

Surveying, Risk Avoidance and Certification of Hydrographic Surveyors in New Zealand

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Abstract

This paper describes the situation in New Zealand where hydrographic surveying is mostly unregulated. It identifies some of the implications and risks relevant to New Zealand Port and Harbour Operators, Regional Authorities, Consultants, Engineers and Coastal Scientists who may be engaging unqualified or uncertified personnel to deliver survey data. Some suggestions for improvement will be presented.

Keywords: surveying, risk, hydrography, certification, port, coast.

1. Introduction

Modern hydrographic equipment and computer technology have resolved many of the issues related to achieving high accuracy hydrographic surveys [1]. Automated practices have removed many of the earlier constraints associated with the quality control and manipulation of large data volumes and the visualisation and presentation of results. Despite these advances what should be considered before a particular company or individual is contracted to deliver survey data?

The achievement of accurate hydrographic surveying results, which pass quality standards, are obtained with minimum risk and are fit for purpose, depends mainly on the skill and experience of those people supervising and undertaking the field survey.

2. The Balancing Act

A hydrographic survey for any project involves understanding the relationships that exist between three elements. Two of these elements are included in every project; **Time** (for the project to be undertaken), and **Cost** (or Available Budget). The third element is usually a combination of Quality, Accuracy, Risk, and or Fitness for Purpose (of the results). These three elements can be likened to the three legs of a surveyors tripod, and the challenge is keeping the top plate level.

Those planning and decision making for hydrographic surveys of any purpose intuitively know that one or more of these three legs will dominate the selection of project methodology, and have a direct impact on results. In most organisations project timeframes and budgets are predetermined and sometimes constrained by others. Consequently the person(s) responsible for delivering the project may have to obtain results using only those variables available from the third element of the tripod. If data quality and accuracy are critical then equipment or personnel costs will be high and project timeframes longer. Where time is constrained and accuracy is important, then costs will be higher, and if time is short and budget

low, the quality and/or data may not be fit for purpose.

Personnel working in hydrography and associated fields involving government funded science, coastal zone engineering or management, or monitoring the environment know what type and densities of data they require for their research, modelling or design project. Often these people are not the ones who make financial decisions about projects. The technical expert is aware of the limitations of equipment, systems and software, whereas management often are not, and consequently focus on the two tripod legs of time and cost. Before raw hydrographic survey measurements are useful a number of corrections will need to be applied. An understanding of these corrections and the limitations of technology at the specification writing stage can save a considerable amount of heartache later. Whatever the scenario, there will always be an imbalance between the three legs of the tripod. The degree of imbalance will dictate how, and by whom, the project will be undertaken and also impact the quality of results.

3. Current Situation

If you were to engage a lawyer, hanging on their office wall will be evidence that he or she is qualified and suitably licenced to represent you. In the event that you did not get good legal advice, there is recourse for complaint through an independent body, the Law Society, [2]. When a licenced surveyor is engaged for a set out, building or engineering project they are bound by the New Zealand Institute of Surveyors (NZIS) rules of conduct and professional practice [3]. In these two scenarios the risk to you, the client of receiving poor advice or inadequate results is mitigated by engaging qualified and certified practitioners who are monitored by an external body.

Apart from what is included in a written contract between two parties; there is no law, or regulator, or impediment with respect to practicing and providing hydrographic surveying services or advice in New Zealand. The NZ hydrographic

industry is an environment where “caveat emptor” reigns. Anyone who purports to be able to provide hydrographic services or information can do so if they choose.

4. Legislative and Regulatory Overview

In Australia the Navigation Act 2012 [4] establishes the Royal Australian Navy Hydrographic Service (AHS), as the body responsible for official information required for the safety of ships navigating in Australian waters and for those hydrographic services required by the International Convention for the Safety of Life at Sea (SOLAS), 1974. This legislation empowers the AHS to work alongside other agencies and issue instructions relating to the provision of survey data for use in charting and to set standards for hydrographic work.

No similar legislation exists in New Zealand. Land Information New Zealand (LINZ) is the National Hydrographic Authority for New Zealand and is charged with administering New Zealand's land and seabed legislation [5] and whilst LINZ has four statutory officers [6], there is no statutory position to represent hydrography. LINZ CEO provides hydrographic services to fulfil New Zealand obligations as signatories to the International Maritime Organisation Convention for Safety of Life at sea (SOLAS) Chapter V, the Conventions of the International Hydrographic Organisation (IHO), and the United Nations Convention on Law of the Sea (UNCLOS). LINZ is also responsible for providing official nautical publications required for vessels to comply with Maritime Rules Part 25 [7], issued by Maritime New Zealand under the Maritime Transport Amendment Act (MTA) 2013. The MTA sets out the role of Harbourmasters and Councils in keeping New Zealand waterways navigationally safe [8], however the act stops short of requiring hydrographic surveying be undertaken as part of those roles.

The Crown Minerals Amendment Act 2013, Section 43 [9] details the requirement for companies to lodge prospecting reports (which include survey data), but otherwise, there is no legal requirement for any hydrographic data to be forwarded to LINZ to maintain and update the national chart portfolio. LINZ periodically receives survey data from most New Zealand port operators, but this is more out of the benefits accrued to the provider than from a formal arrangement. Hydrographic surveys are not specifically listed in the Resource Management Act 1991, but surveys contribute to, and inform applications for consents under the act. Survey results are often accepted and identified as standalone supporting documents rather than official plans.

A review of current legislation indicates there is no hydrographic regulation or regulatory body in New

Zealand with the authority and jurisdiction to restrict service or take disciplinary action against hydrographic surveyors. Whilst the New Zealand Region (Branch) of the Australasian Hydrographic Society provides a learned organisation open to anyone interested in any form of hydrography, there is no national forum through which LINZ could influence best practice, advise or consult on hydrographic standards or specifications. In this absence of any particular legislative or regulatory framework for hydrography in New Zealand, *caveat emptor* remains the *modus operandi*. Hydrographic surveys can be undertaken by anyone, whose tender is accepted, or whose proposal meets client requirements, and or price.

5. Principles, Guides and Specifications

Those who compile specifications for a hydrographic survey or compile a tender response that includes hydrographic work, should consider the content of available resources and guides before they pick up a pen. When attempting to define the third leg of the tripod; (specification, quality, accuracy, risk), one test could be to question, “is the data fit for purpose and the client fully aware of the data limitations?” The risks associated with a survey dataset are often only clear after the survey, when results are challenged or data gets used for a different purpose. Questions about what results you want, how they are obtained can often be answered by considering the rationale behind, and clarity of, project specifications. References and guides do not list accuracies or deliverables for particular jobs. That responsibility remains the purview of the contract or specification writer.

A number of helpful documents that can assist with compiling specifications are available from either the publisher direct or the internet [11]. Suggested reference materials relating to the principles and practice of hydrographic work include; the IHO publication C13, Manual on Hydrography, the USACE Hydrographic Surveying Manual and the NOS manual on Hydrographic Surveys Specifications and Deliverables. Some of the available guides to best practice include; the Maritime New Zealand Guidelines of Good Practice for Hydrographic Surveys in New Zealand Ports & Harbours, The International Federation of Surveyors (FIG) Publication 56, Guidelines for the Planning, Execution and Management of Hydrographic Surveys in Ports and Harbours and Maritime Safety Queensland Hydrographic Standards.

The use of any particular survey guidelines is not mandatory in New Zealand but best practice suggests that these types of references should be consulted and included as part of hydrographic survey risk and safety management plans for ports. Similar consideration could be made by

third parties when drafting specifications for contracted hydrographic services. An independent review of the implementation of the New Zealand Port and Harbour Safety Code undertaken in February 2014, [12] endorsed the code as a useful and functional means of voluntary regulation.

At the international level IHO Special Publication S44 sets out the minimum international standards of accuracies for hydrographic surveys for nautical charting and safe navigation [13]. These IHO standards are often augmented or replaced by national or local requirements for surveys. Ports Australia, (PA) have established an agreed set of national principles now used by all Australian Ports when surveying is contracted in/around the port. These principles require use of certified hydrographic surveyors and the signing of a method statement/report [14]. In New Zealand any survey undertaken from which the data could be passed to LINZ and used for updating national charts should where possible comply with LINZ Contract Specifications for Hydrographic Surveys, Version 1.2 [15]. Companies who tender for LINZ contract survey work need to fully comply with these specifications which include a clause requiring a signed statement by a certified surveyor prior to commencing work [16].

6. Certification

Certification of an individual involves the assessment of academic learning and professional field experience. There are a number of educational institutions around the world offering a range of hydrographic courses which achieve IHO Category A and B levels of learning. Only the Australasian Hydrographic Surveyors Certification Panel (AHSCP), and the Royal Institute of Chartered Surveyors (RICS), review and assess both aspects against the International Board for Standards and Competency for Hydrographic Surveyors and Nautical Cartographers (ISBC) syllabus and requirements before certifying that person as either a Certified Professional or Chartered Surveyor.

The Australasian Hydrographic Surveyors Certification Panel (AHSCP) [17] started in 1991 and has been certifying surveyors since 1994. The AHSCP received international recognition from the ISBC in 2012 [18]. It is the only certification panel in the southern hemisphere and is sponsored by the NZIS and Surveying and Spatial Sciences Institute (SSSI). In 2014 there were a total of 188 certified Level 1 and 2 hydrographic surveyors, of which 18 were listed as New Zealanders. The current list of AHSCP certified surveyors can be found on SSSI website.

The low numbers of certified hydrographic surveyors in New Zealand is considered the result of certification not being a contractual requirement.

In Australia where use of a certified surveyor is a contract requirement for some hydrographic work, there is no shortage with nearly 150 to choose from. An argument against using certified surveyors is that costs increase the more qualified personnel are. The counter argument is that certified surveyors offer risk mitigation, ensure accountability and deliver quality results efficiently by using best practice. Surveyors may need to look to their own futures, and consider the benefits that can accrue from certification.

Mandating the use of certified surveyors in New Zealand is unlikely due to the scale of the industry. Workable change could involve the requirement to include evidence of similar work experience as part of any tender for hydrographic work.

7. Risks and Implications

With land surveying the surface being mapped is visible and obstructions can be seen. By comparison the seabed is rarely (excluding intertidal areas) visible, with features remaining undetected unless the right tools are used for the measurements and data analysis. Using certified surveyors to take the measurements or fulfil oversight roles, ensures the risks of an error are reduced. Inherent risks in depth and position measurements can be reduced by rigorous calibration, comparison and independent checks. Frequent checks throughout a survey ensure measurements remain within specification and verify repeatability. Comparison with independent systems gives confidence that parameters/offsets and scale factors are being correctly applied. All these requirements can be included in contract specifications, but, should the surveyor not know how to undertake the checks or interpret results the survey outcomes may still not be fit for purpose.

Whether hydrographic surveys are contracted for charting, engineering, science or coastal projects the client needs assurance that the data will be fit for purpose. The existing voluntary codes, guides and reference material provide a good framework for compiling specifications for hydrographic survey contracts. With a set of clear end objectives and specifications the certified surveyor can determine a survey methodology and technology that is affordable and which increases the likelihood that results will meet accuracy, coverage, quality and repeatability requirements.

One of the benefits of engaging certified surveyors is they will explain and offer clients new techniques or approaches for the work. If a company contracted hydrographic services from one provider for repeat jobs over a period of time, then provider capture could unwittingly take place. Results for the same job are supplied in the same format and accepted without independent check or

question. Costs and methodology do not change, and management does not seek any other outputs or question services. Any alternative provider with different technology who could produce the same outputs or offer additional results that may benefit the company is unlikely to be able to enter that market. Even if there is no requirement to advise a client of improvements in methodology or suggest new outputs, the certified surveyor ensures a client is aware of them.

Following a project the often left unanswered question is; "if the client has accepted the results/data have they also accepted liability for any errors omissions or faults?" When a contracted surveying company is required to maintain a liability insurance policy for a specified time, to cover costs of potential claims due to errors or faults in the work, the cost of that policy will be added into the contract price.

If the end client of a dredging contract takes no steps to verify the accuracy of the final survey before accepting the results, they can have little confidence the survey was ever accurate. By using independent pre and post dredge surveys the client receives an assurance of both the final volume removed and a comparative check on the final results. The client can accept liability for future claims based on evidence rather than merely fund a contractor's insurance policy.

8. Options for Improvement

One change to the existing caveat emptor situation in New Zealand could be the introduction of legislation requiring use of certified surveyors. This would bring hydrographic surveying into line with those who practice as cadastral surveyors, engineers or lawyers. It is unlikely that present political will exists, nor is there a need for such a step in New Zealand. In view of the small numbers involved the cost of implementing and maintaining a registration/certification system could not be justified. As a potential improvement, legislation is not an option.

Change for the better is however already taking place. Hydrography was recently included as one of the five Professional Streams of the NZIS [19]. This implies the NZIS has, in the absence of any other body, become the defacto regulator for the hydrographic surveying profession in New Zealand. Anyone seeking a hydrographic survey of any port, harbour, coastal area, lake, waterway or water body will, by engaging members of the NZIS receive a level of assurance that the work will be done according to the NZIS professional code of conduct, using best practice with relevant technical expertise. An NZIS member will not offer to provide services for which they do not have the expertise or skills. With the NZIS standing behind members (even if they are not certified in

hydrography) there is a reduction in risk for clients who then have some recourse in the event of poor results. The NZIS Hydrographic Professional Stream encourages surveyors to seek certification through the AHSCP process.

Improving specifications in contracted work is another risk management strategy that should give rise to improved results and outcomes. Disseminating information about the existing guides and publications is likely to occur by word of mouth or as organisations accept and use the framework principles in contracts. By increasing awareness and promoting the use of such documents, there should, in time be an improvement in the quality of contract specifications. Any agency or business seeking to contract a survey can adopt and include the headings from the voluntary codes and principles in their contracts. Templates to use or lists of headings of areas to report on can be specified or encouraged in contract documentation. The quality measures suggested in hydrographic principles can provide a level of assurance that results will be fit for purpose and also identify constraints in the final data. An increase in the use of the guidelines documents may also encourage the use of certified surveyors.

It is possible that a paradigm shift may be required for those involved in hydrography in New Zealand. Surveyors who are self-directed and obtain certification, can market themselves accordingly. Describing to clients the benefits of using a certified surveyor could make the difference when a tender or contract provider is being selected. Any change or preferences to using certified providers would be slow in the small New Zealand market.

There has been a global scarcity of entrants into the hydrographic industry. There are no queues of young people lining up to become hydrographic surveyors in either New Zealand or Australia. Whilst Universities, Polytechnics, and online papers or courses are available, the numbers registering for them are few. Hydrographic surveying jobs are generally with offshore companies and the work requires being away for extended periods. Hydrography is not often seen as an attractive career for young people. Following academic studies it can take anywhere from 3-5 years or longer to become proficient in the field. Very good money can be earned when employed offshore where salary expectations are driven by oil and gas exploration. The same earnings cannot be made in the small New Zealand domestic hydrographic market.

An option for improving this situation in New Zealand is a long term one that requires industry; including consulting, engineering firms and science institutions to offer hydrographic internships during

study breaks for students. Early employment in the industry and observation of the opportunities that exist may encourage some of these younger surveyors to continue with a hydrographic career. The constraint with this approach is that business need to have sufficient capital to engage non-productive resources on a short term basis, and project timeframes that enable training opportunities.

Improvements in hydrographic service quality could also be driven through auditing surveying companies. Audits for compliance with specifications could be undertaken in the same way that health and safety audits of contractor risk and safety plans take place. Whilst an unpopular approach, auditing is one way a client can mitigate risk of project failure.

9. Conclusion

Hydrographic services in New Zealand are voluntarily self-regulated by those providers who adopt existing guidelines and apply the principles of industry best practice. In general, data quality and accuracy are achieved by reliance on specific individual contract specifications. The use of existing guides and documents to improve and tighten contract specifications is a matter germane to all hydrographic practitioners and managers. In the desire to achieve value for money clients need to be open to using alternative survey methodologies that can lead to better or improved results.

By default the NZIS has, in the absence of any other industry body, recently become the quasi hydrographic regulator. In conjunction with the AHSCP, the NZIS is developing a platform that will certify, educate, inform and represent the small hydrographic surveying profession in New Zealand.

Certification of hydrographic surveyors in New Zealand will take place slowly in step with the demands of the domestic and offshore hydrographic industry. For surveyors, certification could provide opportunities to offer new services, but in many cases surveyors need to take the first step before industry will embrace them. Only time will tell whether using uncertified surveyors for hydrographic work in New Zealand, will have any consequences or effect on the industry.

This paper offers no panacea for the hydrographic industry in New Zealand. It does contend that there are a number of ways forward, that will lead New Zealand away from the current paradigm where surveying standards are set by whoever pays. It is up to industry to decide whether or not to retain the status quo.

Authors' Note

Conclusions drawn within this paper are the Author's own and do not seek to represent the views of Discovery Marine Limited, the NZIS or LINZ.

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