Te Hunga Takutai o Aotearoa
NEW ZEALAND COASTAL SOCIETY

Coastal News

Newsletter of the New Zealand Coastal Society: a Technical Group of Engineering New Zealand

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Buoyed up

New Zealand is no longer reliant on a single tsunami-detecting DART buoy with the recent deployment of four new buoys, and more to come. For the what, where and how of DARTs, see the article beginning on page 3.

DART buoy in the Tasman Sea, similar to those now being deployed (Photo: NOAA).

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Word from the Chair

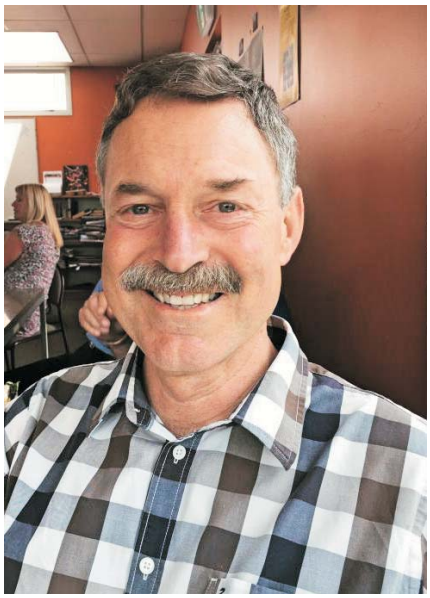
It is with the greatest sadness that I confirm Eric Verstappen, a well-respected and highly regarded member of the NZCS management committee, passed away unexpectedly on Saturday 8th February.

Eric was a member of the NZCS management committee since 1995, and served as Treasurer from 2001 until the time of his passing, where he shared this responsibility with Michael Allis.

Eric's funeral and celebration of his life was held in Nelson on Saturday 15th February, and was very well attended. Those who spoke, including family, friends, work colleagues, and representatives of organisations that Eric was part of, portrayed a person who was willing to give freely of his time as a volunteer and always placed others before himself. It was a moving service that celebrated Eric's life in a way I am sure he would have approved of.

Terry Hume (NZCS Life Member), spoke at the service on behalf of the NZCS, outlining Eric's long and valued association with the NZCS and how he would be sorely missed both professionally and personally. Terry and I were also able to meet some of Eric's family and pass on our condolences directly on behalf of the NZCS and wider coastal community of New Zealand.

I know many of you (including myself) have known Eric for many years, and have had the pleasure of working closely with him, for which we can be grateful. Eric was one of the most humble and genuine people I have had the privilege of meeting and his passing



will continue to be keenly felt within the NZCS and across the wider coastal community.

This issue of *Coastal News* is dedicated to the memory of Eric, and includes an obituary written by Terry Hume (see page 19), which helps to summarise a life I consider was lived to the fullest.

The management committee of the NZCS will be discussing a fitting way to honour Eric's legacy over the coming weeks, and this will be shared in the next edition of *Coastal News*.

Our thoughts remain with Eric's wife, family, friends and colleagues at this time.

Paul Klinac
NZCS Chair

About the NZCS

The New Zealand Coastal Society was inaugurated in 1992 'to promote and advance sustainable management of the coastal environment'. The society provides a forum for those with a genuine interest in the coastal zone to communicate amongst themselves and with the public.

The society's mission is to take a leading role in facilitating robust discussion and nationally-coordinated interactions to better manage and learn about our coastal and marine environment.

The society currently has over 300 members based in New Zealand and overseas, including representatives from a wide range of coastal science, engineering and planning disciplines, employed in the consulting industry; local, regional and central government; research centres; and universities.

Membership applications should be sent to the NZCS Administrator Renée Coutts (nzcoastalsociety@gmail.com).

Tsunami-detecting DART buoys deployed offshore of New Zealand

Jose Borrero, eCoast Ltd

In mid-December 2019, the New Zealand Government announced that the first four of an anticipated 12 tsunami-detecting DART buoys were deployed offshore of New Zealand.

So, what is a DART buoy, where are they, and how do they work?

DART stands for **D**eep-ocean **A**ssessment and **R**eporting of **T**sunamis. The technology was developed by the National Oceanic and Atmospheric Administration (NOAA) of the US Government and was first introduced in 2001 with a six-buoy array deployed mostly in the North Pacific Ocean. By 2008 there were 39 stations deployed around the Pacific Rim and in the Indian and Atlantic Oceans (see Figure 1). Real time data from these stations can be viewed online at: www.ndbc.noaa.gov/dart.shtml

Each DART buoy consists of two main components: a sea floor mounted bottom pressure recorder (BPR) and a floating surface buoy. Temperature and pressure data (used to determine the sea surface height), are collected by the BPR every 15 seconds and transmitted to the buoy via an acoustic link. The buoy processes the raw data and transmits the information via satellite to a data centre in either the USA or Australia (or, more recently, now in New Zealand). Under normal conditions, the buoy transmits data every 15 minutes, however when large earthquakes occur in the vicinity of a particular buoy, it converts to 'event mode' and begins transmitting data every minute.

The genius of the DART system is its ability to distinguish a tsunami from the chaos of ocean waves on the high seas. A quick look at the DART locations reveals that these buoys are deployed in some of the stormiest seas on Earth. How then can the system distinguish between a tsunami wave, which may only be centimetres high, when the swell and wind waves are tens of metres high?

The secret lies in the clever algorithm developed by scientists at NOAA that determines the amplitude of the pressure signal at tsunami frequencies and compares it to threshold values. Remember, pressure can be used as a proxy for water depth and therefore wave height. Since tsunami waves have very low frequencies (or long periods, generally tens of minutes to hours) while wind and swell waves exist at much higher frequencies (shorter periods, up to 20 or so seconds), one can filter out the effects of the shorter period wind and swell waves and look only at the underlying tsunami signal.

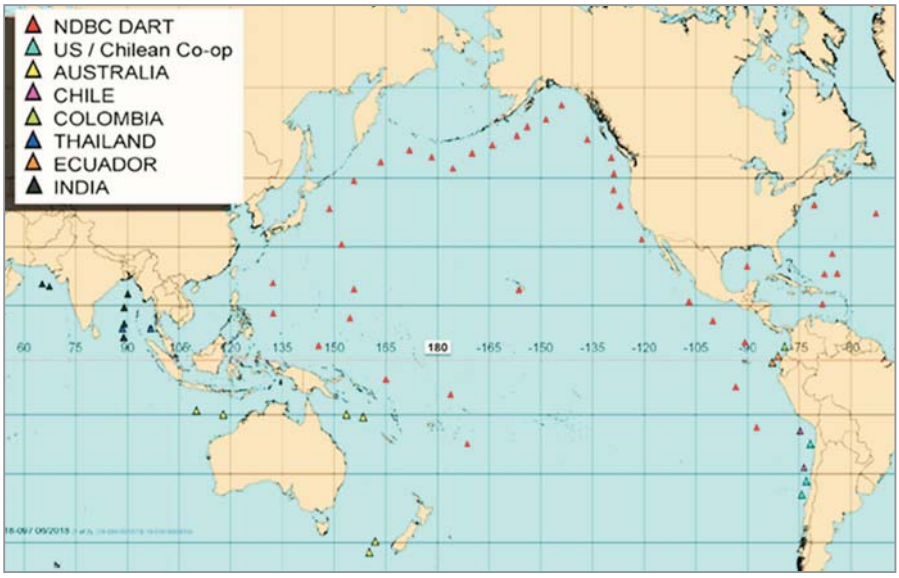


Figure 1: Locations of existing DART buoys prior to the New Zealand array (National Data Buoy Center, NOAA).

Recall however that these BPRs are measuring variations in water depth of millimetres over total depths of more than 5,000 metres! Thus the accuracy and reliability of these instruments is remarkable. More details on this algorithm can be found here: www.ndbc.noaa.gov/dart/algorithm.shtml

Ultimately, the benefit of DART technology is that the system measures tsunami waves directly and much sooner than relying on data from coastal tide gauges or the analysis of data from the earthquake itself. Because tsunamis are 'long' waves, their propagation speed is entirely dependent on the water depth, travelling faster in deeper water. With the buoys positioned in deep water adjacent to the tsunami source zones, a tsunami can reach the nearest DART buoy within minutes of the causative earthquake allowing the warning centres to assess an event's destructive potential within 15-30 minutes of arrival at the buoy.

While this can speed up the issuance of warnings or guidance by several hours, it is also important to note that the technology can be used to call off warnings and avoid unnecessary evacuations, which are both costly and potentially dangerous.

DARTs around New Zealand

Figure 2 shows the locations of the recently deployed DART buoys and locations of planned future deployment sites. The instruments are to be deployed largely along the Tonga-Kermadec Subduction Zone (TKSZ), including the southern extension (Hikurangi Trough), with additional instruments to be deployed in the vicinity of Vanuatu and the New Hebrides subduction zone. Note that the DART stations are mostly located on the eastern side of the TKSZ, for the 'deep water' reasons described above.

Even so, the time for detecting and analysing a tsunami and ultimately making a decision on whether or not to evacuate can be quite short. For example, peak wave heights from a tsunami generated near location 'E' in Figure 2 would reach the eastern shore of Great Barrier Island in about one hour, Whangarei in two hours, and Auckland in

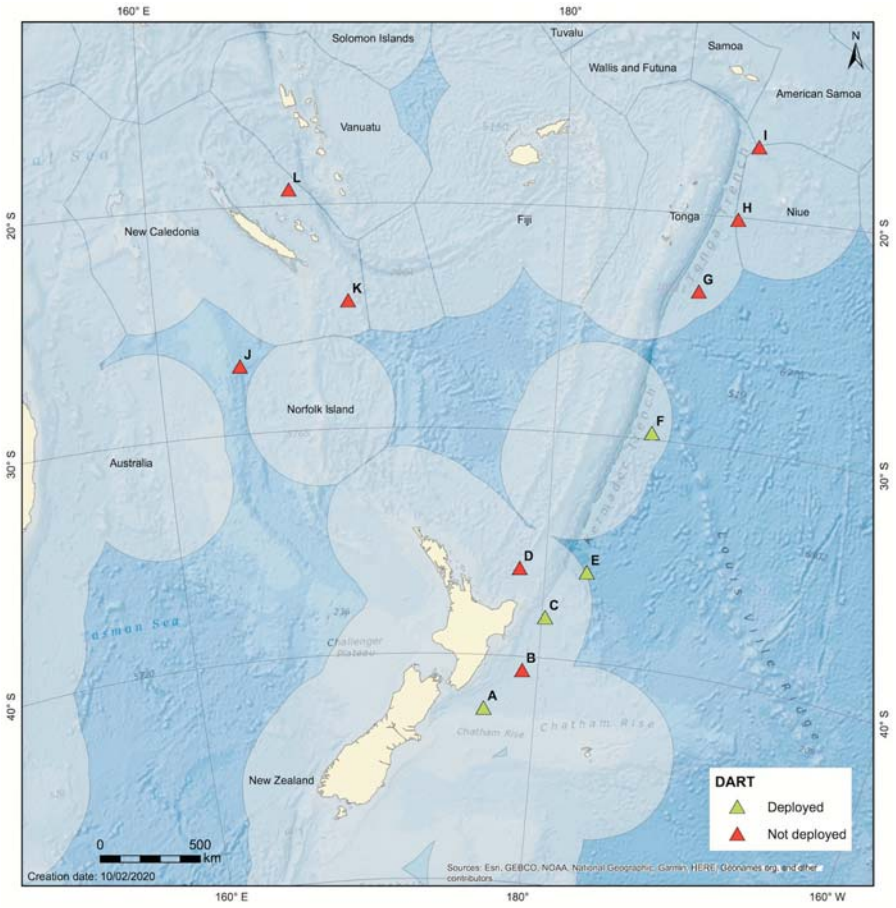


Figure 2: Locations for the 12 planned DART buoys to be installed offshore New Zealand and in the southwest Pacific. The four installed stations are indicated with the green triangles. Map courtesy of Bill Fry, GNS Science.

less than two and a half hours. Response times are even shorter for Gisborne and Hawke's Bay, where a tsunami generated directly offshore could begin affecting the coast quite quickly with peak tsunami heights arriving in approximately 30 minutes. For events such as the January 1976 tsunami – caused by an earthquake near location 'F' in Figure 2 and which caused significant damage to boats and piers in Tutukaka Harbour – the tsunami arrived in just over two hours. For events occurring further afield, in southern Vanuatu, the Solomon Islands or Tonga, there is slightly more time – two hours from Vanuatu and three to four hours for waves from either the Solomons, Tonga or Samoa to reach Cape Reinga.

However, these source regions have been shown, through modelling and actual data, to be less hazardous to New Zealand relative to tsunami generated directly east of us on the TK or Hikurangi Subduction Zones (Power et al., 2011). Thus, even under a best-case scenario where everything runs smoothly, confirmation of a destructive tsunami may only come as tsunami surges are already affecting sections of the coast. Therefore, we must continue to focus on community-based education and awareness efforts such as 'Long or Strong, Get Gone' to get people to heed natural warning signs and prompt self-evacuation.

New Zealand's DART array will also provide some peace of mind to our friends around the Pacific as the readings from our buoys can be used to verify whether or not a damaging or destructive tsunami was generated off our coast. This will also be particularly useful for Chile (and to some extent Australia) who are in the direct line of fire from a tsunami generated along the TKSZ.

If (when?) these new DARTs are put to the test, it won't be the first time that DART technology was used to forecast a tsunami's impact in New Zealand. On the evening of March 11, 2011, immediately following the great earthquake offshore of the Tohoku region of Japan, I used a tsunami source model derived from data recorded on DART stations located offshore of Japan to accurately forecast tsunami heights in New Zealand waters. Model results were available some three to four hours after the earthquake (nine to ten hours prior to arrival in New Zealand) and the information was delivered to duty officers at GeoNET, who used it to adjust the tsunami threat levels and issue warnings guidance to the country (Borrero et al., 2012).

Data access

At this time data from the New Zealand DART buoys are only available to the National Geohazards Monitoring Centre (NGMC) and GNS Science. This is in contrast to the rest of the global DART array, where data can be viewed online by anyone (see the weblink on page 3). During a tsunami event, duty officers at the NGMC, in conjunction with the Tsunami Experts Panel (TEP), will analyse the data and make recommendations to the National Emergency Management Agency who will then advise regional and local civil defence and emergency management (CDEM) groups.

While it has been suggested that the intention is to make the data more widely available, this has not happened yet and it is not clear when it will. Of particular importance is that the data be accessible to New Zealand based tsunami experts as well as scientists at NOAA (the original developers of the system) so that the information can be used to make real time estimates of the tsunami source and provide accurate forecasts of the tsunami effects throughout the Pacific Basin – the very technique that allowed accurate, 'faster than real time forecasting' to benefit New Zealand during the 2011 Japan event.

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Ōhinepouwera (Karitāne Sand Spit) driftwood windbreak – community-led and sustainable coastal management

Tom Simons-Smith, DCC

When faced with the decision to construct an engineered sand fence on Karitāne Sand Spit, Dunedin City Council (DCC) staff worked with Kati Huirapa Rūnaka ki Puketeraki and the wider Karitāne community to design and build a nature-based alternative. The work was a true collaboration with Puketeraki Rūnaka and involved using driftwood to construct a natural windbreak to trap windblown sand and encourage the restoration of the sand spit.

The original purpose of the work was to promote sand accumulation on the sand spit to dissipate wave energy and minimise the impact of storm waves on the inland area. As the project progressed, broader community benefits were realised, along with opportunities for shared learnings. This project adopted a true partnership approach with mana whenua, adapting as community values became better understood.

DCC is proud to have been involved in developing an innovative and sustainable method while working towards a stronger partnership with mana whenua and the broader Karitāne community.

Ōhinepouwera (Karitāne Sand Spit), north of Dunedin, is an area of environmental significance to mana whenua and the broader Karitāne community. Located within the East Otago Taiāpure, the sand spit serves as a nesting site for the native black or variable oystercatcher. It is home to a range of indigenous insects and tuatua (shellfish) and provides a safe site for New Zealand's native sea lion to haul-up and find shelter. The shape of the spit and delta also contributes to the quality of two significant surf breaks.

Rarely are coastal communities empowered to engage in coastal management practices. Many of us who do take the time to listen and engage with our communities are so eager to extract value (information) from the engagement that we miss out on the journey.

At the confluence of the Waikouaiti River and the South Pacific Ocean, Karitāne Sand Spit is morphologically dynamic and has, in the past, been eroded and overtopped by storm waves and riverine processes (flood waters). Over the last several decades the southern tip of the vegetated sand spit has been gradually receding northwards. This recession widens the high-tide river mouth and enables waves to enter the harbour and inundate the coastal frontage.

Aerial view of Karitāne Sand Spit and Waikouaiti River, September 2018 (Photo: Shane Flavell).

A small piece of work at Karitāne Sand Spit saw the DCC working with Puketeraki Rūnaka (mana whenua), community groups and individuals on ways to better retain sand and restore habitat to the southern tip of the sand spit. This article talks to this process, partly the innovative sand retention method that was adopted, but more so the community engagement element and the leading role that Puketeraki Rūnaka is now taking.

A volunteer group getting ready to travel across to the sand spit (Photo: Tom Simons-Smith).

The local knowledge and understanding developed around community values/ preferences truly guided this project. By demonstrating a willingness to learn from local knowledge holders, we have been able to be part of a project that has garnered trust and empowered Puketeraki Rūnaka to take a leading role.

Traditional approaches to trapping windblown sand include planting sand-binding grasses and building formal fences that use large posts, wire and cloth. Knowing that the components of any formal sand-trapping structure would inevitably wash up on the beach and riverbanks in a large storm, DCC and Puketeraki Rūnaka decided to jointly develop a method that did without such materials.

Aerial view of the driftwood windbreak on the day of construction. Fence alignment was determined based on the local wind conditions and took into consideration the way that the sand spit has accreted in the past (Photo: Tom Simons-Smith).

Following on from numerous meetings and informal site visits with local fishermen, environmentally-interested groups, and the East Otago Taiāpure Management Group, we decided that a sand-trapping structure could be designed and built entirely out of materials sourced from the sand spit. So, in July last year (2019), Puketeraki Rūnaka and 37 local volunteers built a 75 m long windbreak using driftwood picked up off the beach and slash collected from the nearby sand dune. Everyone was ferried across to the sand spit via waka provided by a local tourism operator. My role on the day (as the DCC) was quite simply to draw a line in the sand (to set the orientation of the fence) and to run the barbeque.

Locals working on the windbreak and a young community member getting ready to do some measurements (Photo: Brendan Flack, Puketeraki Rūnaka).

Since the driftwood windbreak was installed, it has effectively trapped windblown sand. Had an engineered approach been taken, the risk of environmental pollution would have been present, a risk that has been eliminated by using driftwood. In the six months following construction of the driftwood windbreak, we estimate that roughly 500 m^3 of sand accumulated as a direct result of the windbreak and a further 1000 m^3 in the following two months. This rapid increase in accretion rate over the summer has been driven by an extremely windy period of weather, with some areas experiencing more than 1.8 m of vertical accumulation. It is expected that without the driftwood windbreak, this sand would have been blown over the sand spit and reworked by riverine and tidal processes.

The community's role in the work has been evolving across the full life of the project. As sand has accumulated against the windbreak, and people have seen it working, they have become more and more interested. Māori Tours, a local tourism operator that operates using waka, now includes stacking wood on the driftwood windbreak as part of its habitat restoration experience. Local children visiting the sand spit do the same, adding to the fence and allowing it to grow vertically as it is progressively buried by windblown sand. Photo points have been set up by Puketeraki Rūnaka to allow these changes to be monitored, and one young local has even become protective over the type of wood used and the angle of its placement on the structure.

This work is by no means ground-breaking, but the way that the local community has become involved in lending a hand and learning about coastal processes has been a fantastic thing to be a part of. Puketeraki Rūnaka have become proud of their driftwood windbreak and are eager to build a second, parallel fence, with the help of the local community. The intent of the second fence would be to hasten sand accretion and create a zone between the two structures that could be planted with native sand-binding grasses. As with the driftwood windbreak, we know any plants will only last so long – but in that time there are opportunities for learning, for the community to further care for their coast, and for council and community to gain a stronger and shared understanding of how this valued environment changes over time.

Demonstration of the sand accretion between July 2019 (top) and January 2020 (bottom) (Photos: Tom Simons-Smith).

Disclaimer

Opinions expressed in *Coastal News* are those of the contributing authors and do not necessarily represent those of the editor, the NZCS management committee, or the New Zealand Coastal Society. While every effort is made to provide accurate and factual content, the publishers and editorial staff, however, cannot accept responsibility for any inadvertent errors or omissions that may occur.

Contributing to *Coastal News*

We welcome contributions for forthcoming issues of *Coastal News*. Please contact the Editor, Charles Hendtlass, at cellwairmonk@gmail.com if you'd like to submit an article, contribute a news item, have content suggestions or a photo to share, or to give some feedback on the newsletter.

The submission deadline for the next issue is 31 May 2020.

A Contributor's Guide is available for download from the Society's website at www.coastalsociety.org.nz (under the 'Publications' tab). This provides information on the style and format requirements when writing for NZCS publications. An index of articles previously published is also available for download.

Morphology change at the Avon-Heathcote Estuary mouth: A 2019 update

Justin Rogers[1], Amrit Raj[2], Tim Dodd[3], Mujahid Musa[4]

The Canterbury Earthquake Sequence (CES) altered the morphology of the Avon-Heathcote Estuary (AHE). Much of the tidal lagoon uplifted by 0 - 0.4 m, reducing the tidal prism by ~12%-18% (Measures et al., 2011). The abrupt CES changes follow a theorized 400-year period of gradual subsidence and tidal prism increase. Questions remain regarding whether estuary morphology has reached a post-quake equilibrium. Inlet-area relationships would suggest a reduction in inlet cross-sectional area as a possible response. The question of whether the estuary will tend to infill or erode has great relevance to the surrounding suburbs' resilience to sea level rise (Hughes et al., 2015).

As the most recent survey was in 2014, a group of University of Canterbury Geography students was encouraged by Dr Deirdre Hart to update our knowledge of the estuary and inlet. A field programme, including beach profiles, Real-Time Kinematic (RTK) surveys, single-beam echosounder data, drone photography and photogrammetry was undertaken in April and May of 2019 in the AHE inlet region.

Our fieldwork returned useful data that was analysed against historical sections and Digital Elevation Models (DEMs) (see Figure 1). We observed a fluctuating shoreline on the New Brighton spit; a cyclic north-south meander of the channel; the main channel deepening; a secondary flood channel scouring out; and the erosion of multiple sand bars. A vegetation-line analysis indicated shoreline accretion on the seaward side of New Brighton Spit between 2004 and 2019, and erosion within the estuary. This is further supported by the beach profile survey results, which also show erosion along the mudflats on the northeast side of the estuary.

Friedrichs (2011) notes that 'the morphological response of most tidal flats is rapid relative to the decade-plus timescales of engineering works, climatic fluctuations, and sea-level rise.'

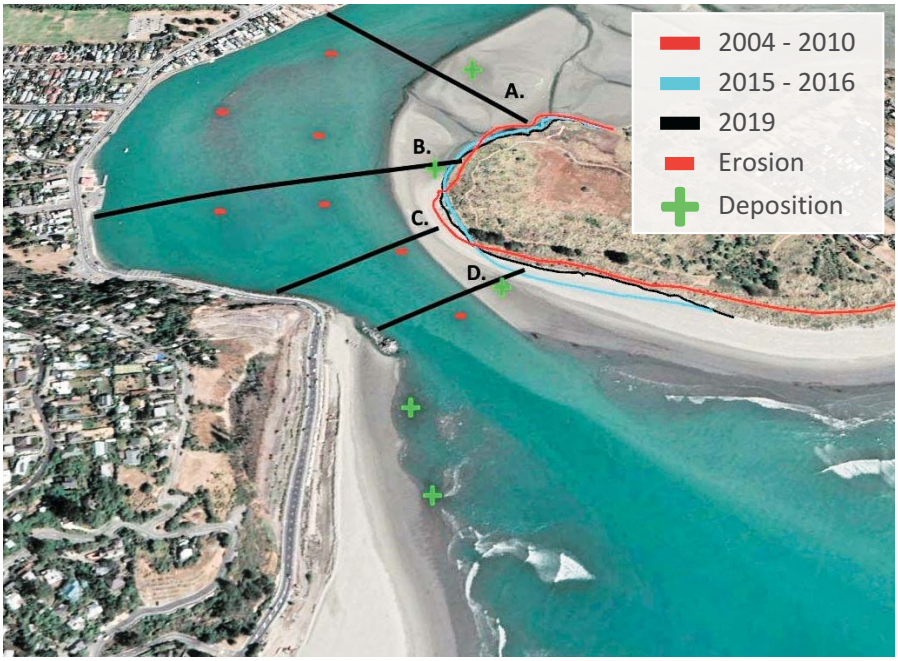

Figure 1: Avon-Heathcote Estuary mouth, showing erosion and deposition since 2011-13 interpreted from 2019 data; changing vegetation extent on New Brighton Spit digitised from aerial photos; and Transects A, B, C and D interpolated from bathymetric surveys.

The ratios of inlet volume to estuary volume, and the hypsometry of the estuary itself, can cause the tide to rise and fall at different rates – this is tidal asymmetry. This leads to an asymmetry of velocity, and thus sediment transport. Wind waves within the estuary can also contribute to sediment transport asymmetry (Hunt, 2016).

We hypothesized that the uplift and sediment supply associated with the CES could be analysed relative to asymmetry relationships, tide observations, and recent surveys to understand the timescales of estuary morphological response and look for any 'tipping points' towards infill-favouring morphology or hydraulics.

Tidal height data and DEM analysis within the AHE, corroborated by model results from Richard Measures at NIWA, indicate an estuary that is flood-dominant except for the deep channels, which are ebb-dominant. Most bulk asymmetry ratios indicate flood dominance, and a small reduction in flood dominance was found using a 2011 DEM as compared to pre-CES data.

The form of the tide within the estuary gave interesting clues to the post-CES adjustment period. Harmonic analyses of records from tide gauges on the lower Avon and Heathcote Rivers showed small changes to in-estuary tidal constituents, indicating an increased frictional effect after the CES. This signal in the M2 and M4 tidal constituents reverted to pre-CES magnitude at the two tide gauges after a period of 3-4 years, indicating that a hydraulic equilibrium was reached around 2014. Survey results indicated that the inlet channel and some flood tidal delta regions have been eroding back to pre-CES elevations (see Figure 2). The CES does not appear to have shifted asymmetry relationships, with our 2019 survey showing estuary channels deepening towards their pre-CES cross-sectional area, rather than continuing to infill.

The long-term trend of in-estuary tidal prism increase, while interrupted by uplift and deposition, appears to have resumed. The

(1) Coffey, a Tetra Tech Company; (2) University of the South Pacific; (3) Tasman District Council; (4) Northland Regional Council.

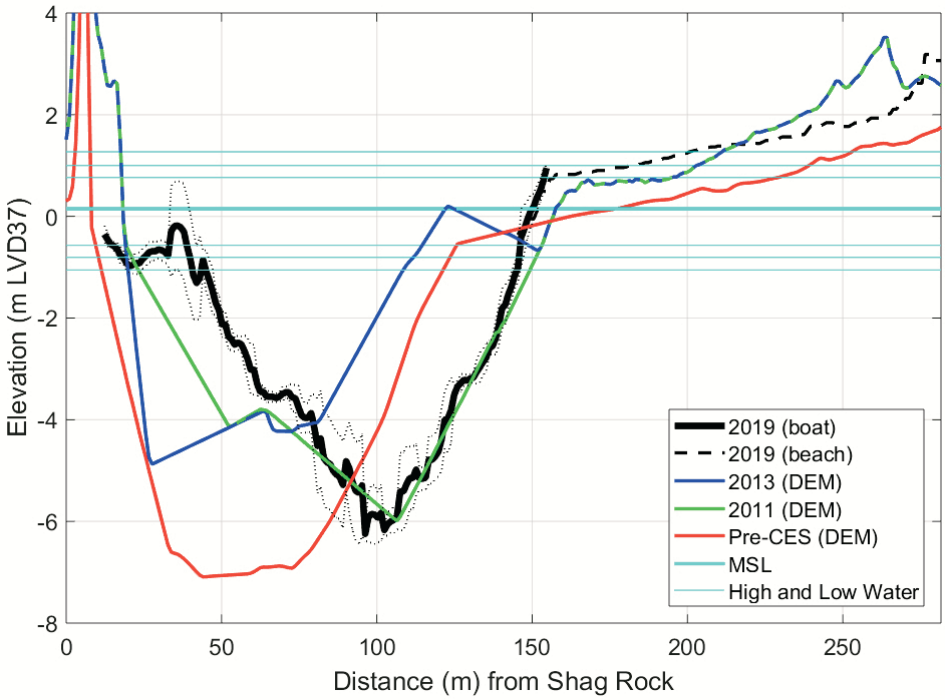

Figure 2: Beach and bathymetric surveys were compared with historical DEMs at Transect D. The inlet channel changes are interpreted as follows: Pre-CES – Deep (7m) channel, south side; 2011 – Shallower (6m) channel, north side, beach accretion; 2013 – Shallow (5m) channel, south side. Bar offshore of New Brighton Spit; 2019 – Channel back to 2011 depth (6m), north side. Beach higher below HW, lower landward.

potential 'respite' from sea level rise provided by uplift appears to be short-lived due to the energetic environment within the estuary and the likely fine-grained infill.

Up-to-date surveys and interpretation relative to the physical processes shaping the form of New Zealand's coastal waterbodies, including potential tectonic changes, must be emphasized when managing coastal hazards.

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For your calendar... NZCS Conference 2020

The 2020 NZCS Conference will be held on Waiheke Island, from 17-20 November. Further details and updates will be made available on the NZCS website (www.coastalsociety.org.nz/conferences/nzcs-2020) and in the July issue of *Coastal News.*

This year's theme of Small Islands, Big Oceans reflects both the challenges and opportunities faced by the islands in the Hauraki Gulf and is reflective of New Zealand as a group of small islands in the Pacific. Waiheke Island and the Hauraki Gulf reflect challenges faced in many coastal and island locations. They are places where the growing demand for coastal use, transport, infrastructure, tourism and changing culture are balanced with unique opportunities to support land conservation and the need to understand and preserve a unique marine environment in a changing world.

The conference theme provides the opportunity for cross disciplinary exploration of the sustainable management of our islands and our oceans, the changing governance, uses and expectations, and the potential to both lead the world and learn from and be inspired by case studies from other small islands within big oceans.

Responsive, relevant, ready: PDA report from Mobile, Alabama

Josie Crawshaw, Bay of Plenty Regional Council

I was awarded the NZCS Professional Development Award to attend the 25th Biennial Coastal and Estuarine Research Federation (CERF) conference in Mobile, Alabama. Mobile is a port city on the edge of Mobile Bay on Alabama's Gulf Coast, connected to the Gulf of Mexico.

The conference began with a Mardi Gras parade through the conference venue, highlighting the rich Mardi Gras history of Mobile (the home of Mardi Gras, rather than the now popular New Orleans). The conference had 10-12 concurrent sessions at a time, making it hard to see everything of interest! The conference had a strong theme of inclusion, including rainbow lanyards to signal you were approachable to the LGBTQI+ community, and the majority of bathrooms were made unisex.

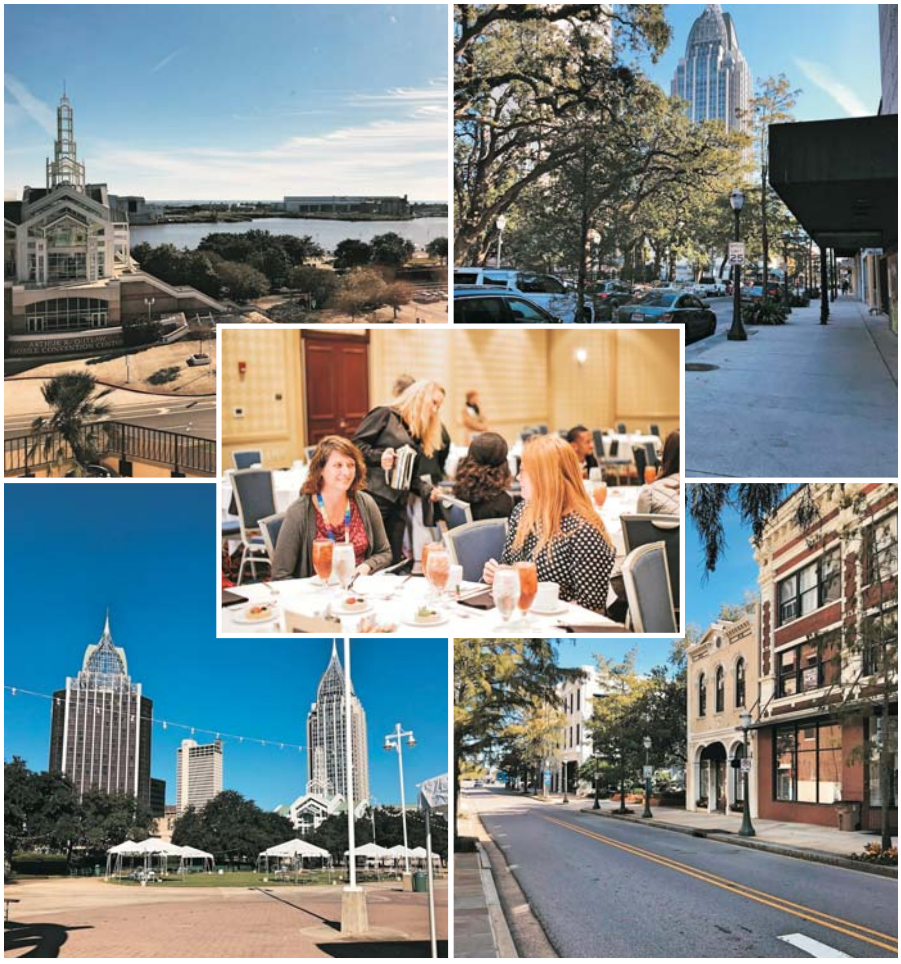
The themes of the conference were 'Responsive, Relevant, Ready'. The conference ran over five days, with one day of field trips and workshops. I began the conference with a trip to Dauphin Island, a small town on a barrier island on the edge of Mobile Bay. It is home to the Dauphin Island Sea Lab, a marine research/teaching space shared by a number of universities across the US.

The trip also visited the Estuarium, an educational outreach facility and aquarium highlighting the key habitats of coastal Alabama: the Mobile Tensaw River Delta, Mobile Bay, the Barrier Islands, and the Northern Gulf of Mexico. The highlight was seeing a horseshoe crab up close, seeing the huge number of oil rigs in the distance off the coast, and hearing about the large research fund (> $500 m) that was established after the Deepwater Horizon oil spill that funds much of the research in Mobile Bay.

The conference ran a number of fantastic plenary talks and evening events, with highlights including a career networking evening and the CERF Inclusion Lunch – with a number of speakers focusing on minority nationalities and women in science, which was an empowering event attended by over 100 people. The social event was held at the GulfQuest Maritime Museum, an interactive museum focusing on the rich maritime history of the Bay. Highlights included the boat simulator – getting to take the helm of a container ship coming into port at Mobile Bay – and the natural hazards simulator – making fast decisions in the face of an impending hurricane. To top off the week, we had a tornado touch down on the edge of Mobile City – first warning was hundreds of cellphones beeping during the talks (tornado warning, take shelter now), then lots of scientists running outside to watch the tornado form…

I attended a large number of talks under the key themes of: emerging technologies for coastal management (drones, sonar, satellite imagery), assessing cumulative impacts to estuaries, living shorelines and marsh based infrastructure, setting ecologically relevant targets for management of marine plant habitats, restoration priorities and socio-ecological benefits, developing molecular ecology tools into estuarine monitoring, quantification of ecosystem services of shellfish, and adaptive management frameworks.

Even across the other side of the world it was fantastic to run into some other New Zealanders, including past colleagues, staff from NIWA, and students from Auckland University. Evening meals were spent catching up with old and new marine scientists bouncing ideas and sharing career advice over the incredible seafood the Gulf had to offer. It was an inspirational week and a fantastic experience and many thanks to NZCS for supporting my trip.



(Top left) The CERF Convention centre in Mobile, Alabama; (top right, bottom left & bottom right) Views of Mobile; (inset) Josie at the Inclusion Lunch (Photos: Josie Crawshaw).

Review: NZCS Annual Conference 2019

The annual NZCS conference was held in Invercargill-Waihopai from the 12th to 15th November and attended by about 130 delegates from all over New Zealand. This year we had 66 presentations, three trade displays and nine posters. We saw an increase in the number of posters from previous years and were very impressed with the quality – the delegates managed to take the opportunity to read the posters at the Icebreaker or during the conference breakouts.

Keynote speakers are so often a highlight of conferences, and the line-up at the 2019 conference was no exception. Dr Rebecca MacLeod opened the presentations with a fascinating and local insight into the inner workings of the Fiordland Marine Guardians. The complexities and successes of establishing marine reserves, mātaitai and the unique concept of 'china shops' in remote coastal New Zealand certainly provided food for thought for many delegates. Dr Cliff Law of NIWA and Graeme Blick of LINZ also provided interesting and informative presentations, keeping delegates abreast of some of the foremost research being carried out in New Zealand.

A big part of any conference is the location and we were proud to showcase Murihiku/Southland. Delegates visited Waituna, the Ramsar-classified lagoon on our south coast that is an important habitat for native fish and birds, including the elusive mātātā/fernbird. Others visited Motupōhue/Bluff, to check out a coastal restoration project and kōrero with local iwi. Our final field trip was to Ōreti/New River estuary where we learned about its history and current state, mucked in with some restoration planting, and then headed to Ōreti beach to meet the toheroa ... where one brave delegate took the opportunity for a quick dip!

All in all, the diversity and beauty of the Murihiku/Southland coastline was very much on display. Some hardy souls even stayed in the Deep South after the conference to explore some of the jewels in our crown: Rakiura/Stewart Island and Te Whakataka-kārehu-a-Tamatea/Fiordland.

The quality of the presentations was again outstanding, proving a challenging task for the judges when it came to awards. In saying that, a huge congratulations should go to the NZCS award winners announced at the Conference Awards Dinner at Bill's Shed:

- *Terry Healy Award:* Project Reef Life: South Taranaki
- *Best Overall Oral Presentation:* Mark Ivamy
- *Best Student Oral Presentation:* Kate Macdonald
- *Best Poster:* Kyla Sherbanowski
- *eCoast Sustainability Award:* Tom Simons-Smith.

We would also like to take this opportunity to once again thank the conference sponsors for their generous support of another fantastic NZCS conference. Without the support of these groups we wouldn't have the opportunity to get together and share our collective knowledge of all things coastal. Tēnā rawa atu koutou to: Ministry for Primary Industries, NIWA, Tonkin + Taylor, eCoast, Urban Solutions, Southern Institute of Technology, 4Sight, Department of Conservation, Environment Southland, e3Scientific, WSP, Pattle Delamore Partners, and Great South.

This year the conference is heading back up north to Waiheke Island – we look forward to seeing you all there!

Mā te wā.

Matt Hoffman and Bryony Miller
Co-chairs of the NZCS Conference Local Organising Committee 2019










Seaweek Ocean Champion 2020

The 2020 Seaweek Ocean Champion was awarded on Thursday 5th March at an event hosted by the Hutt City Council and officiated by the mayor. Ryan Abrey, the Wellington NZCS Regional Coordinator, presented the award on behalf of NZCS to Lorraine Shaab and the Petone Beach Clean Up Crew. The New Zealand Coastal Society sponsors this award annually and the winners receive a $500 prize.

Lorraine's ocean challenge began while plogging (picking up litter whilst jogging) four years ago, and for the past three years she has organised beach clean ups as part of the volunteer group, Petone Beach Clean Up Crew.

From small beginnings, activity has grown over the years to the point where she now aims to raise awareness of plastics pollution and the use of nurdles in manufacturing. Her main concern is that several plastic manufacturers in Wellington import nurdles, the raw material used to make plastic products, and they are getting spilt during production and transportation and contaminating our beaches. Two beaches are already heavily contaminated, with one being home to blue penguins. Lorraine is committed to putting more pressure on the plastic manufacturing industry to ensure these granules stop entering our waterways, and to informing the public about this issue, as most are unaware that these granules are ending up in the stormwater drains that flow into Wellington Harbour.

Photo: Hutt City Council.

See more at: www.seaweek.org.nz

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Newsletter archive & downloads

Back issues of *Coastal News* (from 1996 onwards) are available to download from the Society's website at www.coastalsociety.org.nz (under the 'Publications' tab). Also available for download are author and article indexes for issues 1 to 65 (these will be updated each year), a Contributor's Guide to writing articles for *Coastal News*, and copies of the three NZCS Special publications – *Rena: Lessons learnt* (2014); *Adapting to the consequences of climate change* (2016); and *Shaky shores: Coastal impacts & responses to the 2016 Kaikōura earthquakes* (2018).

News from the regions

Northland

Laura Shaft, Regional Representative

Regional climate change adaptation strategy

A regional climate change adaptation strategy is being developed collaboratively by a joint councils adaptation working group. This will help councils understand how different communities and natural resources will likely be affected by climate change, and set out priorities for community adaptation planning. Northland Regional Council is undertaking a two-stage spatial risk assessment, which will provide valuable insights for the strategy, as well as raising a whole lot of new questions and opportunities for research. The aim is that a ten-year regional adaptation planning work programme will be developed, and delivered with coordinated and consistent methodologies, funded and implemented by the four Northland councils.

Climate change and coastal communities

Understanding the impacts of climate change on coastal communities requires good information, and we are busy working on improving our knowledge of coastal hazards using the near-completed regional LiDAR data. Updates for our coastal hazard maps for erosion and flooding include a full coastline bathtub flood model, a hydrodynamic model for the Kaipara harbour, and new and updated coastal erosion assessments. We are also working with the University of Auckland on a coastal erosion hotspot research programme. A new extreme water level will be used in the development of hazard maps, based on a 1% AEP storm event with 1.52 m of sea level rise (equivalent to SLR at 2130), and used for the control of category A development as recommended in the 2017 MfE guidance.

Rebuilding restrictions

Implementing coastal management into policy is as ever a challenge, especially when it comes to existing land uses. Northland's new regional plan includes a new policy (D.6.3) and rule (C.8.6) that restricts rebuilding after a building suffers material damage as a result of a natural hazard. The policy effectively means that houses or buildings sited in hazard prone areas may potentially have their existing use rights extinguished following a hazard event that has a material impact. Ideally an integrated community-centric approach to coastal management would help address some of these issues proactively. For instance, coastal protection consents are currently assessed on a property-by-property basis, and perverse outcomes can eventuate where a patchwork of approaches is used between neighbouring properties. Ideally NRC would like to be able to better manage coastal protection works in a coordinated and consistent way, and in alignment with climate change adaptation planning. However, as always, there are significant challenges including funding issues, lack of clarity around responsibilities, and appropriate regulatory instruments.

Waikato

Christin Atchinson and Jacqui Bell, Regional Representatives

Regional Coastal Plan review

WRC is seeking feedback from the public on issues that need to be addressed in the Regional Coastal Plan review. The feedback provided will be used by the project team to further refine the plan, and to develop options to address those issues. A paper on each issue will be developed, incorporating and summarising the feedback from this engagement phase. These will be published prior to the regional council seeking stakeholders' views on the options proposed to address the issues. This is currently scheduled to happen in mid-2020. The community's views will be reported back to the Regional Plan Review Committee and Waikato Regional Council.

Formal community feedback (in accordance with Schedule 1 of the Resource Management Act) will be sought when the proposed plan change is notified in mid-2021 as the Waikato Regional Coastal Plan. Further submissions will then be sought, and a hearings panel process will lead to the final recommendations to Waikato Regional Council. Once a decision has been made and any appeals resolved, the revised plan will become operative.

Māui Dolphin Day 2020

Whāingaroa Environment Centre will again be hosting Māui Dolphin Day and the event will be held at Papahua Domain in Raglan on the 28th March 2020. Whāingaroa Environment Centre has been running the event annually now for 15 years. It is a collaborative community celebration highlighting the importance of our marine environment, our whanau, and our community's creativity and spirit.

Numerous Raglan Community groups have worked together to support the dolphin. These have included: Harbour Care planting over 1 million trees, fencing over 600 kms of harbour and stream edge; Xtreme Zero Waste preventing leachate from old landfills and installing and servicing enviropods in all storm water entering the harbour; Whāingaroa Environment Centre conducting water quality advocacy, implementing the Catchment Plan and general dolphin advocacy; and KASM assessing and submitting on sea-bed mining applications. These projects have had a major positive impact on the harbour and coastal environments with a radical increase in biological abundance and diversity.

Māui Dolphin Day celebrates the work we have all been doing and shares the latest about the dolphin and what is next in terms of its recovery plan. The event will be held in conjunction with the Xtreme Zero Waste Recycled Raft Race. There will also be games, info stalls, live entertainment and food. Head along and support the conservation of the Māui Dolphin.

Port Waikato – Update

Following the significant erosion that has occurred recently at Port Waikato, Waikato District Council is providing regular updates about the situation and plans going forward.

Council will be trialling the peel-back of the first metre or two of chipseal from the edge of the bank of the beach car park to assess the rate of erosion. Council will also be removing the concrete pad, hall septic tank, concrete poles, and cable from the beach car park.

Meetings have started between the most imminently affected property owners on Ocean View Road and council's building and consents teams.

The District and Regional Council are working together in the adaptive management

planning discussions with the Port Waikato community and other stakeholders. Regional advisors from the Ministry of Civil Defence and Emergency Management (MCDEM) have also provided advice and connections to other relevant work in central government.

If you have comments or suggestions, please email Waikato District Council's Community Resilience Team at IMT@waidc.govt.nz

Weekly testing shows heavy rain affects coastal water quality

Heading off to the beach for a break and want to know if the water quality stacks up for swimming and recreation? Waikato Regional Council tests the water quality at seven Coromandel Peninsula and two west coast beaches once a week from November until March, with the latest results available to beach users at waikatoregion.govt.nz/coastalresults and the Land and Water Aotearoa (LAWA) website.

Coastal and marine team leader Michael Townsend says the water quality at Waikato's beaches is generally quite high, but the weekly results are important to look at because heavy rainfall events can wash contaminants, such as effluent, from the land into the waterways and out to the coast.

"What we tend to find is that the faecal bacterial levels can be quite high after a lot of rain. So while it might be tempting to rush out for a swim the minute the sun is out again, it's worth knowing that these contaminants may be present in the water for up to two days and we'd recommend caution. The number of faecal bacteria present in the water indicates the likelihood of getting sick from the many possible pathogens such as bacteria or viruses."

If the results are of concern, the regional council works with district councils and the Waikato District Health Board to undertake more testing and to understand if there could be any public health implications.

"So far, each time we've done further testing the bacteria levels are back to an acceptable range, but if there was a problem then the DHB will issue a health warning."

The council uses national guidelines to determine whether the monitoring results show the water is suitable for recreation. The Coromandel beaches monitored are Whitianga, Hot Water Beach, Tairua, Pauanui, Whangamatā, Onemana and Whiritoa, and Sunset Beach (Port Waikato) and Ngārunui on the west coast.

Weekly monitoring gives an understanding of the typical water quality at each location over time, and an overall grade is updated for each location at the end of the sampling season.

This is the fourth consecutive year that the regional council has done coastal water quality monitoring, and it recruits students to help with sample collections.

"It's important to understand the quality of the water so we can make good decisions on managing our coastal and marine area," says Dr Townsend.

Article published by Waikato Regional Council on 13/12/2019

Communities help plan to improve health of west coast harbours

Landowners in the west coast harbour catchments are helping Waikato Regional Council develop harbour and catchment plans for Kāwhia, Aotea and Whāingaroa/Raglan. The regional council has been holding workshops with rural landowners, iwi representatives, agencies and stakeholders to understand their concerns, aspirations and ideas for the harbours and their catchments. The plans will help the council to prioritise the work it does with landowners to improve the health of the catchments, waterways and harbours.

"Our catchment management programme has grown year on year since the West Coast Zone was established in 2010, and we now have more funding than ever for landowners to make environmental improvements on their properties," says project manager Tracie Dean-Speirs.

Typically this work includes riparian planting and fencing, land retirement, erosion protection and river management.

"We're getting great uptake by landowners who want to make improvements on their land, however we do find that demand can exceed the funds available. Therefore it's important that we direct funding towards work that will make the most difference."

The council this year secured $1.39 million from the Ministry for Primary Industries' Hill Country Erosion Fund 2019-2023 for soil conservation work in the West Coast Zone, which includes the harbour catchments. It has also put in an application for funding from the government's One Billion Trees Programme to help landowners undertake native planting.

The West Coast Zone has the highest proportion of erosion-prone farmland in the Waikato region, and its rivers have high sediment loads. It also has the lowest population (3 per cent).

"These plans will help us get extra funding support, and communities can also use these plans to help get funding from other sources, too."

Issues, concerns and trends identified at the workshops included declining numbers of shellfish in harbours, coastal erosion and inundation, impacts from increased urban development, sedimentation, an increase in pest plants and animals, and lack of funding available.

Waikato Regional Councillor Fred Lichtwark, who is the chair of the council's new Community Restoration Committee, says people want improved water quality, greater biodiversity and more green spaces around harbours and waterways.

"We need communities to help us do it, and we have the resources to help communities take action."

Landowner groups are already forming in some parts of the Kāwhia harbour catchment.

Councillors Stu Kneebone and Andrew Macpherson, who attended the Kāwhia workshop, say it's inspiring to see landowners wanting to work together to develop better environmental outcomes for their properties and the whole of the catchment.

"We're really behind neighbours working with neighbours – that's how we can make the biggest improvements to our waterways," says Councillor Kneebone.

The regional council will hold public information days in Kāwhia and Raglan on the harbour and catchment management plans during 2020.

Residents and landowners can still have their say via an online survey at: www.waikatoregion.govt.nz/westcoast-survey. To find out more about harbour and catchment management plans go to: www.waikato.govt.nz/hcmp

Article published by Waikato Regional Council on 12/12/2019

Hector's dolphin

There has been a recent (end of 2019) confirmed sighting of one lonesome Hector's/Māui dolphin in the Eastern Coromandel district. The Māui dolphin is a critically endangered sub-species of the Hector's dolphin that lives only in the North Island. Hector's and Māui dolphins look identical, only DNA can tell them apart. Current known distribution for the Māui dolphin is restricted to the west coast of the North Island from Taranaki to Northland. Hector's dolphins are only known to live in the South Island.

The Department of Conservation periodically gets sighting reports of Hector's/Māui dolphins in areas where they are not known to reside, such as the Bay of Plenty/ Coromandel. In November 2015 there were five sightings of small groups of Hector's/ Māui dolphins between Mount Maunganui and Whitianga. December 2015 saw two animals in the eastern Bay of Plenty, and again in April 2016. There have been a further two sightings in March and April 2017. All of these sightings were validated by a contracted independent external expert. Currently the population of the Māui dolphin is estimated at 63 individuals (> one year old) and is classified as Nationally Critical (likely to face extinction). Whilst the Hector's dolphin population stands at an estimated 15,000, this species is classified as Nationally Vulnerable.

New marine pest *Clavelina oblonga*

Biosecurity staff are on alert. A new marine pest, *Clavelina oblonga*, has been discovered at Great Barrier Island. While *Clavelina oblonga* is not in the Waikato yet, there is a strong boating connection between the Coromandel and Great Barrier Island. The Waikato Regional Council marine surveillance programme will be adding *Clavelina oblonga* to its watchlist.

Clavelina oblonga is a sea squirt that can form dense colonies. The colonies are made up of many individual sea squirts, which look clear and gelatinous. These colonies can overgrow mussel and oyster farms, and are another competitor in the environment. The common name for *Clavelina oblonga* is 'little bottles'.

Long distance spread of *Clavelina oblonga* is through vessel biofouling, ballast water, or via aquaculture. It is suspected to have arrived via vessel biofouling. The limiting of further spread is via ensuring a clean hull prior to moving – Clean Below Good to Go.

If you think you've seen something suspicious, take a photo, collect a sample, record the location, and call the Ministry for Primary Industries on 0800 80 99 66.

Bay of Plenty

Jonathan Clarke, Kieran Miller and Josie Crawshaw, Regional Representatives

Mauao base track reopens

The Mauao Base Track reopened for the busy holiday season. Tauranga City Council staff and contractors worked tirelessly since a decision was made in November 2019 to repair a section of track damaged by a major slip in 2017. Mayor Tenby Powell said the feat was a testament to the commitment, determination and hard work of everyone involved. The mayor said the accomplishment wouldn't have happened without the guidance and goodwill of Mauao's iwi owners. The Mauao Trust has guided council staff in their engagement with experts to ensure the maunga (mountain) is safe and accessible for wheelchairs and prams. The Trust represents the three iwi of Tauranga Moana, who collectively own Mauao. The repairs include excavations, track realignment, handrail installation, drainage improvement, and stabilisation with geotech cloth and soil nails.

Whakatāne District Council achieves climate change certification

Whakatāne District Council reached a significant milestone in a project that aims to measure and reduce its greenhouse gas footprint. The council has been certified under the world-leading Toitū carbonreduce® programme, previously known as CEMARS. Whakatāne joins the likes of Kāpiti Coast District Council, Wellington City Council and Waikato Regional Council to become one of eight New Zealand local government councils to be Toitū carbonreduce® certified.

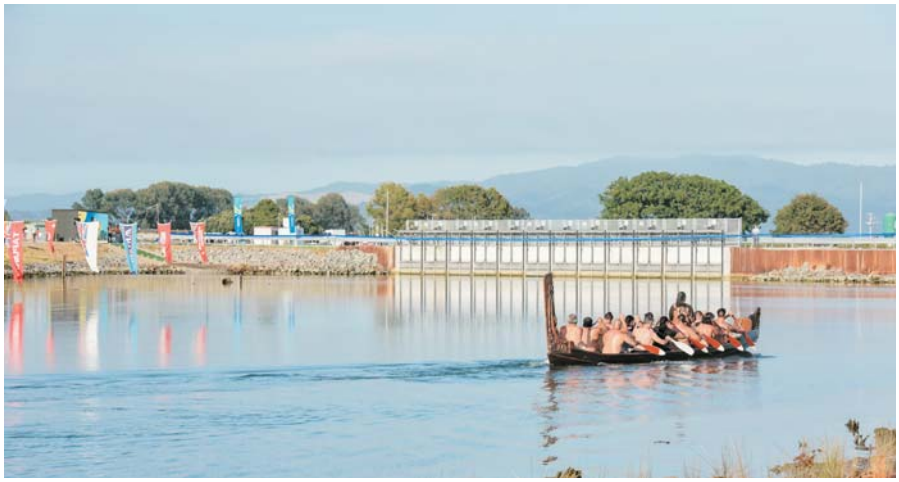
The internationally recognised certification endorses the positive steps the council has taken since signing the New Zealand Local Government Leaders' Climate Change Declaration. The 2017 declaration committed the council to put in place ambitious action plans to reduce greenhouse gas emissions, as well as build the ability of the organisation and the community to recover quickly from difficulties. To gain certification, the council measured and assessed greenhouse gas emissions for 2017-18. This provided twelve months of data on which to base an emissions management plan and reduction targets. A number of projects are being implemented to achieve these targets. The Toitū carbonreduce® audit process for 2018-19 emissions is now underway. The council also adopted a set of Climate Change Principles, following a public engagement process earlier this year where more than 900 pieces of public feedback about climate change were received. The principles will be embedded into the council's decision-making processes and key documents to ensure climate change is a consideration in all projects and proposals.

Kaituna River re-diversion

On the 12th of February the Kaituna River re-diversion to Maketū estuary was celebrated, following a long journey by iwi and residents to return freshwater to Maketū estuary following the degradation of the estuary's health. The day began with a dawn karakia with the kaitiaki of Maketū estuary, followed by a public event later in the morning and the official opening of the culverts. The Te Arawa waka was paddled under the flags of Te Arawa and downstream towards the estuary – carried by the first significant flows from the Kaituna River since it was diverted out to sea via Te Tumu Cut in 1956.

The Bay of Plenty Regional Council invested $16.6m to complete the project, which was completed on budget and five months ahead of schedule. There has been widening of the Ford's Cut Channel, moved and upgraded stop banks, and installation of a new 60 m wide channel (1 km long) to carry freshwater from the Kaituna River to Maketū estuary via 12 large culverts, fitted with automatic gates under the Ford Road bridge. In addition, a salinity block has been installed downstream of the new channel to reduce saltwater intrusion into the upper estuary, and boat ramp facilities have been upgraded. Lastly, a 20 ha wetland (Te Pa Ika) was created on low-lying paddocks near the upper estuary, which has now been planted with 65,000 native plants.

Nine of the 12 gates are open for the first year of operation to give the estuary time to adapt and allow intensive monitoring to take place. On project completion up to 20% (600,000 m^3) of the Kaituna River's flow will be returned to the estuary every tidal cycle,



The Te Arawa waka paddling towards the Ford Road bridge's 12 newly installed culverts (Photo: BOPRC).

whilst maintaining existing levels of flood protection and boat access through the Te Tumu Cut.

For further information see: www.boprc.govt.nz/kaitunarediversion

Hawke's Bay

José Beyá, Regional Representative

Cape Kidnappers landslide (update from last edition)

The Gannet Beach Adventures concession to undertake guided tractor-trailer tours to Cape Kidnappers was suspended by DOC amid safety concerns around landslide risks. The suspension is planned until they are satisfied that it is safe to resume the activity. The QRA (Quantitative Risk Assessment Report) completed last year is to be peer reviewed.

3D aquifer mapping

Hawke's Bay will be the first region in the country to use the latest airborne electromagnetic survey technology (SkyTEM), which will map large-scale, deep-underground soil strata with the main aim of identifying aquifers. While most of the mapping is planned inland, coastal areas and four alongshore transects for the area from Te Awanga to the Port of Napier are included. For the details, see www.hbrc.govt.nz/hawkes-bay/projects/3d-aquifer-mapping-project/

Pollution response (update from last edition)

The old dumping ground at Clifton motorcamp, uncovered by coastal erosion, has now been cleaned by the regional council (Figure 1).

Clifton to Tangoio 2120 Coastal Hazards Strategy (update from last edition)

The concept design for the Clifton to Tangoio 2120 Coastal Strategy-Stage 4 has been completed for most of the units and is currently being peer reviewed by Tonkin and Taylor. The design of a 2 km long flood defence for Pandora Unit is under development. An assessment on the consentibility of the proposed alternatives is being undertaken by Mitchell-Daysh, who will evaluate wider environmental and socio-cultural impacts. A study on how managed retreat options may look and cost has been proposed for this year.

A renewed Joint Committee with recently elected councillors was brought up to speed on the strategy at their first meeting in February.

Figure 1: Exposed old dumping ground uncovered by erosion at Clifton motorcamp being cleaned.

6 Wharf project

Since signing the contract in November last year, Napier Port and HEB Construction have been establishing the construction site, procuring materials, and completing environmental management plans for the 6 Wharf project.

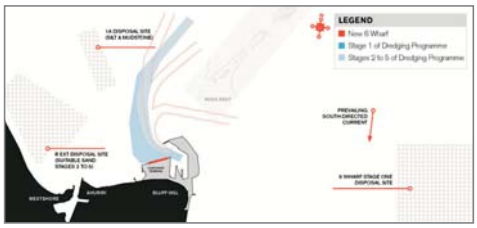
The $147 million venture involves two major tasks: the construction of a 350 m long and 34 m wide wharf, and the first stage of a dredging operation, which involves creating a berth pocket to a depth of 13.0 m and dredging parts of the inner harbour and navigational channel to achieve a depth of 12.5 m, with an estimated volume of 1.3 million m^3 (Figure 2).

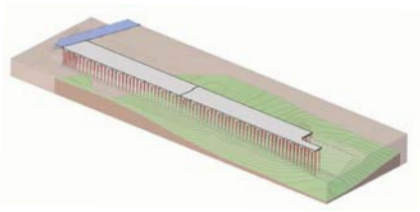
Four hundred piles will support the decking and finger structure. The latter, and a land-based mooring structure, replaced the two dolphins in a previous design (Figures 3 and 4).

The wharf project also involves the removal of the existing rock revetment and its replacement with specially placed precast blocks in a 1.84 (horizontal) to 1 (vertical) slope. This uncommon type of structure was designed by Beca and physical-model tested at the UNSW Water Research Laboratory, Australia. The design provides scour protection against waves and ship-induced flows (Figures 5, 6 and 7).

Artificial reef for ecological enhancement

Napier Port received a resource consent to develop an artificial reef 1.4 km north east of Pania Reef, using limestone rock from the revetment wall to be dismantled for the 6 Wharf project. For this, the port is working in partnership with LegaSea Hawke's Bay, a group of recreational fishers dedicated to rebuilding Hawke's Bay's fish stock, to create the reef.





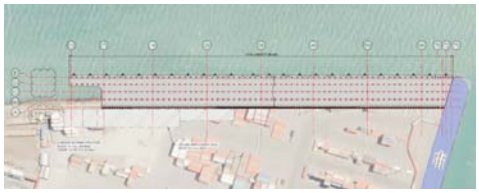


Figure 2 (top left): 6 Wharf project layout (general).

Figure 3 (top right): Wharf 3D view.

Figure 4 (bottom left): Wharf plan view.

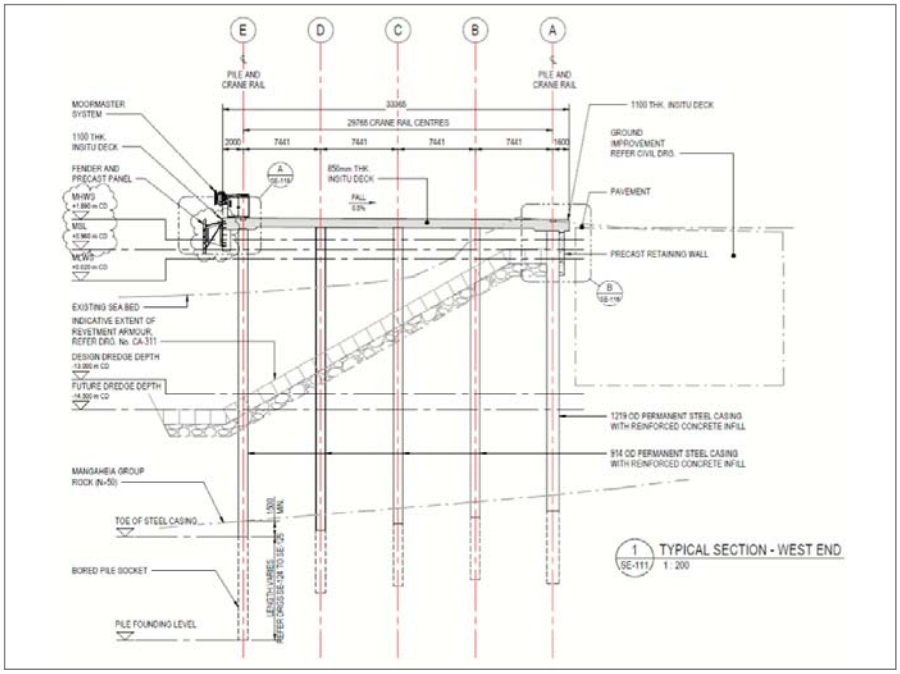


Figure 5: Wharf typical cross section.

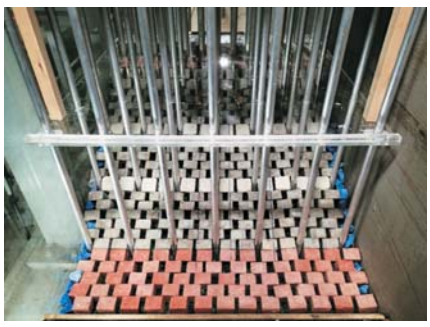


Figure 6: Wave tank testing at the UNSW Water Research Laboratory (Australia) for the specially-placed precast concrete block revetment (front view).

Figure 7: Wave tank testing at the UNSW Water Research Laboratory (Australia) for the specially placed precast concrete block revetment (side view).

While the consent allows the deposit up to 20,000 m^3, the amount of rock to be used is still to be determined as some of it will be used to maintain existing revetment walls around the port. The port also has resource consent to support a second reef about 24 km from Pania Reef at the location of the 'Gwen B' shipwreck, which it will do if there is enough limestone after maintenance and establishing the first reef.

A barge-mounted excavator will dismantle the rock revetment in stages and transfer it onto another barge for transportation to the reef. Napier Port expects to take the first limestone rocks out to the reef site on the dredging barge that will be used for 6 Wharf in mid-2020. The reef should be established in the second half of the year.

Hardinge Road coastal protection (update from July 2019 Edition)

During February and March, coastal rock protection work has been constructed along the reserve area next to Hardinge Road, from opposite Ahuriri Lane, to where the Ahuriri Bypass begins (Figure 8).

This work is to protect the roadway and the footpath that runs alongside it. It involves excavation, and the addition of a large quantity of limestone rock, carried into the area by truck. Four other sections of shoreline have been worked on since 2012.

As Little Penguins are known to nest in the area, it will be checked for burrows. The work is taking place outside breeding season, but if any resting or moulting adults are found, approved penguin handlers will move the birds to the nearby kororā sanctuary, featuring nest boxes for displaced penguins, at Napier Port.

For more information, go to:
www.napierport.co.nz #korora sanctuary
or
www.napierport.co.nz/our-business/our-future/6-wharf/building-sustainably/korora-sanctuary/

Figure 8: Hardinge Road coastal protection works, February 2020 (Photo: José Beyá).

University news

University of Auckland Water Group

A delegation of the University of Auckland (UOA) Water Group visited the University of New South Wales (UNSW) in Sydney during the last week of January. The goal of this trip was to discuss water-related courses teaching at both institutions and to establish long-lasting research collaborations. The first day included a tour to the main UNSW campus teaching facilities and a field trip to visit some of the beach sites that UNSW has monitored for over 40 years. During the visit UNSW staff presented CoastSnap, their new collaborative-science research tool to monitor beach profiles. On the second day the UOA delegation visited the Water Research Laboratory in Manly, which comprises several facilities for coastal and hydraulic modelling. The day continued with presentations by both parties and extensive discussion and finished with a seminar on high-fidelity computational fluid dynamics (CFD) modelling to share some of the new capabilities that UOA is developing in that field.

During the month of February, UOA hosted seminars from Associate Professor Scott Draper (University of Western Australia) and Dr Davide Wüthrich (University of Queensland). Scott Draper presented on scour around squat subsea structures, a comparison to field data, and settlement of shallowly-embedded subsea structures. Davide Wüthrich presented the results of a range of experiments on wave impacts on structures, in particular considering the effect of building geometry and debris damming on the applied loads. Both seminars initiated interesting discussions on fundamental and applied problems related to their research, and the possibility of collaborative projects on these topics.

UOA delegation visiting field sites monitored by UNSW (Photo: Tom Shand).

New course in climate change for civil and natural resource engineers at the University of Canterbury

The Civil and Natural Resources Engineering department has introduced a new compulsory course at 300 level on climate change and civil systems engineering. The primary objective of the course is to introduce students to climate change and the engineer's role in tackling systems and sustainability challenges. While teaching the students technical skills such as systems, network, and risk/resilience analysis, the course will differ from their other technical papers by emphasising the engineer's role as policy leaders, collaborators with interdisciplinary teams, and kaitiaki (stewards of the environment). Students will be taught strategies for climate change mitigation and adaptation, as well as approaches for decision making with high levels of uncertainty. They will be taught how to evaluate alternative interventions, including geoengineering theories, based on engineering ethics and maladaptation potential with the goal of seeking strategies to anticipate and avoid such issues. The course is undergoing development and will be taught in the second semester of 2020 by Drs Rebecca Peer and Tom Logan – two lecturers appointed to the department's recently established Civil Systems Group.

Antarctica and Greenland melting

Craig McConnochie (lecturer in Civil and Natural Resources Engineering, University of Canterbury) has been researching the processes driving melting of Antarctica and Greenland. Better understanding of these processes will inform global climate models and help constrain predictions of future sea level rise. The work has identified that a regime of ice melting, currently ignored by climate models, might be important to parts of Antarctica with weak flow velocities. If this regime is widely important, current models are underestimating future sea level rise.

Tauranga Harbour: Submarine groundwater discharge, nutrient inputs and algal blooms

University of Waikato PhD student Ben Stewart is investigating submarine groundwater discharge, nutrient inputs and algal blooms within Tauranga Harbour. This work has been supervised by Karin Bryan (NZ, chief supervisor), Conrad Pilditch (NZ), Christian Winter (Germany) and Isaac Santos (Sweden). At the beginning of the project, Ben found that submarine groundwater discharge was a major vector of both inorganic and organic nutrients into Tauranga Harbour.

New work is examining the temporal and climate-related hydrologic changes (changes in water movement and harbour flushing rates/dilution rates, etc.) and their influence on water quality, including nuisance algal blooms. Past work has shown that algal bloom events in the Bay of Plenty Region are well correlated with inter-annual El Niño phases of the southern oscillation index (Park et al., 2011). However, the drivers of these blooms are still not clear.

We hypothesised that changes in the hydro-climatic conditions during El Niño phases reduces the dilution rates and increases the overall flushing times of the harbour. This may lead to regions of more stagnant water masses, particularly in the sub-estuaries, that help promote the retention of captured nutrients and the development of algal blooms.

Using a combination of modelling techniques, Ben predicted harbour dilution rates in response to changes in wind, rainfall, river flow and tidal influence. This has been done by calculating dilution rates from conservative tracer simulations of a calibrated, high resolution (20 x 20 m grid size) Delft 3D hydrodynamic model. These outputs were then used to train an artificial neural network to predict dilution rates over longer inter-annual timescales, using measured datasets as predictors.

Our results have shown a negative relationship ($r^2 = 0.41$, $p = 0.001$) between dilution rates and algal bloom mass in the harbour over a timescale of 22 years. Both dilution rates and algal blooms were also correlated with changes in the El Niño/La Niña southern oscillation index. These findings demonstrate the importance of larger global scale climate drivers in tandem with local drivers on the functioning of regional coastal systems. Understanding the response of coastal systems to (1)

groundwater input and (2) changing hydro-climatic conditions will need much further attention over the next decades due to predicted changes in climate.

University of Waikato PhD student Ben Stewart at work (Photo: Ben Stewart).

Damage to Napier Port breakwater under potential tsunami impact

New Zealand is exposed to tsunamis, especially the coastal areas near the Hikurangi Subduction Zone, and Napier Port in Hawke's Bay is one of the most exposed New Zealand ports. If a tsunami was to strike the now robust breakwater protecting the port, its likely performance is of obvious interest to the port authority, cargo owners, and local residents.

Recently, Zhonghou Xu, Bruce W Melville and Liam Wotherspoon of the University of Auckland have conducted experimental research to investigate the stability of the Napier Port breakwater under tsunamis, in collaboration with staff from Napier Port Ltd.

Experiments were carried out at the Fluids Mechanics Laboratory at the University of Auckland. The tsunami flume consists of a reservoir with a storage capacity of 30 m^3 and a 19 m long channel. It can generate tsunamis up to 10 m in height at a 1:40 geometric scale. Elements of the breakwater were scaled down and manufactured in the laboratory. The researchers found that damage to the breakwater was initiated by movement of the concrete armour units, then displacement and washing away of the under layer (limestone rocks), washing away of the crown concrete blocks, and subsequent displacement of precast concrete blocks. This research is preliminary, aimed at designing more resilient coastal infrastructure when exposed to tsunamis.

Further research could be undertaken to investigate the performance of other New Zealand breakwaters under the impact of tsunamis.

Napier Port breakwater before (left) and after (right) a tsunami.

NZCS Regional Representatives

Every region has a NZCS Regional Representative who is available to help you with any queries about NZCS activities or coastal issues in your local area. If you are interested in becoming involved as a regional representative, please get in touch with Sam Morgan (samm@4sight.co.nz) or Ana Serrano (ana.serrano@wsp-opus.co.nz).

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Eric Verstappen – Obituary

It is with the greatest sadness that we learn that Eric Verstappen, a well-respected and highly regarded member of the NZ Coastal Society and its Management Committee, passed away unexpectedly on Saturday 8th February. Eric joined the Society shortly after its formation in 1992. He became part of the Management Committee in 1995 and served as Treasurer from 2001 until the time of his passing.

Eric's funeral and celebration of his life was held in Nelson on Saturday 15th February. Those who spoke included family, work colleagues, and representatives of organisations that Eric was part of. The speakers portrayed a person who was willing to give freely of his time as a volunteer and always placed others before himself. Many of us in our Society had an association with Eric through our professions, but we knew less about his early life.

Eric was born in Wellington in 1954, two years after his parents had emigrated from Holland. His Dad worked as a Technical Draughtsman with NZ Rail, and his Mum worked as a doctor's secretary. After three years in Wellington, the family moved to Tokoroa where his Dad took on a job in the design office at NZ Forest Products, Kinleith Mill. Tokoroa at the time was very much a pioneering and progressive town with the development of forestry, and construction of the new pulp and paper mill. Big brother Eric, his younger brother and three sisters attended Tokoroa East Primary School.

School holidays were spent camping mostly at Papamoa Beach for six weeks for about 10 years. Eric rejoiced in taking his Dad's wooden dinghy out through the waves and setting the Kontiki out for fish. As he grew older there were many pig hunting trips with his Dad and brother. These progressed to hunting expeditions for rabbits, and into the back blocks of the King Country for goats, geese and turkeys. At high school Eric was a competitive academic student and runner-up Dux. During this time, he enjoyed tramping trips into the Tongariro National Park with classmates, and rafting trips to remote rivers like the Motu. Eric left school to attend Canterbury University and complete a Masters Degree in Engineering. Here, running in Christchurch's Port Hills became a favourite past time.

Eric began his professional career as a Civil Engineer in the Ministry of Works and Development in Hamilton where he worked on roads and bridges. It was here Eric met his wife to be, Heather. In 1980 he and Heather moved to Nelson where he joined the Nelson Catchment Board and began his long career with water. One project from that time was his involvement in the flood modelling of the lower Motueka River, looking at the ability of the stopbank to protect the Motueka Plains and township, following the large flood of 1983. Only recently he was advising on that issue again. When the Nelson Marlborough Regional Council was formed Eric changed roles, advising on consent applications where rivers were affected. The Regional Council then became Tasman District Council, where he continued in that role, but adding coastal science to his skill set. His early tasks extended from advising on consent applications, to managing the extraction of gravel from rivers and advising on coastal erosion and inundation and assembling a legacy dataset of valuable survey and photographic information. He helped immensely in shaping natural hazard management and planning in Tasman and Nelson. From that work, Tasman has provided some of the key case law and planning examples that guide this work nationally and is highlighted as best practice by the Ministry for the Environment. In particular, he led Council's thinking on how to protect people's assets by setting minimum ground and floor levels for buildings and subdivisions prone to river and coastal flooding. He argued strongly against engineering practices he considered disfiguring or harmful to the environment, or pointless in the long run. He led Council's approach in pushing up sand to replenish beaches in places like Torrent Bay and in turning old gravel extraction pits in the Waimea river into wetlands and fishing locations. In August last year Rob Bell of NIWA, who went through university with Eric, accompanied Eric on a road show around Golden Bay and Tasman Bay. Its purpose was to deliver the results of a coastal flooding and inundation mapping project to communities. Rob said that Eric was really in his element and doing what he was so very good at – being on site, debating coastal planning and engineering issues with people, and – when necessary – bounding up rock sea walls to engage directly with property owners. The nature of Eric's work, however, meant he was sometimes the interface between people wanting to pursue self-

interest ahead of the wider community good. Eric took more than his share of abuse as a result, but he always played the issue and not the person, countering arguments with reason and polite discussion.

Eric's workmates in Council describe his willingness to place others before himself in his advocacy and role as union delegate for many years up until now. He didn't particularly believe in unions per se, but the PSA was a vehicle that allowed him to speak on behalf of those unable to protect their own interests for whatever reason. Eric felt a need to look after the little guy. In negotiations he was never disrespectful, and showed remarkable patience, and a willingness to go back for as many rounds as were necessary.

Nelson was a wonderful place for Eric, Heather and family. Along with son Andre and daughter Jennie, they made the most of the outdoor environment running and walking trails. Eric also ran marathons in Westland, New York, Hawaii, England, Christchurch and Rotorua. He ran in road races, cross country races, hill climbs, road relays – whatever happened to be on that weekend. Eric contributed greatly to the community through serving on club committees – the Amateur Athletic Harrier and Cycling Club and the Nelson City Harriers – and helped organise events. He was named president of Athletics Nelson in 2001. Other interests outside work included the Nelson wine club and an extensive collection of fine wines in his garage. More recently he sang with the Nelson Civic Choir.

Eric was an active supporter of the NZCS from the time he joined and particularly through his role on the Management Committee for 25 years. He attended virtually every annual conference. He was easy to spot, being tall, sporting that Magnum PI (Tom Selleck) moustache, and usually wearing a colourful shirt to complete the image. He would always engage technical presenters with carefully thought out questions. Eric told me once that an aspect of the conference he really enjoyed was sharing his knowledge at the Young Professionals Breakfast. This is a small gathering over breakfast where beginners in our industry get the chance to discuss work experiences and opportunities with those of us, like Eric, who had decades of work and life experience to share. Members of the NZCS will remember Eric very fondly. He was always very supportive of the society's activities, and we benefitted greatly from his institutional knowledge, and sound judgement on administrative, financial and coastal matters. Eric was one of the most humble and genuine people and his passing will be keenly felt within the NZCS and across the wider coastal community.

Kia hora te marino
Kia whakapapa pounamu te moana
Kia tere te kārohirohi i mua i tō haurahi

May the calm be widespread
May the sea glisten like that of greenstone
May the shimmering light guide you on your journey

Dr Terry Hume
Life Member NZ Coastal Society

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About the authors

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Tom Simons-Smith is a coastal geomorphologist and Coastal Specialist at the Dunedin City Council. He is deeply involved in climate change adaptation work and the link with coastal communities. Tom has a passion for nature-based approaches and is committed to developing stronger council-community relations.

Justin Rogers is a scientist with a background in ocean modelling who has been exploring estuaries, lakes and rivers as a consultant for over a decade. After a 2016 move from Vancouver to Christchurch, he is studying in UC's Waterways department and consulting both remotely and locally.