Geophysical Research Abstracts,
Vol. 11, EGU2009-9230, 2009
EGU General Assembly 2009

Tackling the Issues of Landscape Characterisation for Natural Resource Management in Urban and Peri-urban Western Sydney, Australia: Application of the Hydro-Geologic Landscapes Approach

C.L Moore and K Harvey

Dryland Salinity Hazard Mitigation Program, University of Canberra, ACT, Australia (leah.moore@canberra.edu.au)

Dryland salinity is a natural resource management issue and a planning hazard in urban/peri-urban Western Sydney, where there is enormous development pressure. The level of detail available on local geological, hydrogeologic and soils maps commonly does not provide sufficient detail for sub-catchment scale urban development planning and natural resource management (NRM) decision-making. The dominant lithologies for the area are relatively thick (up to 300m), flat-lying, Triassic fluvial and shallow marine siliciclastic sediments of the Sydney Basin. Localised areas of Cainozoic gravels cover the palaeo-landscapes developed on older rocks, and modern fluvial processes along the Hawkesbury River and tributaries continue to modify the landscape.

Salt is concentrated in this landscape through aeolian accession and deposition from oceanic aerosols, but almost never as fossil (connate) salts. The redistribution of salts by the process of aeolian accession typically takes place when the salts are coupled with windblown dust known as parna. For south-eastern NSW, this dust originates from areas which are more arid, such as the western regions of the NSW and Victorian states. Aerosols from the ocean can be responsible for the deposition of salts up to a few hundred kilometres from their source. This process is responsible for a significant contribution of salt in the Sydney area.

Field observations have shown that salt outbreaks are more dominant on some Sydney Basin units, specifically the Wianamatta Group sediments, some Cainozoic units, and along many active drainage systems. The Wianamatta Group sediments comprise three sub-groups; the Bringelly Shale, Minchinbury Sandstone and Ashfield Shale. The Cainozoic sediments comprise at least three units; the Saint Mary's Formation, Rickaby's Creek Gravels and Londonderry Clay. In Western Sydney these successions form an east-west oriented, tear-drop-shaped sub-basin, the Cumberland Basin, that narrows and thins to the east.

In the field, it has proven difficult to consistently discriminate between the Wianamatta Group sequence and the Cainozoic sediments without precise geomorphological characterisation of the landscape coupled with stratigraphic profiling. Further, terraces in the Recent fluvial deposits contribute to the development of a complex "stepped" landscape structure. Detailed biophysical typing of landscapes in this area using Hydro-Geologic Landscape characterisation, a scaled and modified Groundwater Flow System approach, allows constraint of salt storage and distribution, and development of conceptual models for saline fluid flow, and hence informs urban planning and NRM decision-making and provides evidence for implementation of preferred land use practices.

Strategic planning for dryland salinity, with respect to urban development, must address two principal concerns: the manifestation of land salinisation, and salinisation of waterways in this landscape; and, the impact of a high runoff, high recharge, low perenniality, low groundwater-consumption land use model (e.g. high density suburban housing). Land salinisation impacts on engineering structures, roads, and built infrastructure, and stresses vegetation. Water quality is an issue, especially if development occurs in a drinking water catchment. In order to minimise these impacts on future urban developments, a well-structured decision support system that underpins planning is required.

Biophysical characterisation of the landscapes, using the Hydro-Geologic Landscapes (HGL) technique, is

complimented by careful studies of the stratigraphy of the Wianamatta Group sediments, the overlying Cainozoic sediments and the Quaternary-Recent deposits in this area. In addition a preliminary groundwater study has been undertaken. Understanding of the detailed regolith geology, hydrology, geomorphology and geological structures allows for appropriate management in a delicate landscape and underpins development planning in outer urban Sydney.