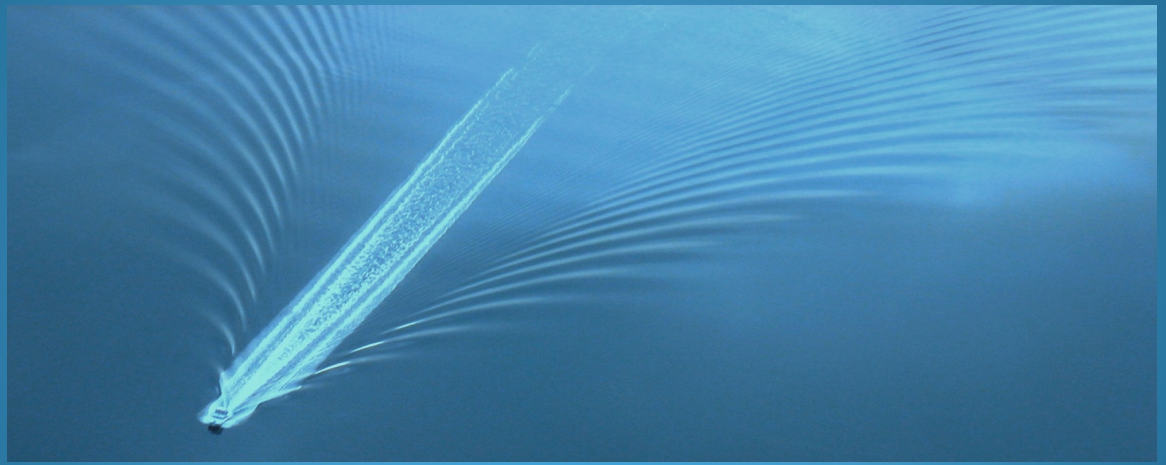
Associate Professor Gregor Macfarlane (FRINA)
Australian Maritime College (AMC), University of Tasmania, Australia

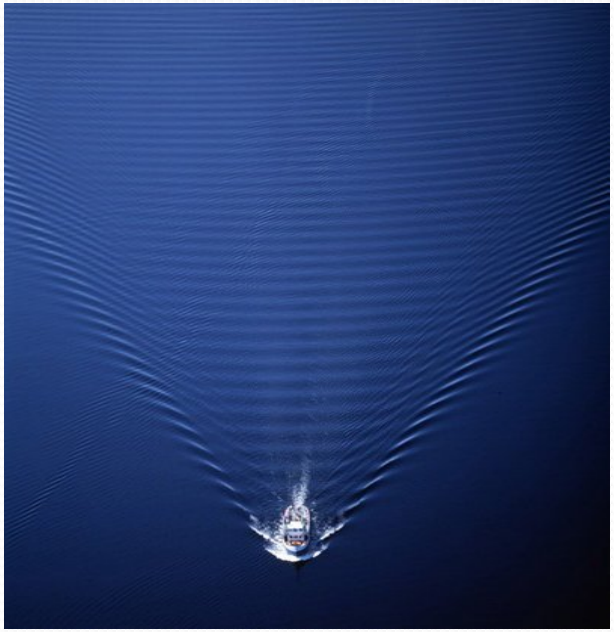
# Wave Wake From Recreational Craft



# Introduction

- Almost 30 years studying boat/ship generated waves.
- Vast experience performing experiments, both in controlled environments (hydrodynamic facilities) and on-site trials.
- Developed rigorous and time-proven testing methodology, instrumentation and analysis procedures.

- The Willamette River boat wave measurement study.
- Technical report is readily available:
  - Includes relevant background, details of experimental equipment and procedures, and presents results (Ref. AMC Report 18WW01).
  - Deliberately avoided making conclusions or recommended solutions – simply made reliable data available to those who need it (including myself).



# Full Scale Boat Trials on the Willamette River (Newberg Pool)

- Primary aims of the study:
  - To acquire reliable wave wake data for wakesurfing, wakeboarding and waterskiing activities. Importantly, like all experimental campaigns I perform, the data must be suitable for publication within high-quality peer-reviewed scientific journal/s.
  - To assist decision making processes for the effective management of waterways having similar conditions/issues.

- Key conditions made this a very interesting opportunity:
  - Deep water river: wave characteristics are unaffected by river bed.
  - River width: remained deep for more than 400 ft, permitting studies of wave decay and dispersion over distance.
  - Range of relevant boat types available, covering recreational activities of waterskiing, wakeboarding and wakesurfing (and fishing).
  - Professionalism of the personnel involved – we shared a common desire to acquire reliable, unbiased data. It was understood that my involvement was conditional on meeting the abovementioned goal that the data must be of suitable quality to withstand scientific scrutiny.

UNIVERSITY of TASMANIA | AMC Australian Maritime College

# Full Scale Boat Trials - Australia

- Most rivers in Australia experiencing wake sport issues are much shallower, where waves are depth-affected and have different shore/bank conditions (e.g. Murray River, Maroochy River, etc).
- The characteristics of the boat waves will be different to those in deep water: they will lose energy.

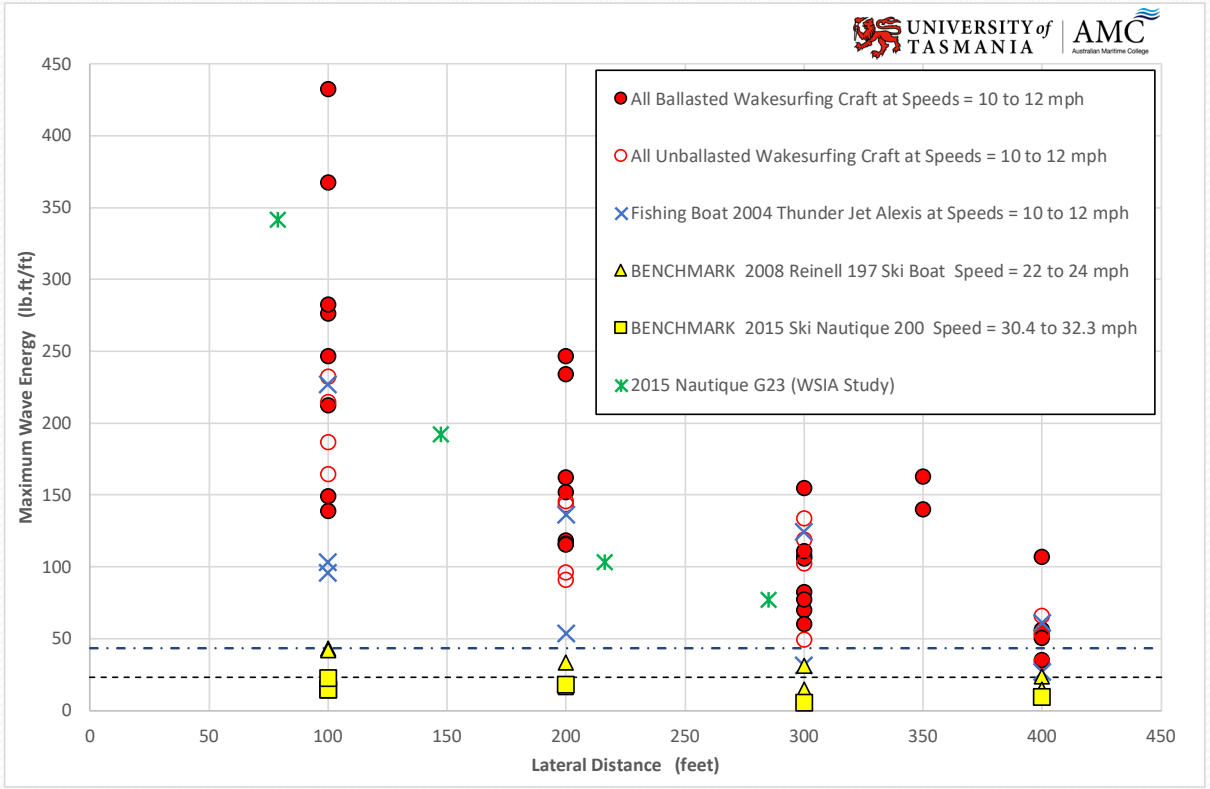
# Full Scale Boat Trials – Lower Gordon River, Tasmania, Australia

- There is one important exception: the World Heritage-listed lower Gordon River in remote south-west Tasmania – where the river depth, width and shoreline are comparable to the Newberg Pool.
- Extensive studies correlating boat wake against bank erosion have been undertaken on the Gordon over 30+ years.
- This has resulted in regulatory criteria which limit vessel speeds to under 6 knots to protect the sensitive river banks.

# Full Scale Boat Trials on the Willamette River (Newberg Pool)

- A commonly adopted regulatory approach is to identify an activity that is generally well-accepted at the site of interest.
- For the Newberg Pool it is suggested that suitable benchmarks be waterskiing and tubing activities, which have been commonplace for many decades.
- We ran experiments to quantify the characteristics of the waves generated by multiple typical waterski boats and runabouts operating at speeds that are commonly used for waterskiing and tubing activities.

# Full Scale Boat Trials on the Willamette River (Newberg Pool)




- These benchmarks (yellow data points) are shown in this plot of results.
- Energy in the maximum (highest) wave is plotted against increasing lateral distance (o feet is the sailing line of the boat).

# Full Scale Boat Trials on the Willamette River (Newberg Pool)

The most salient points from the experiments and subsequent data analysis are:

- Regardless of whether the boat was designed for wakesurfing, wakeboarding or waterskiing activities, when operating at typical wakesurfing speeds (slow, 10-12 mph) the energy of the maximum waves generated at a lateral distance of 100 ft were roughly between 2 and 10 times greater than the benchmark case (i.e. waterski boat operating at waterski speeds; 30-32 mph).

- A lateral distance of at least 400 ft was required to allow the waves generated by typical wavesurfing/wakeboarding boats (with additional ballast to enhance the wake generated) operating at wakesurfing speeds (10-12 mph) to disperse and attenuate sufficiently such that the energy of the maximum wave had reduced to be approximately equivalent to that of the benchmark case.

- Similarly, a lateral distance of approximately 300 ft was required to allow the waves generated by typical wakeboarding boats (with additional ballast to enhance the wake generated) operating at wakeboarding speeds (18-22 mph) to disperse and attenuate sufficiently such that the energy of the maximum wave had reduced to be approximately equivalent to that of the benchmark case.