

NATIONAL INTEGRATED MINERAL EXPLORATION PROJECT (NIMEP)

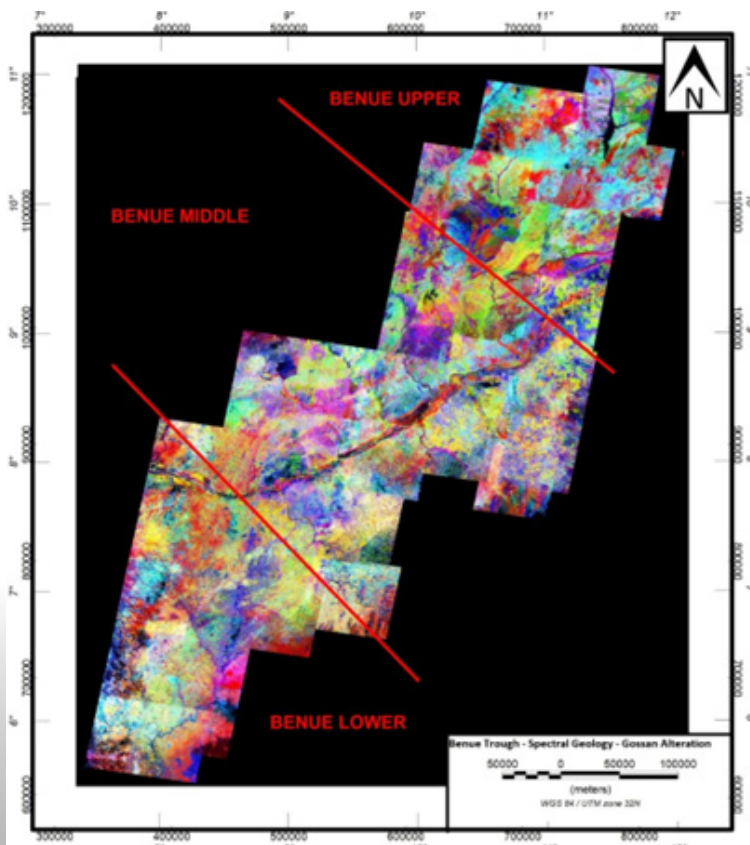
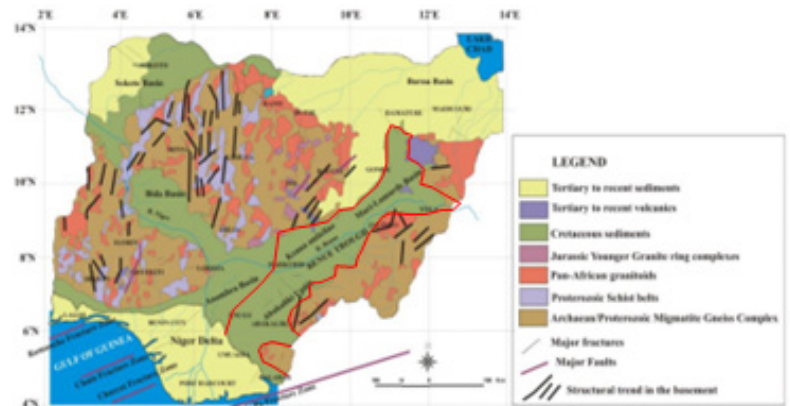


Base Metal Projects

FEDERAL REPUBLIC OF NIGERIA
MINISTRY OF MINES AND STEEL DEVELOPMENT
and the
NIGERIAN GEOLOGICAL SURVEY AGENCY

Base Metal Mineralization within the Benue Trough

Lot A3 of the National Integrated Mineralization Exploration Programme was designed to reveal the mineral potential of Nigeria through worldclass standard investigations of base metals (Pb-Zn-Cu-Ag) in Cretaceous sediments of the Benue Trough. These gently folded marine to fluvial sediments occupy a pseudo-graben formed by sinistral wrenching along an extension of a failed rift arm during widening of the proto-Atlantic Ocean.



The mineralization model is one of clastic-hosted Pb-Zn-Ag fissure-infill. Heated carbonate-rich connate water during the basin sag phase was propelled up conduits associated with Santonian inversion and coeval intrusions. Mineralization occupies normal faults and thrusts associated with NNW-SSE compression, enhancing preferential fluid flow along the faulted margins of intra-basinal horsts and Reidel shears orthogonal to the principal NE-SW regional stress axis. Hence mineralization exists in steep structures aligned N-S to NNW-SSE and less commonly 15°-20° either side of an E-W axis.

Mineralization consists primarily of galena plus sphalerite with minor chalcopyrite >pyrite and barite in siderite-calcite and subordinate quartz gangue. Veins range from 10's cm to >2 metres wide and <50 metres to over 1km long where they normally show an en echelon configuration. With a few exceptions mining is mostly limited to <20-40 metres below surface.

Employing spectral analysis and geophysical interpretation over an area exceeding 80000km², (RTP TMI magnetic image above), 21 targets were chosen including the Eggon deposit in basement near the northern trough boundary.

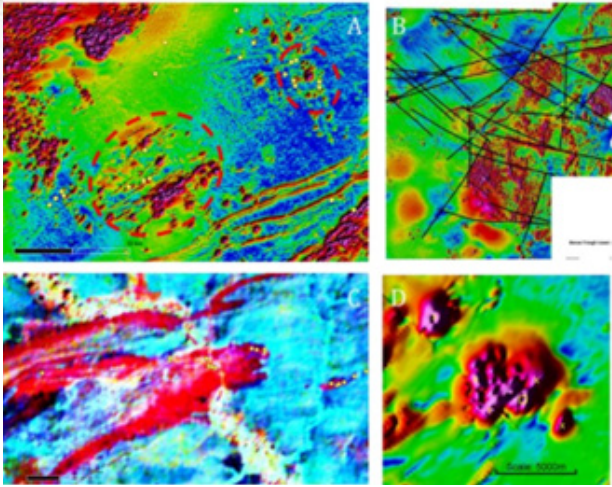
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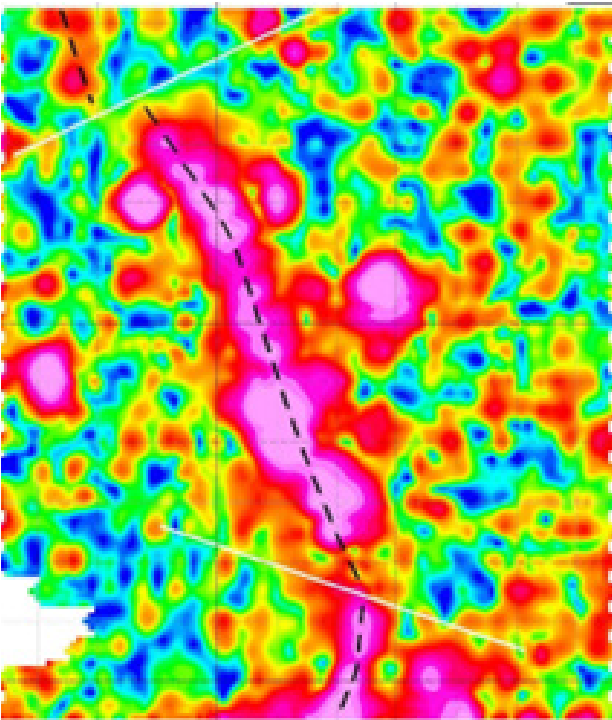
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Pb-Zn-Ag IN THE BENUE TROUGH



- Criteria for selection were based on:
- A) Indications of high heat flow from Analytic Signal based on proximity to possible structures bounding internal horsts;
 - B) Intersecting and Reidel shear lineaments;
 - C) Favourable stratigraphy derived from radiometrics along with known artisanal mines;
 - D) Magnetic highs associated with proximal mineralization.

The Target at D in the Lower Benue Trough was also checked by soil sampling but complications caused by extensive human settlement mitigated against further work.



TARGET 2 TMI

INITIAL GROUNDWORK

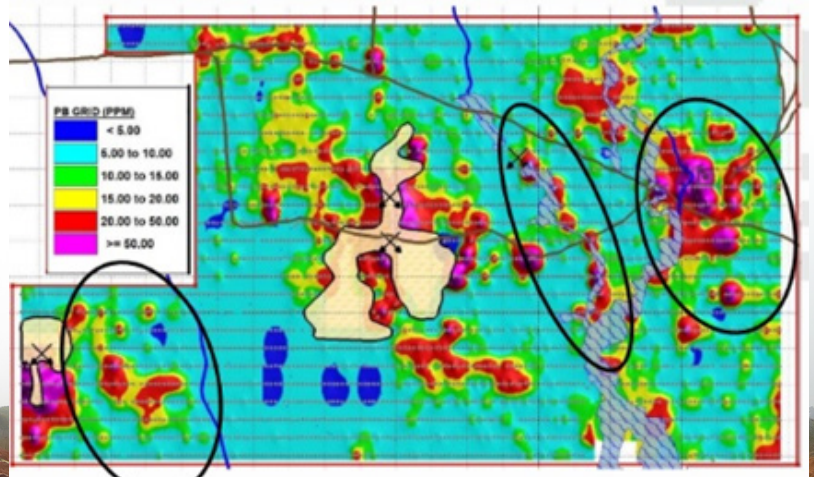
Following ground reconnaissance and initial grab sampling, focus was shifted to 4 main areas in the Middle Benue Trough. These were covered by ground magnetics and followed up by soil sampling on 400 x 100m and infill grids as tight as 100 x 20m (total 10000 samples) with a diagnostic coincident Pb-Zn-Sr geochemical signature.

TARGET 2 south of Wase gave a strong magnetic contrast across a potential structure parallel to prominent mineralised fissures in the district. Strongly anomalous Zn-Pb (120->450ppm) in soils along the eastern flank was matched by a good corresponding response from frequency domain EM. However, drilling across the soil anomaly zone revealed only weakly pyritic shales and micritic limestone without no obvious veining and drilling might need to be extended westwards to explain the emphatic magnetic signature.

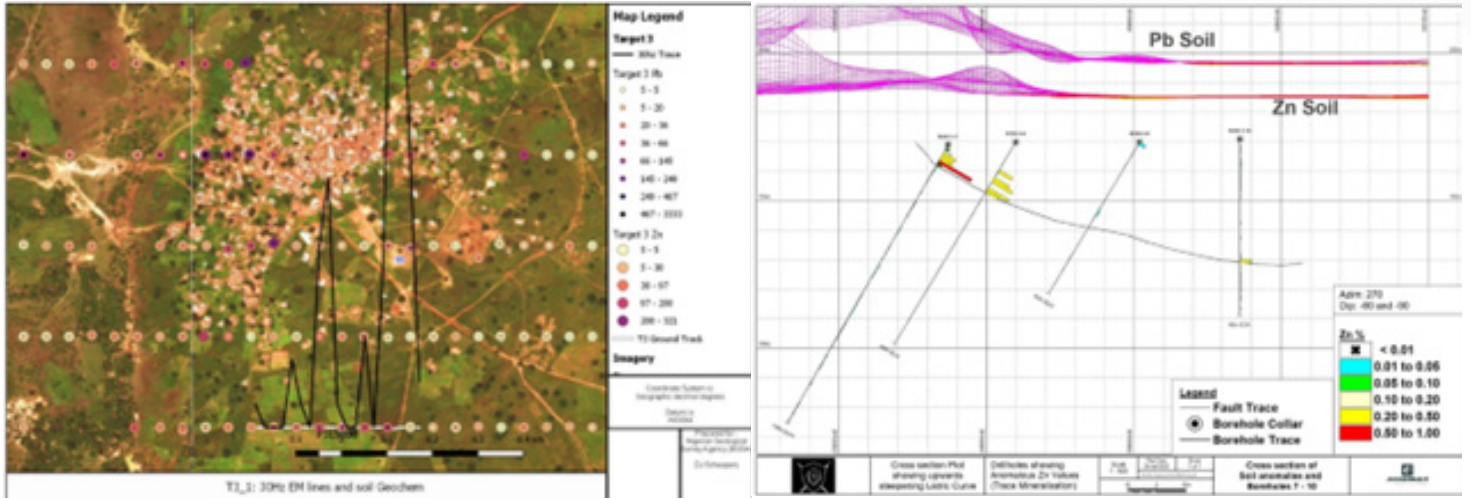
TARGET 3 in the Wase region produced 3 coincidental Pb-Zn soil anomalies.

The larger eastern anomaly (T3-1) is associated with a village where artisanal miners are active and was attributed to contamination. Nevertheless, a very strong 30 hz EM response coincident with soil anomalies was detected on the southernmost line, which on other targets, is associated with mineralization.

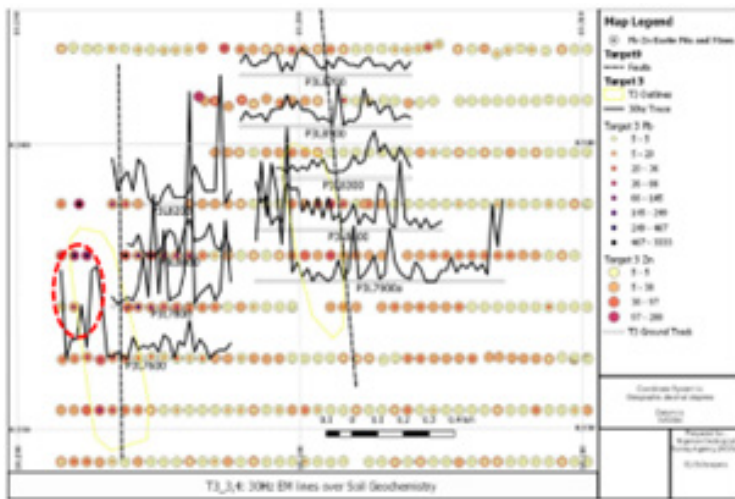
Drilling revealed a weakly mineralised shallow E-dipping, possible listric fault, which is unusual in the Benue Trough. The nearby narrower NNW-trending soil anomaly (TM3-2) produced a more diffuse EM response.



Pb-Zn-Ag IN THE BENUE TROUGH



TM3-3&4: In addition to a notable but dispersed SW-NE magnetic alignment over these otherwise monotonous turbiditic shales >arenites, the alignment of EM peaks and soil anomalies easily picks out the extension of the lode (below).



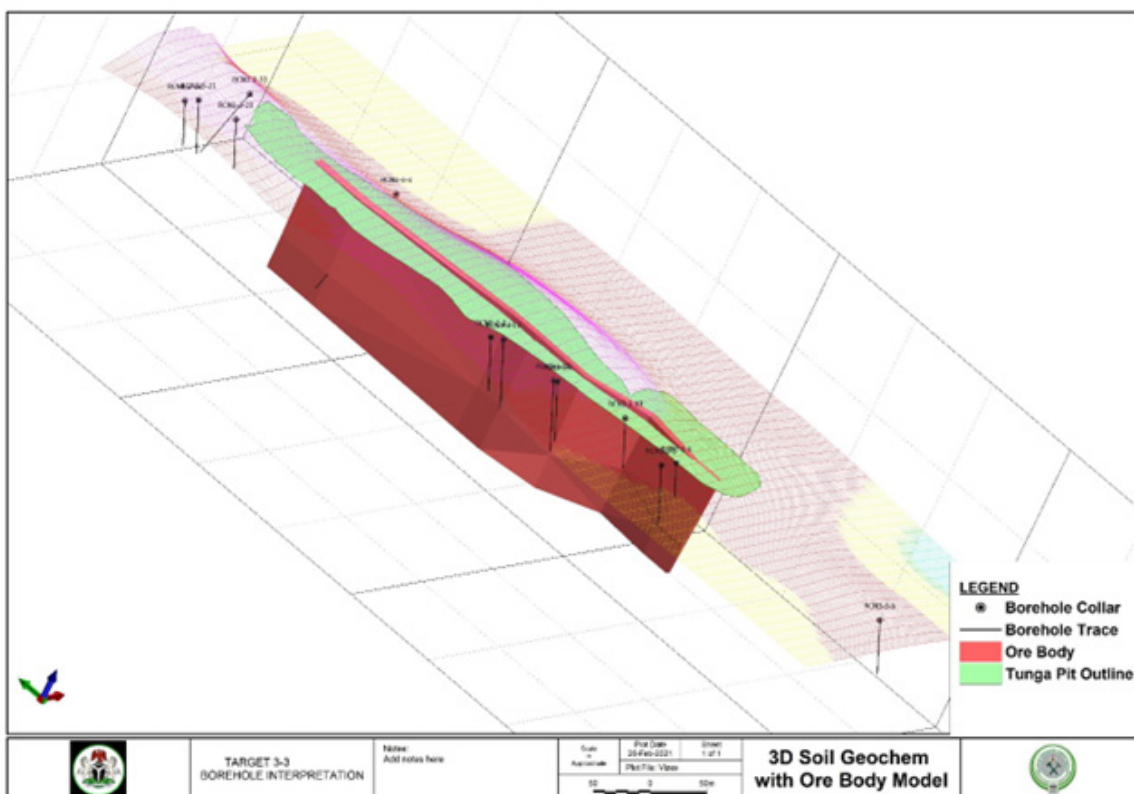
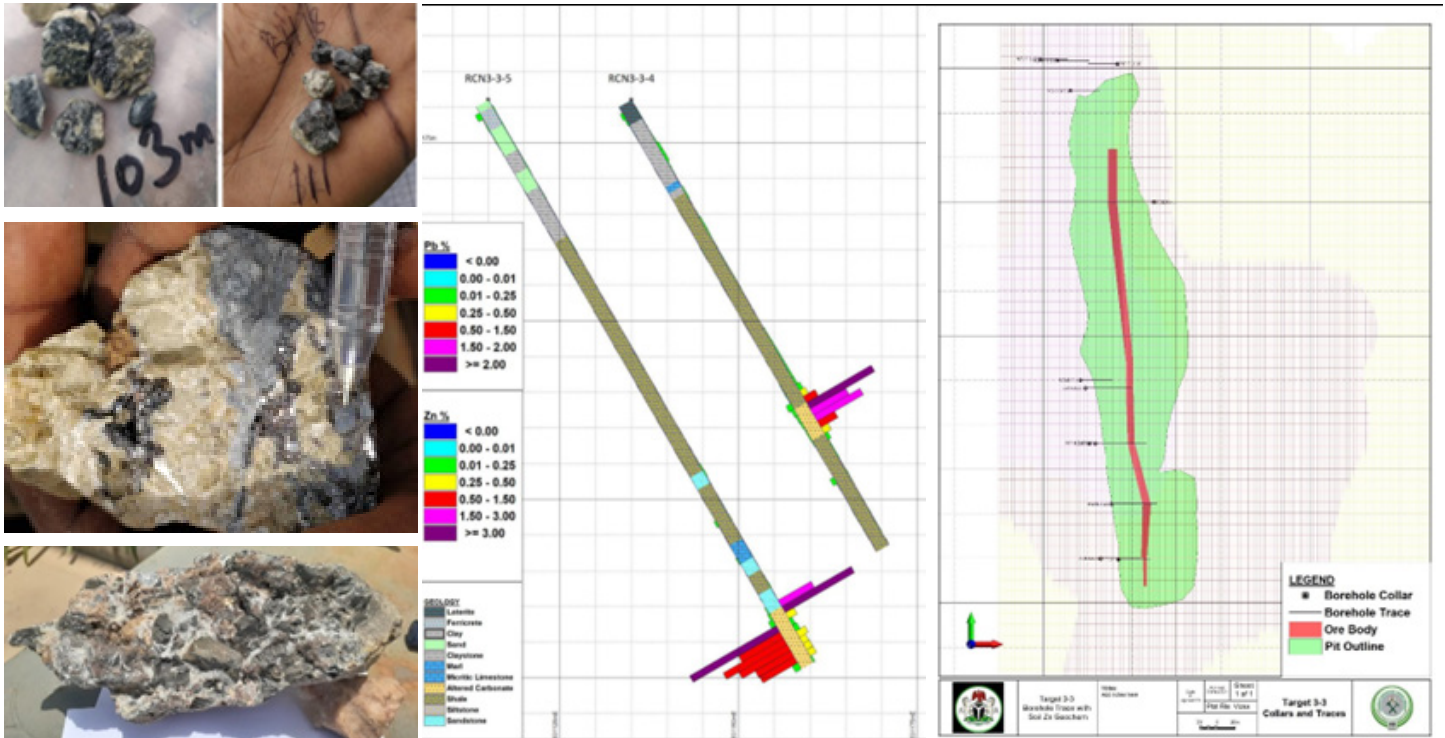
Other modest soil and EM anomalies infer sub-parallel mineralised fractures exist to the east.



Pb-Zn-Ag IN THE BENUE TROUGH

Target 3.3

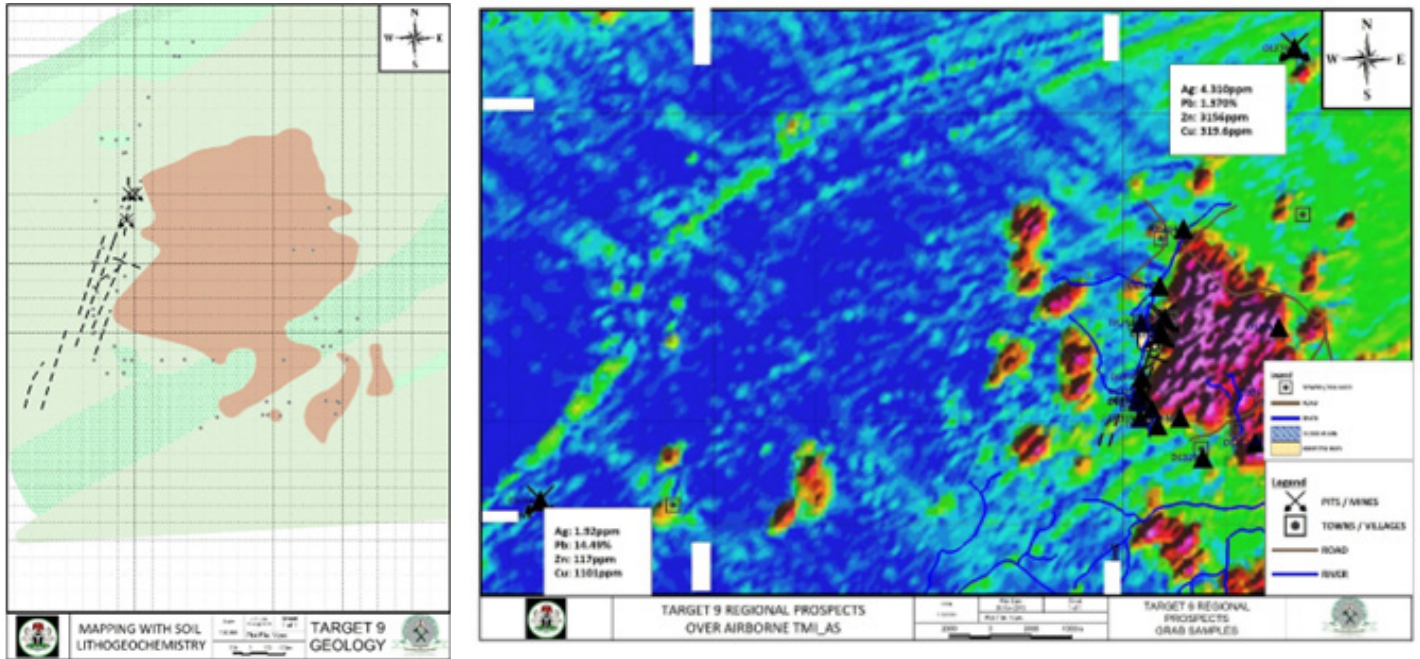
RC drilling returned most encouraging results showing mineralization over true widths of 1->3 metres at 40 to 90 metres vertically in most of the 14 holes. Downhole grades for individual metres were up 19.5% Zn and 1.6% Pb with averages around $\pm 1-2\%$ to $>7.7\%$ Zn, $<1\%$ Pb and $<0.1-0.3\%$ Cu over 2-6 metres, (See below). The paragenesis appears to comprise early quartz with minor galena >> chalcopyrite and pyrite followed by sphalerite \pm galena in thick siderite veins and breccias. A few holes infer the main vein branches and/or sub-parallel veins exist in a lode system at least 500m long and open to the south.



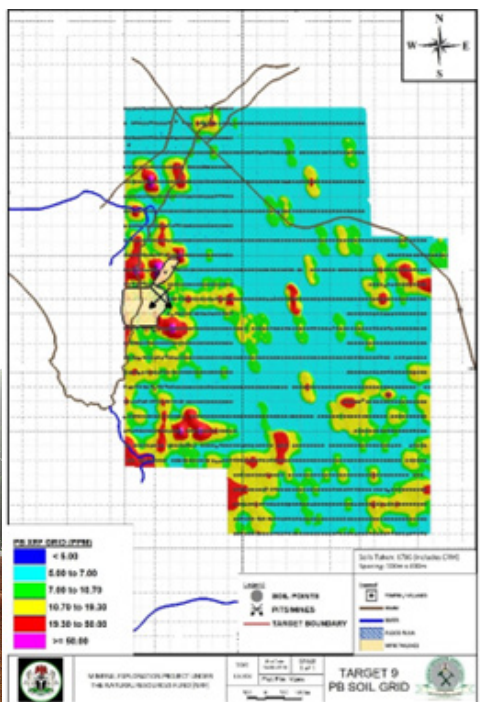
Pb-Zn-Ag IN THE BENUE TROUGH

TARGET 9

Target 9 lies in the core of Keana Anticline and is underlain by shales with a patch of thin amygdaloidal basalt



Detailed soil sampling shows Pb-Zn anomalies that correspond to the almost N-S to NNE trending en-echelon siderite veins occupying Reidel shears. While known workings are >500m long, narrow northerly trending Pb anomalies infer there are indications of more veins on the same trend to the south and possibly to the north, although the possibility of contamination in the north cannot be ruled out. EM surveys were restricted by workings, buildings and basalt boulder contamination and where access was available, the results were inconclusive.



Target 9

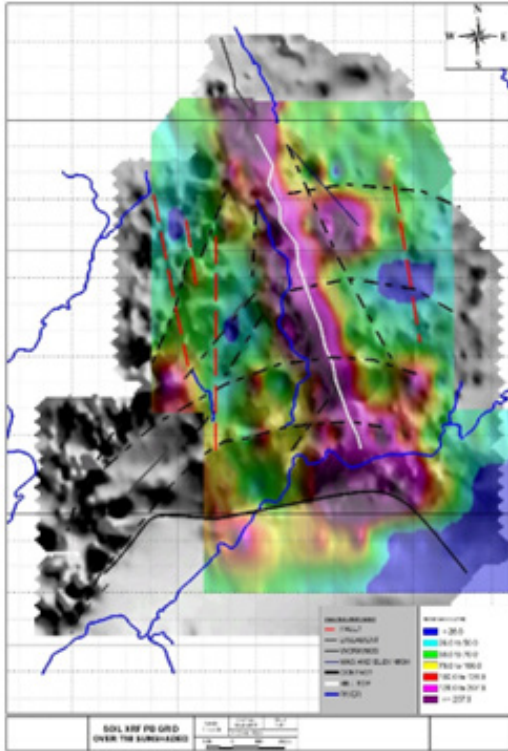
Bands of siderite, sphalerite, galena in pale siderite

Siderite is the dominant gangue mineral with minor quartz > calcite. Minor chalcopyrite, pyrite, bornite have been recorded.

Pb-Zn-Ag IN THE BENUE TROUGH

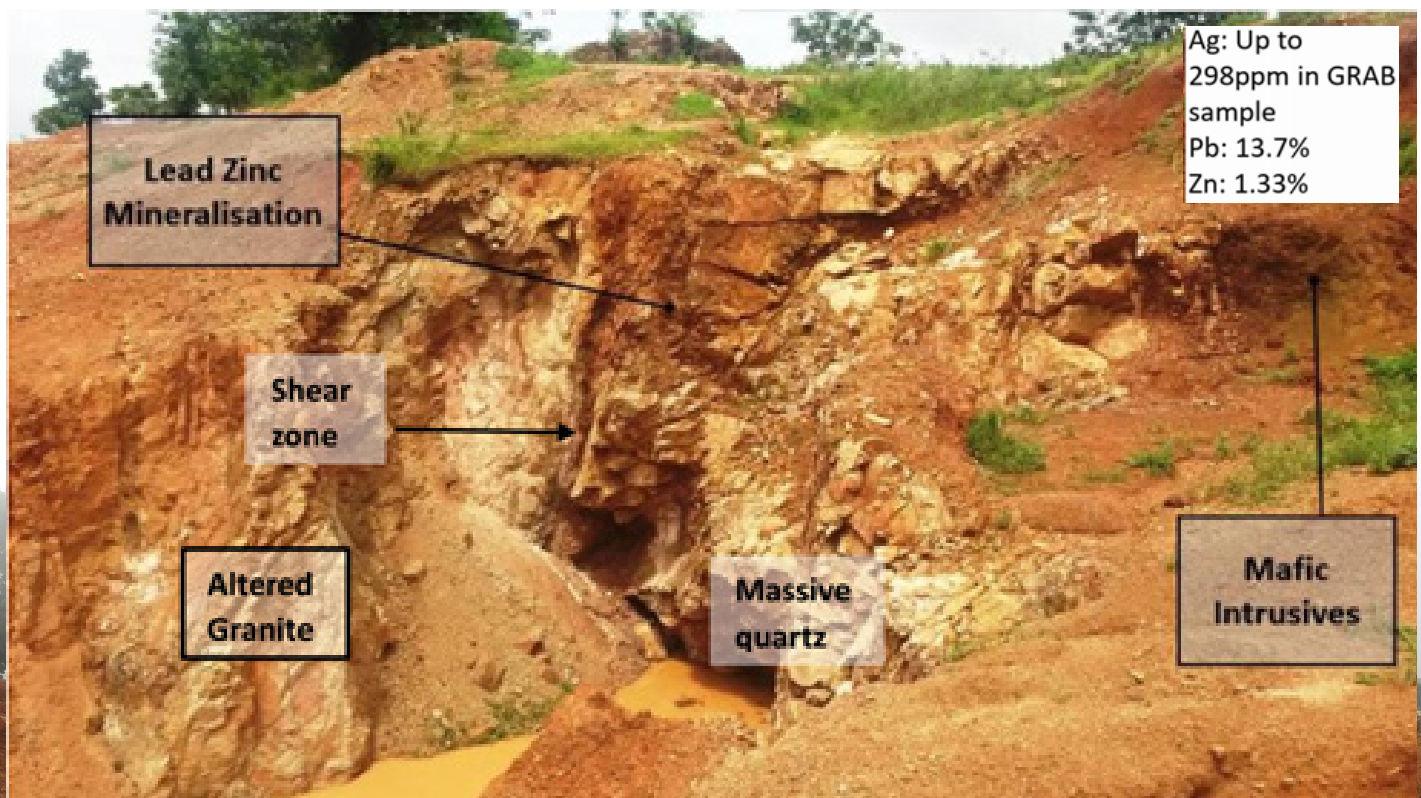
A smaller area (T9A) at Amiri, just east of Keana, was checked with >1800 soil samples and ground magnetics with 3 detailed grids and possible N-S Pb anomalies were disclosed with possible indications of short structures that might resemble other small artisanal mines in the district. None of the 9 RC holes intersected mineralization.

EGGON



An outstanding prospect that includes a working underground mine lies on a major structure in granite at Eggon-Nasarawa 20km north of Lafia.

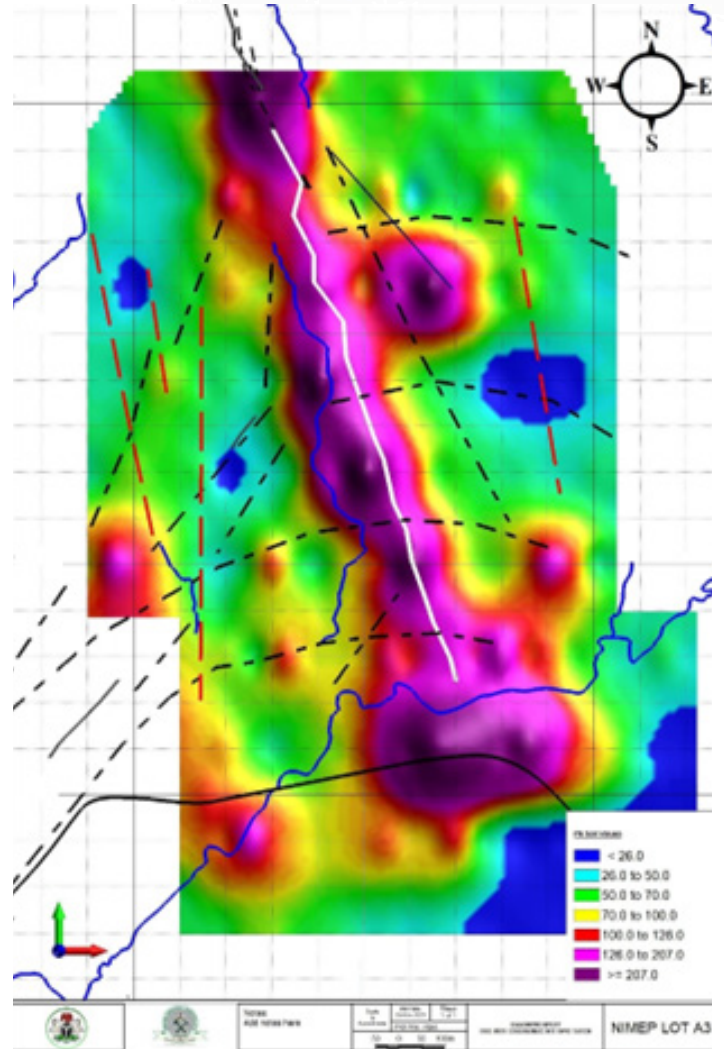
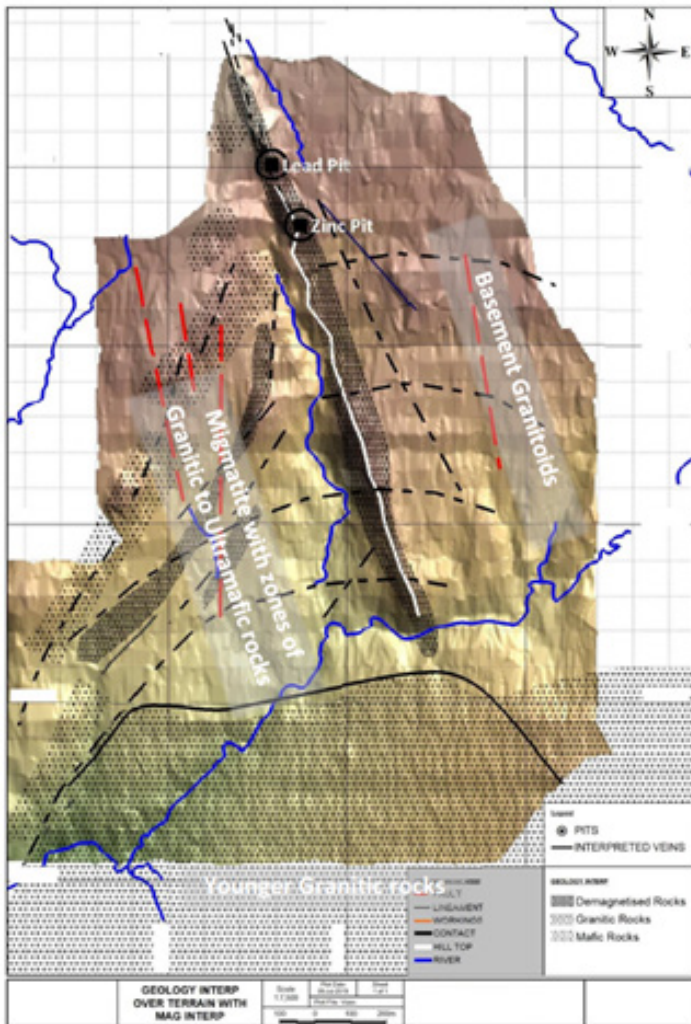
- >2km long quartz vein with parallel mafic dyke;
- Surface mineralization known intermittently over >1.5km;
- One vertical shaft descends to >100m;
- Galena, sphalerite >>chalcopyrite occur in <1m quartz veins along marginal shear between a vertical quartz vein and altered granite and in quartz veins in altered dyke;
- Argentiferous: sphalerite & associated mineralization carries up to +400g/t Ag; (= >4.6g/t Au equivalent);
- Trenching at south end shows broader zones 3-7m wide lower grade (0.5-1%) Pb-Zn mineralization & 2-30ppm Ag in altered mafic dyke with quartz stockwork extending into altered mineralised granite;
- High grade mineralization near south end in narrow quartz-epidote veins with galena >bornite fresher mafic;
- Gossan along margins of main quartz vein in unmined areas carries up to 1% Pb



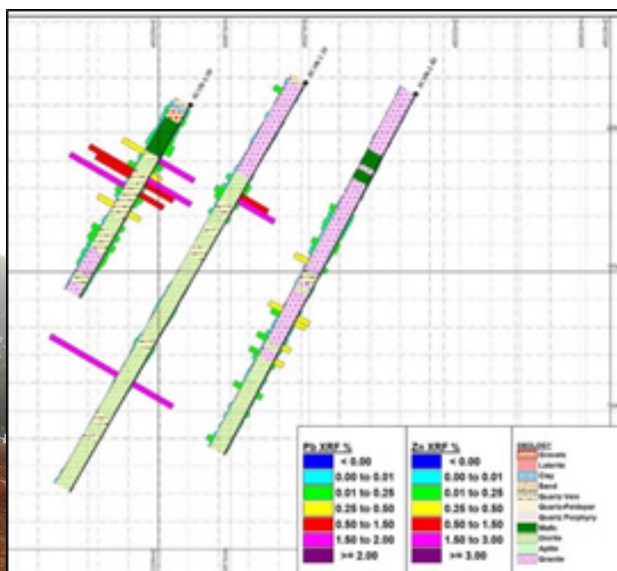
Pb-Zn-Ag IN THE BENUE TROUGH

Magnetometry surprisingly did not reveal a sharp peak corresponding to the dyke but did show a strong contrast with a subdued, low amplitude signature caused by a low younger granite that terminates the mineralization in the south. 14 RC holes were drilled totalling 1198 metres. Some examples shown below.

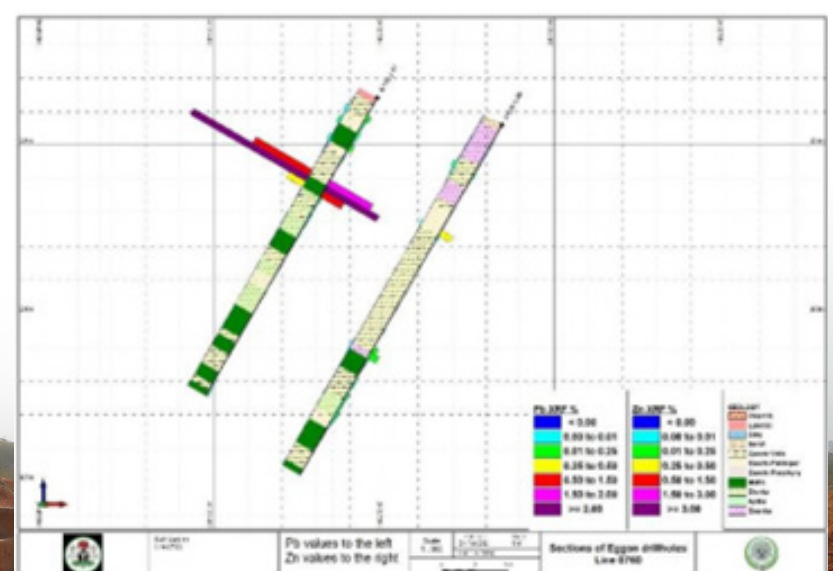
It is believed that IP and/or EM will give a high probability of disclosing new mineralised chutes in the unmined area between the known workings.



Southern Drill Holes



Northern Drill Holes



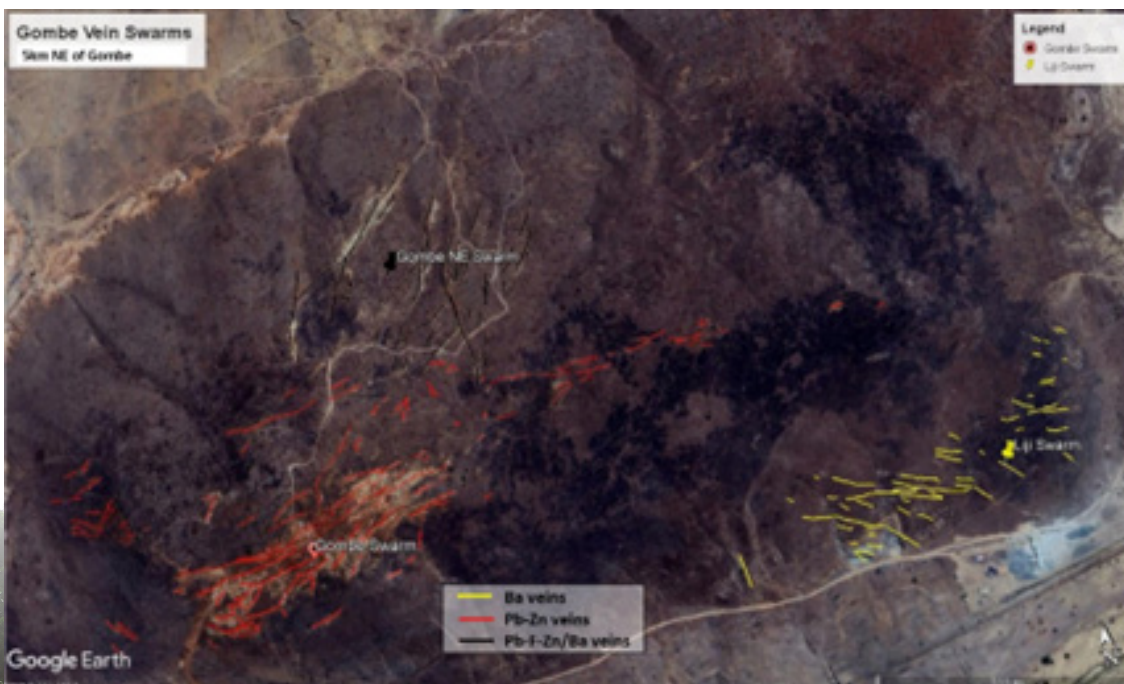
Pb-Zn-Ag IN THE BENUE TROUGH

ADDITIONAL PROSPECTS IN THE BENUE TROUGH

Other Pb-Zn-Ba camps exist in the Middle Benue: Wuse, western Bauchi, Akwana areas; Upper Benue: Gombe town NE; Lower Benue: Abakaliki, Ishiagu, Iyमितet areas with veins having a potential aggregate strike length of probably >80 kilometres.



Western Bauchi:
>12km of known veins
(excludes some veins
SW of the Symbol
operations off the
image. Only worked
to 20-40m depth but
known to extend below
60m



Gombe: The densest vein
swarm in the country
with total vein length of
>15km

