR members joined to the study works on geology, coal quality, coal upgrading and mine planning in Japan as a counterpart trainee. The member names, periods and contents of training were as follows.

2.1 Members and Terms

Name: Mr.Pakpun Siriyarak

Geologist, Mineral Fuels Division in DMR

Terms: February 12, 2001～March 10, 2001

Name: Mr.Ponchai Pongkorn

Geologist, Mineral Fuels Division in DMR

Terms: July 2, 2001～August 1, 2001

2.2 Contents

(1) Exploration, Interpretation, Assessment and Development Technique on Coal Basin

(2) Analysis, Assessment and Mine Planning Technique by computer

Study and training were done on MINEX (Coal Resources Evaluation and Mining Plan System developed by NEDO) and data base system applied on this Study.

(3) Conventional Coal Preparation and Advanced Upgrading Method

Study and training were done on the analysis and interpretation method of float and sink test result, especially about washability curve and Christopher diagram.

Then, the trainees observed learned the condition of upgrading test, which was carried out at the laboratory of Mitsui SRC Development Co., Ltd.

(4) Inspection of Facility and Mine

The trainees inspected the following facilities and mine in Kyushu District.

- Ikeshima undersea coal mine
- Higashidani limestone open cut mine
- Coal center and briquette plant

APPENDIX

Photograph（1～12）

Ph-1 Trenching