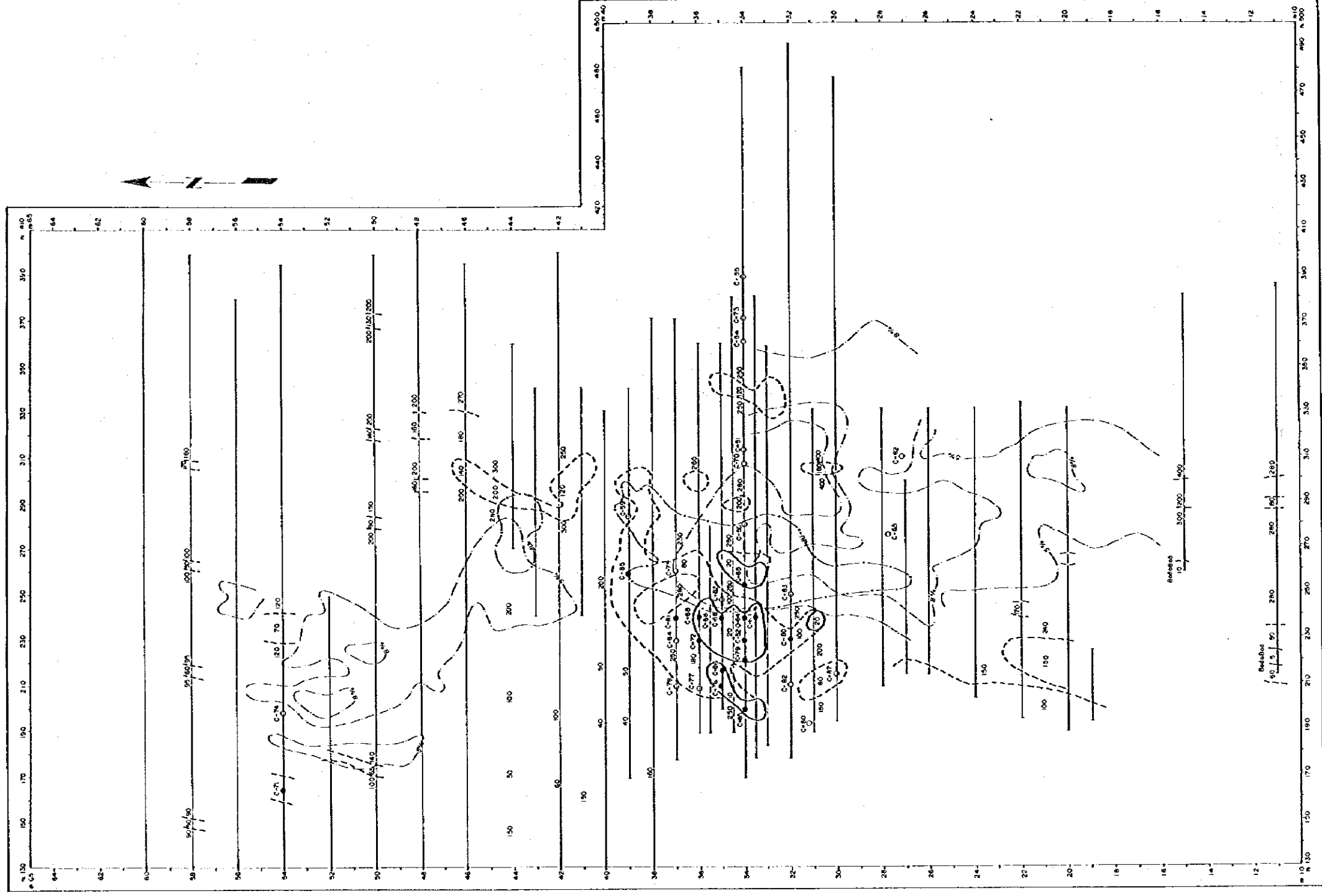


# The Result of Electric Surveys in the Samarsky Area (Scale 1:10,000)



## LEGEND








-  The Anomaly of SP ( Spontaneous Potential ) Method, (mV), data in 1962
-  The Anomaly of IP ( Induced Polarization ) Method, (%), data in 1972
-  The Electrical Conductive Zone from a Well Logging
-  The Conductive Anomaly of IP Method
-  Profiles of Electric Survey
-  Boreholes of Exploration drilling
-  Ore and Ore-free

Plate III-2-2-3 The Result of Electric Surveys in the Samarsky Area (Scale 1:10,000)

Originally Prepared by Central Research Geophysical Expedition

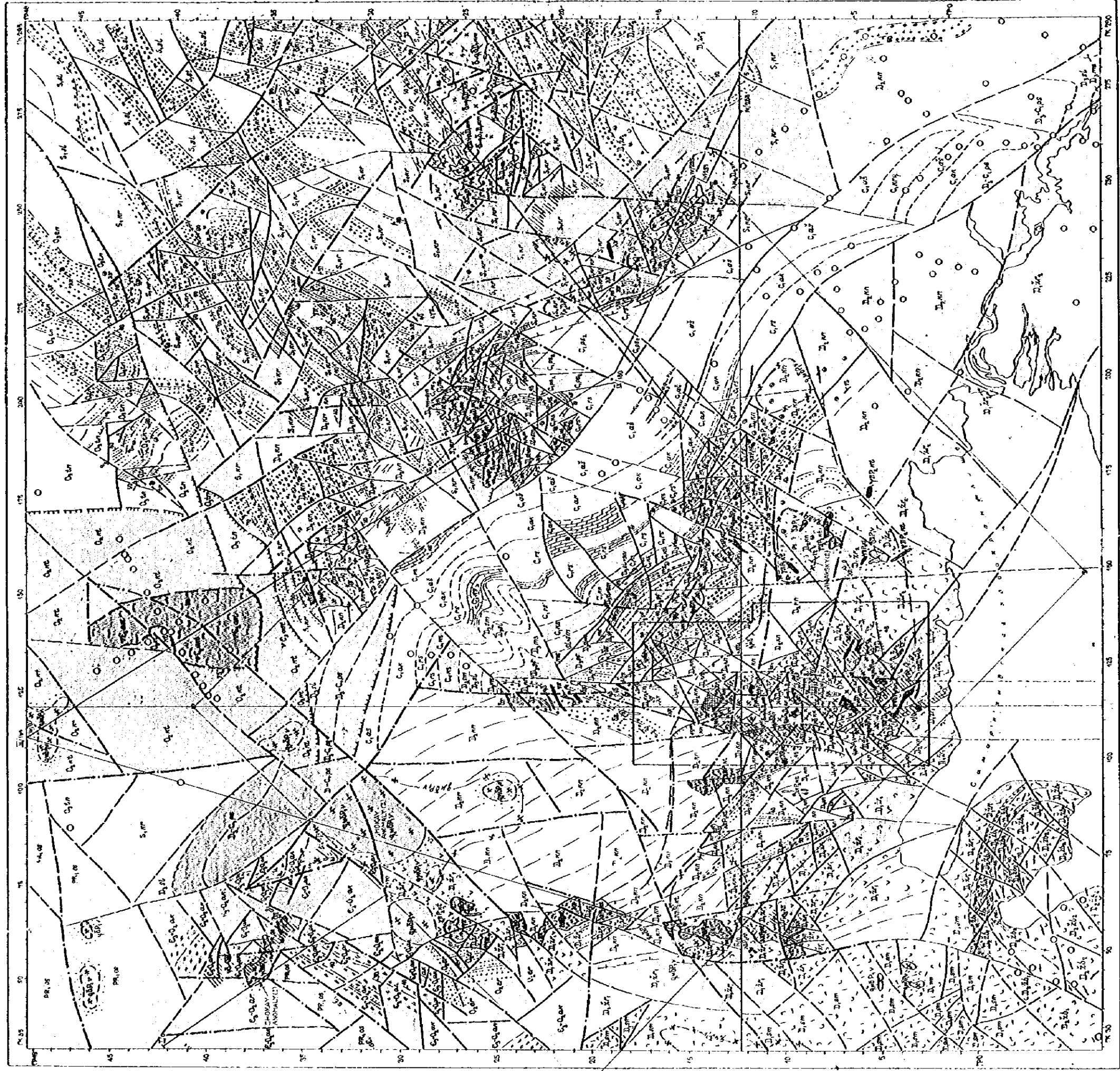


СХЕМА ДЕКРИПТАЦИИ АННОТОВ

|   |    |   |   |
|---|----|---|---|
| A | 1  | A | B |
| B | 2  | B | B |
| C | 3  | C | C |
| D | 4  | D | D |
| E | 5  | E | E |
| F | 6  | F | F |
| G | 7  | G | G |
| H | 8  | H | H |
| I | 9  | I | I |
| J | 10 | J | J |

Начальная обобщенная ст. приращение лист:

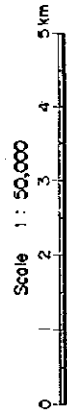
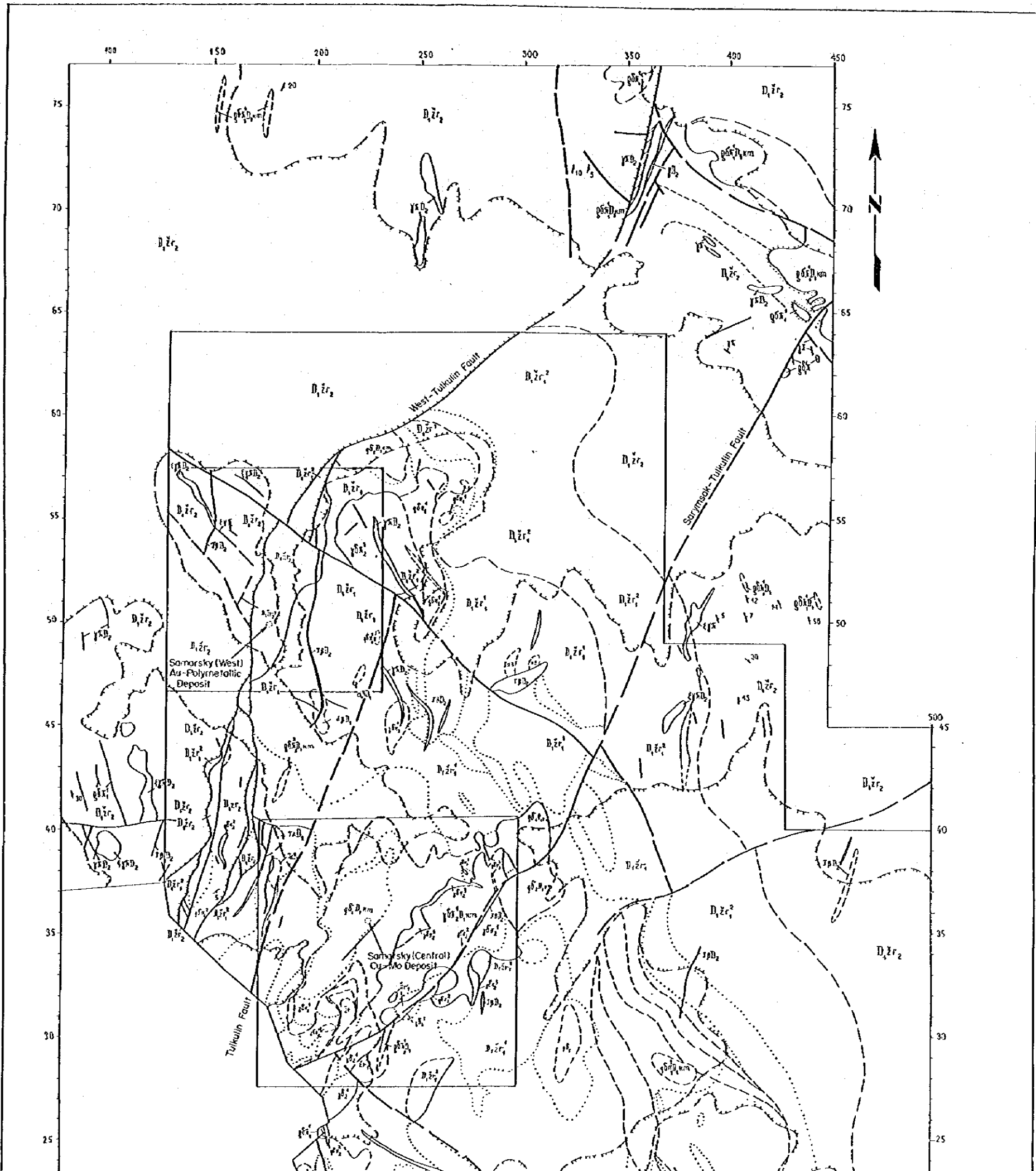
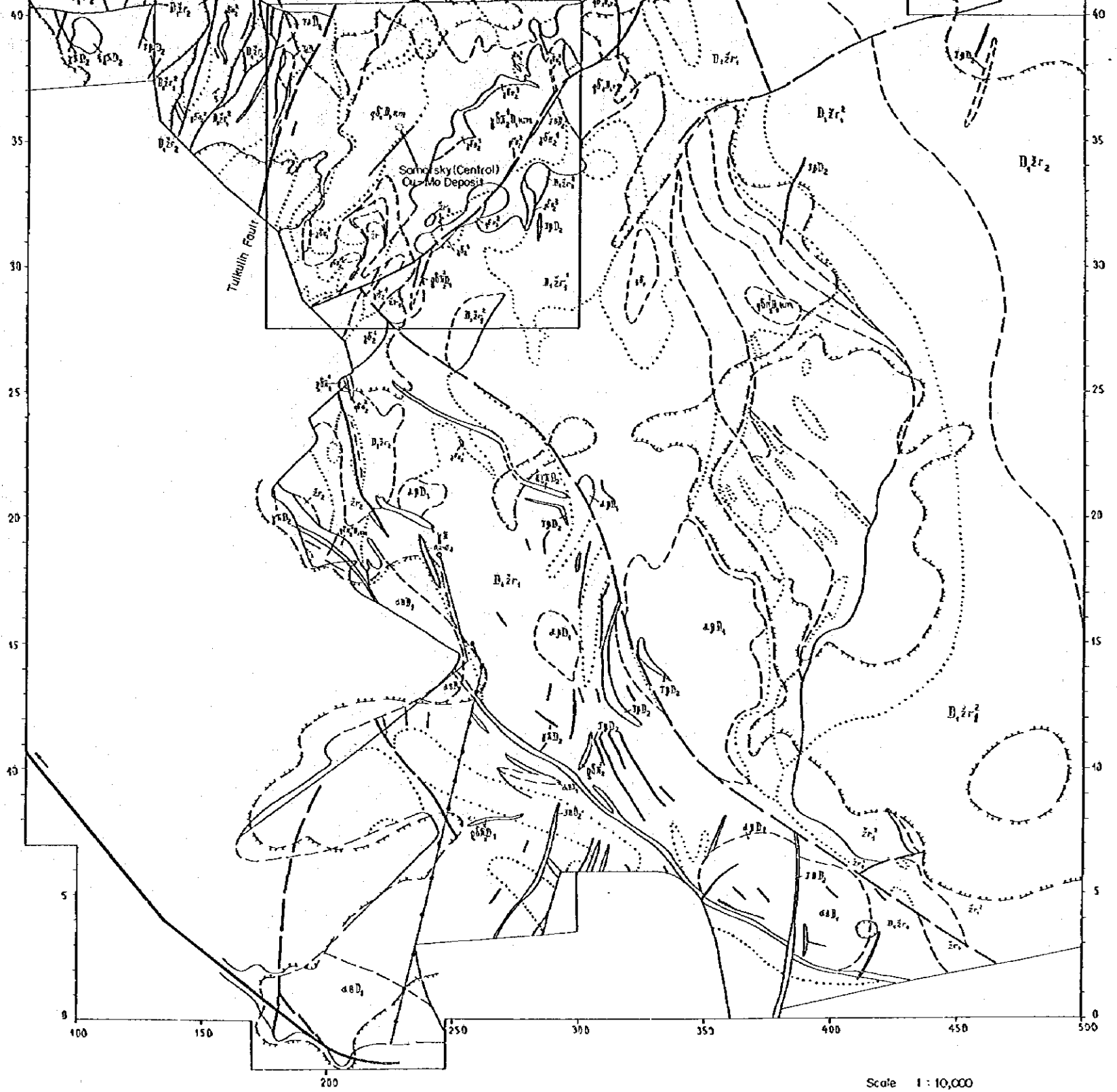


Plate III-2-3-1 Geological Map in the Samarsky Area (Scale 1:50,000)

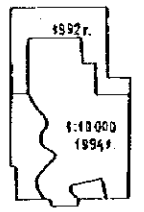
Originally prepared by General Prospecting Survey Expedition, 1994

|   |  |
|---|--|
| Геологическая карта<br>территории<br>Самарской области<br>(с. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100) | Проект о геологической разведке территории<br>Самарской области<br>(с. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100) |
| Приложение<br>лист 2  | Геологическая карта<br>территории<br>Самарской области<br>(с. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)          |
| Масштаб 1:50000   | Масштаб 1:50000  |
| Составил<br>И. П. Павлова   | Составил<br>И. П. Павлова  |





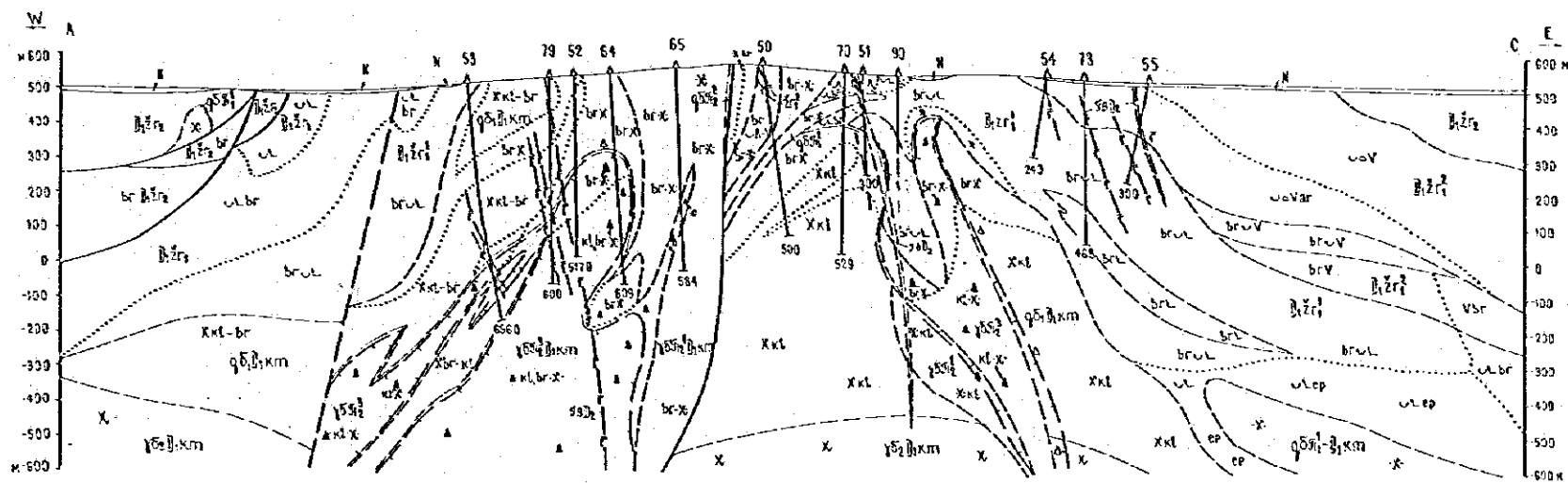
Scale 1 : 10,000  
0 500 1000m



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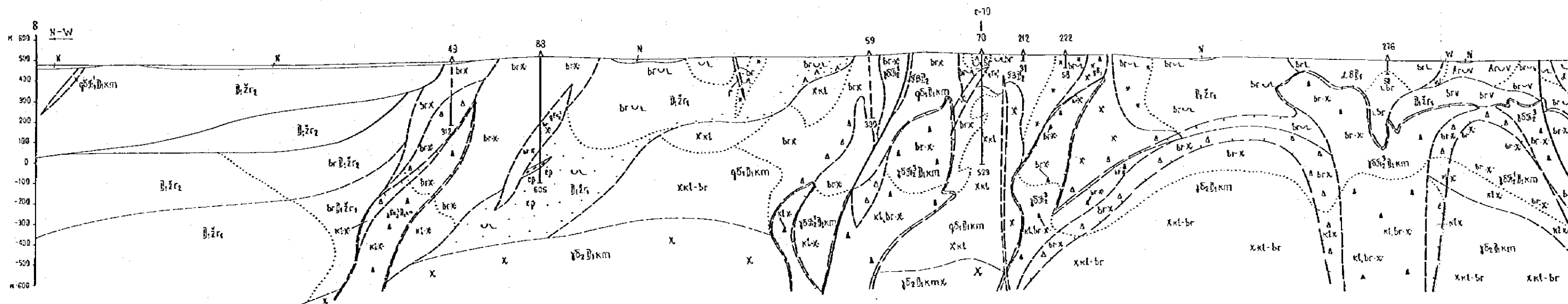
Originally Prepared by Joint Stock Company "Karagandageologia"  
Plate III-2-3-2 Geological Map in the Samarsky Area (Scale 1:10,000)

III-2-3-2



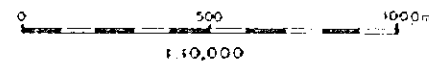
Border of copper ore with Cu content > 65%

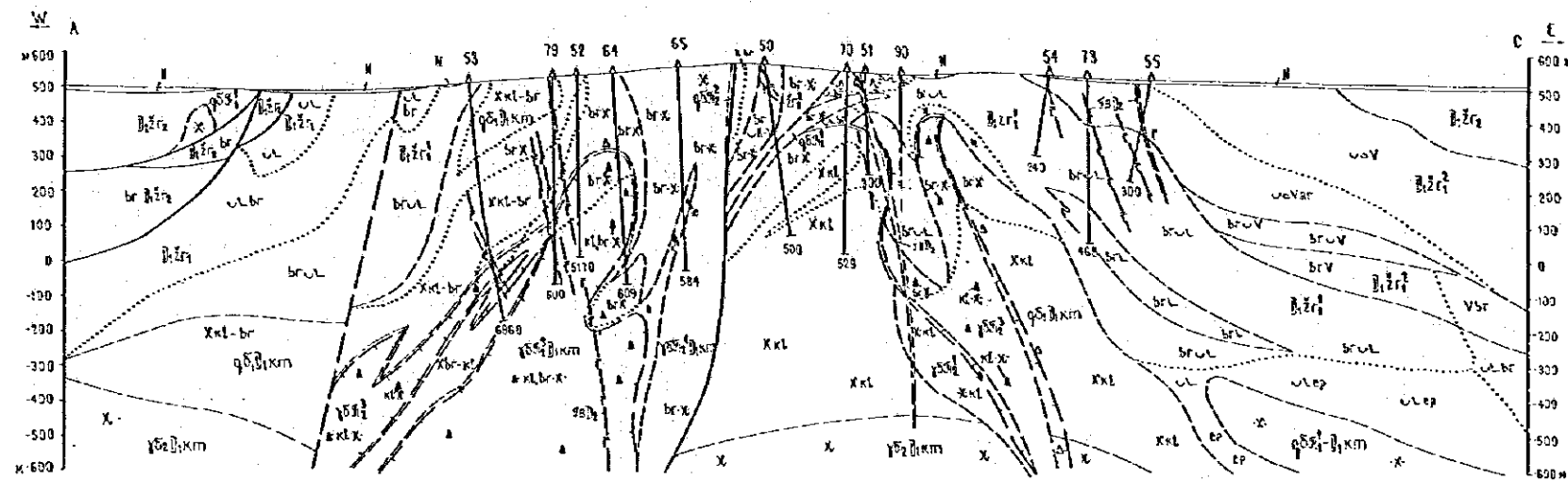
Geological cross-section at line A-B  
Scale 1:10000 - Compiled by Evdokimov IV.




Assumed border of copper ore with Cu content > 65%

Geological cross-section at line N-W  
Scale 1:10000 - Compiled by Evdokimov IV.

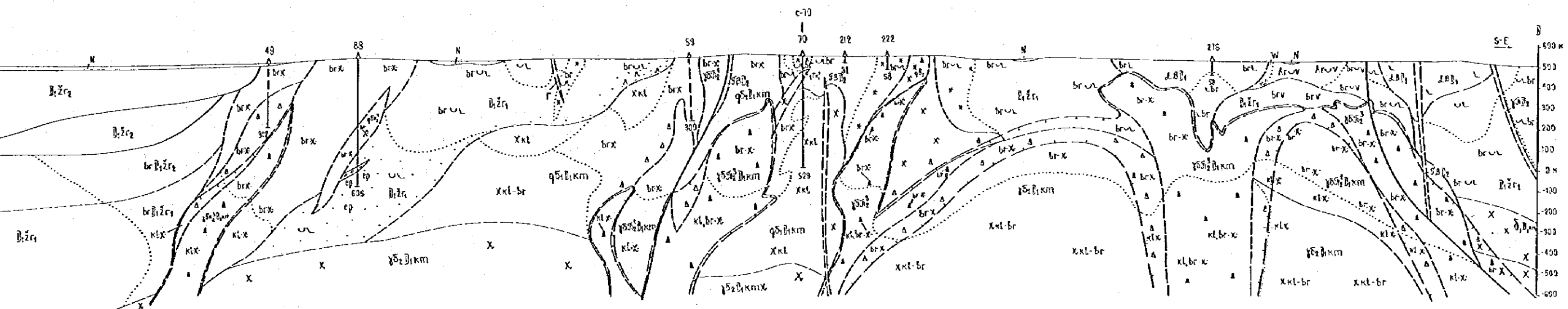




 Border of copper ore with Cu content > 0.5%

Geological cross-section at line A-C

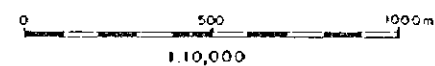
Scale 1:10000 Compiled by Evdokimov IV

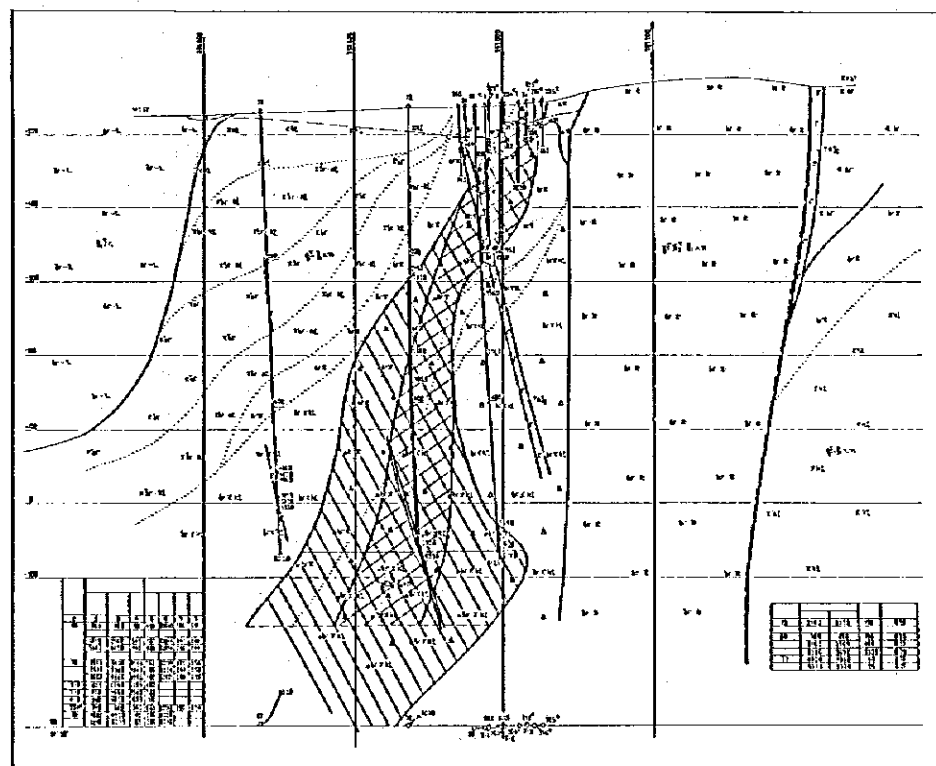
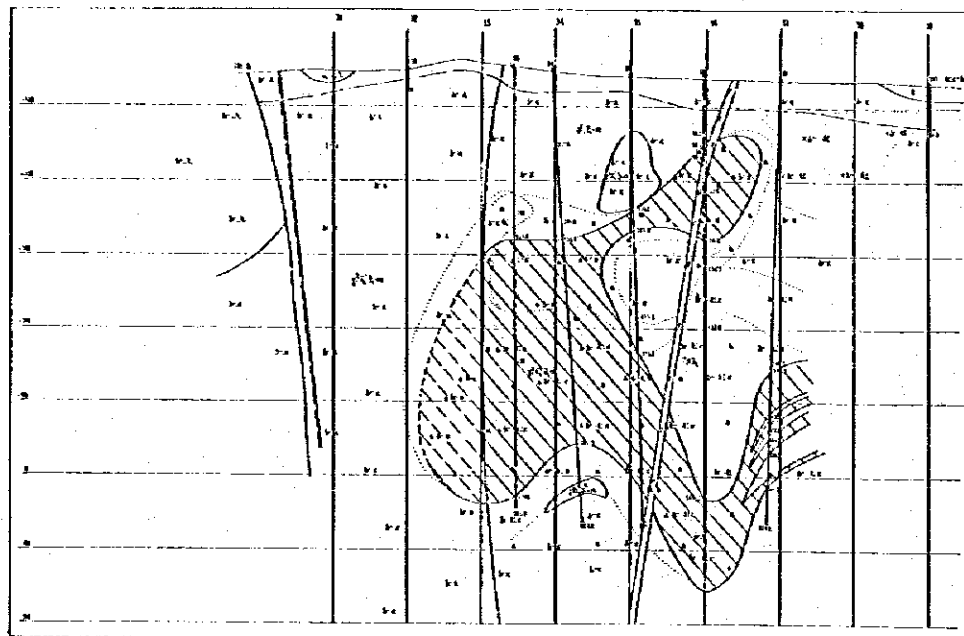


 Assumed border of copper ore with Cu-content > 0.5%

Geological cross-section at line B-C-19-B

Scale 1:10000 Compiled by Evdokimov IV

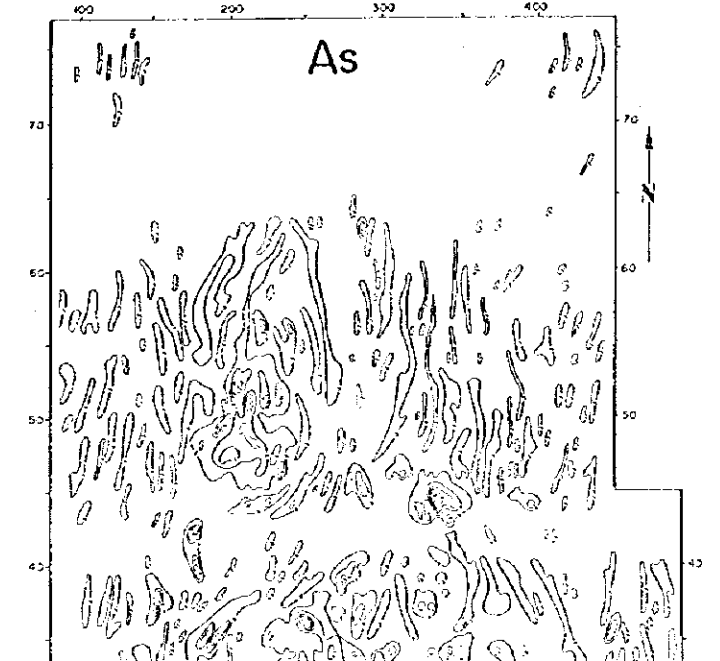
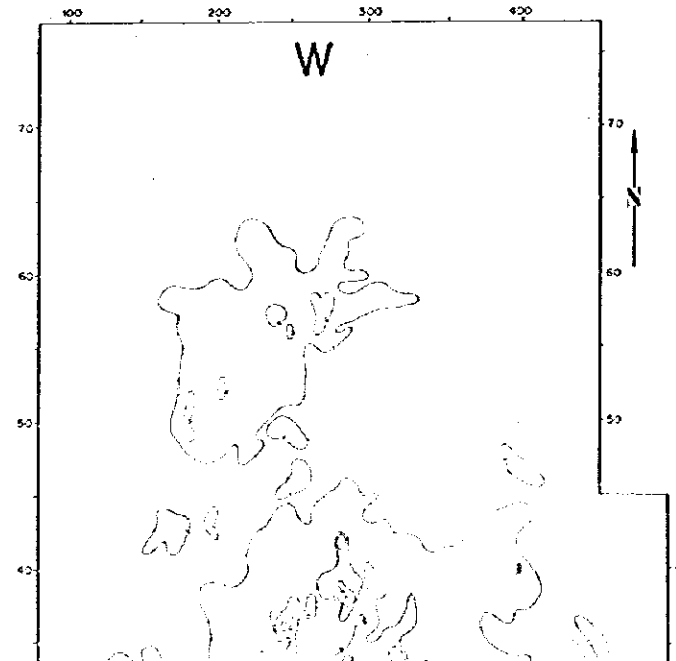
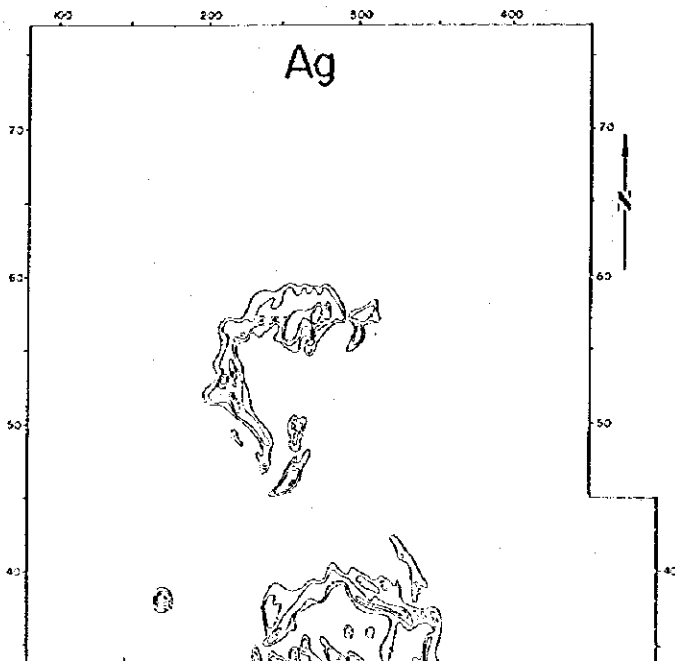
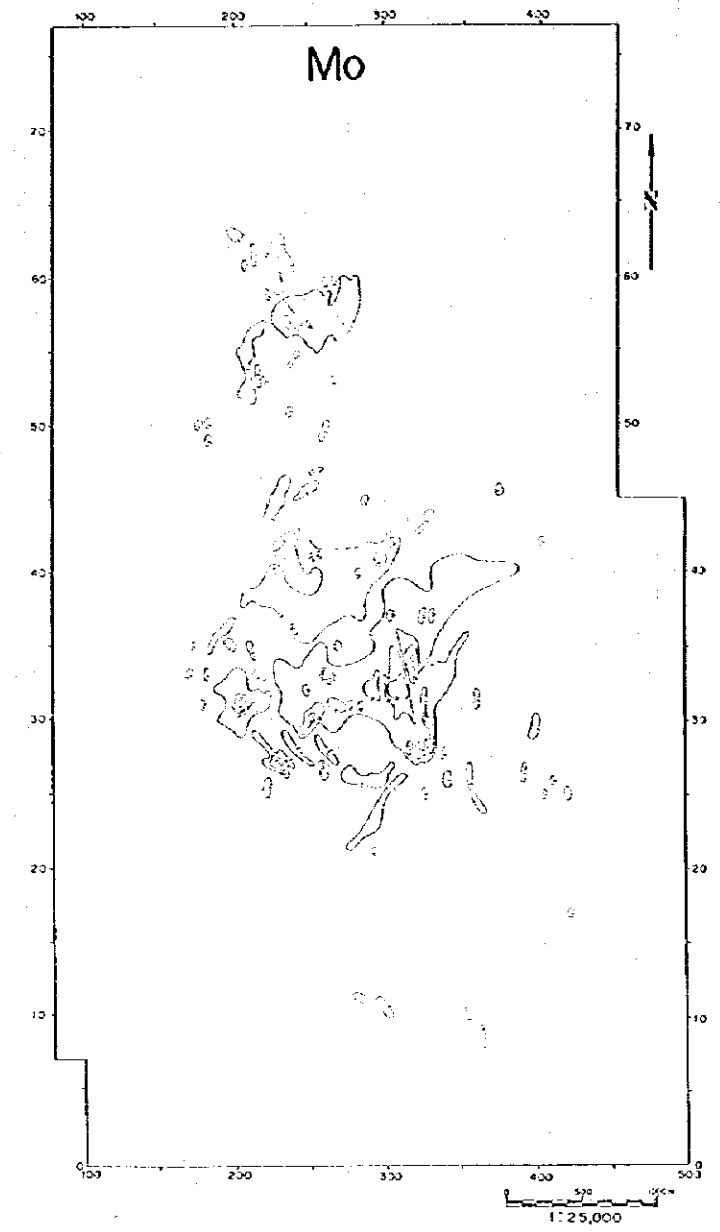
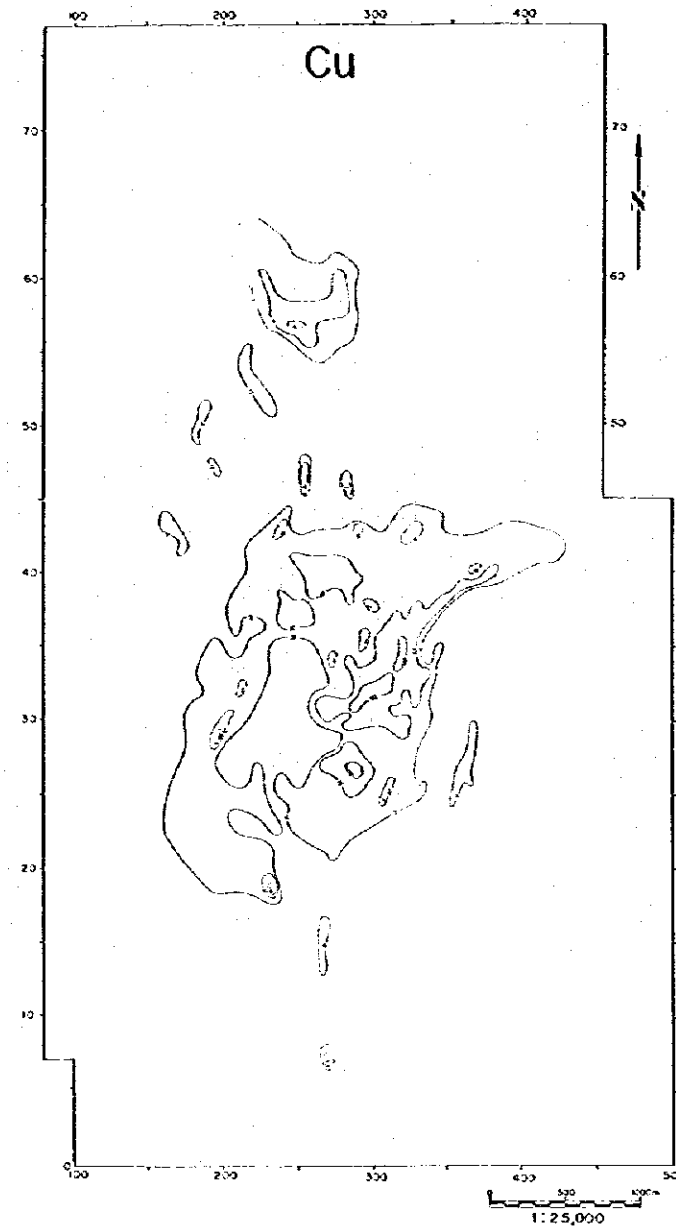
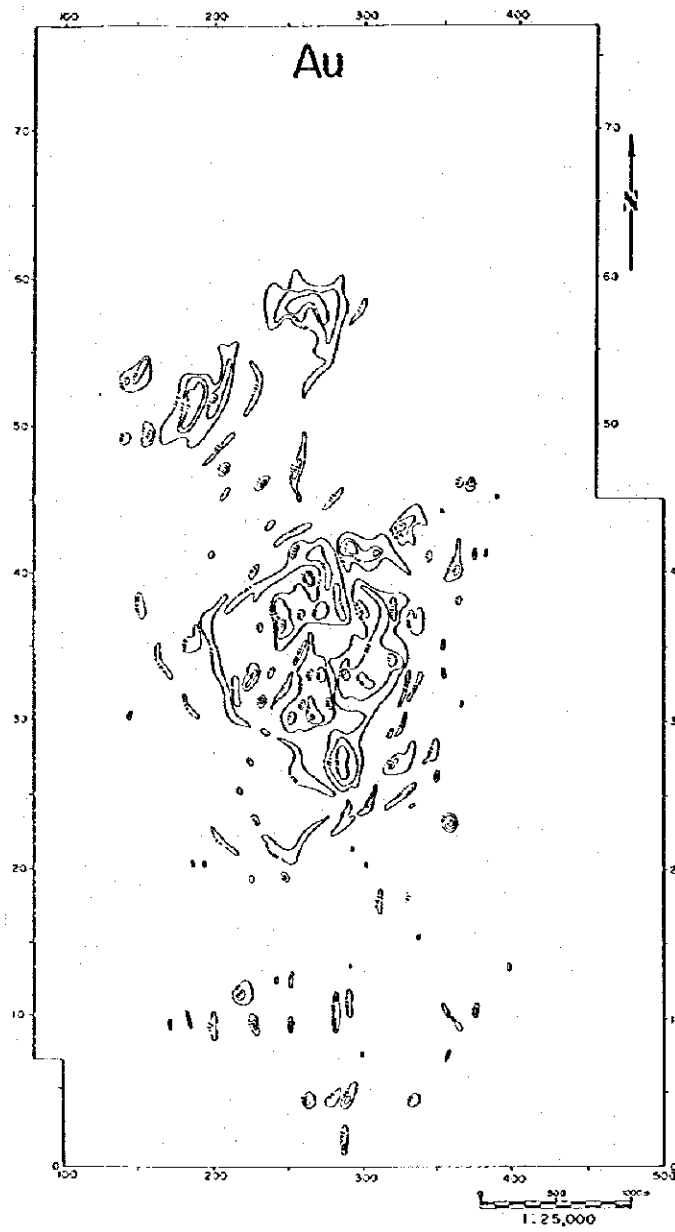




Scale 1 : 5,000  
 0 100 200 300 400 500m

Originally Prepared by Karaganda Geological Exploration Expedition  
 Plate III-2-3-4 Geological Cross-Section along the N-S, and E-W line (Scale 1:5,000)

10101010





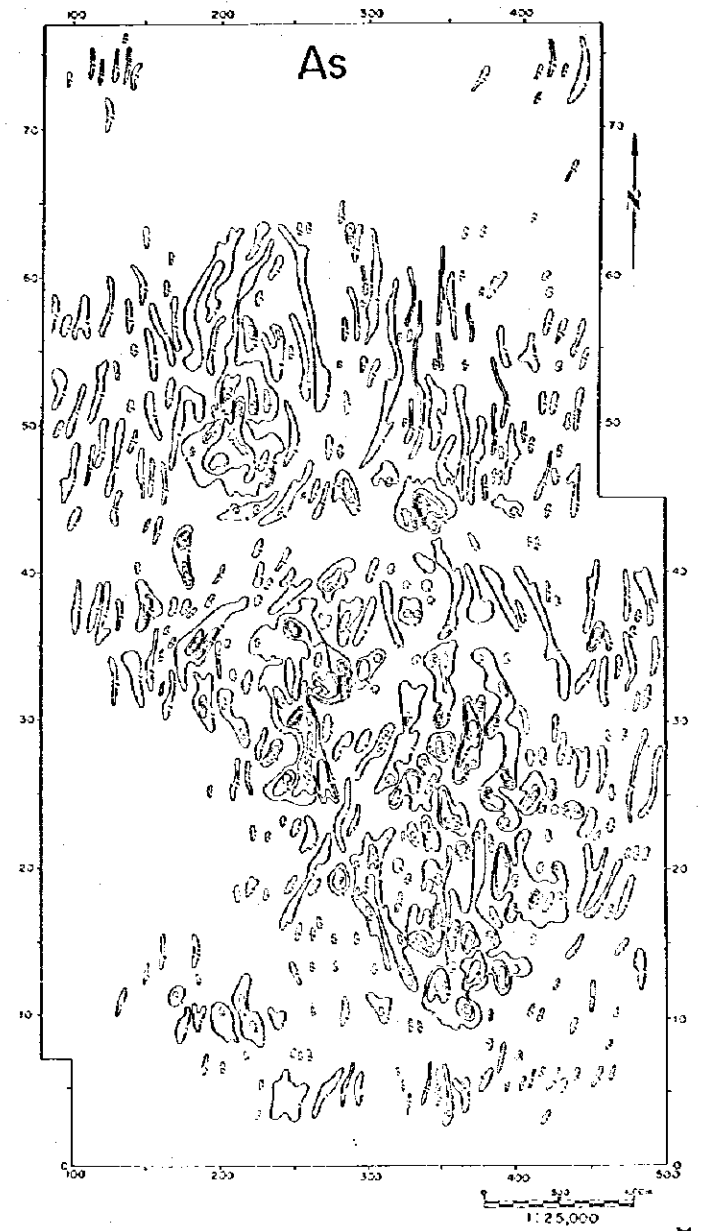
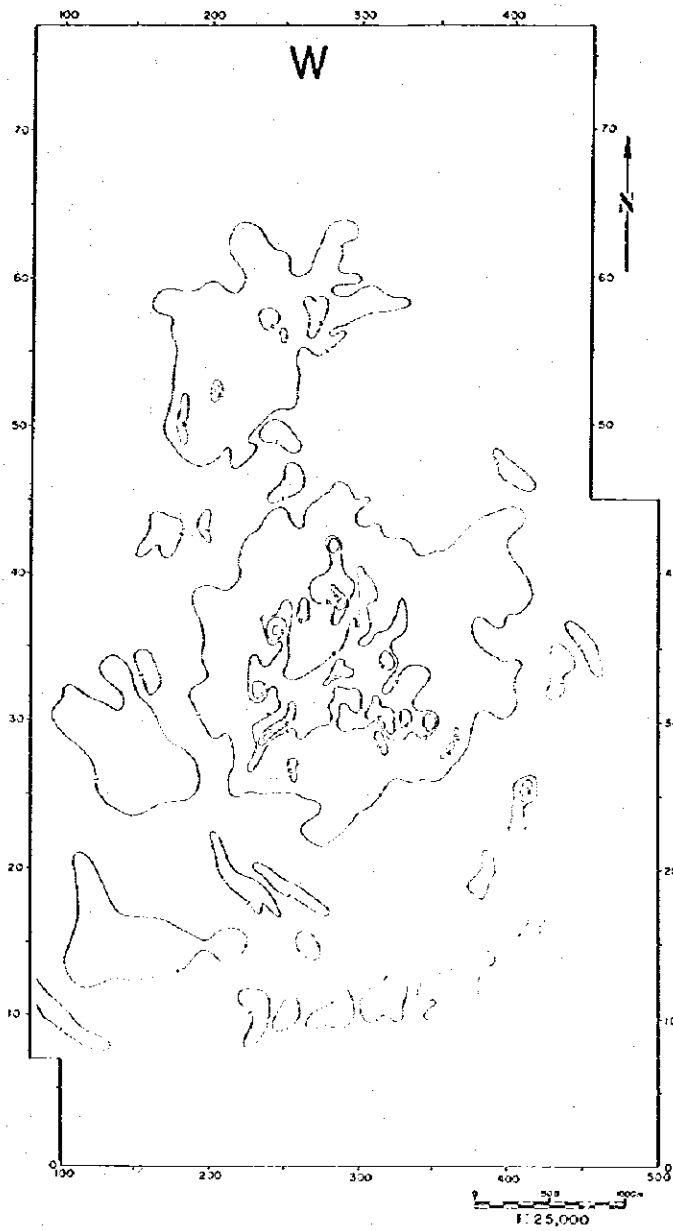
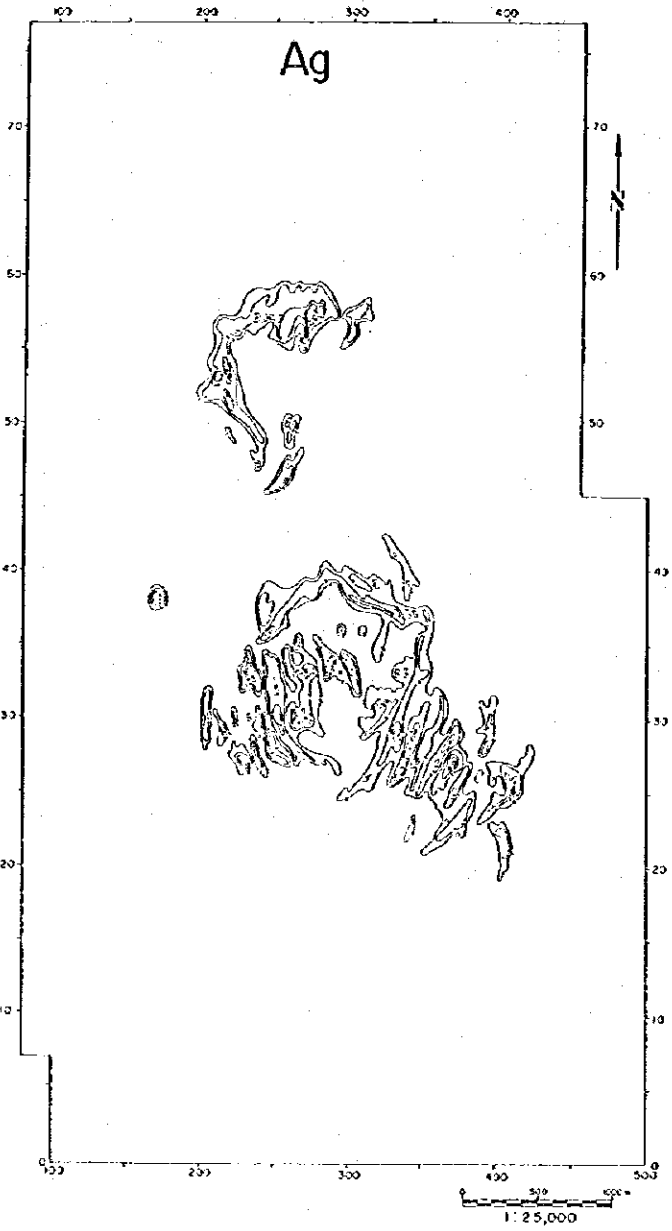
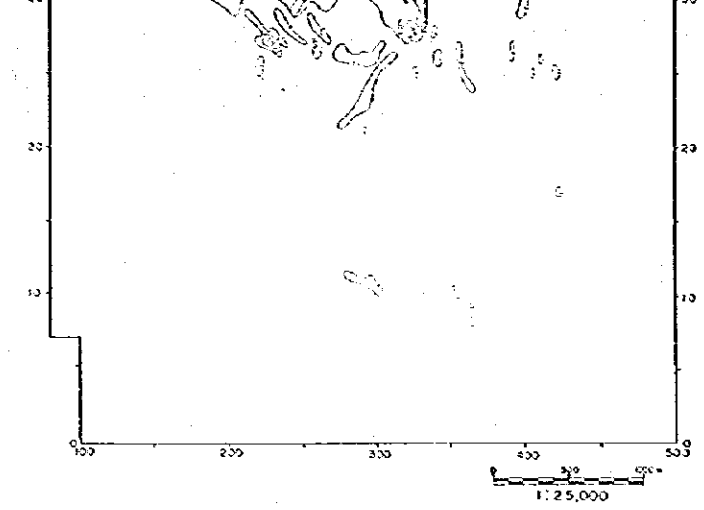
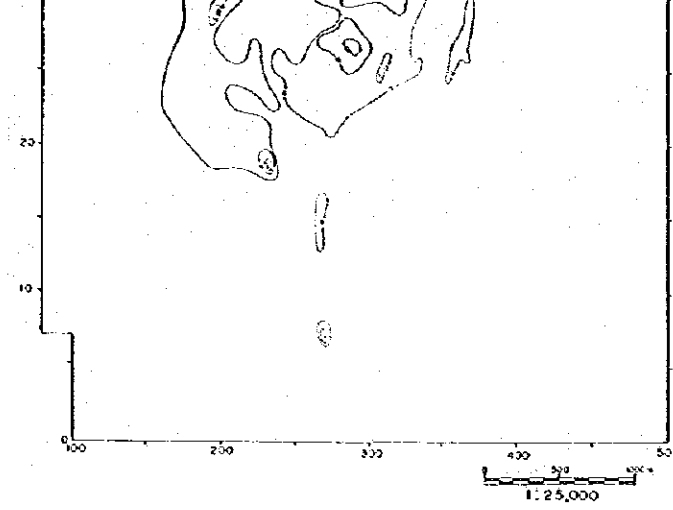
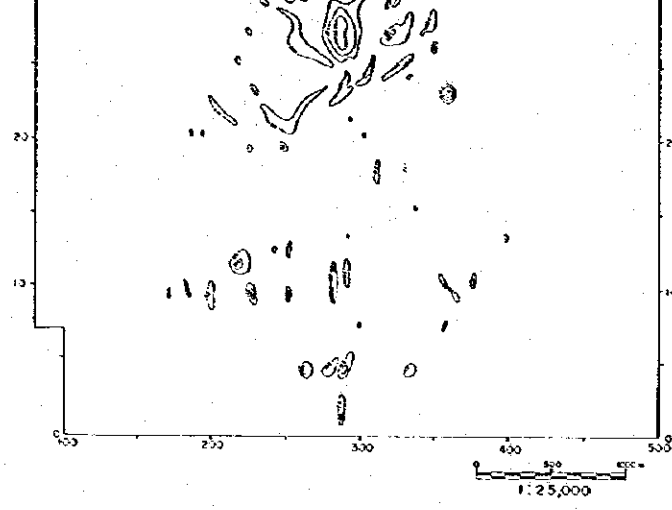
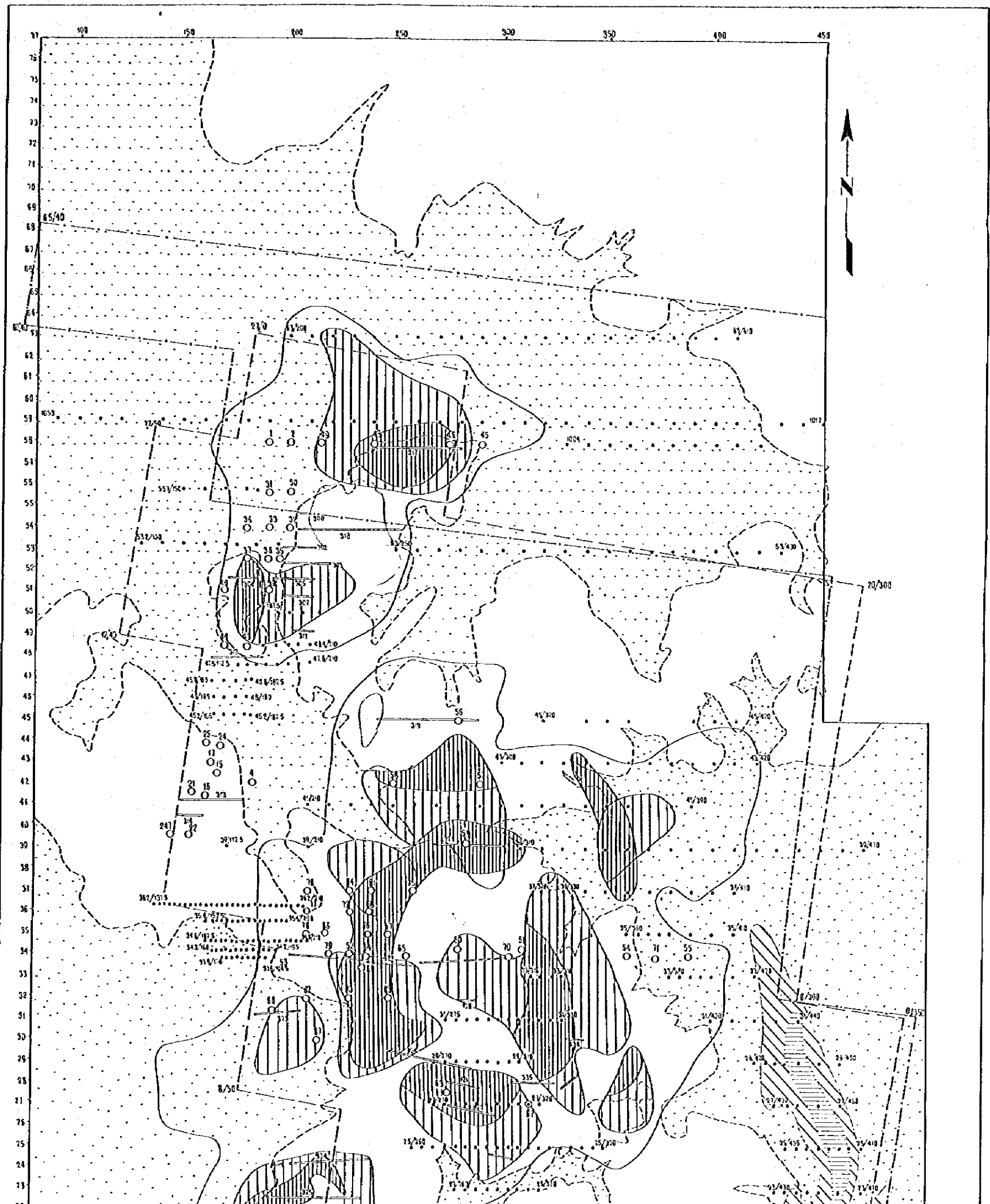
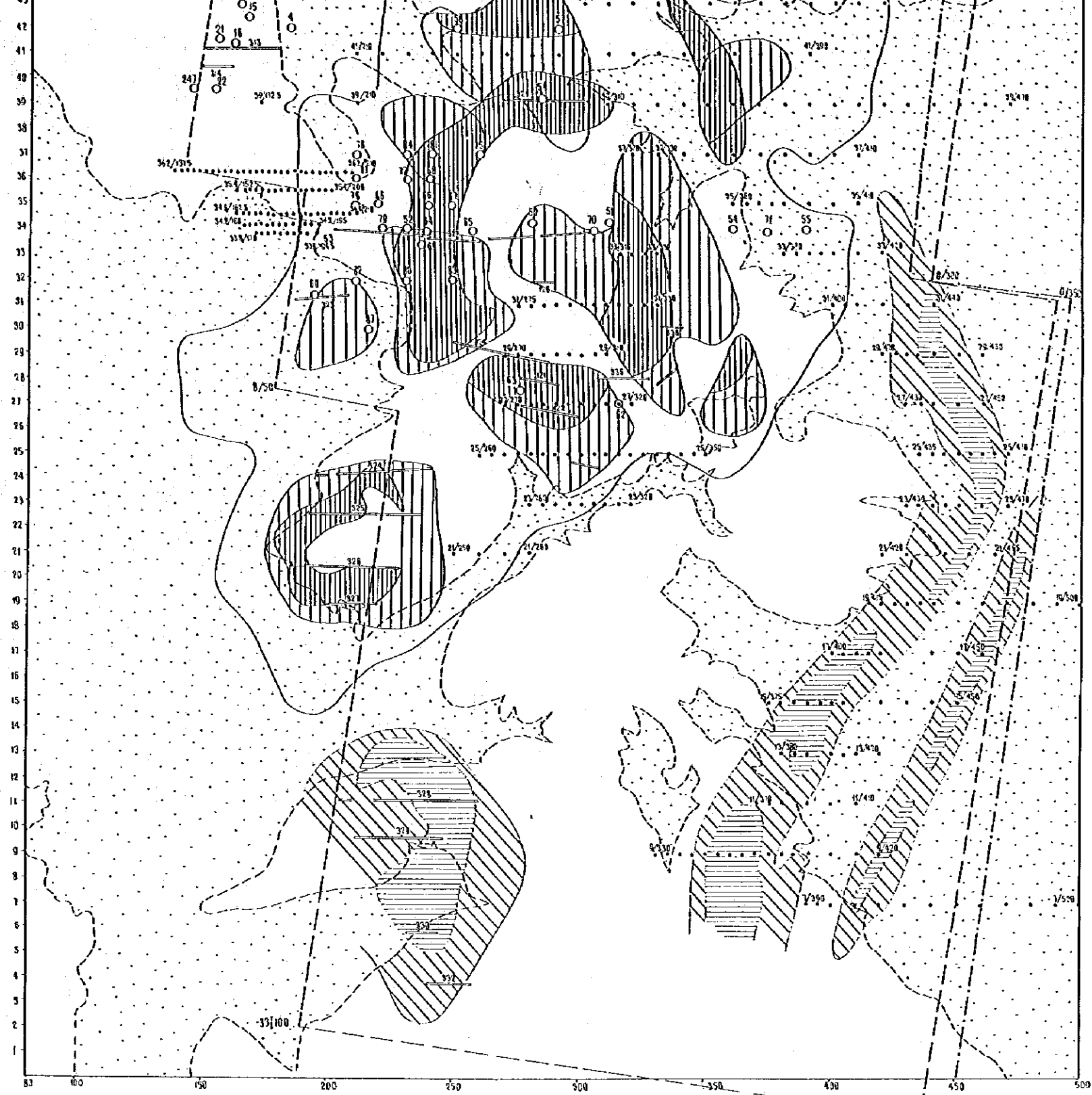













Plate III-2-3-5 Distribution of Geochemical Anomalies in the Samarsky Area (Scale 1:25,000)

Originally Prepared by Alexander V. Pokusaev (1955)

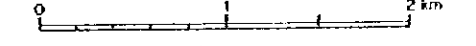




The legend to prognostic map using geochemical data

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|  Loose sediments outline   |  Mapping drillholes   |
|  Zone of low copper mineralization   |  Prospecting, exploration drillholes  |
|  Impregnated copper ore with copper content 0.2 - 0.6% to 250 m depth                        |  Area covered by survey of Shidortinskaya geophysical party Khomchenko, 1962        |
|  Projection of ore zones with copper content >0.8% at depths of more than 200m (massive ore) |  Area covered by survey of Alexandrovskaya geophysical party, Oprashkat, 1966       |
|  Zones prospective for gold-polymetallic mineralization                                      |  Area covered by survey of Balambayskaya geophysical party Ismailov, Km 1992 - 1992 |
|  Trenches  |  |

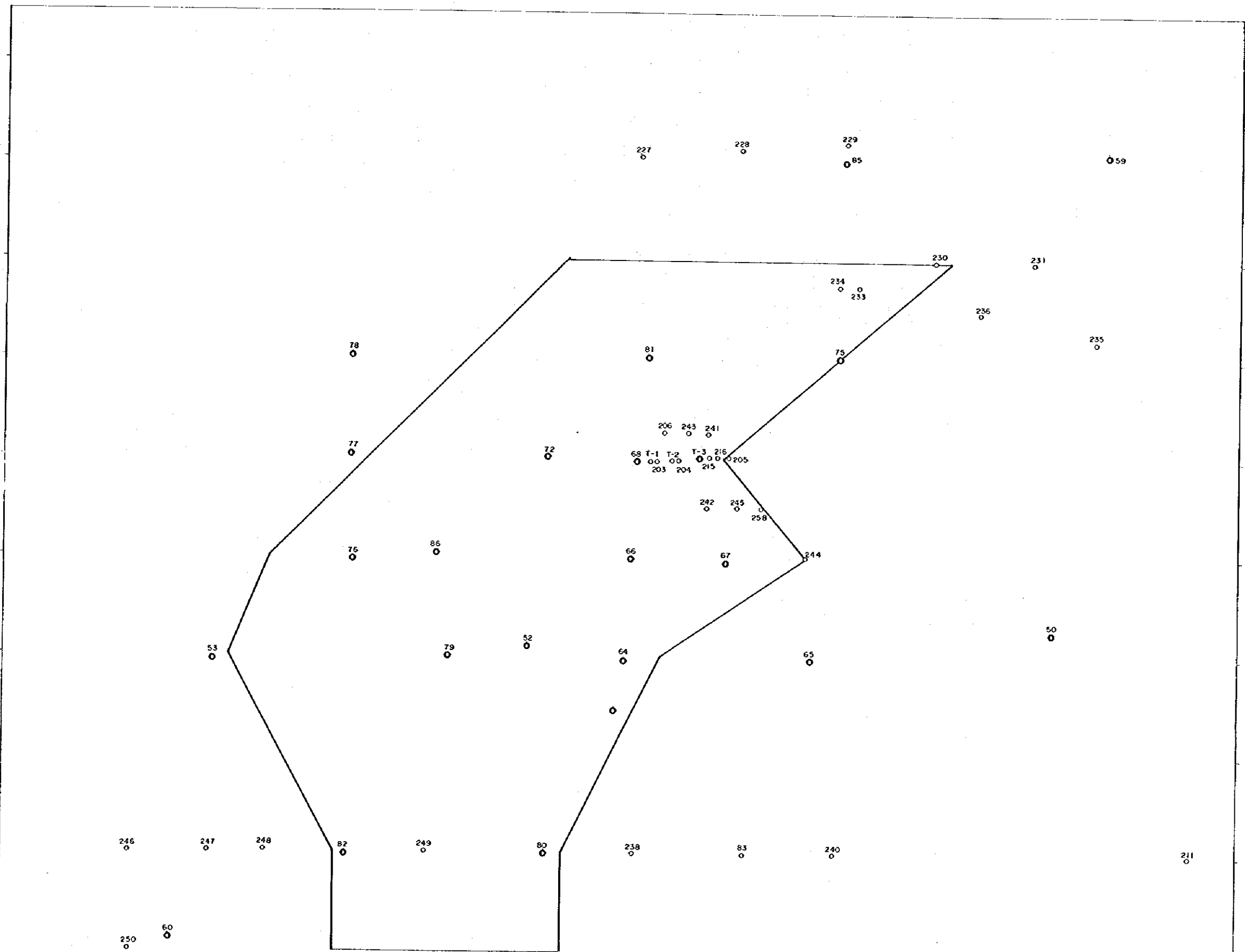
Scale 1 : 20,000

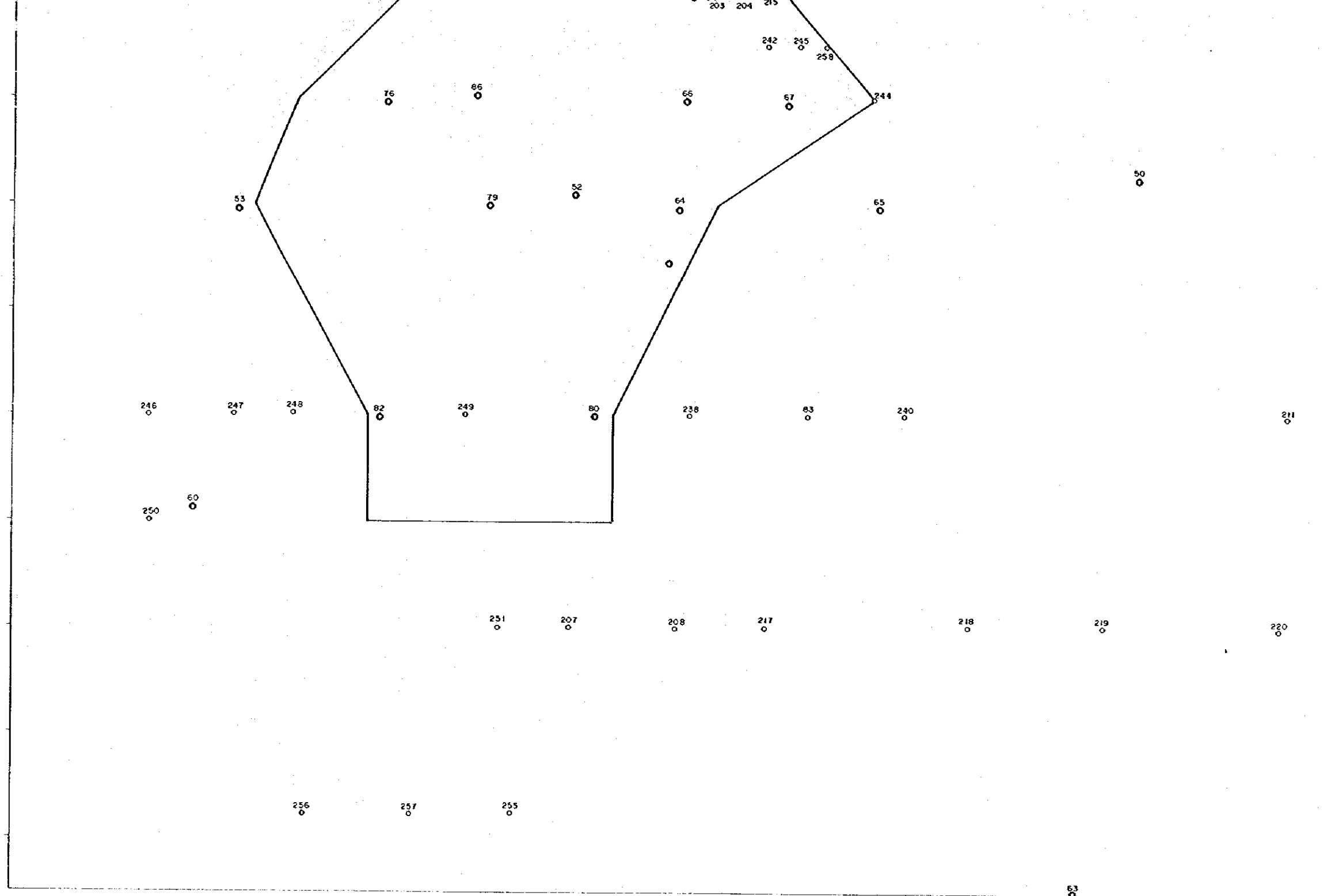


Originally Prepared by Alexander V. Pokusaev (1955) (Scale 1:20,000)

Plate III-2-3-6 Interpretation of Geochemical Survey Results in the Samarsky Area

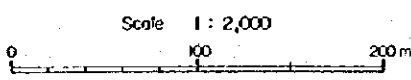
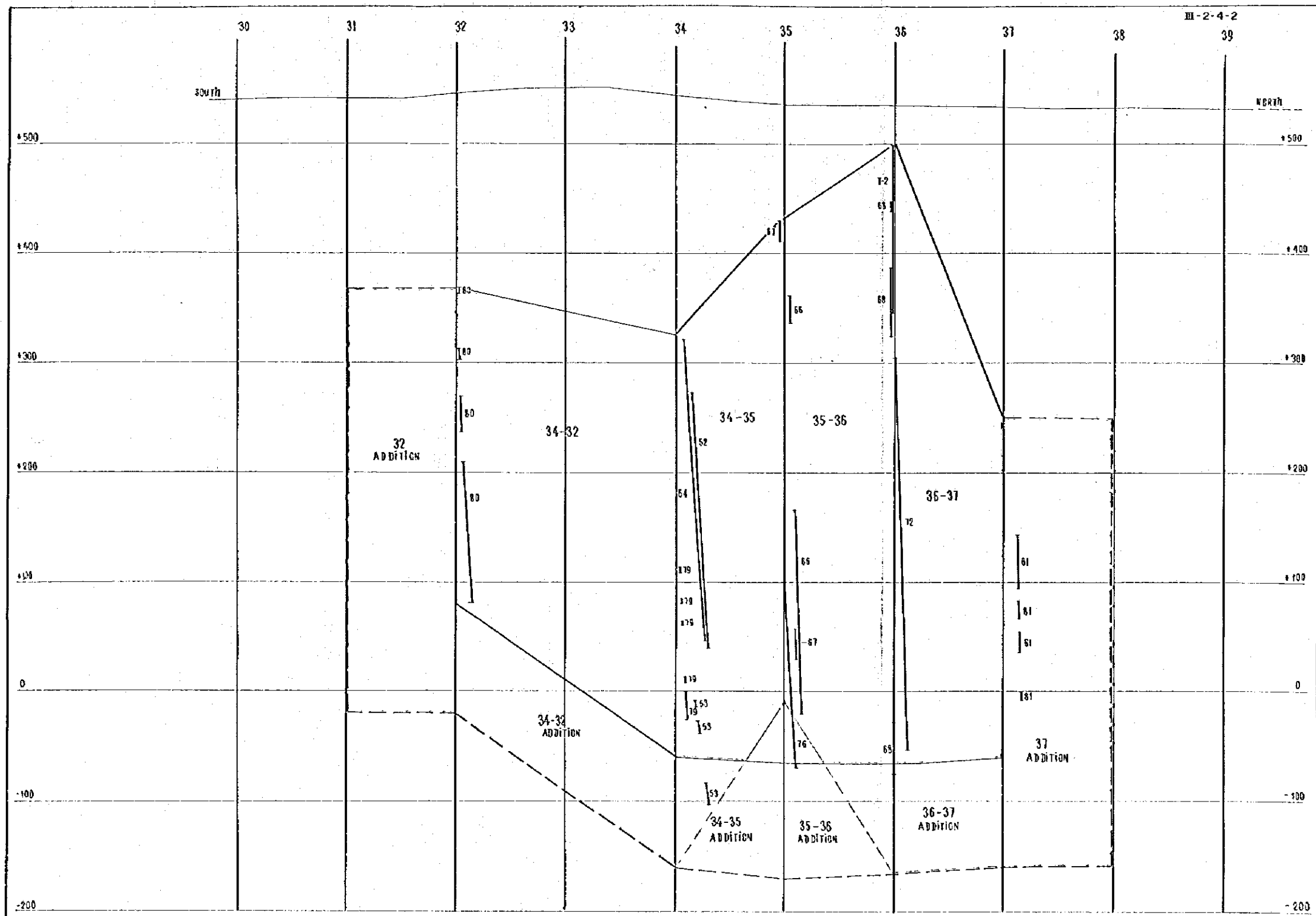
III-2-3-6





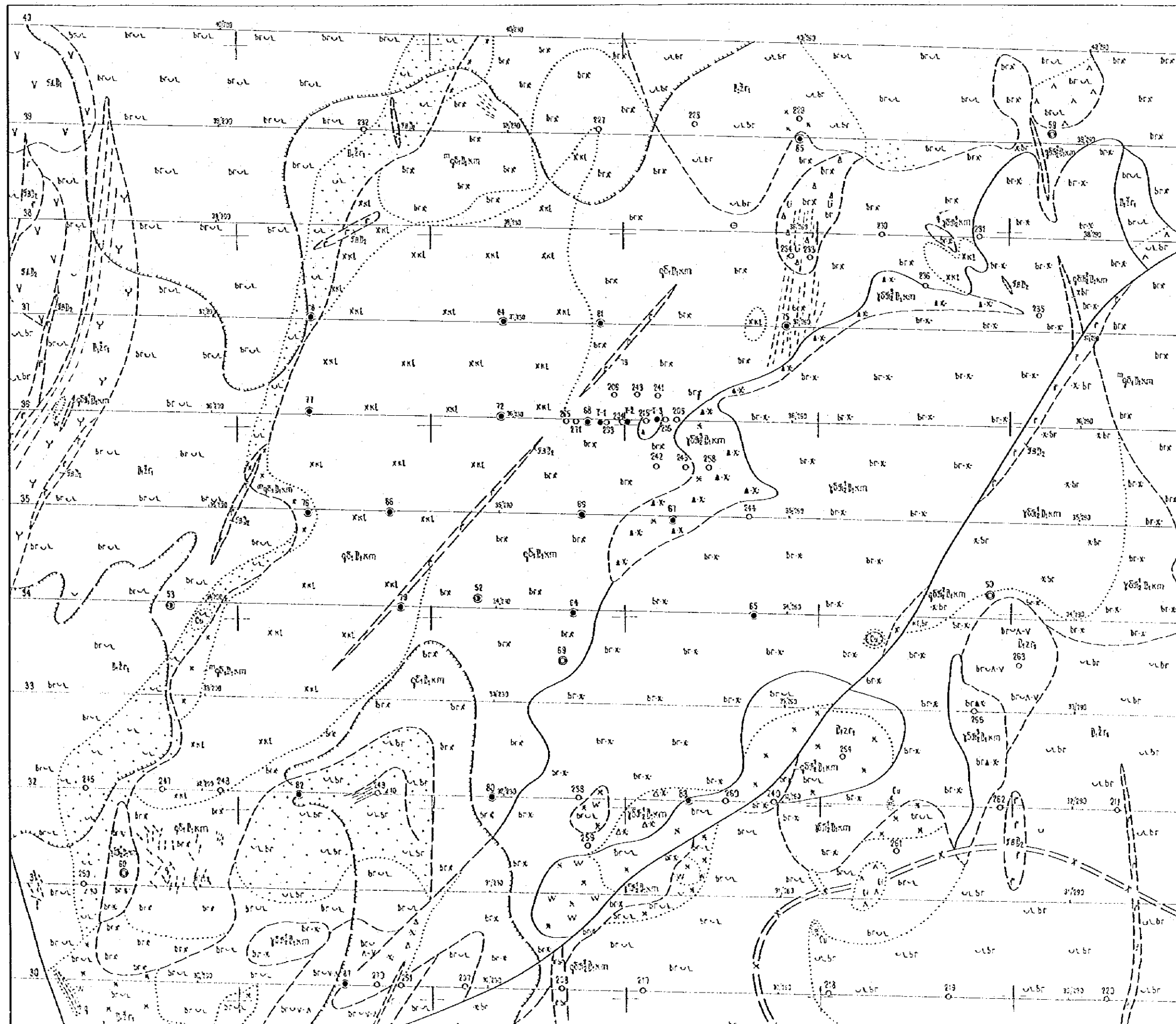
Scale 1 : 2,000  
 0 100 200m

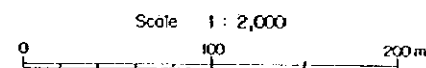
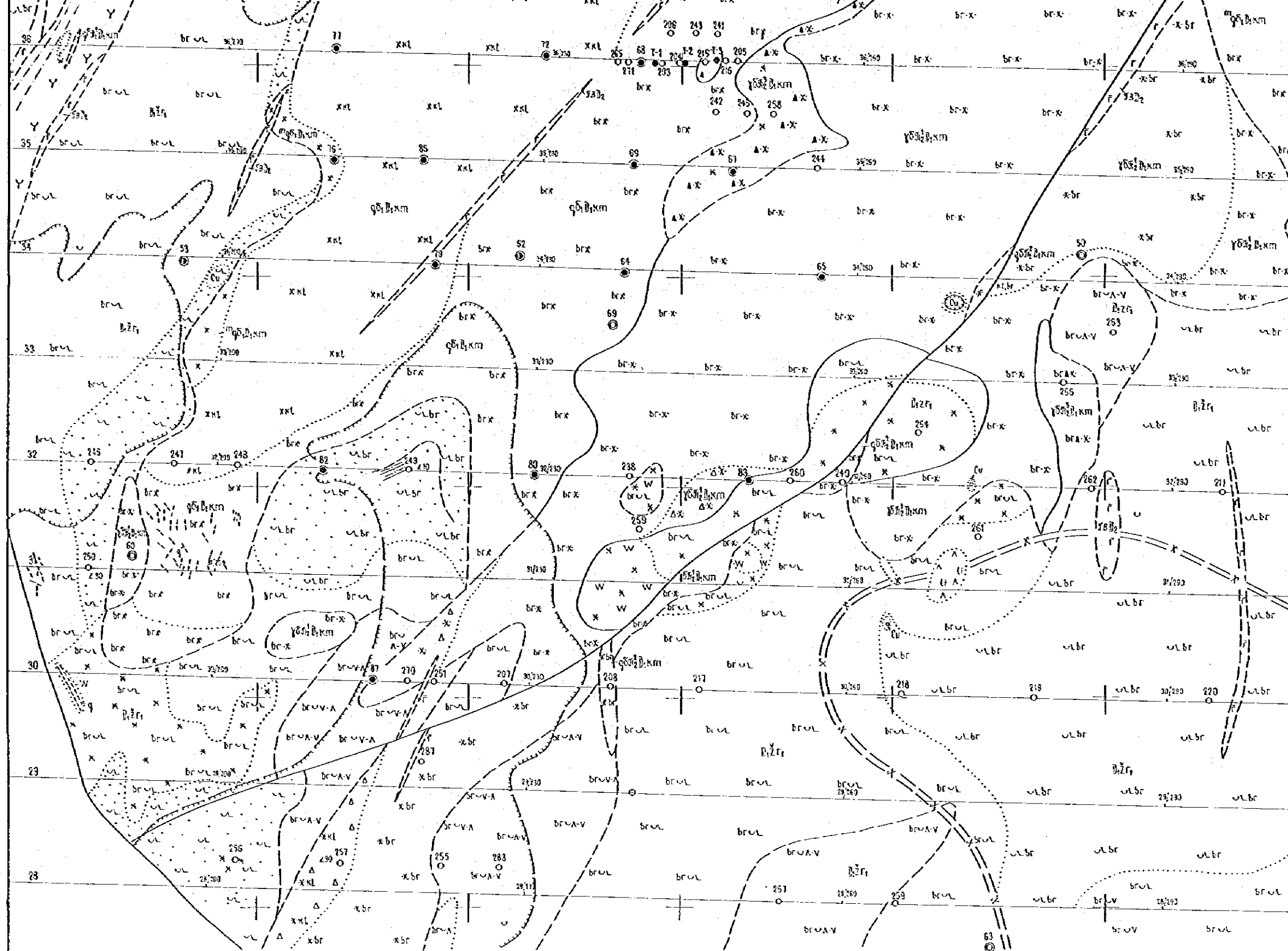
Plate III-2-4-1 Ore Blocks in the Samarsky Copper-Molybdenum Deposit (plan) (Scale 1:2,000)



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Plate III-2-4-2 Ore Blocks in the Samarsky Copper-Molybdenum Deposit (cross-section) (Scale 1:2,000)





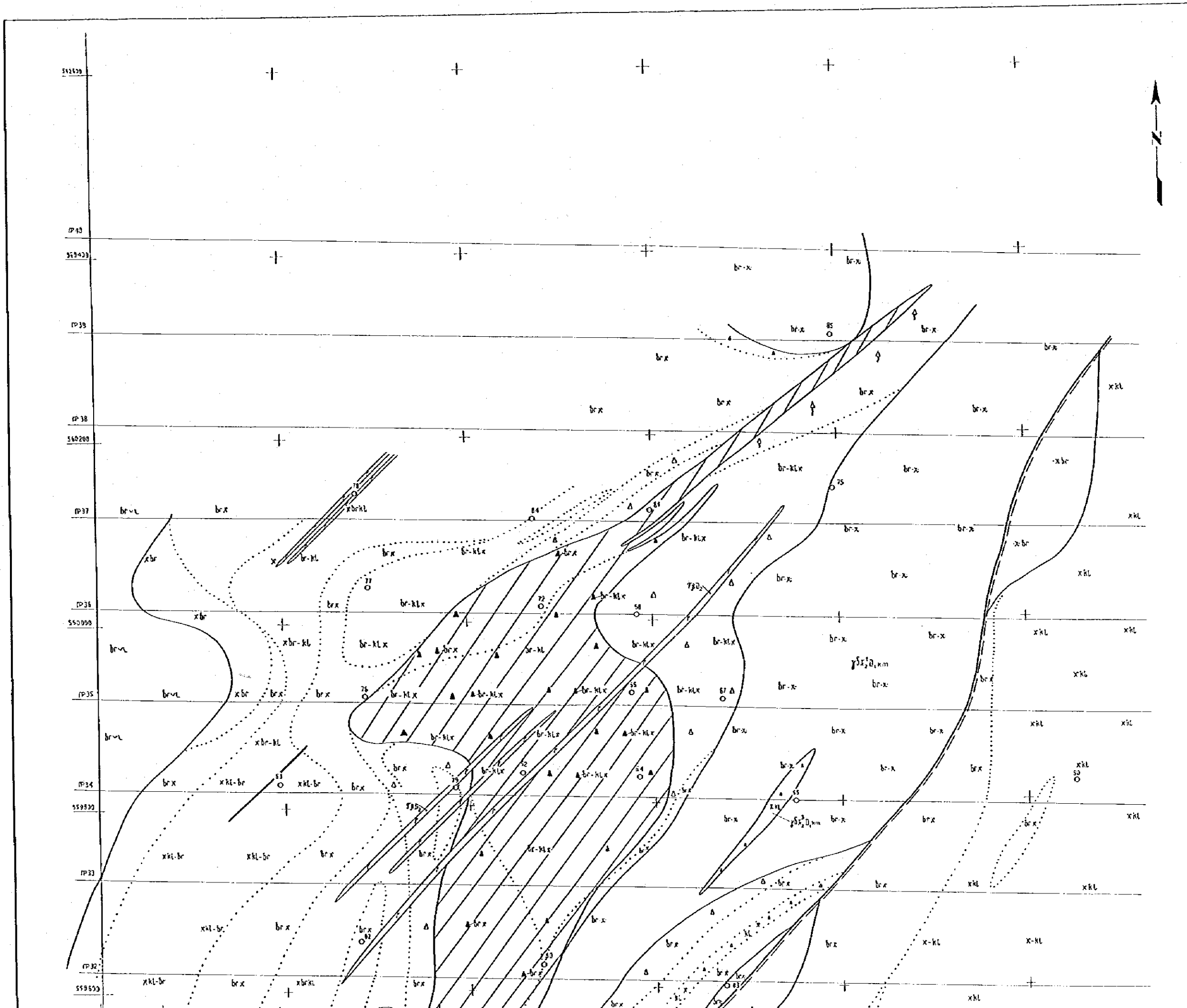
Originally Prepared by Karaganda Geological Exploration Expedition

Plate III-2-4-3 Geological Map of the Samarsky Copper-Molybdenum Deposit with Drilling Location (Scale 1:2,000)

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III-2-4-3





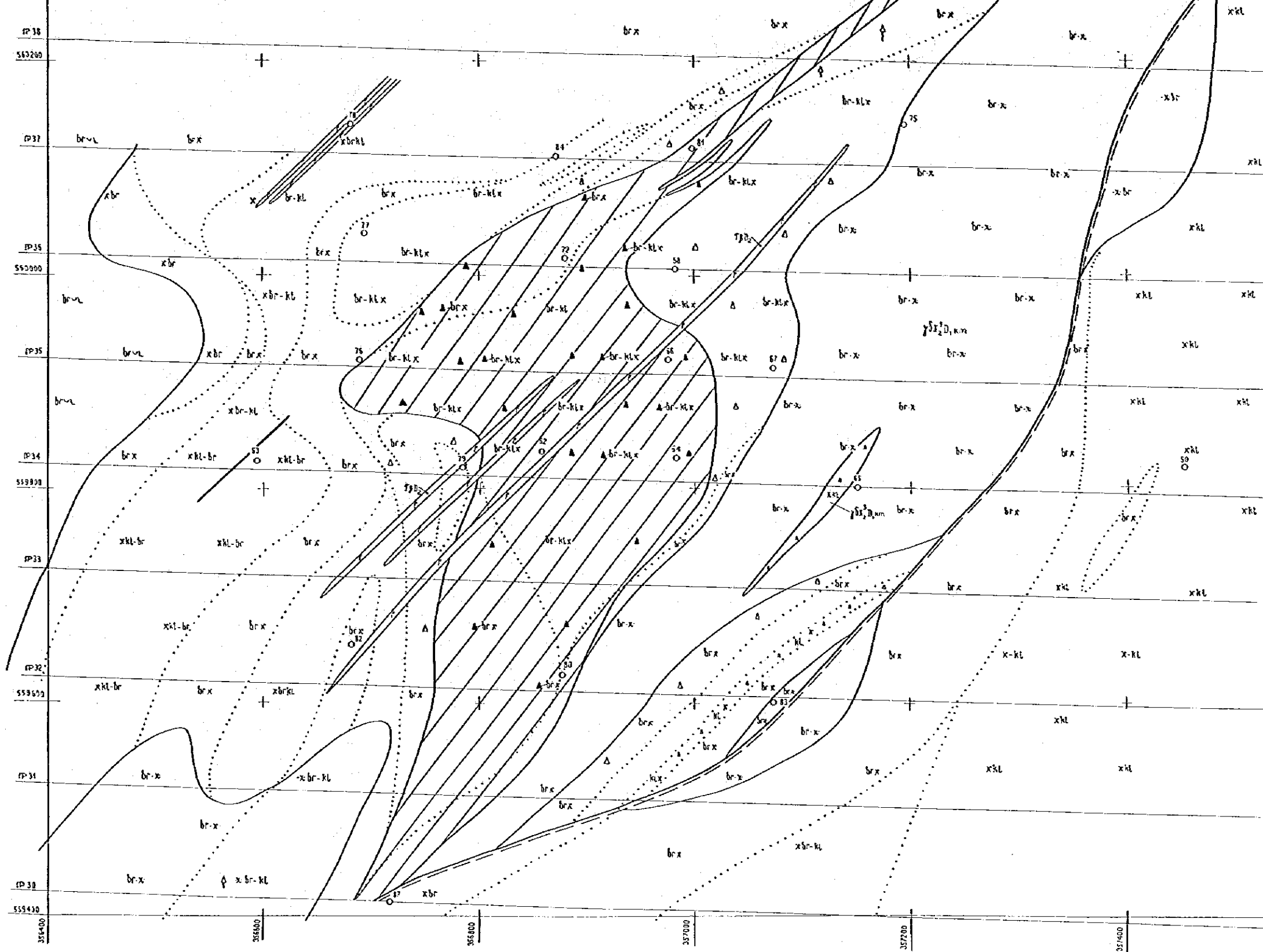


Plate III-2-4-4 Plane View of the Samarsky Copper-Molybdenum Deposit (+100m level sliced map) (Scale 1:2,000)

Originally Prepared by Karaganda Geological Exploration Expedition

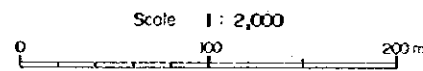
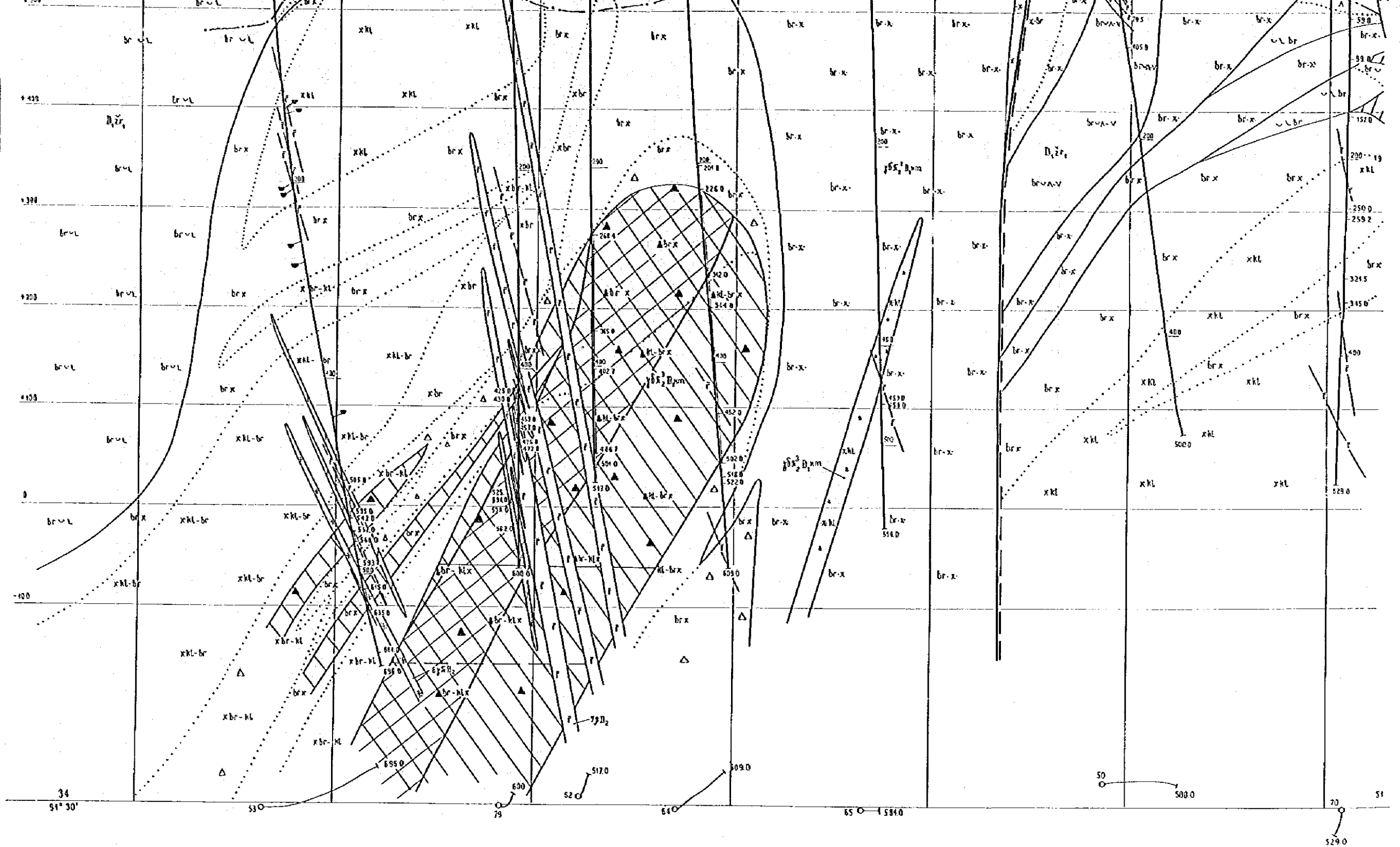
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III-2-4-4



|    | 1     | 2     | 3     | 4     | 5     | 6       | 7       | 8 |
|----|-------|-------|-------|-------|-------|---------|---------|---|
|    |       |       |       | Cu, % | Mo, % | Au, g/t | Ag, g/t |   |
| 52 | 242.4 | 301.0 | 232.6 | 2.83  | 0.093 |         | 2.41    |   |
|    | 261.4 | 365.0 | 56.0  | 2.33  | 0.096 |         | 2.25    |   |
|    | 492.7 | 486.7 | 84.0  | 2.59  | 0.014 |         | 3.52    |   |
| 53 | 536.0 | 542.0 | 6.0   | 4.55  | 0.035 | 0.21    | 2.17    |   |
|    | 552.0 | 566.0 | 8.0   | 4.50  | 0.030 | 0.23    | 3.97    |   |
|    | 615.0 | 635.0 | 20.0  | 4.53  | 0.026 | 0.44    | 7.71    |   |
| 64 | 226.0 | 592.0 | 276.0 | 1.92  | 0.073 |         | 1.07    |   |
|    | 228.0 | 302.0 | 86.0  | 1.65  | 0.033 |         | 1.95    |   |
|    | 334.0 | 502.0 | 168.0 | 1.63  | 0.023 |         | 0.63    |   |
|    | 344.0 | 452.0 | 108.0 | 1.76  | 0.023 |         | 0.73    |   |
|    | 470.0 | 502.0 | 32.0  | 0.77  | 0.024 | 0.39    | 0.50    |   |
| 51 | 516.0 | 522.0 | 6.0   | 4.84  | 0.030 | 0.19    | 0.32    |   |
|    | 62.0  | 98.0  | 36.0  | 0.51  | 0.021 | 0.32    | 1.04    |   |
|    | 420.0 | 426.0 | 6.0   | 4.87  | 0.035 | 0.43    | 3.9     |   |
|    | 490.0 | 494.0 | 4.0   | 4.93  | 0.031 | 0.4     | 2.6     |   |
|    | 490.0 | 494.0 | 4.0   | 4.93  | 0.031 | 0.4     | 2.6     |   |
| 79 | 435.0 | 470.0 | 35.0  | 1.56  |       |         |         |   |
|    | 453.0 | 457.0 | 4.0   | 1.75  |       |         |         |   |
|    | 475.0 | 562.0 | 87.0  | 2.54  |       |         |         |   |

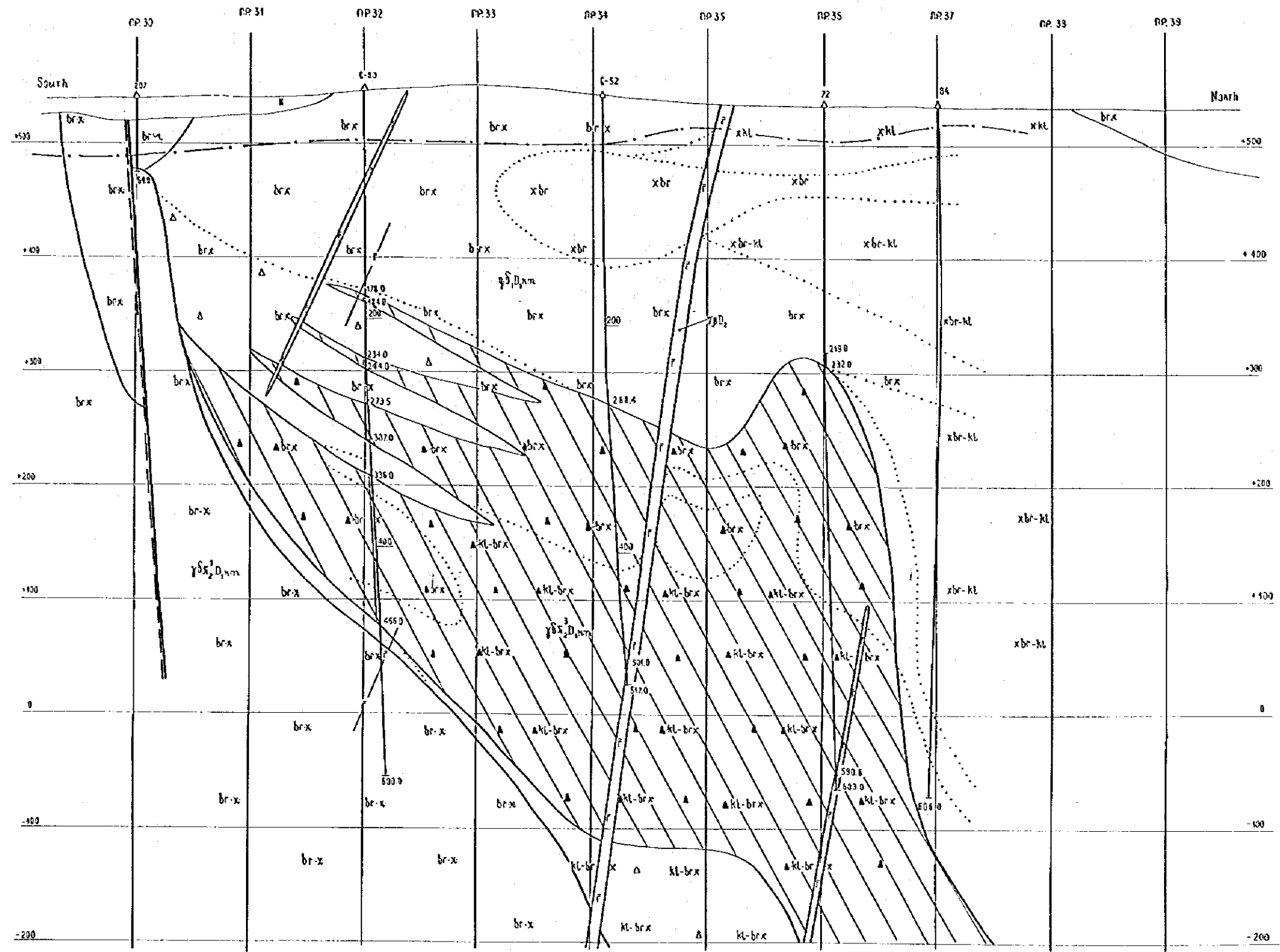
|    | 1     | 2     | 3    | 4    | Cu, % |
|----|-------|-------|------|------|-------|
| 53 | 505.0 | 536.0 | 31.0 | 0.24 |       |
|    | 556.0 | 597.0 | 26.7 | 0.34 |       |
|    | 635.0 | 631.0 | 48.0 | 0.27 |       |
| 51 | 26.0  | 42.2  | 16.2 | 0.41 |       |
|    | 70.5  | 105.0 | 34.5 | 0.22 |       |
| 64 | 204.0 | 226.0 | 22.0 | 0.46 |       |
|    | 592.0 | 603.0 | 10.0 | 0.33 |       |
| 51 | 7.5   | 52.0  | 44.5 | 0.18 |       |
|    | 98.0  | 120.0 | 22.0 | 0.18 |       |
|    | 484.0 | 254.0 | 60.0 | 0.27 |       |
| 65 | 453.0 | 451.0 | 2.0  | 0.25 |       |
| 70 | 15.0  | 59.0  | 44.0 | 0.20 |       |
|    | 99.0  | 457.0 | 58.0 | 0.17 |       |
|    | 250.0 | 239.0 | 11.0 | 0.23 |       |
|    | 321.5 | 345.0 | 23.5 | 0.35 |       |
| 79 | 419.4 | 426.0 | 6.6  | 0.30 |       |
|    | 430.0 | 438.0 | 8.0  | 0.28 |       |
|    | 449.0 | 453.0 | 4.0  | 0.24 |       |
|    | 487.0 | 475.0 | 12.0 | 0.35 |       |
|    | 562.0 | 566.0 | 4.0  | 0.28 |       |



Originally Prepared by Karaganda Geological Exploration Expedition

Plate III-2-4-5 Cross-Section of the Samarsky Copper-Molybdenum Deposit along the E-W Line 34 (Scale 1:2,000)

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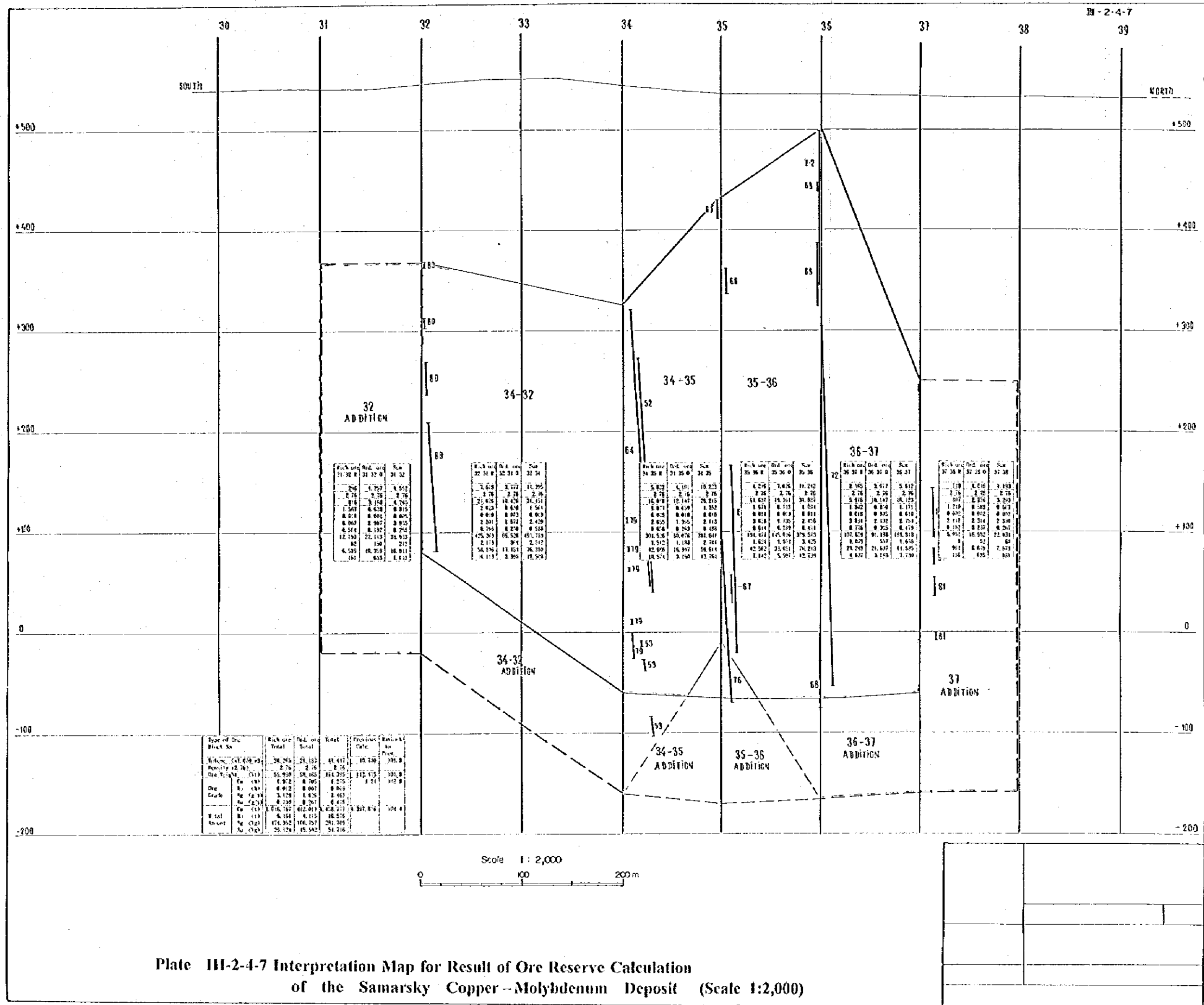


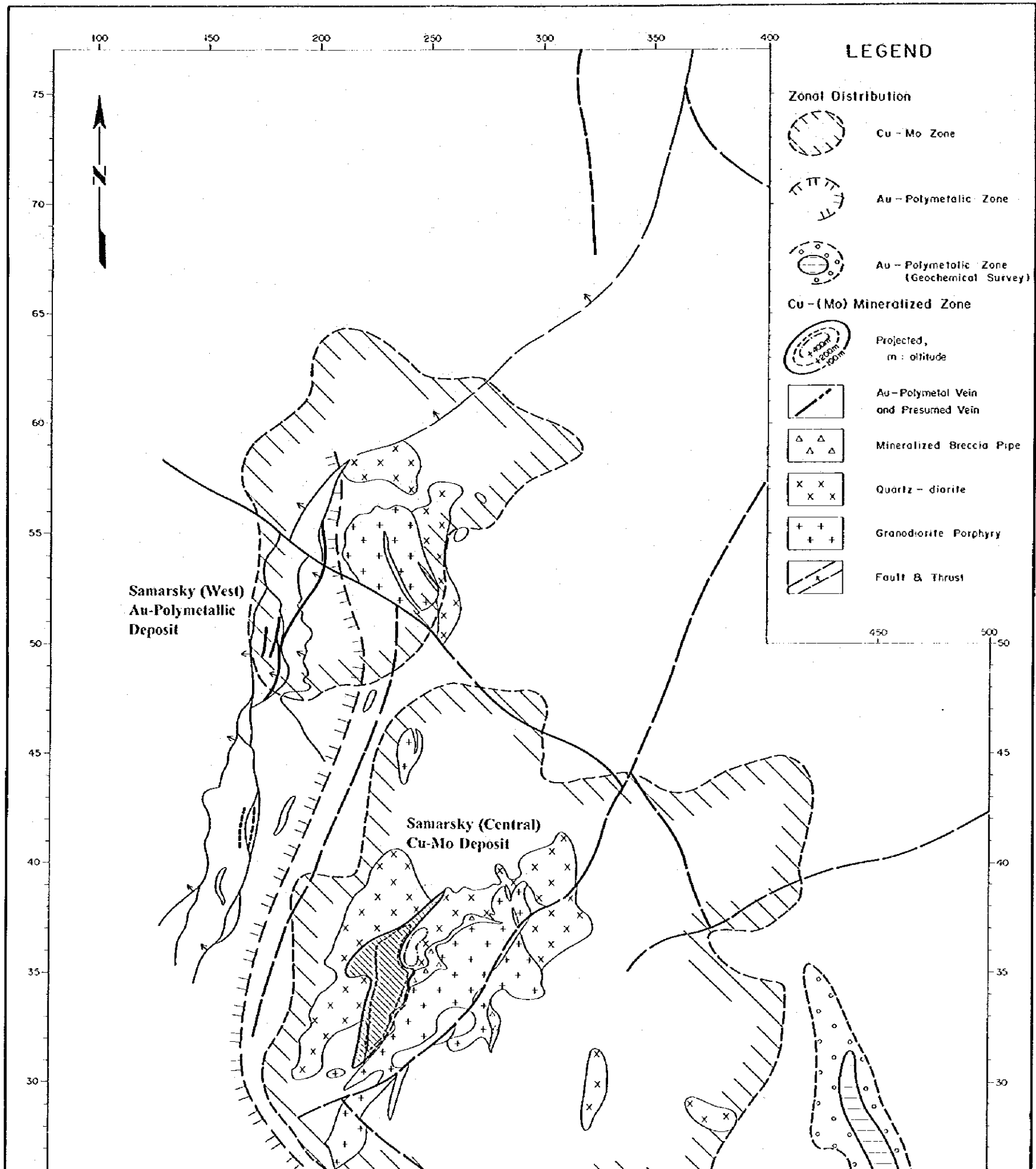
Scale 1 : 2,000  
 0 100 200m

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Plate III-2-4-6 Cross-Section of Samarsky Copper-Molybdenum Deposit along the N-S Line C-80 to C-84 (Scale 1:2,000)

Originally Prepared by Karaganda Geological Exploration Expedition





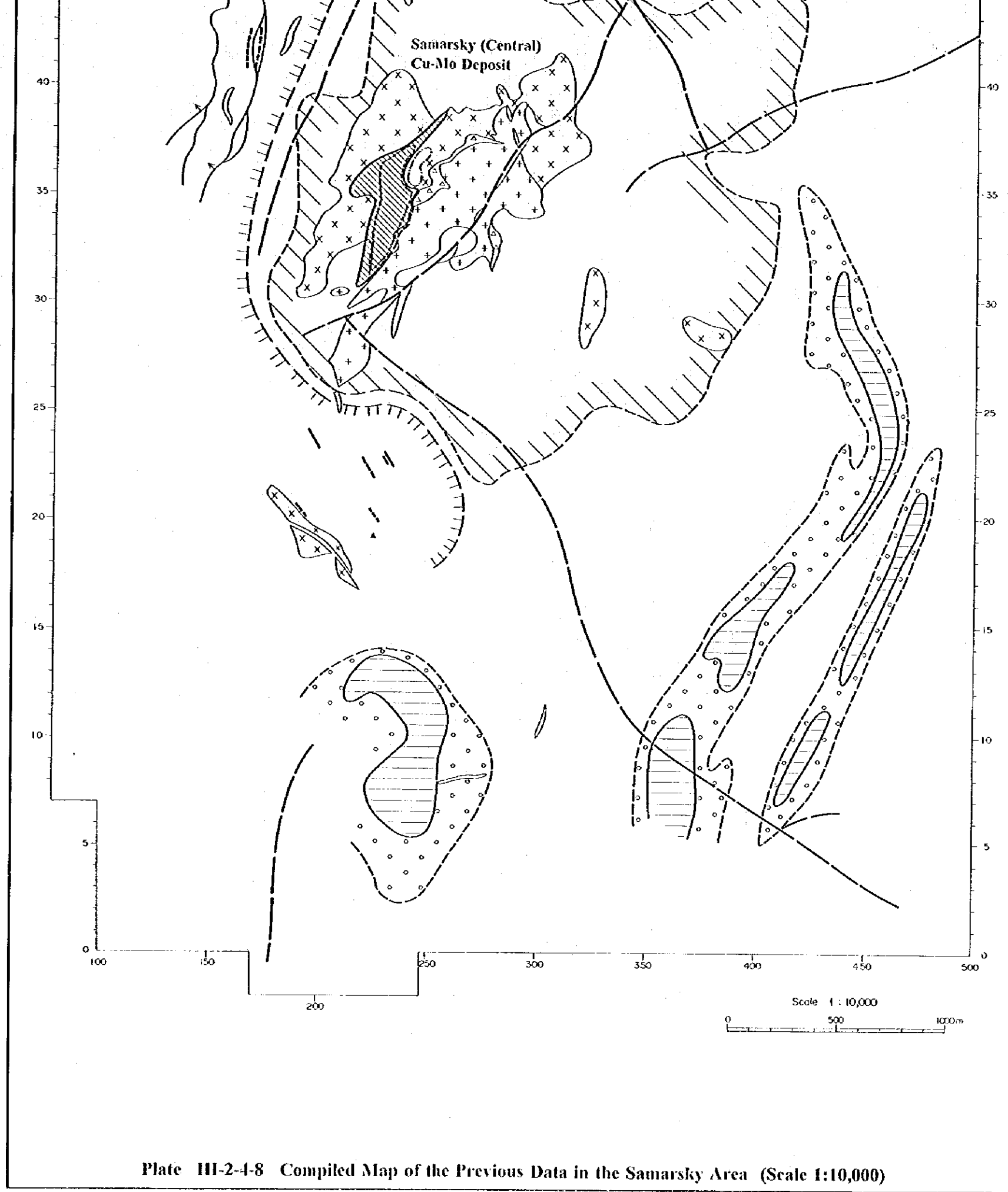


Plate III-2-4-8 Compiled Map of the Previous Data in the Samarsky Area (Scale 1:10,000)

E-2-4-8



| Geochronological Scale | Period     |           | Horizons of Regional Stratigraphic Scheme |                                    |       |           |            |
|------------------------|------------|-----------|---|------------------------------------|-------|-----------|------------|
|                        | Epoch      |           |   |                                    |       |           |            |
|                        | Century    |           |   |                                    |       |           |            |
|                        | Time       |           |   |                                    |       |           |            |
| Permian                | Late       | Bakanas   |   |                                    |       |           |            |
|                        | Early      | Karmyz    |   |                                    |       |           |            |
|                        |            | Kyzylsu   |   |                                    |       |           |            |
| Carboniferous          | Early      | Balauldin |   |                                    |       |           |            |
|                        |            | Dalinen   |   |                                    |       |           |            |
|                        |            | Yajovkin  |   |                                    |       |           |            |
|                        |            | Ishin     |   |                                    |       |           |            |
|                        |            | Rusakov   |   |                                    |       |           |            |
|                        |            | Kassin    |   |                                    |       |           |            |
|                        | Late       | Simorin   |   |                                    |       |           |            |
|                        |            | Sufisar   |   |                                    |       |           |            |
|                        |            | Meysler   |   |                                    |       |           |            |
|                        |            | Fran      | May                                       |                                    |       |           |            |
|                        |            |           | Aydarin                                   |                                    |       |           |            |
|                        |            |           | Talbin                                    |                                    |       |           |            |
| Devonian               | Middle     | Beesobin  |   |                                    |       |           |            |
|                        |            |           | Aurel                                     |                                    |       |           |            |
|                        |            |           |   | Fayztau                            |       |           |            |
|                        |            |           |   |                                    | Early | Kazakh    |            |
|                        |            |           |   |                                    |       |           | Em         |
|                        |            |           |   |                                    |       |           |            |
|                        | Pitakchash |           |   |                                    |       |           |            |
|                        |            | Late      | Akkon                                     |                                    |       |           |            |
|                        |            |           |   | Late Silurian Intrusive Formations |       |           |            |
|                        |            |           |   |                                    | Early | Dorenchal |            |
|                        |            |           |   |                                    |       |           | Outer Zone |

**Koitas (Maylyz) complex**  
 Minor intrusions and dykes of granite porphyry (ix), rhyolite porphyry (ix), Rhyodolite porphyry (ix)

**Manybay complex**  
 Minor intrusions and dykes of sub-alkaline gabbro (ix), gabbro-diorite (ix), diorite (ix)

Minor intrusions and dykes of quartz monzodiorite (ix), diorite (ix), monzodiorite (ix), diorite porphyry (ix), granodiorite (ix), granodiorite porphyry (ix)

**Kuzhokin Brachy Syncline**  
 (Subzone of shallow sedimentation)

**Aslakhev Syncline**  
 (Subzone of abyssal sedimentation)

**Devonian Volcanic Belt**

**Orogenic Volcanic - Tectonic Structures**

**Shidertin Depression**

**Beesobin**

**Kazakh**

**Outer Zone**

- C<sub>1</sub>krq Karaganda Formation - Sandstone, aleuroite, argillite, coaly aleuroite and argillite, beds of coal (>200m)
- C<sub>1</sub>o5 Ashlyarik Formation - Sandstone, aleuroite, coaly argillite, beds of coal (400 - 500m)
- C<sub>1</sub>ok Akkudak Formation - Aleuroite, argillite, sandstone with interlayers of tuffite (450m)
- C<sub>1</sub>rs Rusakov Formation - Limy aleuroite, marl, (50 - 100m)
- C<sub>1</sub>ksv Kassin Formation - Limestone (50 - 150m)
- D<sub>3</sub>sm Simorin Formation - Limy aleuroite, marl (80 - 100m)
- D<sub>3</sub>sf Sufisar Formation - Marl, limy aleuroite limestone (100 - 200m)
- D<sub>3</sub>ms Meysler Formation - Limestone, limy sandstone, aleuroite, conglomerate (50 - 200m)

- D<sub>3</sub>sf Sophin Formation - Spotted aleuroite, sandstone, gravelite, conglomerate (400-800m)
- D<sub>2</sub>ka Konyz Formation - Interfingering of red-coloured, rarely grey-coloured, tuffaceous, volcanogenic polymictic sandstone, gravelite aleuroite, conglomerate, rarely tuff of andesitic-dacite (>1000m)

**Kokkuduktubin Complex**

Fourth Phase - Granite porphyry

Third Phase - Dyke of diorite porphyry (ix), lamprophyry (ix)

Second Phase - Quartz monzodiorite (ix), quartz monzodiorite (ix), propylite (ix), beresite (ix), silicified rock (ix)

First Phase - Monzodiorite (ix), beresite (ix), silicified and sanonized rock (ix)

**Middle Devonian Intrusive Formations**

**Middle Devonian Sub-Volcanic Formations**

Rhyolite porphyries

**Zhetandutack Formation**

Upper Sub-Formation - Lava and tuff of trachyhyolite, rhyolite argimbrita (>300m)

Lower Sub-Formation - Fine clastic and ash tuff of rhyolite composition (>400m)

**Kuzlozek Formation** - Tuff, sandstone aleuroite, limestone, lava and tuff of red-stone volcanics rhyodacite composition, interlayers of andesite and andesitic tuff (600-700m)

**Karamendin Complex**

Third Phase - Dyke of granite porphyry (ix), microdiorite (ix), lamprophyry (ix)

Second Phase - Granodiorites (ix), quartz monzodiorites (ix), beresite (ix), silicified and sanonized rock (ix)

First Phase - Quartz diorite (ix), diorite (ix), beresite (ix), silicified rock (ix)

Early Phase - Gabbro, leucogabbro norite

1 Andesitic Basalt (ix) 2 basalt (ix)  
 3 andesitic-dacite (ix) 4 andesite (ix)

**Zhasor Formation**

Upper Sub-Formation - Tuff, sandstone, aleuroite, conglomerate, horizon of andesite, sandstone and gravelite (500-600m)

Middle Sub-Formation - Mass of moderately acid composition with interlayers of conglomerate, breccia, tuff of andesitic dacite, sandstone, aleuroite, gravelite, conglomerate (500m)

Lower Sub-Formation - Agglomerate tuff, rarely lava of porphyritic andesitic basalt, bands of pelite tuffite, horizons of tuff of andesitic-dacite (>500m)

**Tuzon Complex** - Gabbro, gabbro-chinopyroxenite, tabradorite Gabbro-norite

**Sardzhaf**

**Pitakchash**

**Late Silurian Intrusive Formations**

**Outer Zone**

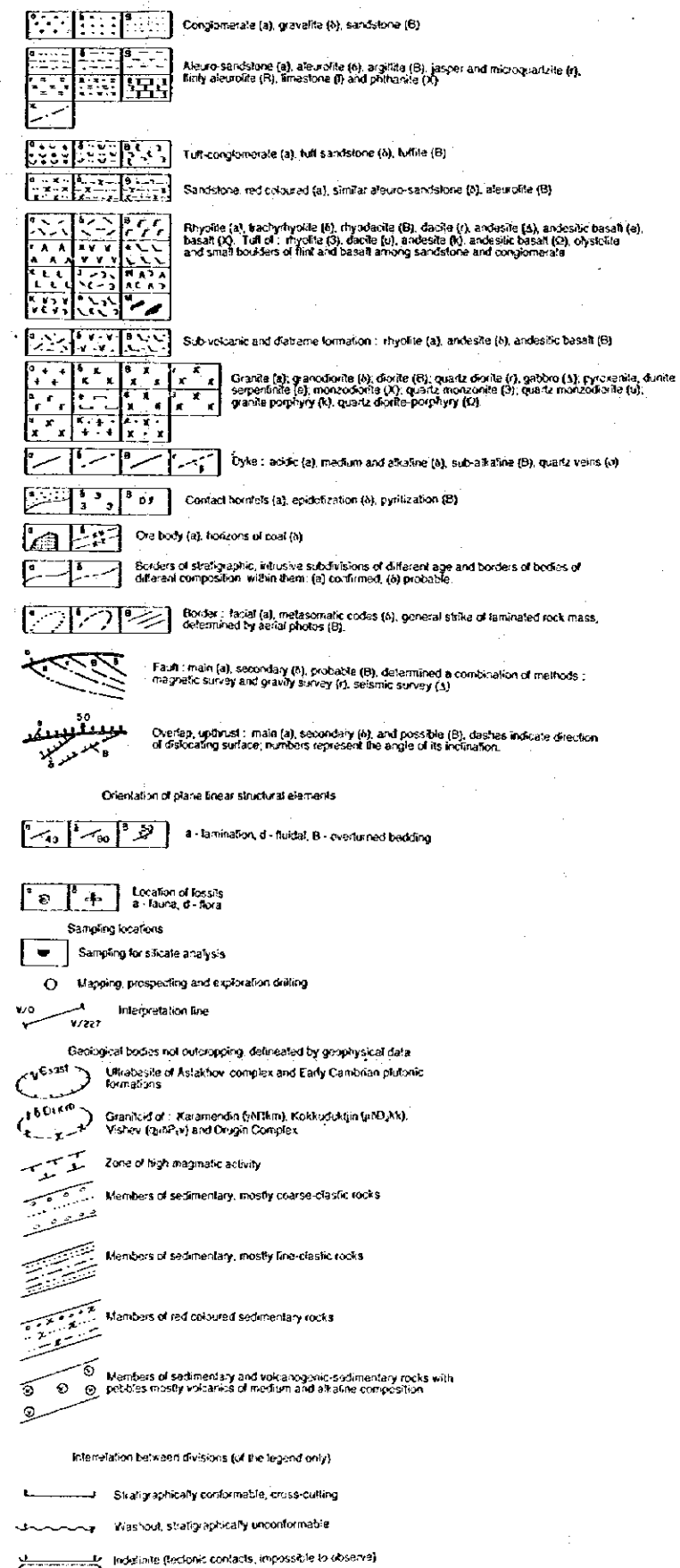
**Sumysar Formation** - Spotted polymictic and tuffaceous sandstone, conglomerate and aleuroite (1500m)

**Early Caledonides**

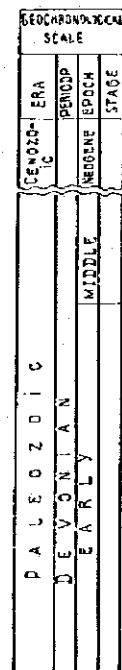
**Late Caledonides**

**Geosyncline Structures**

**Outer Zone**







**N** Speckled clay, clay with admixed pebbles, rock debris and gruss (in cross sections only)

**Middle Devonian Post-ore Dike and Subvolcanic Complex**

**D<sub>1</sub> D<sub>2</sub> D<sub>3</sub> D<sub>4</sub> D<sub>5</sub> D<sub>6</sub> D<sub>7</sub> D<sub>8</sub> D<sub>9</sub> D<sub>10</sub> D<sub>11</sub> D<sub>12</sub> D<sub>13</sub> D<sub>14</sub> D<sub>15</sub> D<sub>16</sub> D<sub>17</sub> D<sub>18</sub> D<sub>19</sub> D<sub>20</sub> D<sub>21</sub> D<sub>22</sub> D<sub>23</sub> D<sub>24</sub> D<sub>25</sub> D<sub>26</sub> D<sub>27</sub> D<sub>28</sub> D<sub>29</sub> D<sub>30</sub> D<sub>31</sub> D<sub>32</sub> D<sub>33</sub> D<sub>34</sub> D<sub>35</sub> D<sub>36</sub> D<sub>37</sub> D<sub>38</sub> D<sub>39</sub> D<sub>40</sub> D<sub>41</sub> D<sub>42</sub> D<sub>43</sub> D<sub>44</sub> D<sub>45</sub> D<sub>46</sub> D<sub>47</sub> D<sub>48</sub> D<sub>49</sub> D<sub>50</sub> D<sub>51</sub> D<sub>52</sub> D<sub>53</sub> D<sub>54</sub> D<sub>55</sub> D<sub>56</sub> D<sub>57</sub> D<sub>58</sub> D<sub>59</sub> D<sub>60</sub> D<sub>61</sub> D<sub>62</sub> D<sub>63</sub> D<sub>64</sub> D<sub>65</sub> D<sub>66</sub> D<sub>67</sub> D<sub>68</sub> D<sub>69</sub> D<sub>70</sub> D<sub>71</sub> D<sub>72</sub> D<sub>73</sub> D<sub>74</sub> D<sub>75</sub> D<sub>76</sub> D<sub>77</sub> D<sub>78</sub> D<sub>79</sub> D<sub>80</sub> D<sub>81</sub> D<sub>82</sub> D<sub>83</sub> D<sub>84</sub> D<sub>85</sub> D<sub>86</sub> D<sub>87</sub> D<sub>88</sub> D<sub>89</sub> D<sub>90</sub> D<sub>91</sub> D<sub>92</sub> D<sub>93</sub> D<sub>94</sub> D<sub>95</sub> D<sub>96</sub> D<sub>97</sub> D<sub>98</sub> D<sub>99</sub> D<sub>100</sub>**  
 Dikes and Minor bodies of subalkaline diabase and trachybasalt (v<sub>1b</sub>), subalkaline granite porphyry (γ<sub>1a</sub>), and granite porphyry (γ<sub>1a</sub>)  
 Minor body of trachyandesite (td)

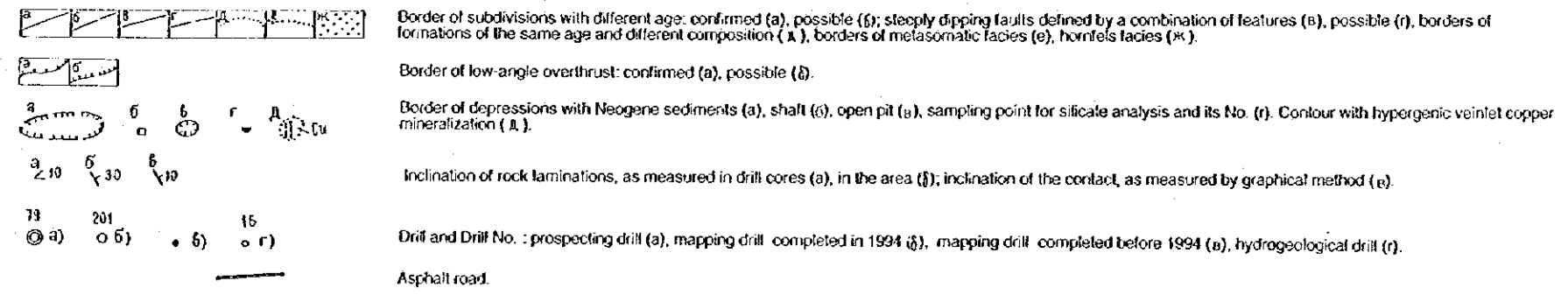
**KARAMENDIN INTRUSIVE COMPLEX**

**γ<sub>2</sub> γ<sub>3</sub> γ<sub>4</sub> γ<sub>5</sub> γ<sub>6</sub> γ<sub>7</sub> γ<sub>8</sub> γ<sub>9</sub> γ<sub>10</sub> γ<sub>11</sub> γ<sub>12</sub> γ<sub>13</sub> γ<sub>14</sub> γ<sub>15</sub> γ<sub>16</sub> γ<sub>17</sub> γ<sub>18</sub> γ<sub>19</sub> γ<sub>20</sub> γ<sub>21</sub> γ<sub>22</sub> γ<sub>23</sub> γ<sub>24</sub> γ<sub>25</sub> γ<sub>26</sub> γ<sub>27</sub> γ<sub>28</sub> γ<sub>29</sub> γ<sub>30</sub> γ<sub>31</sub> γ<sub>32</sub> γ<sub>33</sub> γ<sub>34</sub> γ<sub>35</sub> γ<sub>36</sub> γ<sub>37</sub> γ<sub>38</sub> γ<sub>39</sub> γ<sub>40</sub> γ<sub>41</sub> γ<sub>42</sub> γ<sub>43</sub> γ<sub>44</sub> γ<sub>45</sub> γ<sub>46</sub> γ<sub>47</sub> γ<sub>48</sub> γ<sub>49</sub> γ<sub>50</sub> γ<sub>51</sub> γ<sub>52</sub> γ<sub>53</sub> γ<sub>54</sub> γ<sub>55</sub> γ<sub>56</sub> γ<sub>57</sub> γ<sub>58</sub> γ<sub>59</sub> γ<sub>60</sub> γ<sub>61</sub> γ<sub>62</sub> γ<sub>63</sub> γ<sub>64</sub> γ<sub>65</sub> γ<sub>66</sub> γ<sub>67</sub> γ<sub>68</sub> γ<sub>69</sub> γ<sub>70</sub> γ<sub>71</sub> γ<sub>72</sub> γ<sub>73</sub> γ<sub>74</sub> γ<sub>75</sub> γ<sub>76</sub> γ<sub>77</sub> γ<sub>78</sub> γ<sub>79</sub> γ<sub>80</sub> γ<sub>81</sub> γ<sub>82</sub> γ<sub>83</sub> γ<sub>84</sub> γ<sub>85</sub> γ<sub>86</sub> γ<sub>87</sub> γ<sub>88</sub> γ<sub>89</sub> γ<sub>90</sub> γ<sub>91</sub> γ<sub>92</sub> γ<sub>93</sub> γ<sub>94</sub> γ<sub>95</sub> γ<sub>96</sub> γ<sub>97</sub> γ<sub>98</sub> γ<sub>99</sub> γ<sub>100</sub>**  
 Intrusives and dikes additional to the second phase and associated metasomatic formations: granodiorite-porphyry (γ<sub>6</sub><sup>2</sup>), quartz-diorite-porphyry coarse impregnated and biotite-plagioclase-like (q<sub>5</sub><sup>2</sup>), eruptive breccias of granodiorite-porphyry (b<sub>5</sub><sup>2</sup>), beresite (br<sub>2</sub>), potassium feldspar facies (kl<sub>2</sub>).  
 The first phase and associated metasomatic formations: quartz diorite, medium grained, medium-fine grained (q<sub>5</sub>), microdiorite and quartz-diorite-porphyry of exocontact facies (q<sub>5</sub><sup>1</sup>), beresite (br<sub>1</sub>), potassium feldspar facies (kl<sub>1</sub>), secondary quartzite (vk<sub>1</sub>), additional intrusive of quartz diorite porphyry (q<sub>5</sub><sup>1</sup>).

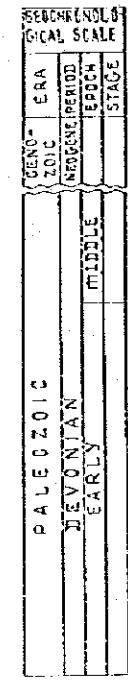
**Early Devonian Subvolcanic Complex**

**d<sub>1</sub> d<sub>2</sub> d<sub>3</sub> d<sub>4</sub> d<sub>5</sub> d<sub>6</sub> d<sub>7</sub> d<sub>8</sub> d<sub>9</sub> d<sub>10</sub> d<sub>11</sub> d<sub>12</sub> d<sub>13</sub> d<sub>14</sub> d<sub>15</sub> d<sub>16</sub> d<sub>17</sub> d<sub>18</sub> d<sub>19</sub> d<sub>20</sub> d<sub>21</sub> d<sub>22</sub> d<sub>23</sub> d<sub>24</sub> d<sub>25</sub> d<sub>26</sub> d<sub>27</sub> d<sub>28</sub> d<sub>29</sub> d<sub>30</sub> d<sub>31</sub> d<sub>32</sub> d<sub>33</sub> d<sub>34</sub> d<sub>35</sub> d<sub>36</sub> d<sub>37</sub> d<sub>38</sub> d<sub>39</sub> d<sub>40</sub> d<sub>41</sub> d<sub>42</sub> d<sub>43</sub> d<sub>44</sub> d<sub>45</sub> d<sub>46</sub> d<sub>47</sub> d<sub>48</sub> d<sub>49</sub> d<sub>50</sub> d<sub>51</sub> d<sub>52</sub> d<sub>53</sub> d<sub>54</sub> d<sub>55</sub> d<sub>56</sub> d<sub>57</sub> d<sub>58</sub> d<sub>59</sub> d<sub>60</sub> d<sub>61</sub> d<sub>62</sub> d<sub>63</sub> d<sub>64</sub> d<sub>65</sub> d<sub>66</sub> d<sub>67</sub> d<sub>68</sub> d<sub>69</sub> d<sub>70</sub> d<sub>71</sub> d<sub>72</sub> d<sub>73</sub> d<sub>74</sub> d<sub>75</sub> d<sub>76</sub> d<sub>77</sub> d<sub>78</sub> d<sub>79</sub> d<sub>80</sub> d<sub>81</sub> d<sub>82</sub> d<sub>83</sub> d<sub>84</sub> d<sub>85</sub> d<sub>86</sub> d<sub>87</sub> d<sub>88</sub> d<sub>89</sub> d<sub>90</sub> d<sub>91</sub> d<sub>92</sub> d<sub>93</sub> d<sub>94</sub> d<sub>95</sub> d<sub>96</sub> d<sub>97</sub> d<sub>98</sub> d<sub>99</sub> d<sub>100</sub>**  
 Natron andesitic basalt (na)  
 Upper Subformation. Sandstone, aleurolite, gravelite, polymictic conglomerate, mostly red coloured, with horizons of tuffite of acidic composition.  
 Upper Stratum, Tuff, tefroid and volcanomictic clastic rocks of andesitic composition, mostly red coloured.  
 Lower Stratum, Tuff, tefroid and volcanomictic clastic rocks of andesitic composition, mostly green coloured.

**D<sub>1</sub> r<sub>1</sub>** Lower Subformation. Tuff and tephrite of andesite and andesitic basalt composition of different sizing (without defining rock types and stratum at ore zone)



Legend for Plates III-2-3-2 and III-2-3-3



**N** Speckled clay, clay with admixed pebbles, rock debris and gruss (in cross sections only)

**Middle Devonian Post-ore Dike and Subvolcanic Complex**

**Dikes and Minor bodies of subalkaline diabase and trachybasalt (tb), subalkaline granite porphyry (εγ), Minor body of trachyandesite (rd)**

**KARAMENDIN INTRUSIVE COMPLEX**

**Intrusives and dikes additional to the second phase and associated metasomatic formations: granodiorite-porphyry (γδ<sub>1</sub>), quartz-diorite-porphyry biotite-plagioclase-like (qδ<sub>1</sub>), eruptive breccias of granodiorite-porphyry (γδ<sub>1</sub>β), beresite (br<sub>2</sub>), potassium feldspar facies (kl<sub>2</sub>).**

**The first phase and associated metasomatic formations: quartz diorite, medium-fine grained (qδ), microdiorite and quartz-diorite-porphyry of exocontact facies (mqδ), beresite (br<sub>1</sub>), potassium feldspar facies (kl<sub>1</sub>), propylite (P<sub>1</sub>), secondary quartzite (vk<sub>1</sub>).**

**Upper Subformation: Sandstone, aleurolite, gravelite, polymictic conglomerate with horizons of tuffite of acidic composition**

**Lower Subformation: Tuff and tefroid of andesite and andesitic basalt composition of different sizing.**

**Tuffite of acidic composition aleurolite and aleuropolite-like (a), trachyandesite (5).**

**Tuff of andesitic basalt (a), tuff of mixed composition with prevailing fragments of dacite and andesite (6), automagmatic breccia of granodiorite-porphyry: fragments located at fluidal cement of the same composition (B)**

**Diabase, gabbro-diabase (a), quartz diorite medium-fine grained, including quartz diorite porphyry in ore zone (6), quartz diorite fine grained (5), quartz diorite porphyry (z), granodiorite-porphyry (δ), granite porphyry (ε), beresite derived from quartz diorite, accompanied by unevenly distributed potassium feldspar (κ).**

**Beresite derived from quartz diorite (a) beresite derived from tuff and tefroid of andesitbasalt (6), beresite (6), (composition of initial rocks is shown by corresponding stripes), beresitized quartz diorite (z), quartz diorite with potassium feldspar (A), secondary quartzite (e), hematization (κ).**

**Eruptive (intrusion) breccia-breccia with different composition of fragments or with different composition of fragments and cementing rocks (a), tectonic pre-ore breccia: fragments of one type are cemented by powdered material of the same composition (5), tourmalinization (6), veinlet silicification, possible orientation of veinlets (z), quartz veins (A), limonitization (e), local silicification (κ).**

**Border of subdivisions with different age: confirmed (a), possible (6); faults defined by a combination of features (1), possible (z), borders of formations of the same age and different composition (A), borders of metasomatic facies (e), hornfels facies (κ).**

**Contour of hypergenic veinlet copper mineralization (a), impregnation and veinlets of minerals: pyrite (5), galena (δ), sphalerite (z), chalcopyrite (A), bornite (e), carbonate (κ), (δ- on geological columns only).**

**Border of depressions with Neogene sediments (a), shaft (6), open pit (6).**

**Inclination of rock laminations, as measured in drill cores (a), in the area (δ); inclination of the contact, as measured by graphical method (5).**

**Drill and Drill No.: prospecting drill (a), mapping drill (6), hydrogeological drill (6), CPSE (previous expedition) prospecting drill (z), technological drill (r), CPSE drill completed by Karaganda expedition in 1993 (e).**

**C<sub>2</sub> category reserves contour (a) outlined by prospecting drilling, (6) addition (on cross sections)**

**P<sub>1</sub> resources contour (on geological map).**

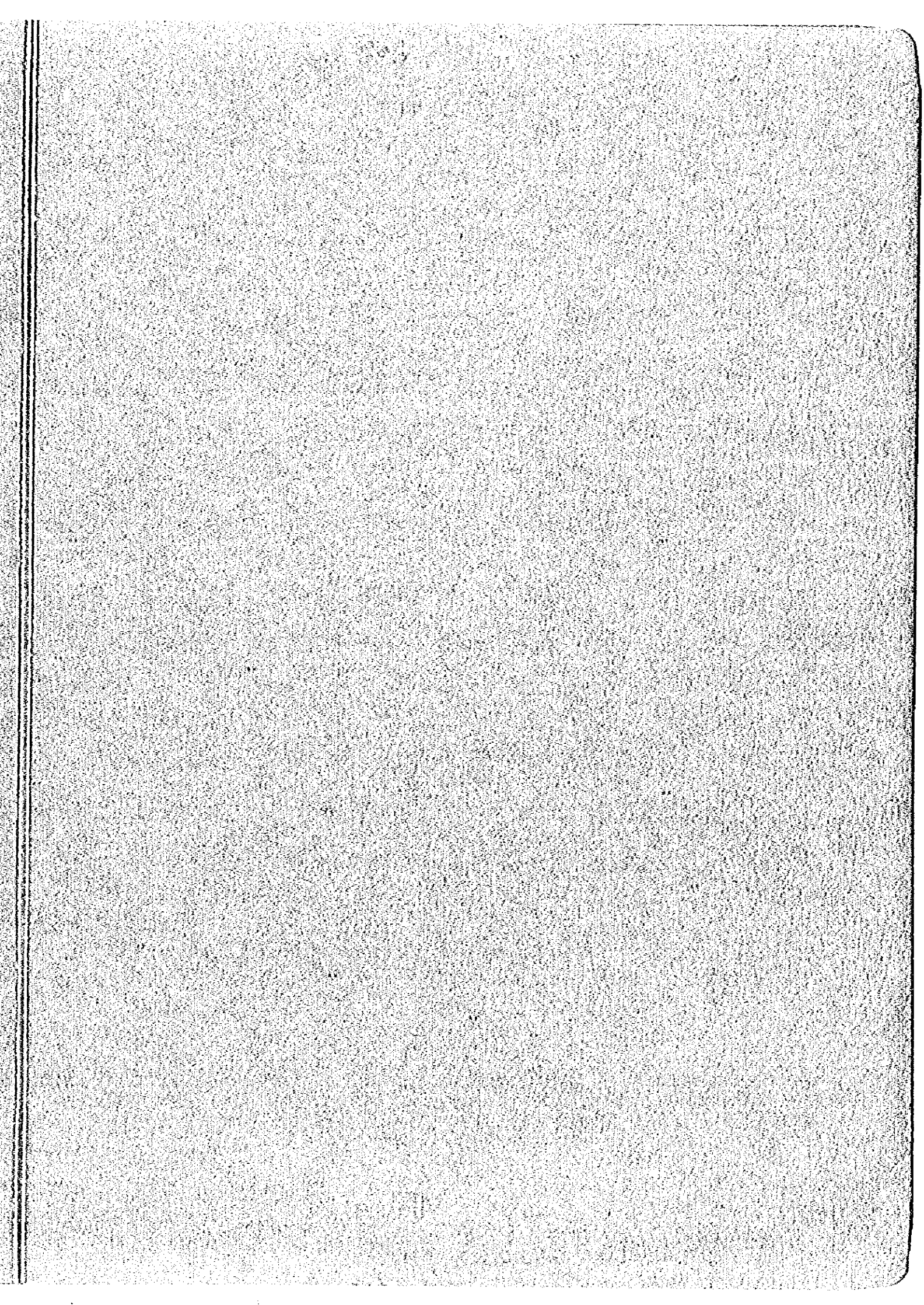
**Oxidation zone border (on the cross sections)**

**Contour of magnetic dome of quartz diorite at the depth of approx. 300 m as per drilling and prospecting data (a).**

**Contour of copper ore, suitable for operations (cut-off 0.5% Cu) (6).**

**Contour of rich copper ore.**

Legend for Plates III-2-3-4, III-2-4-3, III-2-4-4, III-2-4-5 and III-2-4-6



JICA