

LINDSAY MILLARD

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PRINCIPAL ENGINEER



Lindsay brings over twenty years of experience as a civil engineer, strongly focusing on hydrologic analysis. His expertise extends to flood and water resource modelling for natural resource management projects, the transport and mining sectors, and flood risk assessments for local Councils.

Lindsay's leadership in floodplain modelling investigations within WRM is a testament to his capabilities. He has led hydrologic and hydraulic modelling on multiple design flood studies and has extensive experience using industry software.

Lindsay has contributed to flood studies and floodplain management plans, managed their delivery, and ensured their technical quality. His projects have included calibration of historic events, assessment of mitigation options, flood damage assessments, and cost-benefit analysis.

PROFESSIONAL EXPERIENCE

2022 to present
Principal Engineer
WRM Water & Environment Pty Ltd

2014 to 2022
Senior Project Engineer
Seqwater

2011 to 2014
Senior Engineer
TMR

2005 to 2011
Senior Engineer
AECOM (UK)

2001 to 2005
Engineer
TMR

AREAS OF EXPERTISE

Extreme flood estimation

Stochastic modelling

Analysis and design of hydraulic structures

Flood damage assessment and floodplain management

Options assessment with flood damages and cost-benefit analysis

Impact assessments

Expert advice

Project management & technical writing

QUALIFICATIONS

Masters of Engineering Science, University of NSW, 2009

Bachelor of Business, JCU, 2005

Bachelor of Engineering, UQ, 2002

Registered Professional Engineer of Queensland

National Engineers Register, Engineers Australia

Fellow of Engineers Australia

Deputy Chair Queensland Water Panel

CAREER HIGHLIGHTS

One of Lindsay's career highlights includes his significant contribution to the TMR Bridge Scour Manual, 1st Edition, QLD (2014). His work on this project has left a lasting impact on civil engineering.

Darling Downs Flood Link Study (2024 - 2025)

Water Resource Impact Assessments (2024 - 2025)

Design hydrology for major dams in South East Queensland (2016 - 2022)

Consequence Assessment for major dams in South East Queensland (2016 - 2022)

Increased Benefits Assessment for confidential project, QLD (2020)

Risk Tolerance Report for confidential project, QLD (2021)

Brisbane River Catchment Flood Study Technical Working Group, QLD (2017 - 2018)

Technical Working Groups of major dam upgrade projects, QLD (2016 - 2022)

Experience

Linear Infrastructure

DARLING DOWNS FLOOD LINK STUDY, QUEENSLAND (2024)

Developed an approach to disaggregate daily rainfall data and then run in continuous simulation mode of URBS. This enabled hydrologic modelling of current and future climate projections on an hourly step for 136 years for the river basins in the study area (Condamine / Balonne, Mooney and Macintyre River). These models outperformed the runoff generated from hourly rainfalls using GR4H models routed to points of interest using RORB-style non-linear storage models. The URBS models were calibrated to streamflow data recorded at twenty gauges within Study Area. The calibration reproduced peak flows, hydrograph shape, and travel time, which drove closure statistics of a transport network, principally the interdependence and timing of floods occurring at nearby crossings. This was the case for the DDDFS road network, which crosses major catchments at multiple upstream and downstream locations. **QLD Department of Transport and Main Roads**

EMERALD FLOOD MITIGATION PROJECT & HEAVY VEHICLE BYPASS: CHRC (2012)

Hydraulic assessment of flood behaviour using MIKE FLOOD and MIKE11 for existing and developed scenarios. Completed the project's conceptual design of waterway crossings and flood mitigation options. Undertook a township's flood mitigation. Led appraisal of consultant submissions to CHRC and TMR of proposed HV bypass and bridges **QLD Department of Transport and Main Roads**

DAWSON AND CARNARVON HIGHWAYS - ROLLESTON OPTIONS EVALUATION, QUEENSLAND (2013)

Developed a broad-scale hydraulic model for economic assessment of road closures on Carnarvon and Dawson Highways to improve highway flood closure **QLD Department of Transport and Main Roads**

KEELBOTTOM CREEK BRIDGES HYDRAULIC ANALYSIS, QUEENSLAND (2007)

For TMR, Lindsay undertook a scour assessment of 3 3-span bridge and box culvert structures for the Department of Main Roads, developing a concept design of scour mitigation options. Hydrologic evaluation of 42km² of catchments using RAFTS of flood behaviour using MIKE FLOOD and MIKE11 Douglas Arterial Hydraulic assessment **QLD Department of Transport and Main Roads**

NORTHERN TERRITORY GAS ROADS HYDROLOGY, NORTHERN TERRITORY (2024)

Assisted with developing bespoke post-processing scripting to undertake Annual Average Time of Closure analysis from thousands of hydrologic model runs across key roads around the Beetaloo Basin. This assisted with prioritising and calculating existing road upgrades. **Northern Territory Department of Infrastructure, Planning and Logistics**

DOUGLAS ARTERIAL DUPLICATION FLOOD ASSESSMENT, TOWNSVILLE (2006)

Flood modelling assessment for crossing options for Main Roads Douglas Arterial Duplication. Hydrologic evaluation of catchments using RAFTS for existing and developed scenarios. Hydraulic evaluation of flood behaviour using MIKE FLOOD and MIKE11. Concept design of waterway crossings for the four lanes **QLD Department of Transport and Main Roads**

SOUTHERN ACCESS CORRIDOR PLANNING STUDY FLOOD ASSESSMENT, TOWNSVILLE (2006)

Flood modelling with MIKE21 to assess crossing options as part of the Southern Access Corridor Planning Study for the Department of Main Roads. Hydrologic assessment of catchments using RAFTS for existing and developed scenarios. Hydraulic evaluation of flood behaviour using MIKE FLOOD and MIKE11 for existing and developed scenarios. Completed the project's conceptual design of waterway crossings and flood mitigation options. **QLD Department of Transport and Main Roads**

Hydrologic and hydraulic modelling, flood and floodplain management studies

HORSNELL ROAD UPGRADE ASSESSMENT, NORTHERN TERRITORY (2020)

Undertook hydrologic and hydraulic modelling to assess the potential impacts of the Horsnell Road upgrade project as part of the NT Government 'Mango Roads' project. The study utilised XP-RAFTS for hydrologic modelling and TUFLOW for hydraulic modelling and assessed both existing (pre-upgrade) conditions and the predicted impacts of the road upgrade. **NT Department of Infrastructure, Planning and Logistics**

SOMERSET AND WIVENHOE DAM DESIGN HYDROLOGY: QUEENSLAND (2020)

Following the delivery of the AEP of the PMP study and Brisbane River Catchment Flood Study. Lindsay undertook the comprehensive development of design event hydrology for Brisbane, Wivenhoe, and Somerset dam catchments. This required that AEP neutrality was preserved and that representative temporal patterns were developed for 1496 events out to the PMF +20%. These hydrographs are a key input into the generation of the design and consequences assessment for the ongoing Somerset and Wivenhoe Dam upgrade projects. **Seqwater, QLD bulk water supplier**

ELIZABETH RIVER & BLACKMORE RIVER (COOLALINGA) FLOOD STUDY, NORTHERN TERRITORY (2022)

Delivered the flood study of the proposed development area. This required developing and calibrating hydrologic models within the Elizabeth and Blackmore Rivers. The study developed a hydraulic model of the proposed Coolalinga development area to assess existing conditions and flooding behaviour and develop potential mitigation concepts. **NT Department of Infrastructure, Planning and Logistics**

COOLALINGA FLOOD ASSESSMENT, NORTHERN TERRITORY (2022)

Developed and calibrated detailed URBS hydrologic models and TUFLOW hydraulic models of an urban catchment area of interest across Coolalinga. A flood assessment was performed using this region's updated NT planning scheme. **Department of Infrastructure and Planning, Darwin**

LOGAN AND ALBERT RIVERS FLOOD STUDY, QUEENSLAND (2022 - 2023)

Analysed the historical rainfall depths and temporal patterns across the Logan and Albert Rivers catchment for model calibration for the 1974, 1990, 2013 and 2017 historical events. Developed a detailed XP-RAFTS hydrologic model of the Logan and Albert Rivers catchment and a TUFLOW hydraulic model in accordance with the Australian Rainfall and Runoff 2019 (ARR, 2019) guideline. Undertook a joint calibration between the hydrologic and hydraulic models. The calibrated TUFLOW hydraulic model was used to determine design flood levels across the Logan River catchment. **Logan City Council**

FREDS PASS FLOOD ASSESSMENT, NORTHERN TERRITORY (2022)

Developed and calibrated detailed XP-rafts hydrologic models and TUFLOW hydraulic models of an urban catchment for a local recreational area under the new NT planning scheme land use updates. The models were used to develop updated flood planning levels for Litchfield Council. **Litchfield Council, Darwin**

NUMEROUS DAM BREACH ASSESSMENT MODELS (2016 – 2022)

Undertaken dam break, coincident downstream hydrology, and floodplain modelling to determine flood risk and failure impact for many dams, particularly Somerset, Wivenhoe, and North Pine. Delivery of the hydrology, hydraulic and consequence inputs into both parts of the project, emergency management aspects of the essential works, integration with the project and construction teams, and liaising with key external stakeholders. **Seqwater, QLD bulk water supplier**

TOWNSVILLE | KALYNDIA CHASE DEVELOPMENT FLOOD MODELLING, QUEENSLAND (2007)

Lindsay undertook hydraulic and hydrologic modelling (RORB) of the Bohle Plains for trunk drainage paths through the Kalynda Chase development. Flood behaviour hydraulic assessment using MIKE FLOOD & MIKE11 for optimal lot configuration. Conceptual design and evaluation of flood mitigation options. Modelling design to optimise open channels, culverts and other WSUD features. **BMD**

Major Infrastructure environmental impact assessments

PIONEER-BURDEKIN PUMPED-HYDRO AND ELECTRICITY SCHEME, QUEENSLAND (2024)

Development of hydrologic and hydraulic models to support dam design. Modelling was used to assess the performance of the various configurations and four future climate scenarios from 63% to Probable Maximum Flood. This involved developing and calibrating a combined URBS rainfall-runoff and baseflow model to estimate design discharges into proposed reservoirs and downstream within Cattle Creek, Pla Creek and Pioneer River. Developed a TUFLOW model suitable for dam failure consequence modelling and investigation of gauge rating curves. **Queensland Hydro**

WATER AVAILABILITY ASSESSMENT ADELAIDE RIVER CATCHMENT, NORTHERN TERRITORY (2023)

Developed an approach to use the available URBS model in continuous simulation mode between 2018 and 2023 and validated for 1970 and 2017. The event-based model was calibrated to the 2014 and 2018 flood events. The Adelaide River URBS hydrologic model development included catchment delineation and parameterisation, rating curve review, calibration, sensitivity assessment, design event analysis and continuous simulation over the 1970 to 2023 reference period. **NT Department of Environment, Parks and Water Security**

SOMERSET DAM STOCHASTIC AND FLOOD EVENT HYDROLOGY: QUEENSLAND (2021)

Somerset Dam Stochastic and Flood Event Hydrology: To complement the design hydrology was prepared, the loading cases for the dam design upgrade were defined by the existing Stochastic flood dataset (WSDOS) used to implement a Monte Carlo simulation framework (gate availability, Flood Manual and so on) this GoldSim model would then find the TPT estimates of flood flows and flood volumes.

CONSEQUENCE ASSESSMENTS – SOMERSET, WIVENHOE, NORTH PINE, AND OTHERS QUEENSLAND (2016-2021)

Working closely with HARC over numerous assessments, Lindsay has undertaken the hydrologic and dam-break modelling to input into seven dams' LifeSim consequence assessment modelling. Lindsay has developed methods and analysis to define the co-incident downstream flooding of catchments during extreme flood events. This was extended from ungated dam design hydrology to the more complicated Brisbane River catchment with two gated dams and operational rules. This hydrology is a key input and determinant of the consequences defined. Lindsay has had this work reviewed by Professor David Bowles. Lindsay has worked with the risk specialist for each project to develop estimates of breach initiation and progression of failures.

RENEWABLE ENERGY (SOLAR FARMS, WIND FARMS, HV OHTL AND BESS) QLD, NSW, VIC (2023-2025)

Broad experience developing Water Resource Impact Assessments, including flood studies to support development applications and environmental approvals at solar farms, wind farms and Battery Energy Storage Systems (BESS) throughout Victoria, NSW and QLD. Also, studies relating to high voltage overhead transmission lines (HV OHTL) have been delivered. The Flood Risk Assessment component of the projects typically involves how surface water and flooding can be appropriately managed across the proposed site and outlines potential impacts associated with the proposed developments and any mitigation measures. The modelling incorporates the solar PV arrays, BESS modules, operation and maintenance facilities, internal access roads and crossings. Developed hydrologic models software for catchment inflows and rain on grid modelling over the Project Area in accordance with AR&R procedure. Hydraulic modelling impact results were created with TUFLOW and assessed to determine whether the development had any impacts on the adjacent environment and would be suitable for design to provide advice regarding the location of facilities in low-flood hazard areas. **Various clients**

NEERKOL AND DOUBLE CREEK FLOOD RESPONSE, QUEENSLAND (2013)

Undertook rapid response to bridge damage during the 2013 flood event, delivering a rapid assessment of flood damage solution at the Neerkol and Double Creek bridges **QLD Department of Transport and Main Roads**

CELL 1 WALLASEA ISLAND, CROSSRAIL, ESSEX UK (2008 – 2010)

Designed Cell 1 to accommodate 3M m³ of surplus material generated by tunnelling under London. Lindsay project managed the multi-disciplinary team to deliver the Cell 1 planning and design work, allowing Crossrail's use of surplus material to raise land on Wallasea Island seawater ebb and flow. Building on my earlier partnership with the RSPB for planning applications and engineering works to transform Wallasea Island into Europe's most extensive intertidal wetland **Transport for London**.

WALLASEA ISLAND WILD COAST PROJECT, RSPB, ESSEX UK (2010)

The Wallasea Wild Coast project is the RSPB's flagship project, which is to create a 500-ha intertidal nature reserve on farmland. Combined realignment and regulated tidal exchange. Responsible for engineering design utilising TUFLOW and HEC RAS modelling, construction drawings, bills of quantities, contract documents and HSE information for Enabling Works and Cell 5 RTE structures & onsite during the Enabling Works phase to supervise the construction, coordinating engineering **Royal Society for Protection of Birds**

Operations

CONTINUOUS SIMULATION STUDIES (2016 – 2022)

Probabilistic studies to determine reservoir performance during construction flood risk advice and inform environmental compliance and fish passage approvals. Ewen Maddock and Lake Macdonald. **Seqwater, QLD bulk water supplier**

SMEETH LODGE DRAINAGE STRATEGY, CAMBRIDGESHIRE/NORFOLK UK (2009)

The Kings Lynn IDB appointed Lindsay to coordinate the strategic assessment of flood risk within a 175km² of pumped Fenland catchment, including engineering assessment of assets and flood risk modelling throughout the catchment. Utilised the recent FCERM AG, identified system deficiencies; using hydraulic modelling (InfoWorks RS), environmental assessment (SEA), and economic evaluation (PAG3), selected a suitable option developed to apply for an Aid Grant from the Environment Agency's Project Approval Board, **Environment Agency UK**.

MARY AND BRISBANE RIVER CATCHMENTS FLOOD RATING CURVES QUEENSLAND (2016 – 2020)

From an emergency management perspective, large episodic events generally cause significant risk to the community. The flood warning network includes river height gauges and their rating tables estimate flow for a given height. Rating tables are usually constructed from several observed gaugings based upon small flows and then extrapolated for higher flows. However, the uncertainty of flow estimates increases for high-stage discharges. Two-dimensional hydraulic models were developed to generate high-stage rating curves at several gauge sites. The methodology was proposed in consultation with key stakeholders at the Bureau of Meteorology (BoM), Department of Natural Resources and Mines (DNRM) **Seqwater, QLD bulk water supplier**.

TMR BRIDGE SCOUR MANUAL– INITIAL VERSION (2014)

Developed the first TMR guidance documentation for scouring hydraulic structures, informing road agencies on best practices: won an Excellence Award from Chief Engineer **QLD Department of Transport and Main Roads**

SEQFEWS USER MANUAL (2018)

Initiated and wrote key sections to document modelling concepts and usage of URBS and forecasting techniques. Lindsay presented at Australian FEWS User Days and Engineers Australia. Lindsay developed software techniques for integrating with Tuflow, Estry and GoldSim into the Development version of FEWS and presented to FEWS User Groups. **Seqwater, QLD bulk water supplier**

BATHYMETRIC STUDIES (2018 – 2020)

Provided technical input and review to derive storage curves for Seqwater lakes, sedimentation studies, and upgrade works for various Seqwater assets. This also involved the production of the DEMs of difference. **Seqwater, QLD bulk water supplier**

Expert opinion, Peer Review, Legal and Insurance

COURT MATTERS

Assisted and advised on model review, hydrologic modelling, hydraulic modelling and flood damage assessment for various legal matters in multiple courts. **Various clients**

BRISBANE RIVER CATCHMENT TECHNICAL WORKING GROUP QUEENSLAND (2016)

Lindsay provided technical input and review of the BRCFS modelling work, which was implemented from study outputs to deriving risk profiles for Seqwater Assets, developing skills in geospatial data analytics. The outputs were adapted using more recent Somerset and Wivenhoe Consequence modelling.

SITE SPECIFIC HYDROLOGY REPORTS

Following the February 2022 Brisbane flood events, site-specific hydrologist reports for insurance claims across Southeast QLD were completed. Gained experience in the real-world consequences of flooding by undertaking over 50 site visits, meeting with flood-impacted individuals and determining the causes of inundation based on topography, timing and eye-witness accounts. **Various clients**

Publications

Conference papers and technical presentations

MILLARD L 'Probably some practical advice on Flood Frequency Analysis', 2023 HWRS

MILLARD L., RAYMOND M., 'One Breach or More, multi breach assessment', 2019 ANCOLD

MILLARD L., et al., 'A tale of two sites – Fish Passage', 2021 ANCOLD

MILLARD L. et al., 'Draining down the risk', 2021 ANCOLD

Seq-FEWS User Manual various chapters, 2017

Bridge Scour Manual 2013 TMR