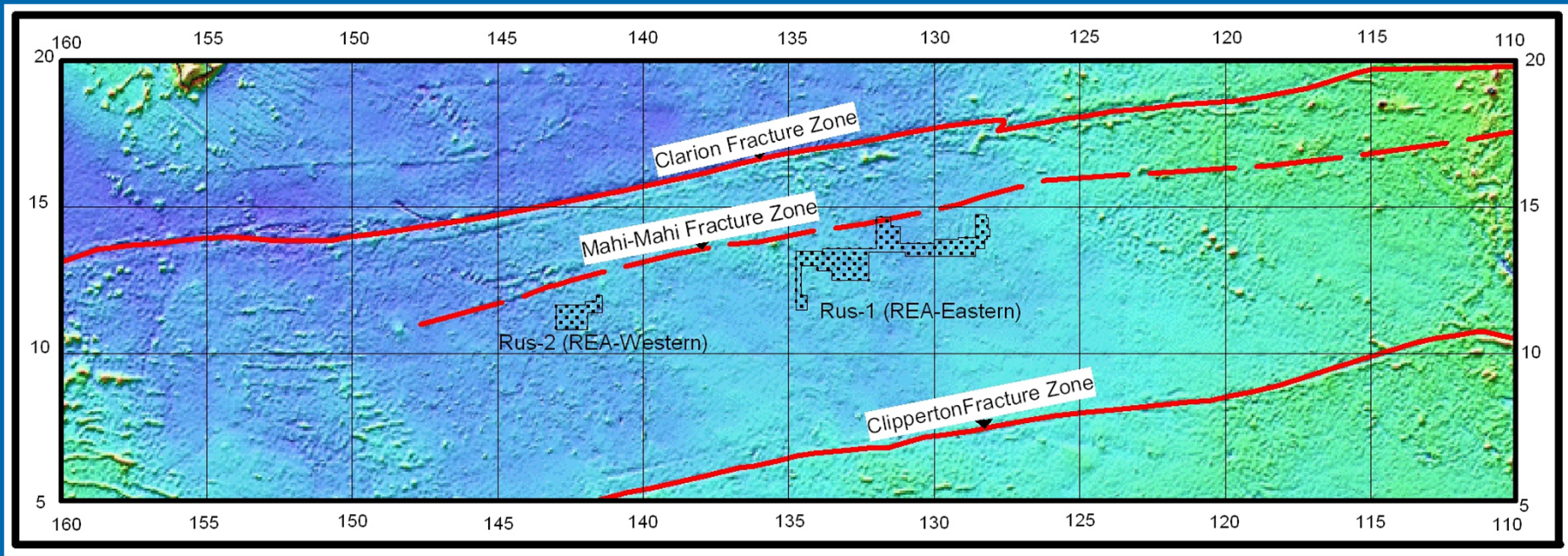




The Concept of the Russian Exploration Area Polymetallic Nodules resource and reserve categorization

State Scientific Center Yuzhmorgeologia, Russia

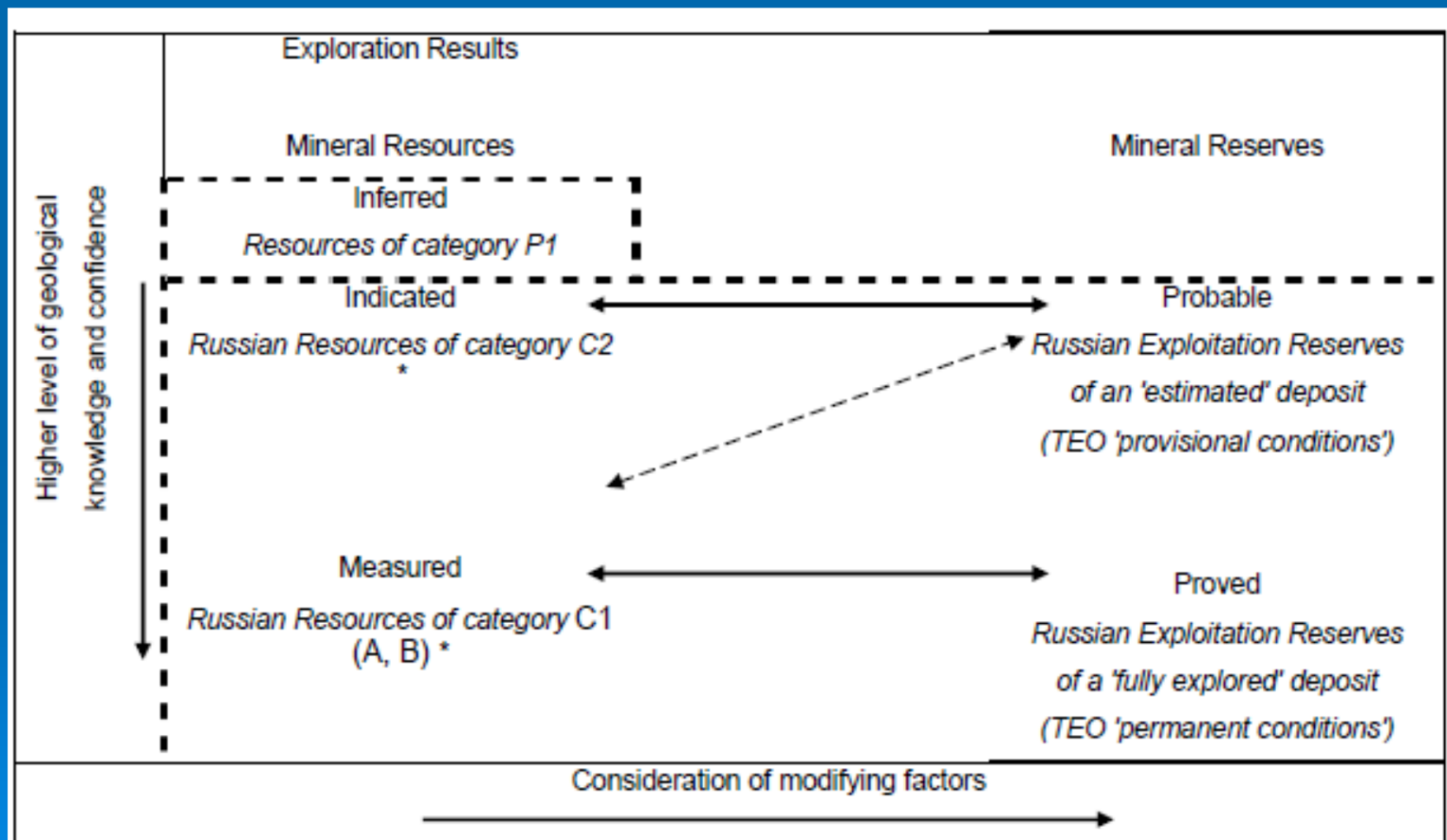




The Russian Exploration Area (REA), which is 75,000 km², incorporates two territories: an Eastern territory (61,200 km²) and a Western territory (13,800 km²). The cumulative resources of the polymetallic nodules within the REA (as dry mass) are assessed as being 448 million tones. The average concentrations of commercially valuable components in the nodule ore of the REA add up to (%): nickel – 1.39; copper – 1.1; cobalt – 0.23; manganese - 29.3



The Contractor SSC Yuzhmorgeologiya used as a basis for assessment of the resources and reserves of polymetallic nodules of the Russian exploration area a Russian classification of mineral reserves and resources, developed by a competent organization - State Commission on Mineral Reserves of the Russian Federal Government Agency. I will not go into detail about the classification, but will try to demonstrate how it is interrelated to a widely-known CRIRSCO Template.



3 A partial mapping of the Russian and CRIRSCO classifications (for the complete mapping see Figure 4. Ple

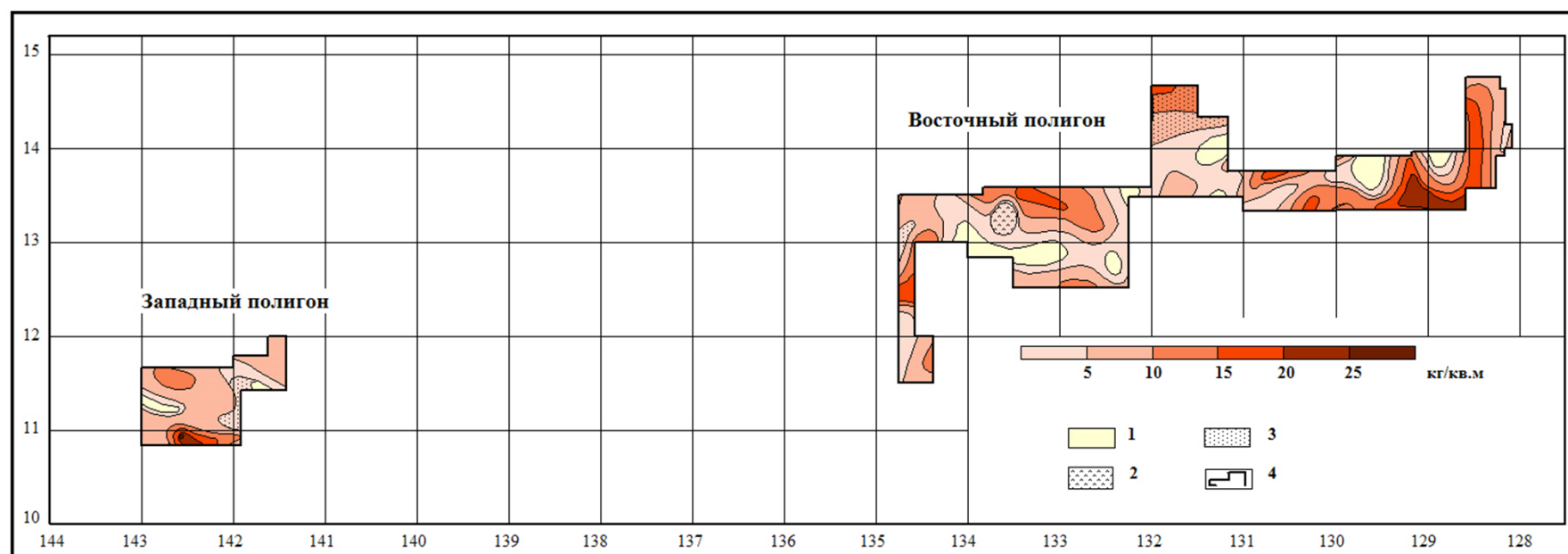


Categories of resources and reserves of hard minerals that are stipulated by the Russian classification and applied by us to polymetallic nodules are related to the categories of CRIRSCO Template in the following way:

Categories of the Russian classification	Categories in the CRIRSCO Template
Prognostic Resources of category P_1	Inferred Resources
<i>Russian Resources</i> of category C_2	Indicated Resources
<i>Russian Resources</i> of category C_1	Measured Resources



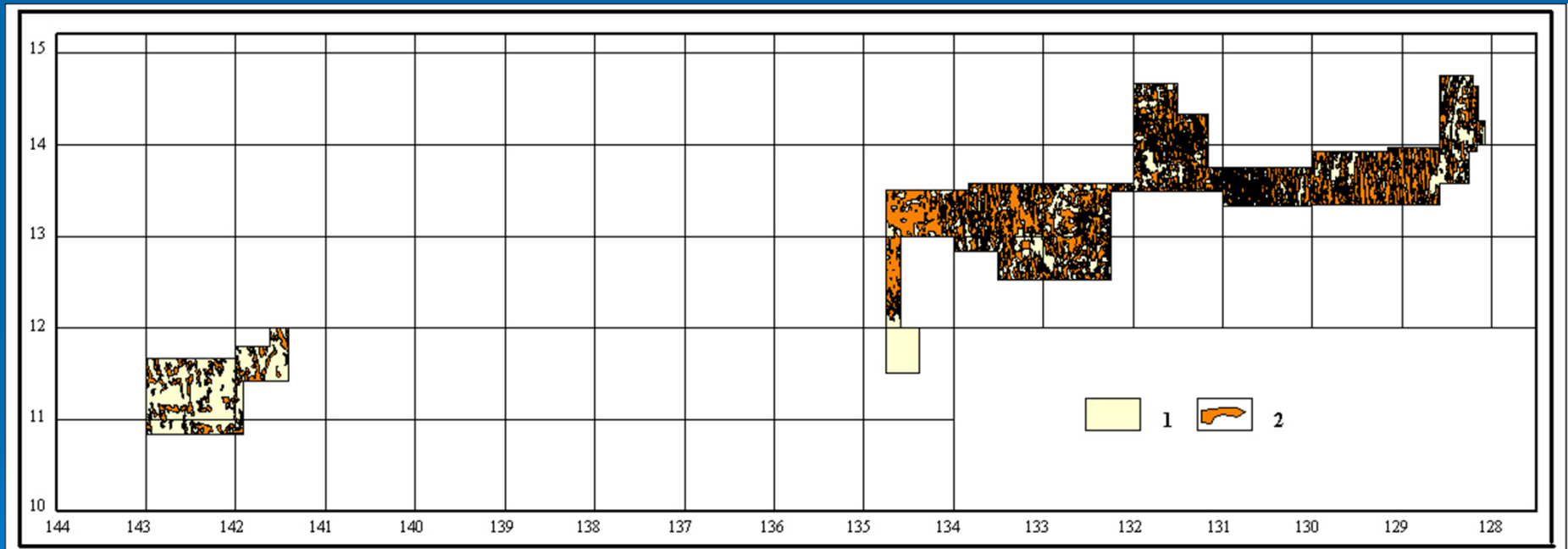
Before the exploration, provided in the Exploration Plan for REA, we supposed that a task of upgrading to better categories of provisionally Inferred Resources of polymetallic nodules, assessed at submitting to the Authority our application that was based upon the results of sampling along a relatively spaced grid of 50 x 50 km, would not be too difficult. This opinion was based on the concept of a simple pattern of spatial distribution of nodules comprising some relatively large accumulations of tens of thousands square kilometers on the bottom surface.



It was assumed that for the assessment of such accumulations of reserves with regard to category C₂ (Indicated Resources) it will be sufficient to perform sampling along a condensed grid and then to specify statistically average values of their tonnage and grade.



However, upon the results of a period of more detailed surveys it became obvious that individual accumulations or, as we called them, ore deposits of polymetallic nodules happened to be substantially smaller and much more numerous than expected. Thus, according to our estimates, a number of ore deposits within the RAE is about 300. The area of about half of them is less than 50 km², and the largest deposit is about 4000 km².



1 – ore-free zones; 2 – ore deposits



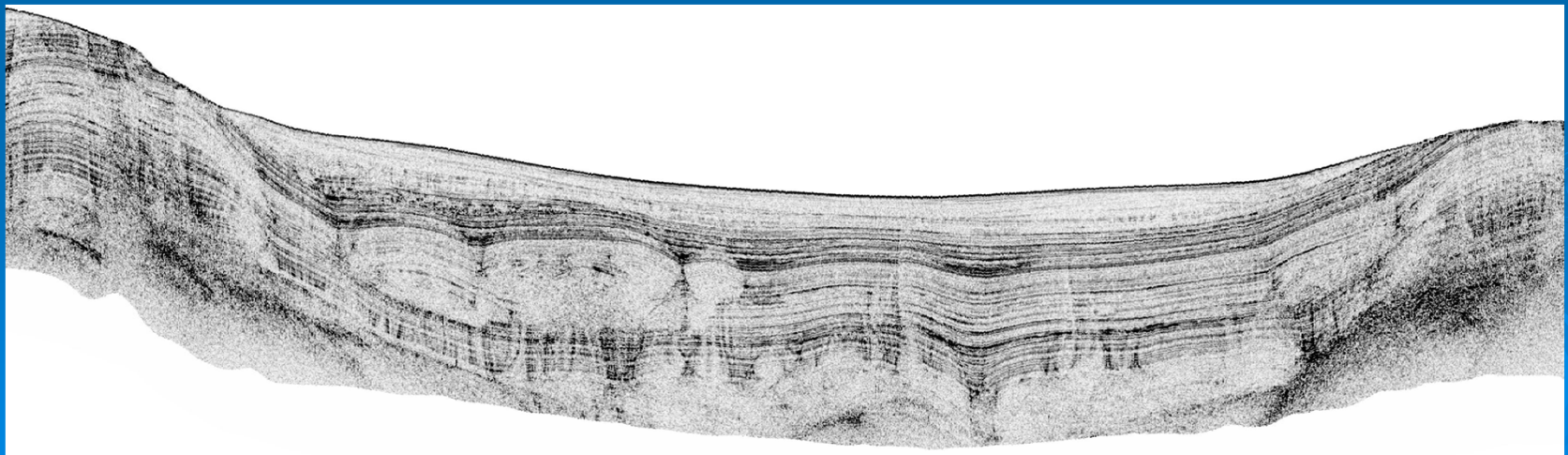
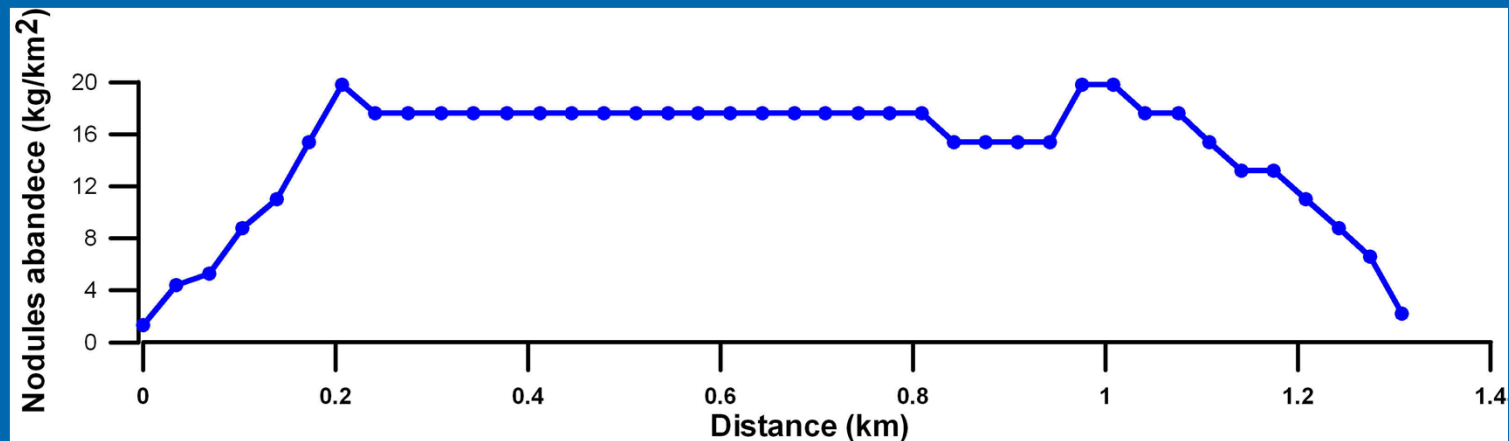
The provided example of a thoroughly studied fragments of the RAE showing a typical sinuous form, small size of ore deposits and boundaries confined to steep slopes and trenches demonstrates necessity of taking into account of such aspects at the assessment of reserves of polymetallic nodules with regard to category C₂ (Indicated Resources). It is clear that such reserves should be considered as a sum of reserves of only those deposits, whose tonnage and grade are prospective for future exploration.



1 – ore deposits ; 2, 3 – ore-free zones, connected with:
2 – zones of flattened bottom relief, 3 – with zones of steep slopes



At the moment Yuzhmorgeologiya is solving this task. Demarcation of deposits is carried out based on photo, video and acoustic surveys along the sub-lattitudinal lines with 3 – 6 km spacing. Sampling grid covering each deposit is regular with 1 sample per 36 km². Acquired practices of classification of ore deposits showed, that within those deposits that satisfy the above requirements, the abundance and grade parameters of polymetallic nodules are quite uniform.



It was discovered that within many of such deposits there are quite abundant zones of so called obstacles for their future development. The most significant obstacles are bottom outcrops of lithified sedimentary and igneous rocks (1, 2), steep slopes and erosive trenches (3), areas of potential slides of unconsolidated sediments (4).



1



2



3

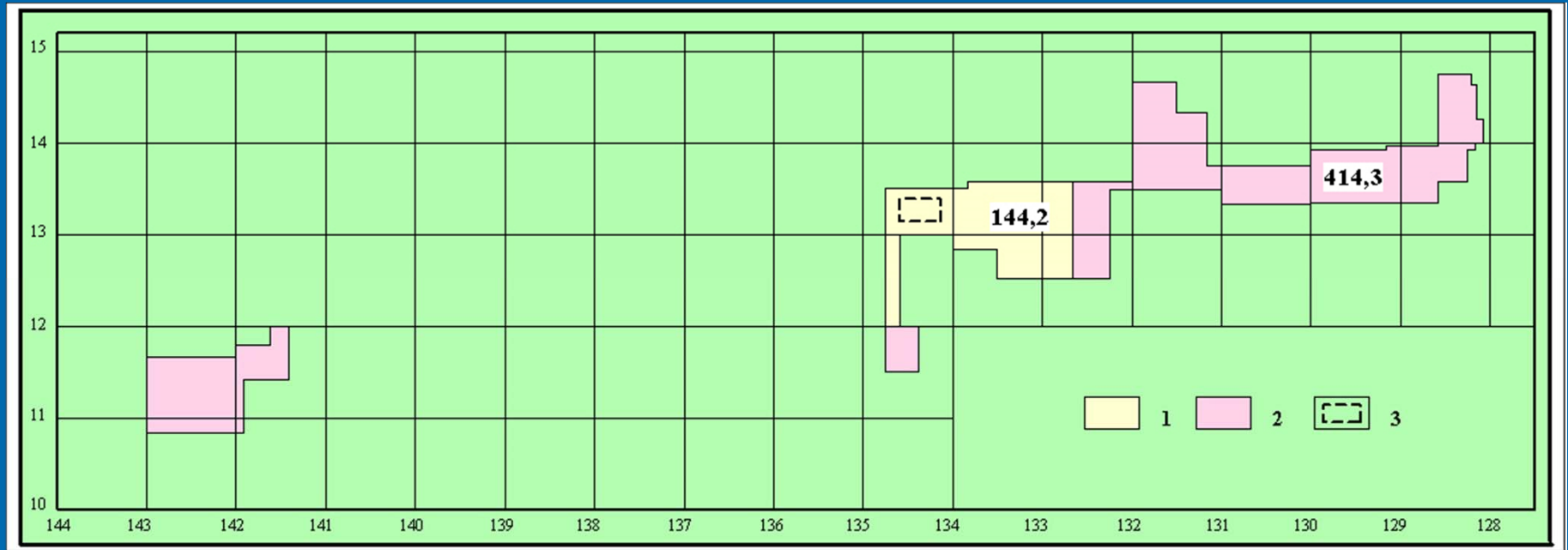


4

That helped us to conclude that at the final stage of the contract activities, along with the specification of tonnage and grade, that are essential for upgrading the resources category from C₂ (Indicated Resources) to the category of C₁ (Measured Resources), the greatest importance belongs to the assessment of such obstacles as a source of potential increasing of hazards at future exploitation of the polymetallic nodules.



This slide illustrates a current situation with the assessment of the resources and reserves of the REA. Pink color (2) shows those REA parts that are studied to a degree that is sufficient for the assessment of the P₁ category resources (Inferred Resources), and yellow (1) of the C₂ category (Indicated Resources). Dashed contour (3) shows a site that was specified for detailed studies required for the assessment of the C₁ category reserves (Measured Resources).



Assessed resources and reserves of the studied areas are: P₁ category (Inferred Resources) – 414.3 and category C₂ category (Indicated Resources) - 144.2 ml t of wet nodules. It is scheduled that by the moment of the Contract completion cumulative polymetallic nodules reserves with regard to C₁ + C₂ categories will reach 180 ml t, including C₁ category of 36 ml t. We qualify such reserves as sufficient for future mining enterprises processing 3 million tones of dry (4.3 ml t of wet) of polymetallic nodules per year in the course of 20-year and the first 5-year period of the mining contract respectively.



Thank you, very much!

