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3D Model of the Silvermines Zn-Pb-Ba Deposits, County Tipperary, Ireland

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The development of 3D models for Irish-style deposits are essential to the continued exploration and development of the Irish Mining industry. Over the past 50 years only five orebodies have been developed (Tynagh, Silvermines, Navan, Galmoy and Lisheen) and unfortunately as of December 2015, all Zn-Pb ore mining activity has ceased with the exception of Tara Mines which currently mine the Navan orebody. With the ever increasing need for exploration and production of economically viable deposits within Ireland, the development of robust 3D models can aid in targeted exploration and help establish key vectors for Irish-style mineralization.

The base metal and barite deposits of the Silvermines area are important historical deposits in Ireland. They were mined for over 1000 years from the 9th century until 1993, mainly for Pb-Zn by Mogul from 1968-1982 and for barite by Magcobar (Ireland) Ltd from 1963-1993 [1]. The Silvermines deposits produced 10.7 million tonnes at 7.36% zinc and 2.7% lead and 5.13 million tonnes of barite ore respectively [1].

The Silvermines area lies along the northern flank of the Silvermines Mountain on the southern limb of a regional syncline. The area is dominated by a complex series of fault structures trending WNW, dipping towards north, which are collectively known as the Silvermines Fault zone [2]. Here, Lower Carboniferous limestones are faulted against Devonian red sandstones and Silurian shales. Pb-Zn mineralization within the Silvermines area is associated with the contact between the upper Waulsortian Reef Limestones (a pale reef limestone associated with biomicrites which has been dolomitized and subsequently brecciated) and the lower Ballysteen Limestone (an argillaceous bioclastic calcarenite unit) as well as the major Silvermines Fault and a series of en echelon NW trending faults [1].

The current study aims to understand the links between mineralization, stratigraphy and the various structures within the Silvermines area in the light of increased insights gained over the past 23 years of continued mining and research of Irish Zn-Pb deposits (i.e. Navan, Lisheen, etc.). Ultimately, this study is part of a larger study aiming to produce detailed 3D structural and stratigraphic models for the Irish Carboniferous Basins as well as several of the Irish Zn-Pb deposits in an effort to produce a robust 3D regional framework.

The Silvermines area was chosen for its varied data sets which include logs and Zn, Pb and Ag assays from exploration and underground boreholes, interpreted mine plans and sections and limited geological surface maps. This site also allowed for the development of a methodology for modelling the Irish-style deposits including the evaluation of various 'state of the art' modelling packages such as GoCAD-SKUA with Mira Mining Suites, Leapfrog3D, and Vulcan.

Preliminary results of the 3D model for the Silvermines area will be presented as well as a discussion on the best practice workflow for future modelling of the Irish Lower Carboniferous.

References:

- [1] Andrews C J (1995) In: *Irish Carbonate-Hosted Zn-Pb Deposits*: Society of Economic Geologists Guidebook Series 21: 247-258.
- [2] Andrews, C.J., 1986, In: *Geology and Genesis of Mineral Deposits in Ireland*: Dublin, Irish Association for Economic Geology, 377–417.

