

**Development of
a GIS based approach
to mining risk
assessment**



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Executive summary

A GIS offers a means by which the data collected during the assessment of possible mining impacts can be stored and manipulated. A GIS that provides a central focus point for the storage, manipulation and retrieval of information generated by the investigation into the geomorphological impact of the ERA Jabiluka Mine has been developed. Implementing a flexible, GIS-centred approach to data management allows the data storage, manipulation and retrieval powers of GIS to be retained whilst maintaining access to the functionality contained within these other software packages. The GIS has also been linked to the DistFW hydrology model and SIBERIA landform evolution model, to provide a more spatial approach to assessing the impact of mining on the long-term landform evolution of a catchment.

A GIS based rapid erosion assessment method has been developed and evaluated. The method allows the user to quickly acquire and evaluate existing data to assist in the planning of more detailed monitoring, modelling and erosion assessment programs. The rapid erosion assessment method is based on a simplified version of the Revised Universal Soil Loss Equation (RUSLE), and allows the rapid parameterisation of the model from widely available land unit and elevation datasets. The rapid erosion assessment method is evaluated through the investigation of the effects of elevation data resolution on erosion predictions and field data validation.

More detailed, quantitative risk assessment can be conducted using a combination of landform evolution modelling and basin analysis in a GIS framework. SIBERIA has been parameterised using field data from Ngarradj* and applied to the catchment. Due to complexities of the catchment there were some difficulties with the hydrology component. However, the results indicate that SIBERIA is suitable and simulations showed little change in the catchment in the long term. Combining these with newly developed GIS tools to provide a geomorphometric basin analysis of the year 0 and year 1000 simulated catchments strengthens erosion risk impact assessment. The geomorphometric measures considered include the hypsometric curve, width function, cumulative area distribution and area-slope relationship.

Three areas have been identified as requiring further study in order to consolidate mining impact assessment: the incorporation of spatial variation in SIBERIA input parameters in the modelling process, an analysis of the sensitivity of the SIBERIA model to input parameter variations or error and the practical application of the GIS/modelling approach to assessing the impact of the ERA Jabiluka Mine on landform evolution in the Ngarradj catchment.

* Ngarradj is the Aboriginal name for the stream system referred to as Swift Creek.

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Note

A section of this report has been published elsewhere as a component of a journal article, but has been included here for completeness. Where referring to this section of the report, please refer to the journal article referenced below and not this report.

Section 3:

Boggs GS, Devonport CC, Evans KG & Puig P 2001. GIS-based rapid assessment of erosion risk in a small catchment in the wet/dry tropics of Australia. *Land Degradation and Development* 12 (5) (in press).