

# Curriculum Vitae

## Edward H Rigby



### **QUALIFICATIONS & PROFESSIONAL AFFILIATIONS:**

B.E. University of Tasmania (1967)  
M.Eng.Sc. University of NSW (1972)  
FIEAust. Fellow Institution of Engineers, Australia  
FASCE. Fellow American Society of Civil Engineers  
MACS. Member Australian Computer Society\*  
MSSI. Member Spatial Sciences Institute\*  
CPeng. Chartered Professional Engineer  
NPER3 (Civil) Registered Professional Engineer 481553

### **TECHNICAL AND OTHER AFFILIATIONS:**

Member Association of Civil Engineering Consultants  
Member International Association Hydrological Sciences\*  
Member International Association Hydraulic Research\*  
Member Stormwater Industries Association\*

*\*Recently retired*

### **SPECIALIST SKILLS**

Investigations and reporting in areas involving advanced hydrologic and hydrodynamic expertise, focussing in the main on the preparation of Hydrologic Studies, Flood Studies and Floodplain Risk Management Studies and Plans

Provider of training to the profession, in areas of hydrologic and hydraulic modelling and the application of these models to establish flood behaviour and/or options for floodplain management.

An active committee member of the Australian Rainfall and Runoff revision project teams investigating 2D modelling techniques (Project 15) and stream/structure blockages (Project 11).

Several decades of experience in programming and software development in regard to tools and modelling related to the above fields and data collection collation and analysis in support of investigations in these fields.

Programmer and co-Author of the Watershed Bounded Network Model (WBNM), an advanced hydrologic model for the simulation of catchment runoff, incorporating the ability to directly model the changes in flow associated with urbanisation and diversions of flow at structures. Programmer and contributor to the development of flood modelling capabilities in the ANU, Geoscience Australia, 2D hydrodynamic model ANUGA.

## **EXPERIENCE GENERALLY:**

**2010 – To date     Director (Semi Retired) - Rienco Consulting, Sorell, TAS**

Significant projects completed or currently underway during this time include:

- Construction of an updated Anuga model to quantify the impacts of a tsunami on the south east coast of Tasmania. This model extends earlier work by Geoscience Australia to consider the impact of scour of protective dune lines and sand spits on otherwise protected areas and to consider the impact of currents and wave patterns on shipping. In addition, this project includes ongoing support as technical advisor to the Tasmanian Tsunami Working Group.
- Consulting support in respect to monti-carlo analysis and quantification of risk from major flooding in the Hawksbury River for Manly Hydraulics Laboratory
- Construction of a Riverflo-2d MD model of the 1872 debris flow event and evaluation as an alternative model to flo-2d pro for subsequent use by Mineral Resources Tasmania.
- Construction of pre and post development hydrologic and hydraulic models and assessment of potential development impacts for a proposed rezoning and development of land at Albion Park for Lyndal Pty Ltd.
- Review of available debris flow models, preparation of recommendations as to a suitable model for adoption by Mineral Resources Tasmania. Construction and calibration of the adopted flo-2d pro model for a historic debris flow event that occurred in 1872 in the Humphries Rivulet catchment.
- Consulting support in respect to hydrologic and hydraulic model establishment and application and peer review of the resulting report for Manly Hydraulics Laboratory in regard to a Flood Study of the Hazelbrook and Woodford Creeks systems, for Blue Mountains City Council.
- Consulting support in respect to hydrologic and hydraulic model establishment and application and peer review of the resulting report for Manly Hydraulics Laboratory in regard to a Flood Study of the Kincumber Creek system for Gosford City Council.
- Catchment wide hydrologic and hydrodynamic modelling of the lower and middle floodplains of Macquarie Rivulet and Marshal Mount Creeks (Shellharbour) for Cardno Wollongong using wbnm/tufLOW. This modelling was undertaken to provide a validation event for earlier modelling that had up until this time been based on only one historic/calibration event.
- An Investigation into and report on the storm of March 2011 and flooding of the Shellharbour LGA resulting from this storm, for Shellharbour City Council.
- A formal review of the draft final report of AR&R project 11 (2d Modelling) for the Institution of Engineers (AR&R Project 11)
- An investigation into the impact of different blockage mechanisms on culvert hydraulics and the development of a procedure for the analysis of the impact of culvert blockages on flood behaviour for the Institution of Engineers (AR&R

Project 11). Four papers and two reports prepared and published on the subject by the Institution of Engineers.

- Development and presentation of two day training workshops on 'Hydrodynamic Modelling Using Tuflow' to Manly Hydraulics Laboratory and Cardno Wollongong
- Consulting support in respect to hydrologic and hydraulic model establishment and application and peer review of the resulting report for Manly Hydraulics Laboratory in regard to a Flood Study of the Mosman LGA for Mosman Council.

**2005 to 2010: Director – Rienco Consulting, Wollongong, NSW**

Rienco Consulting was established in 2004 to provide a more deliberately focussed personal involvement in hydrologic and hydraulic modelling. During this time various hydrologic and hydraulic studies were undertaken involving formal catchment wide Flood Studies for Councils and State Authorities and several substantial site specific flood studies for private clients. A training workshop on hydraulic modelling was presented at the University of Wollongong during 2005 and a training workshop on hydrologic and hydraulic modelling presented to Wollongong City Council during 2006. Considerable time also been spent over this period in developing hydrologic and hydraulic models (wbnm and ANUGA in particular) and in investigating and publishing papers on issues of concern to practitioners in the flood modelling field.

- Catchment wide hydrologic and hydrodynamic modelling of the catchment of JJ Kelly Park (Wollongong) for a consortium of consultants using wbnm/tuflow and Anuga. All hydrodynamic modelling was undertaken with a rainfall on the grid approach using wbnm as a hydrologic sanity check.
- Catchment wide hydrologic and localised hydrodynamic modelling of the lower and middle floodplains of Macquarie Rivulet and Marshal Mount Creeks (Shellharbour) for Cardno Wollongong using wbnm/tuflow (a substantial extension and update of the earlier study for Jordan Mealey). This modelling was undertaken to establish existing flood behaviour and to quantify the likely impact of a proposed residential development on flooding.
- A review of surface water and leachate management practices at Whites Gully refuse emplacement area for Wollongong City Council using a customised version of wbnm for surface/leachate flow simulation and 2D hydrodynamic modelling (tuflow) to explore the impact of various civil works proposed.
- Catchment wide hydrologic modelling and localised hydrodynamic modelling using wbnm and tuflow to establish pre and post development flood behaviour for a site on the lower floodplain of Macquarie Rivulet (Shellharbour) for Jordan Mealey, Consulting Engineers
- Catchment wide hydrologic and hydrodynamic modelling of the Horsley Creek catchment for Shellharbour City Council/DECC using wbnm and tuflow. This involved the acquisition of ALS and aerial photography of the catchment together with detail ground and structure surveys and historic flood data. The hydrologic and hydraulic models were calibrated and the used to establish design flood behaviour for a range of flood AEP's and blockage scenarios.
- A hydraulic assessment of three options for a road bridge over Brandy and Water Creek (Wollongong) including the impacts of each option on flood behaviour in American Creek, downstream of the crossing. This modelling

involved construction of a wbnm model for the American Creek catchment and a tuflow model of the approaches to the bridge site and downstream floodplain.

**1990 to 2004: Director - Forbes Rigby P/L. Consulting Engineers, Planners & Scientists, Wollongong, NSW**

During this time I was responsible for hydrologic and hydraulic investigations and reports including storm rainfall analyses, storm damage assessment, Flood Studies, Flood Plain Risk Management Studies and Plans, Flood Evacuation Plans, Stormwater Management Studies and Plans and the design management, design, documentation and supervision of construction of associated works including flood mitigation works, stream rehabilitation works, specialised drainage structures and drainage networks.

Significant projects completed during this time include:

- A review of OSD procedures applicable to Wollongong with particular reference to PSD/SSR ratios required to control local and catchment wide flooding for Wollongong City Council.
- Wave climate investigation using the US Army 2D model STWAVE and breakwater pre-design with cost estimates for a proposed extension of the Bellambi breakwater for Wollongong City Council.
- Detail design, documentation and preparation of cost estimates for various flood mitigation works in Hewitt's and Towradgi Creeks for Wollongong City Council.
- Investigation and review of existing flood behaviour in Horsley Creek and the impact of development proposed on flooding, together with assessment of FPMM compliance and preparation of development recommendations for various owners of land in the lower reaches of Horsley Creek.
- Project management, conceptual design, review of wave loading, design and documentation of a 400Kw Wave Energy power generation facility at Port Kembla for Wave Power Projects Pty Ltd
- Investigation, analysis and reporting on flood behaviour in the event of August 1998 in the South Fairy Meadow area including creation of a 2D FEM model of the area and simulation of cross flows from Cabbage Tree Creek through the study area, for Wollongong City Council.
- Collection, collation and analysis of blockage data for streams in the northern suburbs of Wollongong following the storm event of August 1998 for Department of Land and Water Conservation and Wollongong city Council.
- Collection, collation and analysis of stage damage data held by QBE and the NRMA for property damaged in the storm of August 1998 for the Department of land and Water Conservation and Wollongong City Council
- Investigation and review of the impact of development proposed on land fringing the floodplain of American Creek at Figtree including development of a 2D FEM model of the study area and simulation of the impact of various development works on flood behaviour for Edenvel Pty Ltd.
- Investigation and development of concept plans for rehabilitation of the surface workings of Kemira Colliery at Mt Ousley including rehabilitation of redirected and infilled streams passing through the study area

- Liaison, collection collation and analysis of rain falling in the storm event of August 1998, in the northern suburbs of Wollongong, for the Department of Land and Water Conservation and Wollongong City Council, together with design and documentation of rehabilitation works in various streams and drainage systems, damaged in the event, for Wollongong City Council.
- Development of a floodplain risk management plan for Hewitt's, Slacky and Thomas Gibson Creeks including community consultation, documentation, 1 and 2D hydraulic modelling and cost/benefit analysis of mitigation options, together with preparation of a final study report and plan of management, for the Department of Land and Water Conservation and Wollongong City Council
- Design management, design and documentation of alternate emplacement land forms and stormwater management measures to accommodate an extension of Russell Vale Golf Course and mitigate downstream flooding at Russell Vale for Bellambi Collieries.
- Investigation and report on flooding in Hewitt's Creek for the Public Works Department (NSW) and Wollongong City Council. Included community interaction, data collection and assessment and 1D and 2D FEM modelling of flood flows.
- Investigation and report on flooding and the impact of development on flooding in the vicinity of Little Lake for Shellharbour Council.
- Investigation and report on flooding in Macquarie Rivulet, in the vicinity of Albion Park for Mobil Oil.
- Investigating & reporting on flooding and impact of development or flooding in the outfall reach of Macquarie Rivulet using a 2D FEM model, in support of a DA for development of part of the associated floodplain by Soredo Pty Ltd.
- Investigation and reporting on the impact of construction of a levee on Pig Island, in the Shoalhaven River, on the hydraulics of flood flows adjacent to the island using a 2D FEM model, for Shoalhaven City Council.

**1979 - 1990: Director - Forbes Rigby & Assoc Pty Ltd, Consulting Engineers, Wollongong, NSW**

Responsible for design management, design and supervision of construction of civil works including floodplain mapping, urban drainage and flood mitigation works, water supply and sewerage schemes, road works and parking areas, structural works including domestic, commercial, institutional and industrial buildings, parking stations, grandstands and specialised drainage structures.

Projects completed during this time include:

- Stormwater master plan for 1200 lot subdivision at Cordeaux Heights – Wollongong
- Building extensions for a coupled pickle line and rolling mill for Lysaghts – Wollongong
- Assistance to Coroners office in respect to fatal mudslide at Coledale – Wollongong
- Review of impact of New Jersey barriers on flood behaviour - Wollongong.

**1972 - 1979: Director - Rigby & Associates Pty Ltd, Consulting Engineers, Wollongong, NSW**

Responsible for design management, design and supervision of construction of civil and structural works including urban drainage and subdivisional sewerage schemes, roadworks and parking areas, the structure of residential, commercial, institutional and industrial buildings, parking stations.

Projects completed during this time include:

- Multilevel car parking station for Blacktown City Council - Blacktown
- Extension of rural water supply & new reservoir - Yerrinbool
- New multistorey office building for Local Government Employees Union - Wollongong

**1970 - 1972: Design Engineer and later Associate - Rooney and Bye, Consulting Engineers, Sydney, NSW**

Design and supervision of construction of civil and structural works for commercial, industrial and residential buildings, parking stations, grandstands and swimming pools, under general guidance and direction of the principal Mr J Rooney.

Projects completed during this time include:

- M A Nobel grandstand for the Cricket Ground Trust – Sydney Cricket Ground
- Multilevel car parking station for Wollongong City Council - Wollongong
- New office & warehousing complex for Hyster – Sydney
- New grandstand for Manly Warringah Leagues Club - Manly

**1968 - 1970: Design Engineer - Maritime Services Board, Sydney, NSW**

Design and supervision of construction of sea-walls, wharves, transit sheds, dolphins, bridges, roadworks, drainage and heavy duty pavements, under guidance and control of Section Leader Mr D Egan and Chief Design Engineer Mr J Jones.

Projects completed during this time include:

- Mooring dolphins & walkways at White Bay Container Terminal - Sydney
- Reconstruction of wharf deck - Balmain Coal Loader - Sydney
- Heavy duty pavement for containers at No 10 Darling Harbour – Sydney
- Review of seawall options for shore protection – Botany Bay

**1967 - 1968: Design Engineer - Johns and Waygood, Fabricators, Hobart, TAS**

Design of steel framing to commercial, industrial and residential buildings, under guidance and control of the Design Engineer and Manager Mr W. Simmons

Design work undertaken during this time includes:

- Reconstruction of Cascade Brewery after fires of January 1967 - Hobart
- New fish cannery complex for Safcol - Margate
- Slipway facility for fabrication of transport barges for pulp mill – Hobart
- Alterations and additions to abattoirs - Hobart

## **PAPERS PUBLISHED:**

Rigby & Weeks (2015) *Evolving an Australian Design Procedure for Structure Blockages*. Proceedings Hydrology and Water Resources Symposium, Hobart, Australia, 2015

Rigby, Mazengarb, Stevenson and Hannon (2014) *Experiences Selecting Implementing and Reviewing the Performance of a Debris Flow Model*, Proceedings Hydrology and Water Resources Symposium, Perth, Australia, 2014.

Rigby & Barthelmess (2011) *Culvert Blockage Mechanisms and their Impact on Flood Behaviour*, Proc IAHR 34<sup>th</sup> World Congress , Brisbane, Australia, June 2011

Barthelmess & Rigby (2011) *Estimating Culvert & Bridge Blockages – A Simplified Procedure Behaviour*, Proc IAHR 34<sup>th</sup> World Congress , Brisbane, Australia, June 2011 (in press)

Rigby (2009) *Quantifying Calibration Uncertainty in Coupled Hydrologic/Hydraulic Modelling*, H2009 - 32<sup>nd</sup> Hydrology and Water Resources Symposium, Newcastle NSW, November 2009

Barthelmess & Rigby (2009) *Quantification of Debris Potential and Evolution of a Regional Culvert Blockage Model*, H2009 - 32<sup>nd</sup> Hydrology and Water Resources Symposium, Newcastle NSW, November 2009

Weeks, Barthelmess, Rigby, Witheridge and Adamson (2009) *Blockage in Drainage Structures*, H2009 - 32<sup>nd</sup> Hydrology and Water Resources Symposium, Newcastle NSW, November 2009

Rigby & VanDrie (2008) *ANUGA – A New Free and Open Source Hydrodynamic Model* , Water Down Under 2008, Institution of Engineers Australia Conference, Adelaide South Australia, April 2008

Rigby & Roso (2008) *Hydraulic Categorisation of the Floodplain – Why and How*, 48<sup>th</sup> Annual Floodplain Management Authorities of NSW Conference, Wollongong NSW , February 2008

Rigby (2007) *The Floodplain Development Manual NSW – A Document in Need of Review*, 47<sup>th</sup> Annual Floodplain Management Authorities of NSW Conference, Gunnedah NSW , February 2007

Rigby & Silveri (2006) *Experiences in Developing an Upgraded OSD Policy for the City of Wollongong*, 30<sup>th</sup> Hydrology & water Resources Symposium, Launceston, December 2006

Rigby & Milevski (2006) *Scaling Issues in the Hydrologic Modelling of Distributed Storages*, 30<sup>th</sup> Hydrology & water Resources Symposium, Launceston, December 2006

Roso & Rigby (2006) *The Impact of Embedded Design Storms on Flows Within a Catchment*, 30<sup>th</sup> Hydrology & water Resources Symposium, Launceston, December 2006

Rigby & Roso (2006) *2D or not 2D – Is that the question*, 46<sup>th</sup> Annual Floodplain Management Authorities of NSW conference at Lismore, February 2006.

Roso, Boyd, Rigby & VanDrie (2004) *Prediction of Increased Flooding in Urban Catchments due to Debris Blockage and Flow Diversions*, Proc Novatech 2004. Lyon France, July 2004.

Rigby, Boyd, VanDrie & Roso (2003) *Storms, Storm Bursts and Flood Estimation – A need for Review of the AR&R Procedures*, Proc 28<sup>th</sup> Hydrology Symposium, Wollongong September 2003

Boyd, Rigby, Roso, Silveri & Davis (2002) *Causes and Effects of Culvert Blockage During Large Storms*, 9th International Conference on Urban Drainage, Portland Oregon September 2002.

Rigby & Silveri (2001) *The Impact of Blockages on Flood Behaviour in the Wollongong Storm of August 1998*, Proc 6<sup>th</sup> Conference on Hydraulics in Civil Engineering. Hobart November 2001.

Boyd, Rigby & VanDrie (1999) *Modelling Urban Catchments with WBNM2000*, Proc Water 99 Joint Congress, Institution of Engineers (Aust), Brisbane July 1999

Rigby, Boyd & VanDrie (1999) *Experiences in Developing the Hydrology Model – WBNM2000*, Proc 8<sup>th</sup> International Conference Urban Storm Drainage, IE(Aust) Sydney, September 1999

Rigby, Short & Anger (1997) *Cementitious Stabilisation of Coal Tailings - Performance and Alternate Agents*, Proc 2<sup>nd</sup> International Conference Environment & Mining Wollongong University Wollongong.

Rigby & Bannigan (1997) *A Review of Factors Influencing Near Coastal Flooding in Hewitt's Creek, Wollongong*, Proc 2<sup>nd</sup> International Conference Environment & Mining Wollongong University 1998.

Boyd, Rigby & VanDrie (1996) *A Comprehensive Flood Model for Natural and Urban Catchments*. Proc. 7<sup>th</sup> International Conference on Urban Storm Drainage Hannover, Germany.

Boyd, Rigby & VanDrie (1996) *A Computer Software Package for Flood Studies*. Proc 7<sup>th</sup> International Conference on Urban Storm Drainage, Hannover, Germany.

Rigby & Bannigan (1996) *The Embedded Design Storms Concept - A Critical Review*" Proc Hydrology , IE Aust Conference, Hobart, May 1996.

Rigby, Bannigan & Anger (1995) *Modelling the Hydrology of a Complex Partly Urbanised Catchment*, Proc Hydrology IE Aust Conference, Hobart, May 1996.

Boyd, Rigby, Sharpin & VanDrie (1994) *Enhanced Runoff Routing Model WBNM94*, Proc Water Down Under, IE Aust Conference, Adelaide, 1994.

Rigby (1993) *Modelling Flood Flows in Macquarie Rivulet using FESWMS-2DH*. Proc International Conference on Environmental Management Geowater and Engineering Aspects, Wollongong Feb 1993.

Rigby (1993) *FESWMS-2DH: A Powerful and Flexible 2D Flood Modelling Package*, Proc Watercomp '93, IEAust/ACADS Conference, Melbourne, March 1993.

Foreman & Rigby (1990) *Urban Flooding and Flood Mitigation in The Northern Illawarra Region*, Proc 30th Annual Flood Mitigation Conference, Wollongong.



Boyd et al (1989) *A Comparison of Design Flood Estimation Methods*, Proc Fifth National Local Government Engineers Conference, Sydney.

Rigby (1984) *Development of a Regional Hydrologic Database*, Proc IE Aust (Illawarra) Conference, Wollongong.

Rigby & Watts (1983) *PSRM - A Design Oriented Runoff Model*, Proc IE Aust Hydrology Conference, Hobart.

Rigby & Watts (1983) *Runoff Model Selection on Performance Criteria*, Proc Second National Conference on Local Government Engineering, Brisbane.

Rigby (1981) *Retarding Basins and Stormwater Management*, Proc First National Conference on Local Government Engineering, Adelaide.