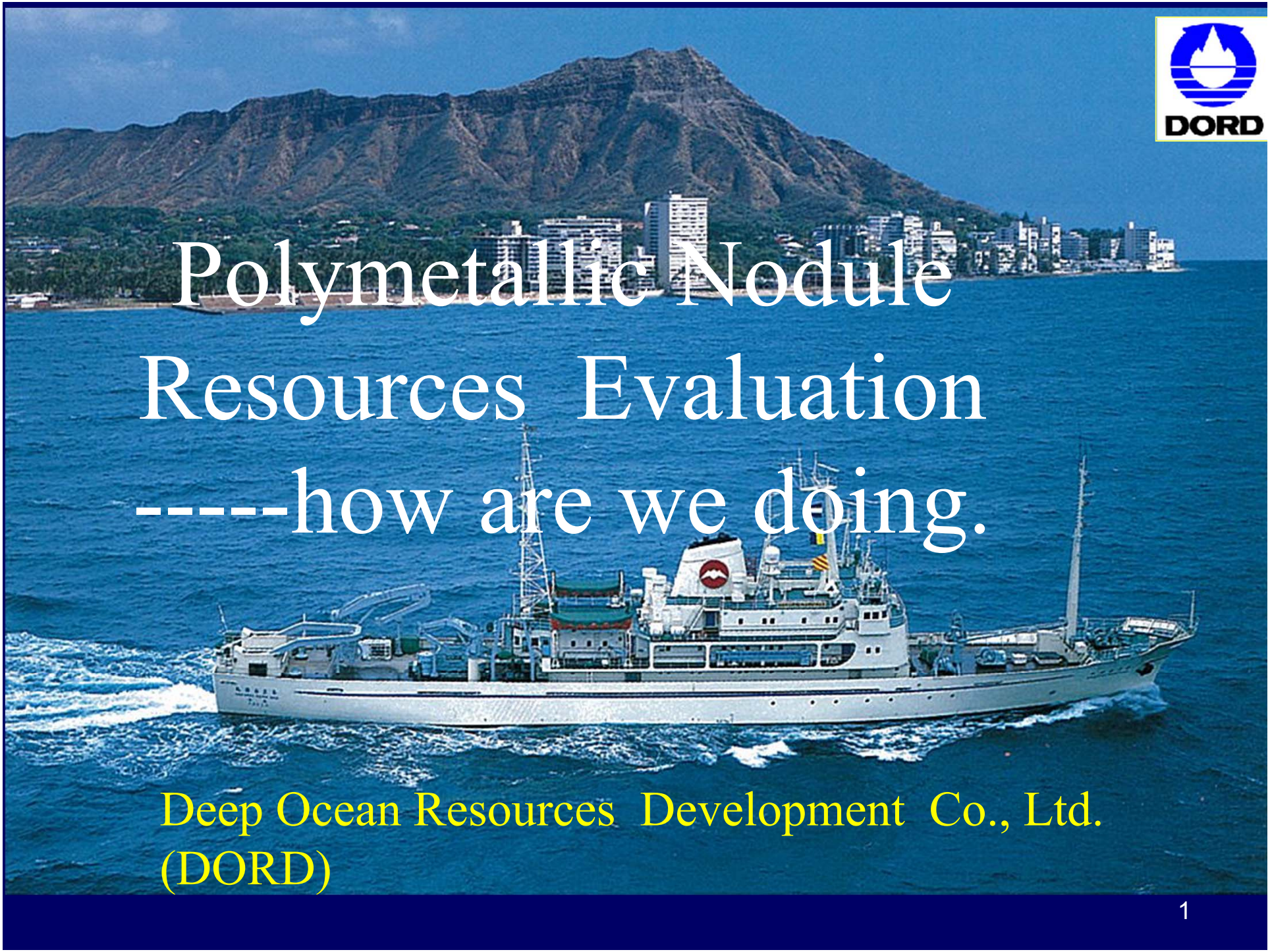


Polymetallic Nodule Resources Evaluation -----how are we doing.

Deep Ocean Resources Development Co., Ltd. (DORD)

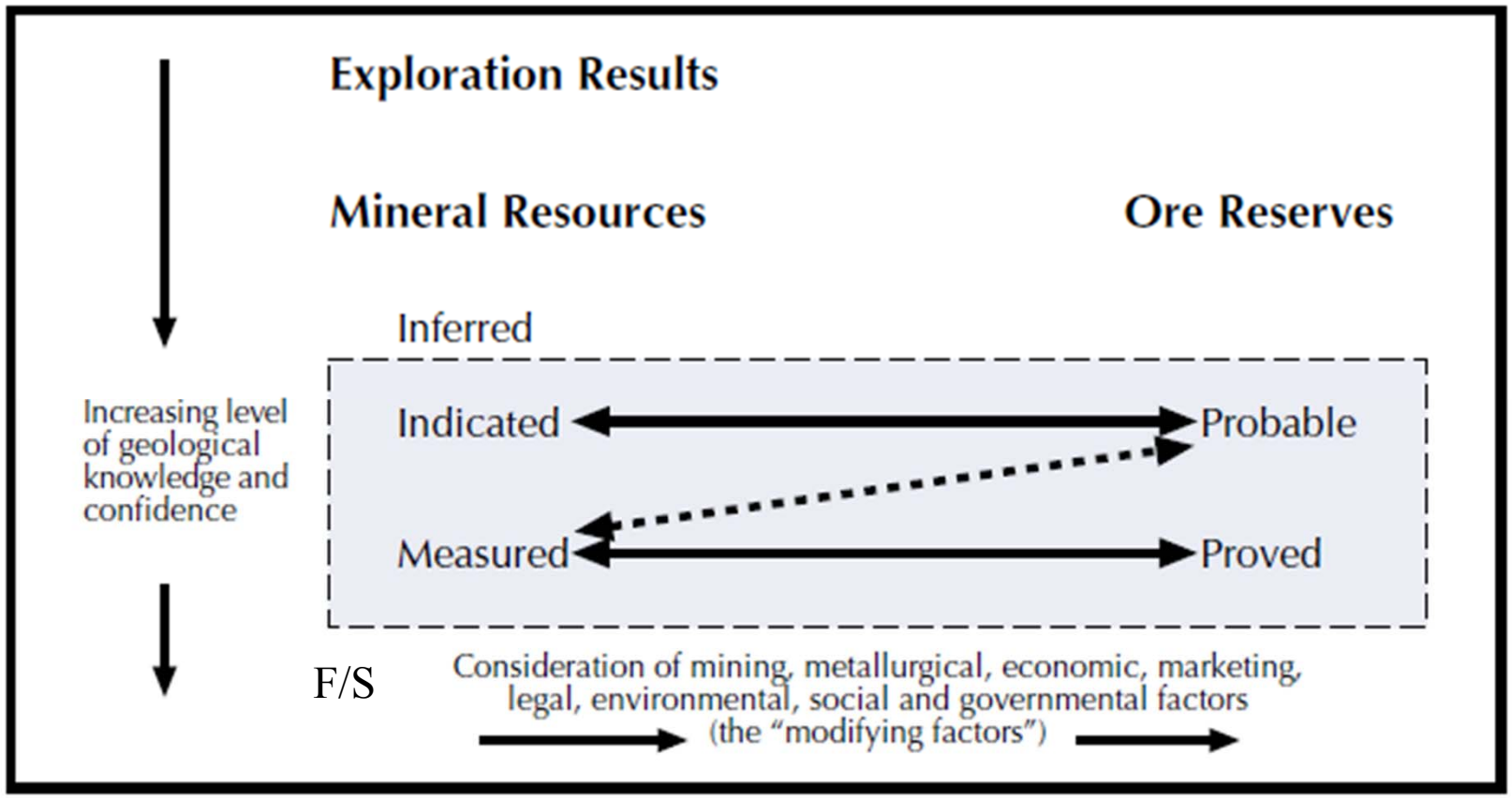
Resources Classification and Evaluation

-At first, we must have mineral resources with a certain level of accuracy to start F/S (feasibility study）.

-Then, based on the mineral resources, economic viability is examined by mining, processing, marketing, environmental, social and etc. factors.

-We must convince investors that the mining operation will be profitable.

JORC-mineral resources studies



JORC （The Joint Ore Reserves Committee of the Australasian)
General Relationship between Exploration Results, Mineral Resources and Mineral Reserves

Resources and Reserves

If we want to consider exploitation we must have ore reserves, otherwise we can not make a plan of mining operation.

Indicated mineral resources
Measured mineral resources

Consideration of mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors
(Modifying Factors)

Feasibility studies

Provable ore reserves
Proven ore reserves
Economically and physically minable part of Measured and/or Indicated mineral resources.

Definition of mineral resources

Inferred Mineral Resources : Characteristics of ore are estimated with a low level of confidence. Inferred from geological evidence and assumed (but not verified) geological and/or grade continuity. Data are insufficient to allow the geological and/or grade continuity to be confidently interpreted.

Indicated Mineral Resources : Characteristic of ore are estimated with a reasonable level of confidence. The locations of sampling and testing are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed.

Measured Mineral Resources : Characteristics of ore are estimated with a high level of confidence. It is based on detailed and reliable information. The locations of information are spaced closely enough to confirm geological and grade continuity.

Mostly based on interval of drilling location.

Comparison of UNFC and JORC

UNFC classification		JORC code	Albania
Proved Mineral Reserves	111	Proved Ore Reserves	
Probable Mineral Reserves	121	Probable Ore Reserves	
	122		
Feasibility Mineral Resources	211		
Prefeasibility Mineral Resources	221	Modifying Factors	
	222		
Measured Mineral Resources	331	Measured Mineral Resources	A+B
Indicated Mineral Resources	332	Indicated Mineral Resources	C_1
Inferred Mineral Resources	333	Inferred Mineral Resources	C_2+P_1
Reconnaissance Mineral Resource	334		P_1,P_2,P_3

UNFC (United Nations Framework Classification for Fossil Energy and Mineral Resources)
(E, F, G): (Economic viability, Feasibility, Geological knowledge)

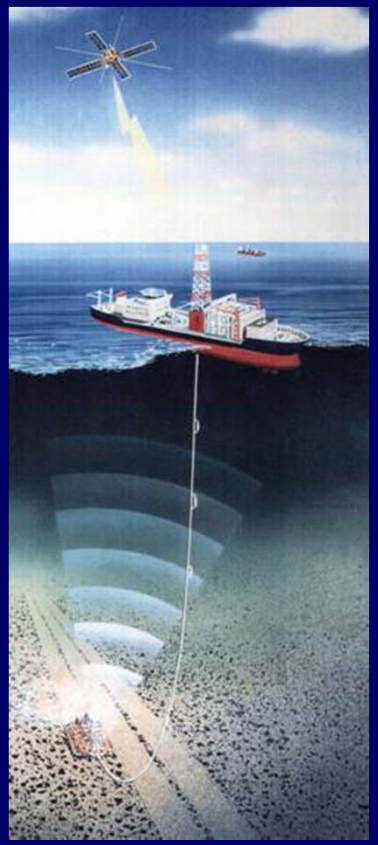
Situation of Polymetallic Nodule

Situation of polymetallic nodule is different from on-land situation and on-land situation, therefore, can not directory be applied to polymetallic nodule.

-two dimensional distribution
- vast distribution scale
-small variation in ore grade → abundance
-covered by water but mostly exposed on the surface of the seabed (should make full use of photograph and video)

Mining of Polymetallic Nodule

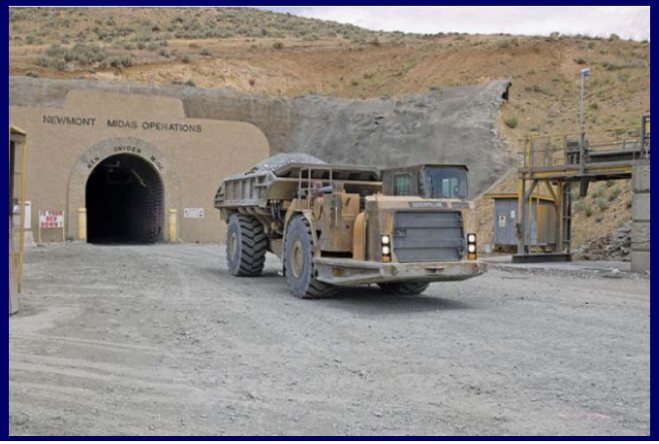
Polymetallic nodule
Not necessary to stay
in the same area



On-land situation

Open pit mine

Underground mine



The areas that we are working for .

Exploration License Area 75,000 km^2

First generation of mining area (High Abundance Area)
approximately 6,000 km^2

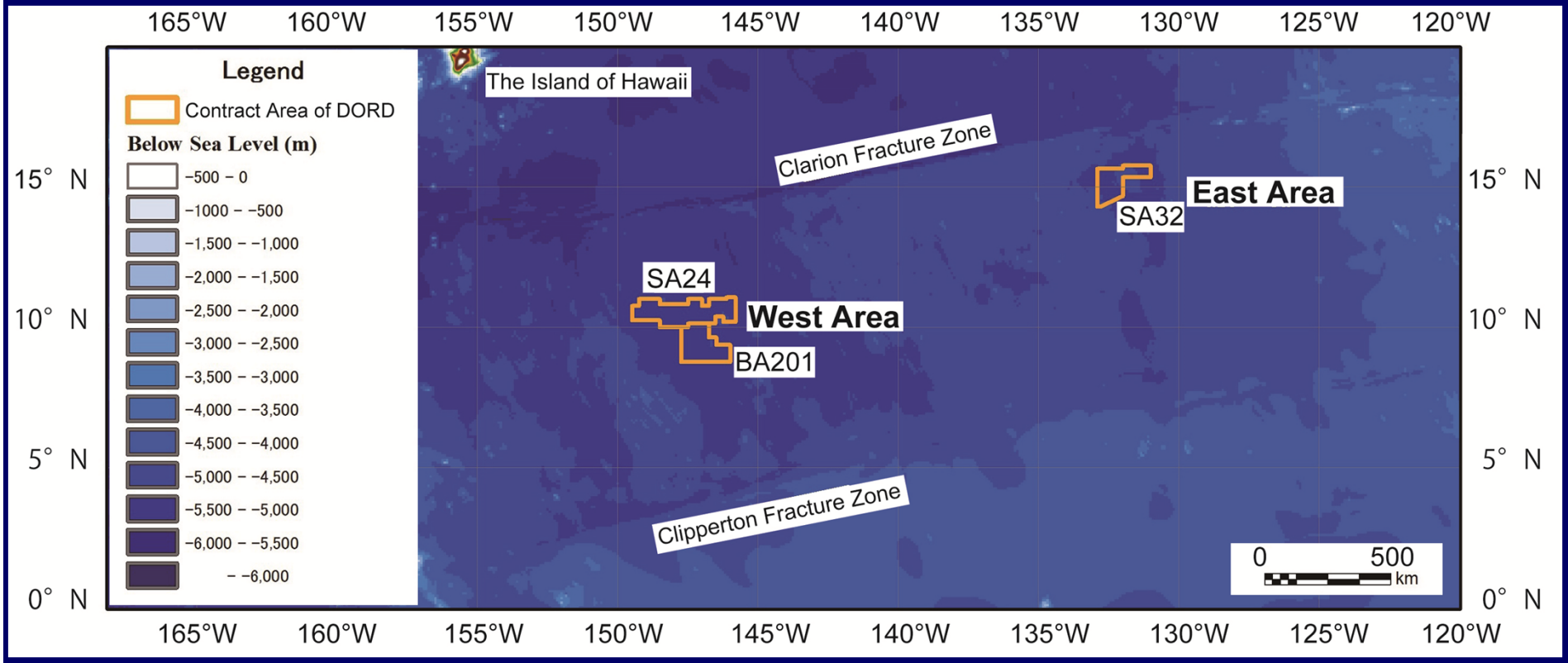
Pre F/S is conducted for the area of about 20 years mining operation.
If average abundance is 10kg/m^2 and annual production 3 mill. ton (10 thousand ton /day x 300 working days/year) then coverage is 300km^2**/year.**

300km^2 x 20 years = 6,000km^2

Model Area for detail survey 80km^2 (at present)

AUV survey is being conducted for understanding the nature of nodule distribution and detail topography. The results is fed back to the High Abundance Area (extrapolation).

License Area of Japan

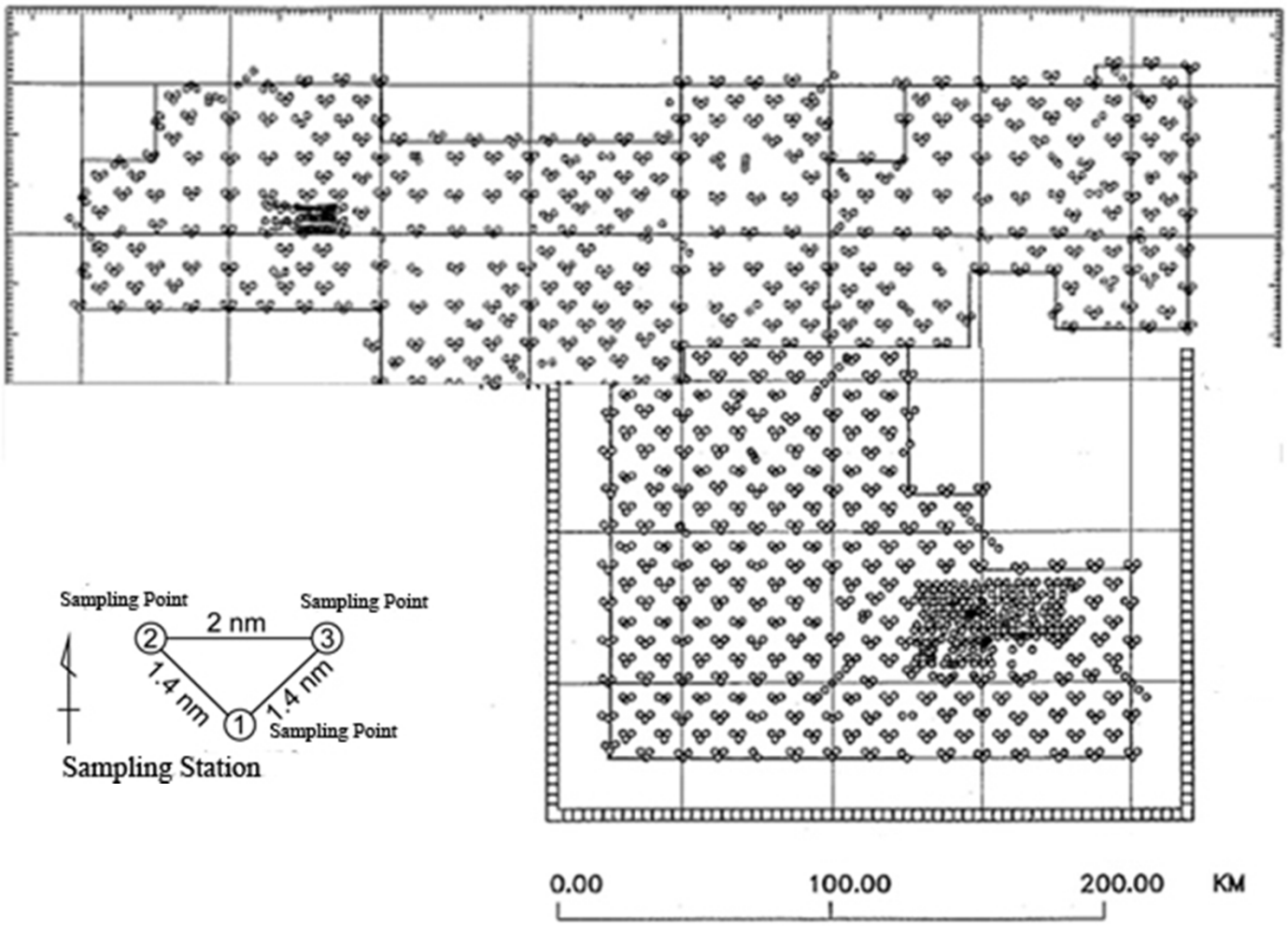


Total Area: 75,000 km^2 (West + East Areas)

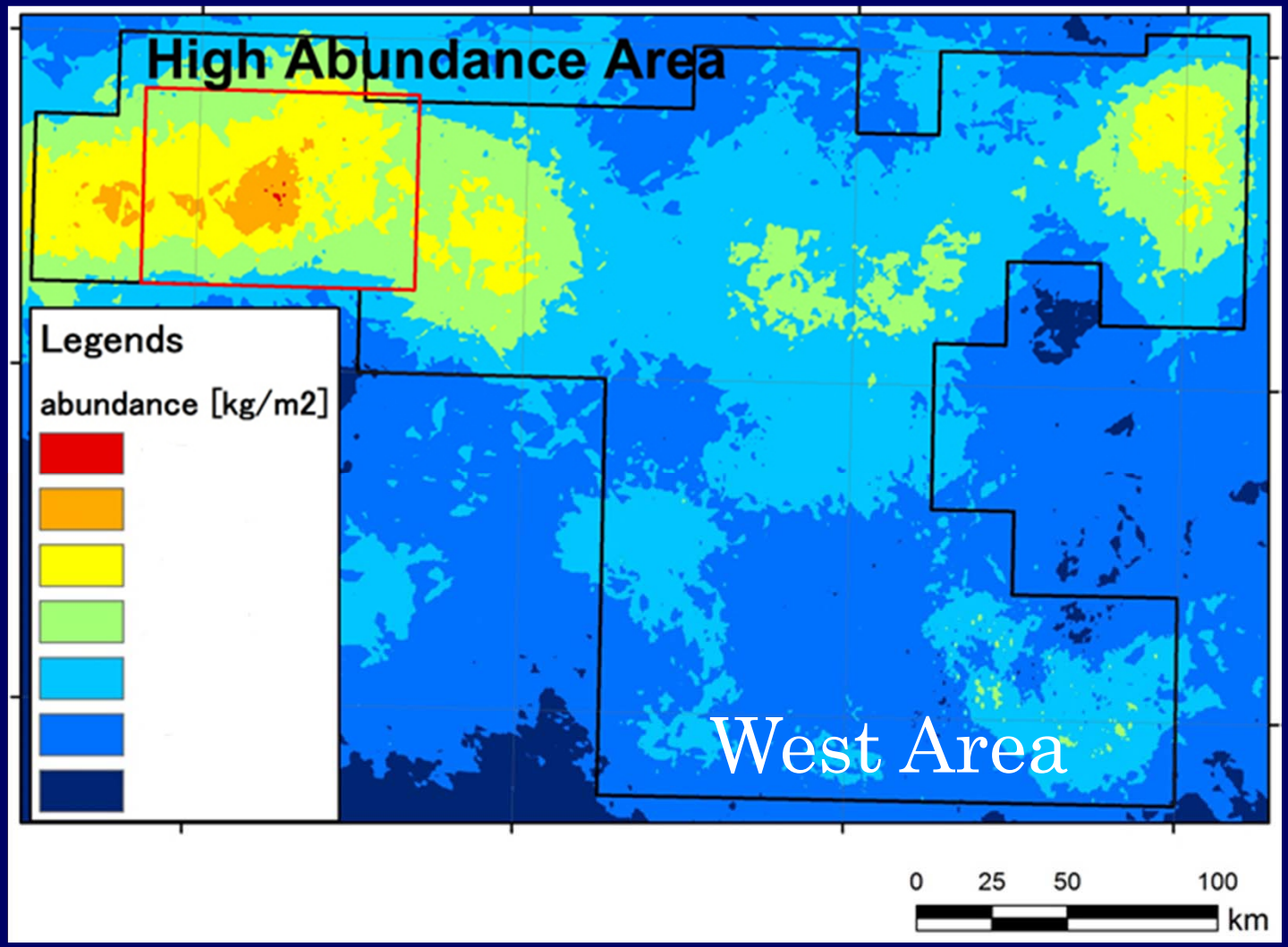
In square shape, it is 274km x 274km

Hokkaido Island: 83,450 km^2.

Sampling Location of West Area



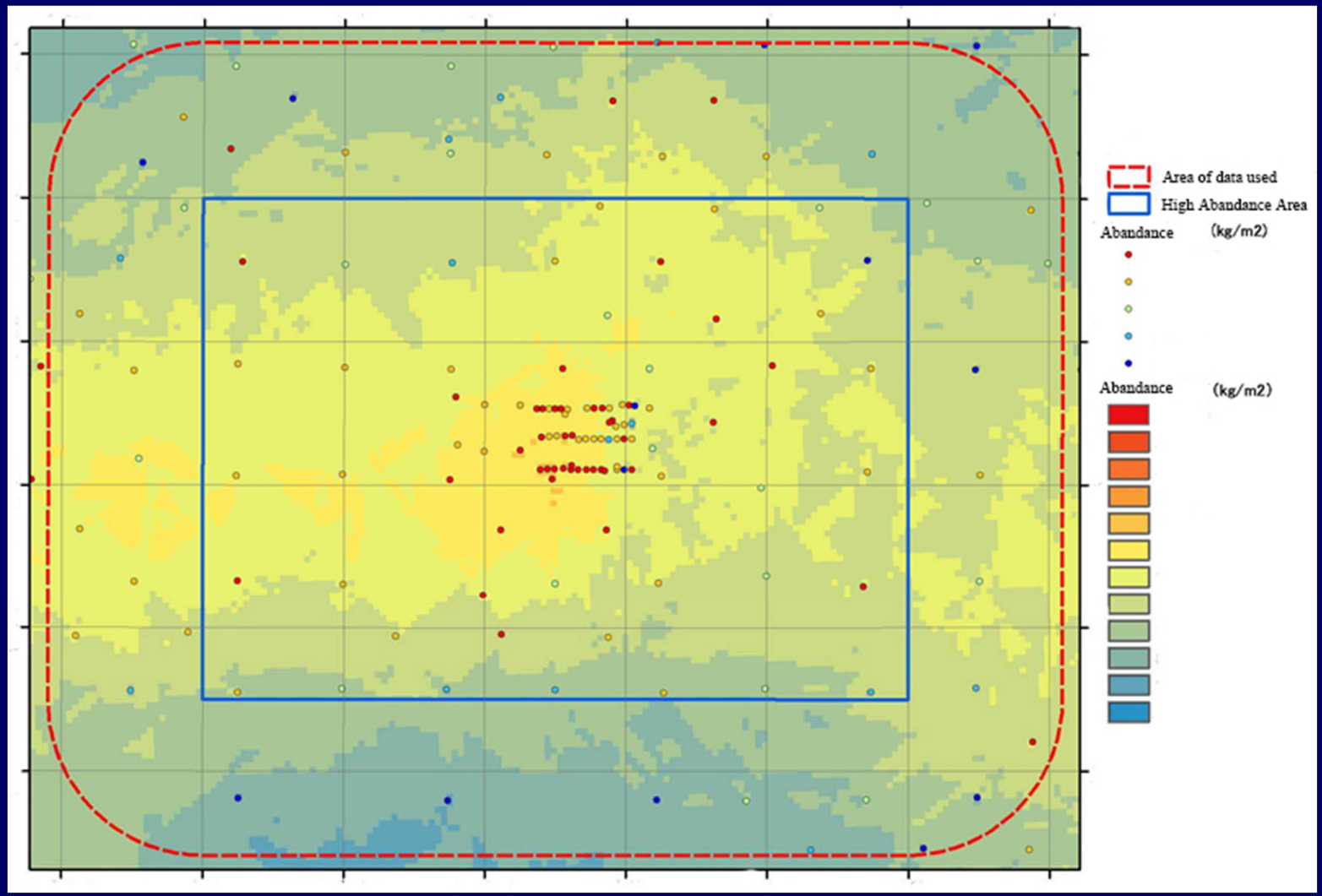
High Abundance Area



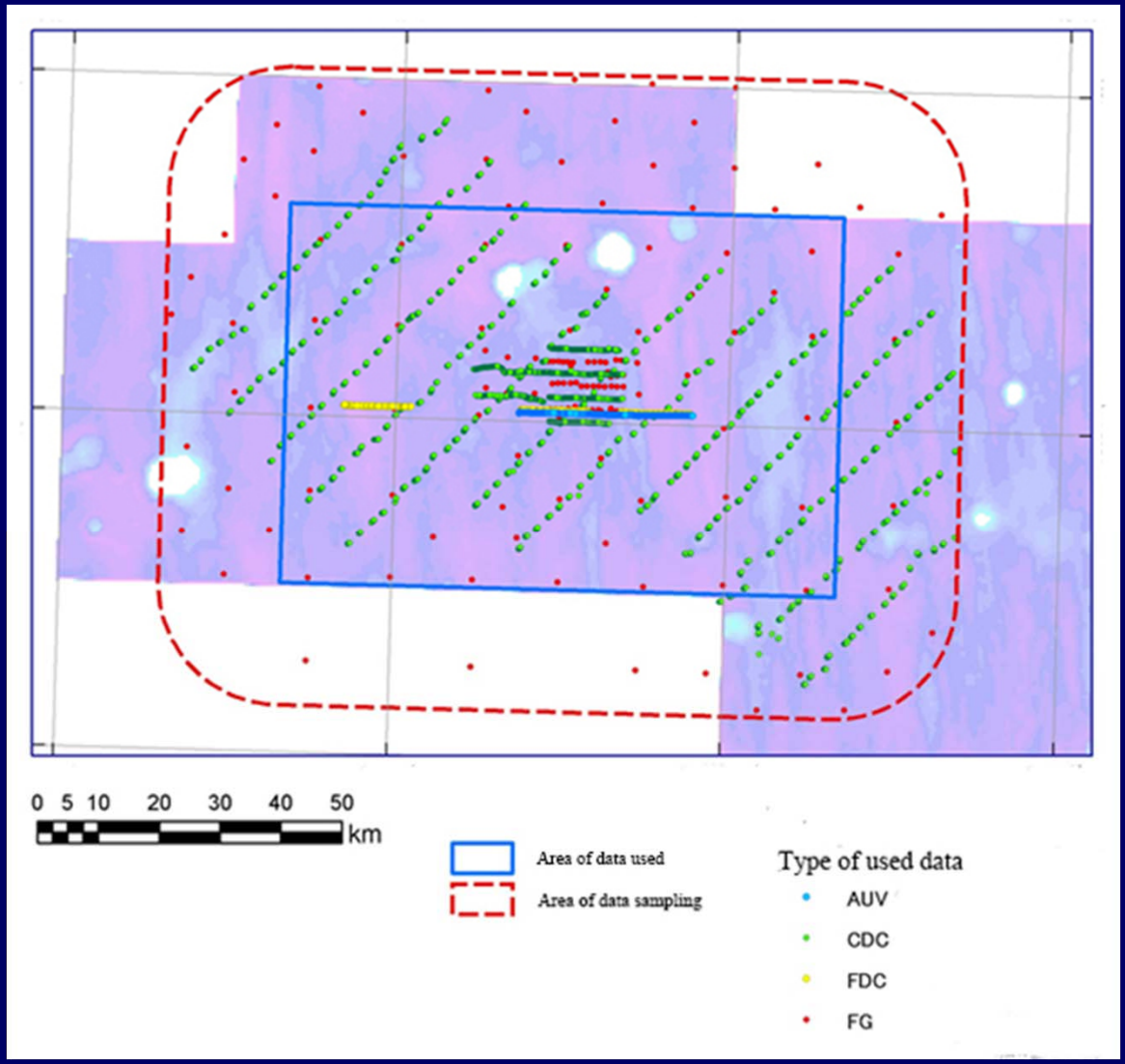
The first generation of mining area.

Abundance of Nodule in High Abundance Area

Mainly FG sampling

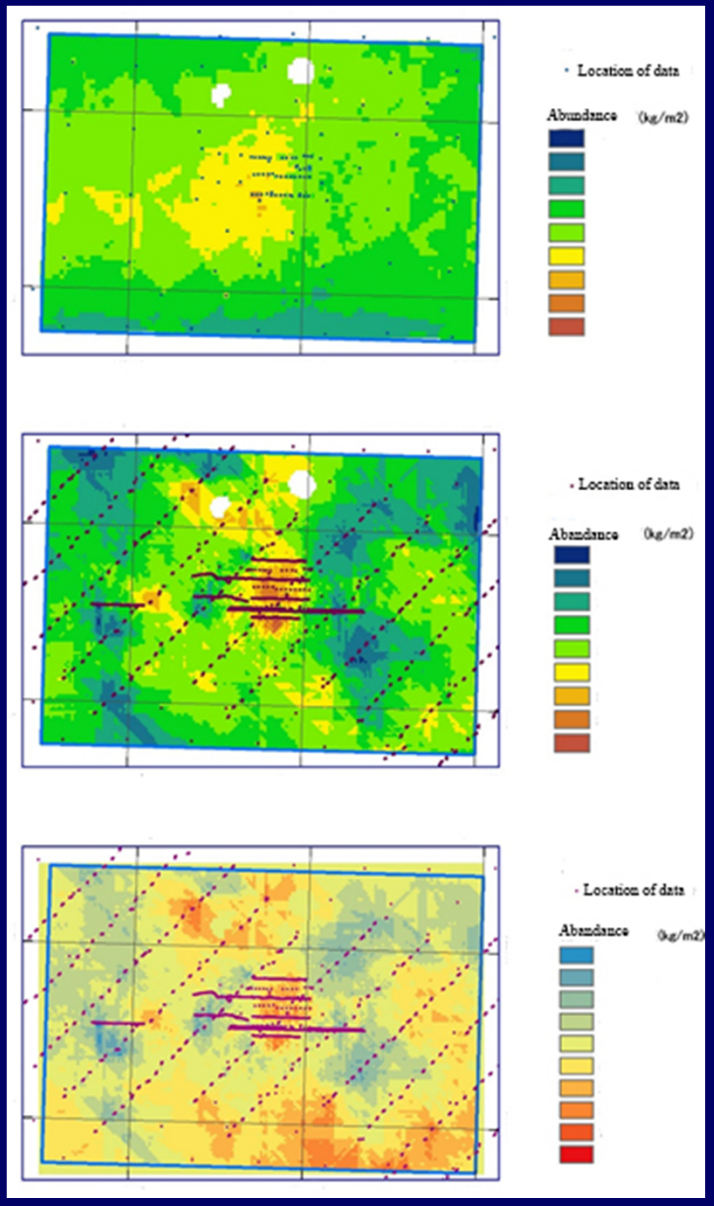


Location of data in High Abundance Area



FG + CDC data
CDC: Continuous Deep-sea Camera

Comparison of two results



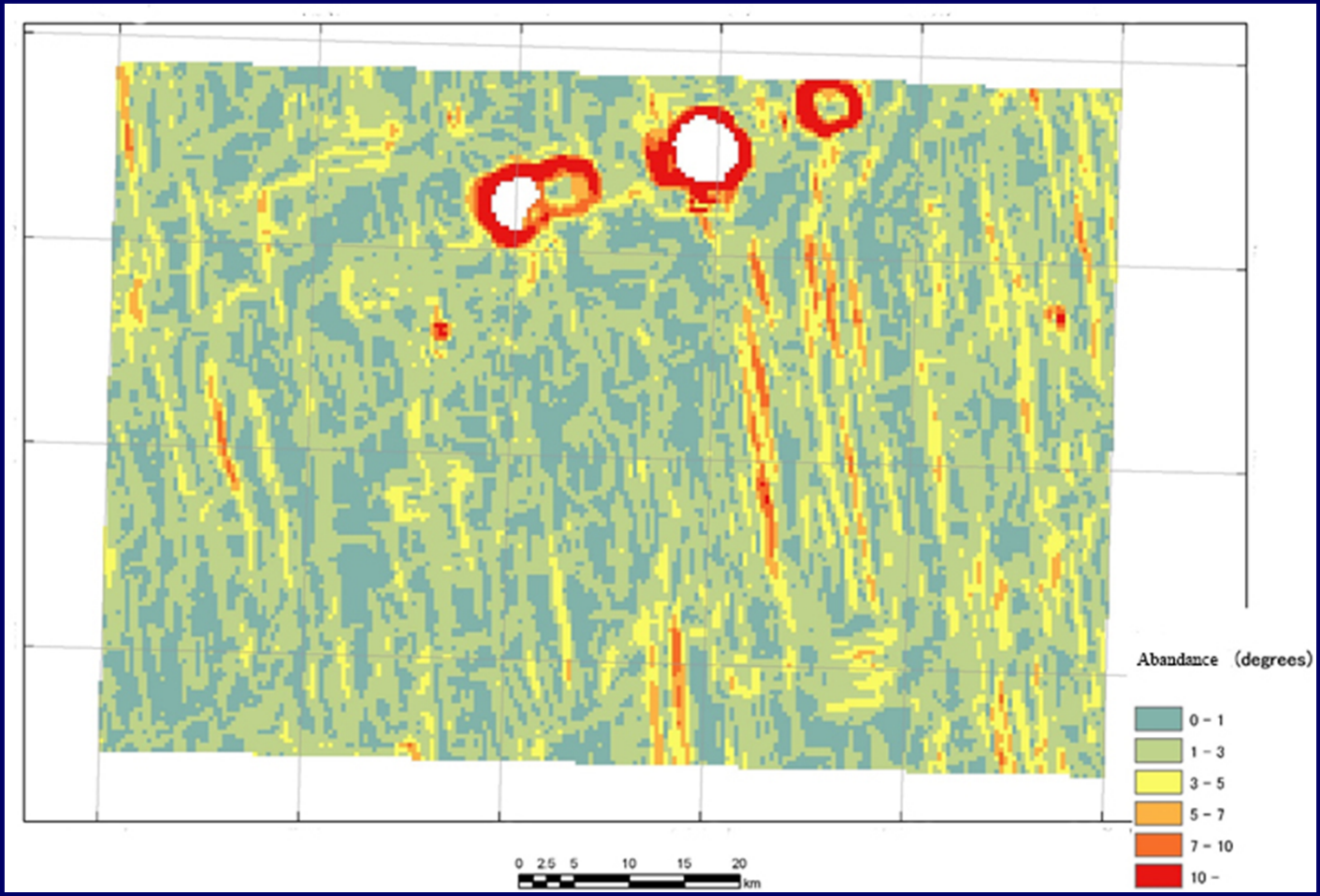
Abundance map from FG data

Abundance map from FG + CDC data

Comparison of resource of two results

FG : 100%
FG + CDC : 94.4 %

Topographical features



More than 5° area
Not minable

Occurrence of
Topographical step

Distribution of slope gradient

Physically minable resources

Minable Resource

More than 7.5kg/m^2 (Cut-off abundance)

(Average 12.31 kg/m^2)

and

Slope gradient less than 5°

92.5 % of the total mineral resources is minable.

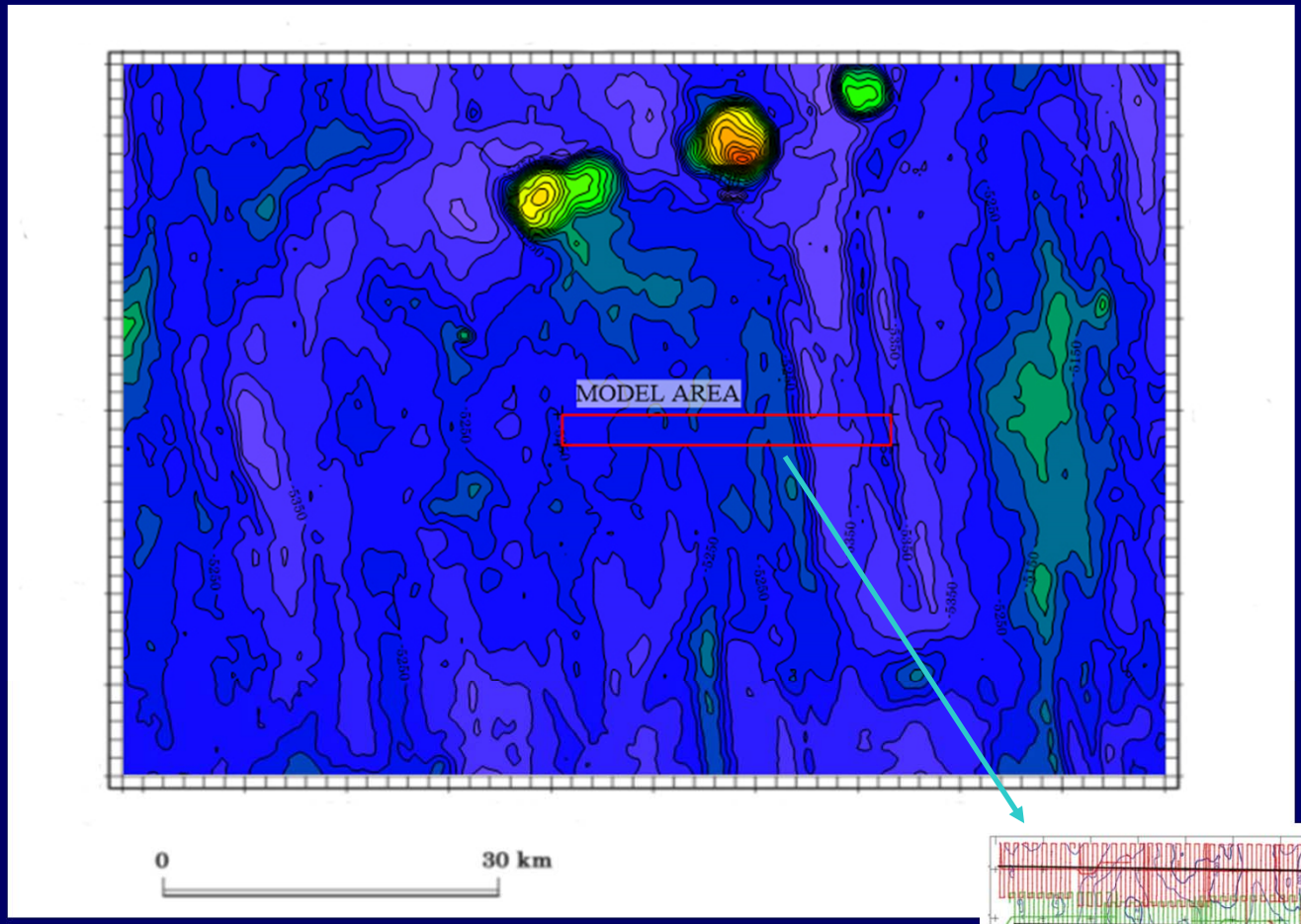
Evaluation of Resources

From FG data inferred resources
FG + CDC data indicated resources ? From

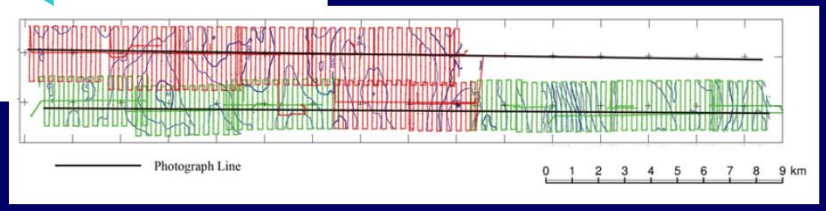
For increasing accuracy of mineral resources to indicated level.
- Detail survey in Model Area to feed back results to the High Abundance Area
  Understanding continuity of nodule distribution and possible relation of nodule distribution to the topography
- Statistical treatment of data and understanding accuracy, particularly, of photograph data.
- Determine proper data interval for indicated resources by statistical treatment, .considering values such as expected value and degree of confidence.

Supplemental data collection in the High Abundances Area by box corer and taking seafloor photograph.

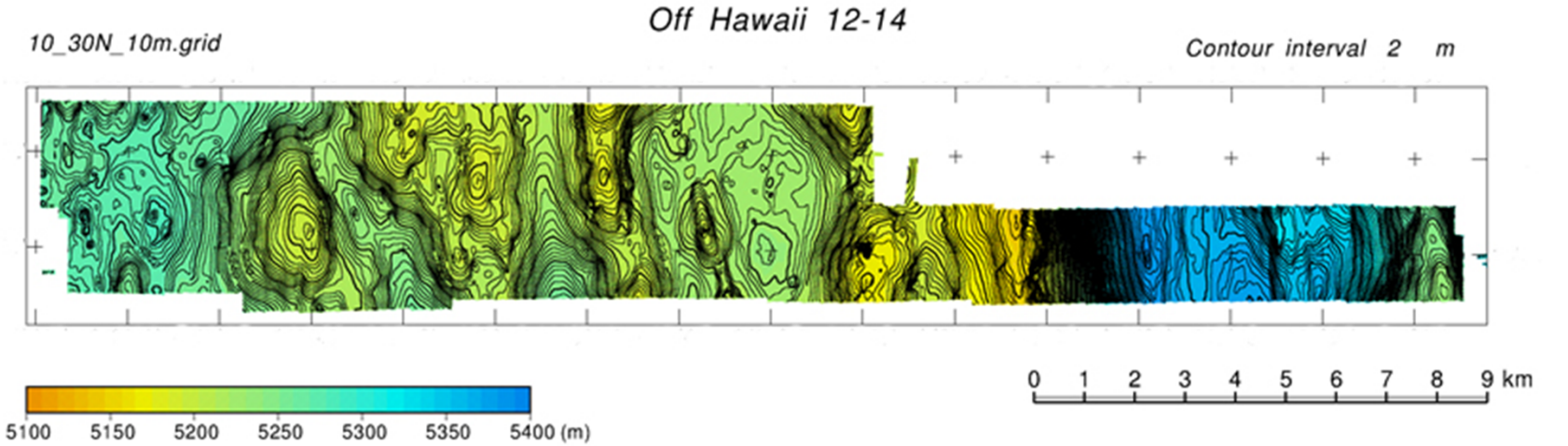
Model Area

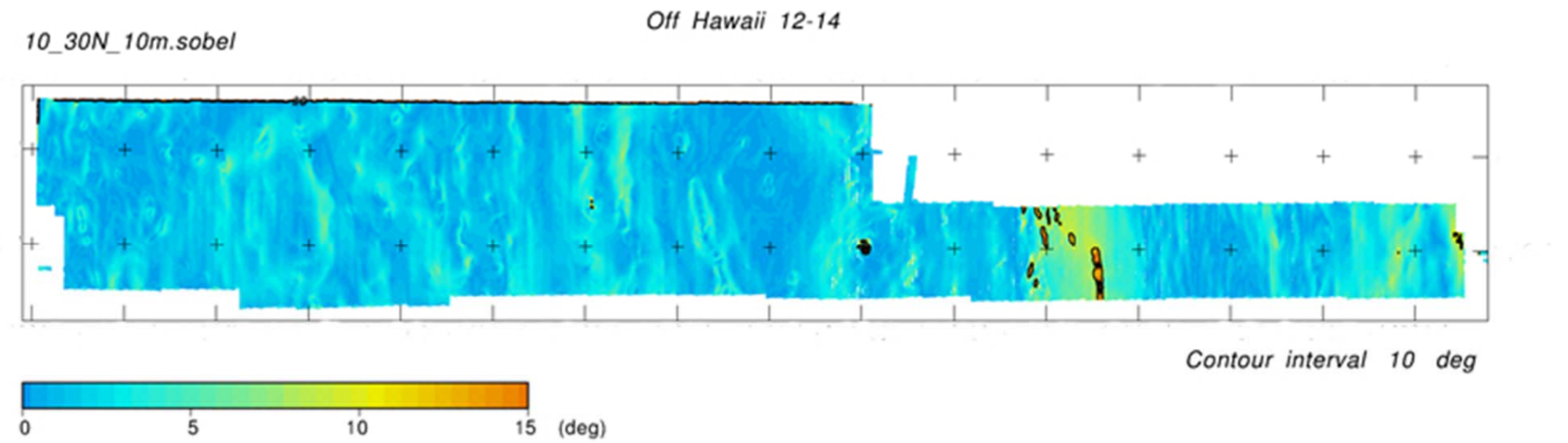


Approximately 80km^2 is covered at present

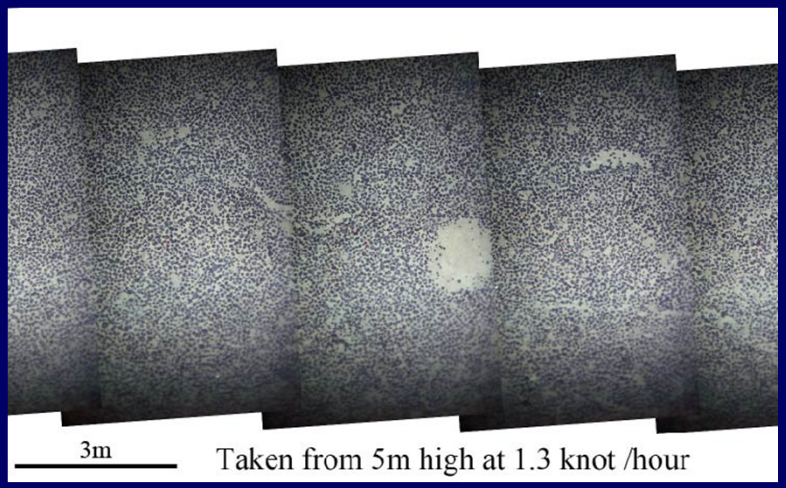


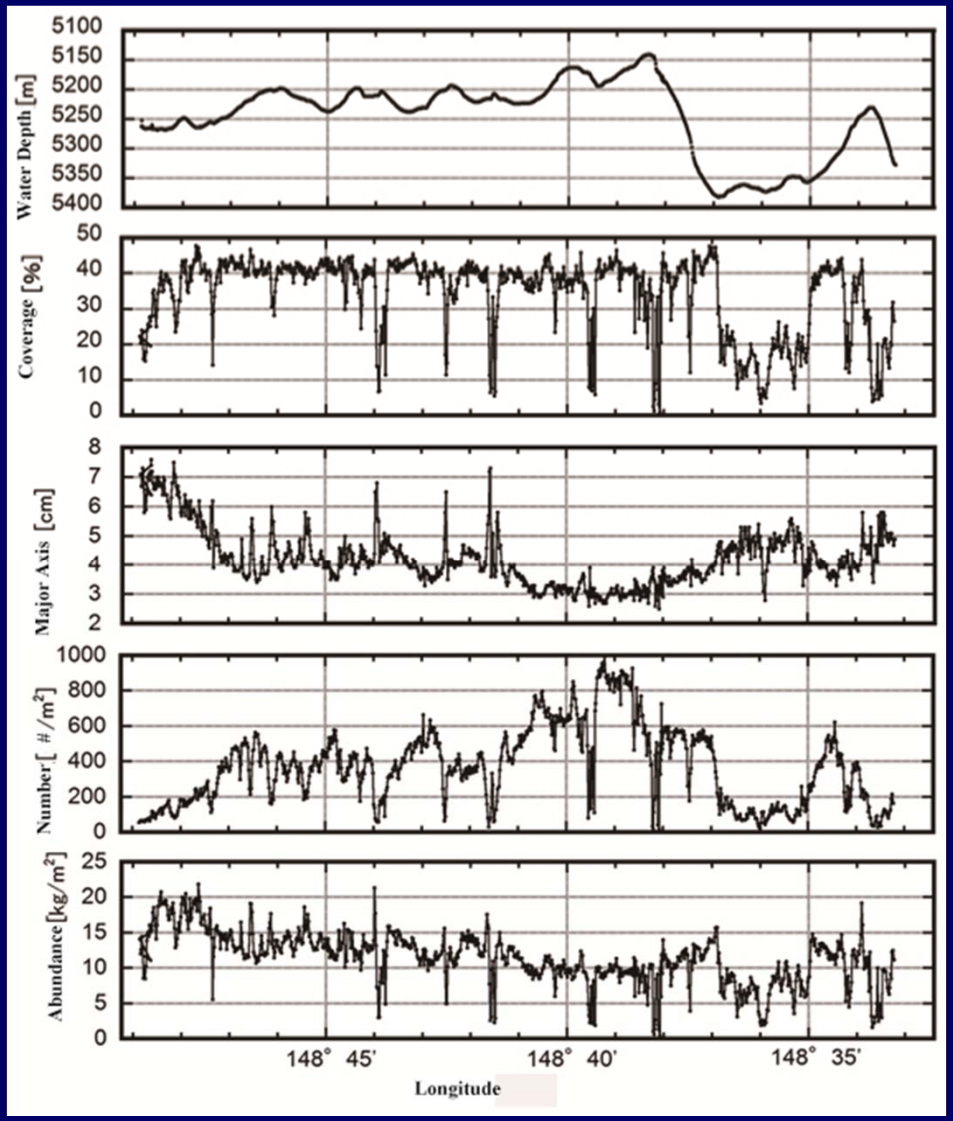
Bathymetrical map and Slope gradient



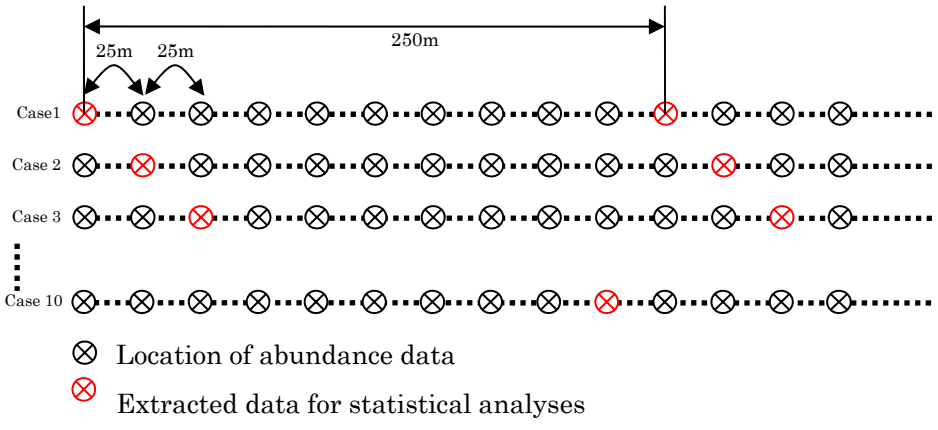


Topography and nodule distribution





Data Extraction Test



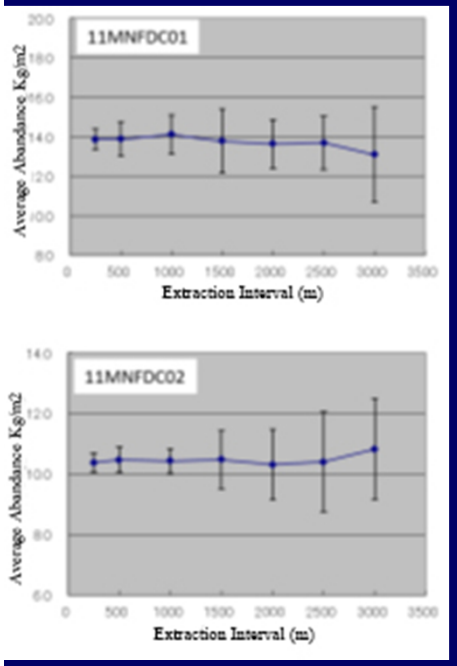
Example of 250m interval extraction

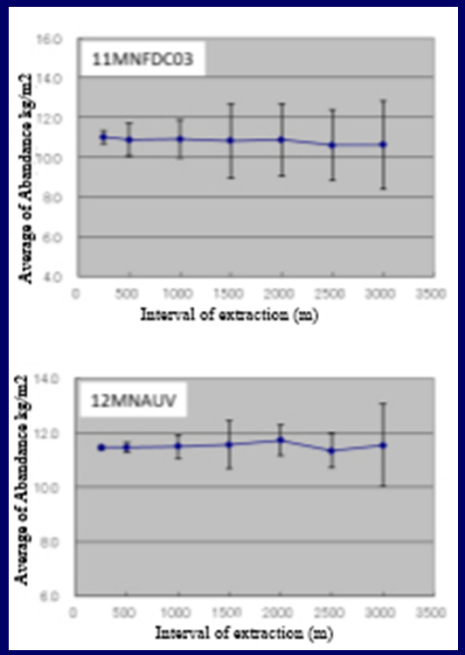
Data interval and degree of confidence

1. Obtaining statistical values of abundance for a whole survey line.
2. Extracting abundance data at constant interval and obtain average of them. Repeating this by shifting extracting location one by one for 10 times.
3. Comparing obtained average and average of a whole data --- should be with confidence interval of 95%

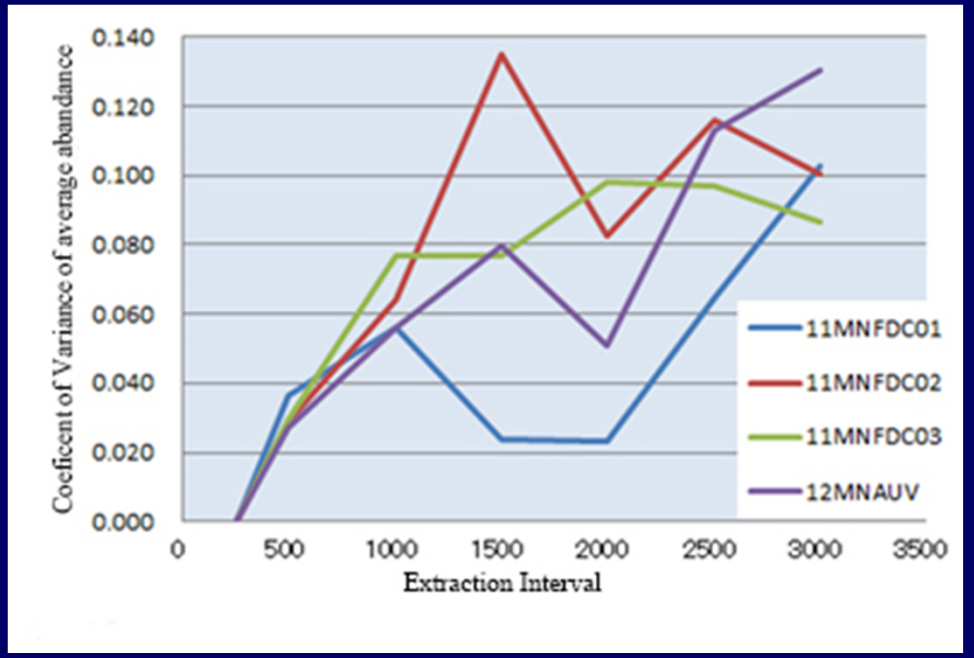
Considered intervals :250m,500m,,1,000m, 1,500m, 2,000m, 2,500m, 3,000m

High abundance Area





Average abundance and extraction interval



Coefficient of variance and extraction interval

Average and coefficient of variance spread widely at extraction interval more than 1,500m.
It suggests that data interval should be less than1,500m.

For increasing accuracy of mineral resources

Statistical treatment of data and understanding accuracy, particularly, of photograph data.

-Accuracy of locations of the old sampling must be qualified
FG, CDC, Box Corer

-Accuracy of photograph data
Data obtained by image analysis, such as coverage, major axis, number of nodule
Empirical equation for obtaining abundance must be improved depending on type of nodule---------- more sampling by box corer is necessary.

-Understanding the distribution pattern and its continuity of nodule by statistical treatment (less than 1.5km ?)

Deciding interval of infill data collection for box corer sampling and photograph taking.

Conclusions

Mineral resources we have now is more than inferred category, but seems to be not accurate enough for indicated category.

-Statistical treatment of data is necessary to decide criteria of indicated category. -------From data of previously collected and the Model Area

-Infill data collection by box corer and photograph taking are necessary.