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*Deep Cove where freshwater meets the sea in a big way, in many ways.
Photo: Craig Stevens, NIWA.*

When river meets the sea

By Dr Craig Stevens, NIWA/University of Auckland Joint Graduate School in Coastal and Marine Science

The Manapouri tailrace outflow into Deep Cove, Doubtful Sound creates an amazing natural laboratory to study how rivers enter the sea and how water bodies mix and entrain. It jets out right at the head of Doubtful Sound into what would otherwise be a typically stratified fjord. It generates flows of several metres per second and creates a sharp interface between fresh and salty water, as well as a tightly focused plume that persists down the fjord for many kilometres. Science around this extends from fjord hydrogeography, through to plume mechanics, stratified entrainment and sampling techniques.

In early March, PhD student Rebecca McPherson from the University of Auckland, scientists from Oregon State University (OSU) and Scripps Institution of Oceanography in the United States, and I visited this natural laboratory to examine what happens when the Manapouri tailrace flows into Deep Cove.

Our first tiki tour to Deep Cove gave our visitors from the United States an immediate sense of the exciting dynamics and challenges of the system, as well as the intrinsic benefits of working in a fjord that partially constrains the variability of the plume.

The Scripps Institute of Oceanography team of Drew Lucas and Tyler Hughen produced a remarkable data set, recording over 2000 high-resolution multi-parameter water column profiles over the top 40 metres. This, combined with an Acoustic Doppler current profiler that was set up by NIWA's Mike Brewer, resulted in a compact but rather powerful sampling vessel. The team applied themselves to a cycle of transects that served to illuminate the shape and nature of the plume in a way not yet achieved.

All the while, the Scripps team had a wave-pumped mooring capturing data of the outside conditions. This neat bit of kit uses waves to drive a profiling package so that high-resolution profile data can be collected continuously at one spot without a vessel – it's like combining a mooring and a ship. The waves would pump the surface float up and down allowing the profiling package to ratchet down until it hit the return trigger (about 50 metres down) before rising back to the surface.

With much of the plume action happening in the top metre it is particularly challenging getting data in this layer. Upwards microstructure profiling is one approach. University of Auckland/NIWA PhD student Rebecca McPherson recorded well over 200 microstructure casts using a couple of different set-ups. These data will prove invaluable in determining the initial losses to turbulent dissipation as the tailrace first hits the fjord. These profiles were pretty hard-won with the wind, boat, tide and tailrace making it a nightmare for the upwards rising twin-line deployment technique, but a couple of hundred profiles gives time enough to develop and improve techniques.

The potential for autonomous sampling was made clear with the first few trials of the OSU ROSS autonomous surface sampler developed by Jonathan Nash's team. This noteworthy piece of engineering showed how river plumes might properly be mapped beneath the surface instead of the incomplete surface picture. This was not without its challenges in this environment due to the strong flows and the multiple objects to avoid. It also demonstrated the tenacity of OSU marine tech June Marion, as an accidental flooding of some control electronics part-way through

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Oregon State University autonomous surface vessel ROSS houses a 10-metre-long instrument chain that profiles as it goes, as well as an acoustic current profiler. Photo: Craig Stevens, NIWA.



Typhoon, one of the two Otago University vessels used for the measurements. These proved perfect for the highly complex navigation required for profiling operations. Photo: Craig Stevens, NIWA.

the experiment meant that manual steering proved to be the only way to collect data by the end of the experiment. So for days on end she would sit in the kayak and drive it manually back and forth across the fjord, building up a fantastic picture of the variability in the plume.

The growing reliance on remote and or autonomous sampling was extended with Joe O'Callaghan's arrival "fresh" from a challenging ocean glider recovery. She brought NIWA's remotely driven sampling boat to look at ways that these tools, normally used for stream flow monitoring, could be used in coastal river plumes.

Amongst all the new technology we did some very old school CTD (Sonde) profiling. The CTD data went



Tyler Hughen (Scripps) recovers wave-pumped profiling mooring. Photo: Craig Stevens, NIWA.

deeper into the basins than any other profiling and showed the weak coupling between the deeper parts of basins as they are all separated by shallow sills. This is classical fjord science where there is the potential to find very old water (potentially thousands of years old) tucked away in the depths of some of these fjords.

Drifter experiments were carried out and are a natural way to picture the flow, you essentially throw GPS into the water on floats and see where they go. While not perfect, because the drifters can't completely follow the flow, when coupled with a drogue they give a neat impression of the rapid changes in the plume structure and the entrainment and meanders that occur.

A brief process experiment, such as the two-week PlumeEx16, can't help but be at the mercy of a major weather event. This happened about mid-experiment, with an 18-hour blast bringing phenomenal rainfall – rain gauges getting over 100 millimetres in a few hours. Wind and waterfalls lit up Doubtful Sound. While it stopped us sampling for a while, this actually proved a boon as it gave the system a bit of a jolt and we could watch the response and recovery through some of the instrumentation that was moored.

The research immediately answered some questions about what happens when a river meets an ocean, but other questions will take more time to consider, including: Why does the plume stay so coherent for so long? Are internal waves being shed from the plume and are they related to changes in flow speed? Can we see the fjord mechanics influence the plume? Do our approaches to measuring turbulence work in such a sheared environment?

Ultimately, the research will help build better predictive tools to manage run-off. For predictive tools, like computer modelling, to work properly, they need to be based on reliable measurements. As a natural laboratory, Deep Cove provided us with a unique opportunity to take measurements and see how a river interacts with the ocean. The research also has given us a greater insight into how fjord systems work.

This research work has been made possible by support from the Marsden Fund, Sustainable Seas National Science Challenge and NIWA.



The team: L-R, Drew Lucas (Scripps), Sean Heseltine (Otago), June Marion (OSU), Craig Stevens (NIWA/UoA), Tyler Hughen (Scripps), Rebecca McPherson (UoA) and Bill Dickson (Otago). Photo: Craig Stevens, NIWA.

Makara Estuary monitoring

By Tim Haggitt and Shaw Mead, eCoast Ltd

In this issue we feature a summary of a paper presented by Tim Haggitt and Shaw Mead at the 2015 Australasian Coasts and Ports conference. The full paper is available in the conference proceedings. Contact nzcoastalsociety@gmail.com for more information.

Makara Estuary is the southernmost estuary on the north-western coast of Wellington. The steep catchment surrounding Makara Estuary predominantly is used for farming and forestry. Over the last decade wind farms (Project West Wind and Mill Creek) have been developed by Meridian Energy along this stretch of the coastline.

As part of resource consent condition monitoring for Meridian Energy's Mill Creek wind farm development, monitoring of the benthic ecology, sedimentation rates, and identifying regions of erosion within the Makara Estuary was undertaken between 2012 and 2015. The monitoring consisted of three phases: pre-construction, construction, and post construction. Each phase encompassed at least one dry (late summer) and one wet (late winter) period.

For the initial pre-construction survey, three locations within the Makara Estuary were sampled. These same locations were re-sampled for all subsequent construction and post-construction surveys. The three locations were:

- Location 1 – the inner entrance and lagoon region;
- Location 2 – 400 metres upstream of the entrance; and
- Location 3 – 800 metres upstream of the entrance.

At each location biological and physical benthic sampling was undertaken together with measuring sedimentation rates.

Pre-construction phase overview

The first two (wet and dry season) pre-construction surveys revealed an extremely degraded estuary. This



Makara Estuary locations. Credit: Google Earth.

was evident at all three sampling locations, which were characterised by homogeneous, fine, anoxic, silty mud; patches of decaying macroalgae (Location 1); various states of bank erosion (active, slow, and historical) throughout the estuary; and, ad hoc reclamation (Location 3). Average taxa richness (epifauna and infauna combined) was uniformly low at all locations being <3 species.core⁻¹ for both surveys. Polychaete fauna enumerated from infaunal cores were also synonymous of degraded environments. There was widespread deposition of fine sediment on intertidal cobble habitat and mudflat regions at Location 1 during the second pre-construction survey, suggesting that sedimentation was impacting the estuary prior to wind farm development.

Construction phase overview

All construction phase surveys continued to support the notion of the Makara Estuary being a degraded environment within faunal diversity, benthic community composition, and abundances of polychaetes remaining low and highly variable across locations and surveys. The autumn 2014 construction phase survey was particularly notable, as the entire intertidal and subtidal sample area at Location 1 was covered in an extremely dense cover of beach-cast macroalgae (up to 0.5 metre in vertical height in places). The macroalgae (multiple species) had presumably been deposited into the estuary from the adjacent coastline during a recent storm event or tidal flood.

Similar but reduced effects were also evident at Location 2 with deposition of macroalgae on intertidal mudflats. There was further evidence of very recent tidal emersion of the terrestrial vegetation lining the northern and southern banks coupled with small slips 10 metres in length.

Survey findings

Biological and physical surveys of the Makara Estuary as part of resource consent monitoring have indicated that much of the estuary is degraded, with impacts consistent with long-term (decadal), and persistent sedimentation. There is also evidence that dynamic,



Pre-construction sediment sampling. Credit: eCoast.

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Riparian planting. Credit: eCoast.

yet intermittent, natural events, such as storms and tidal inundation, that push large volumes of macroalgae into the estuary where it subsequently gets trapped and decays, negatively impact the lagoon region (entrance) of Makara Estuary. While sediment deposition continues to occur throughout the estuary, there is no conclusive evidence that the low biological diversity and measured rates of sedimentation are due to the Mill Creek wind farm construction. The dilapidated state appears to be symptomatic of the poor land-use practices contained within the wider Makara Estuary catchment.

Over the course of sampling, the extent of degradation continues to be apparent in both biotic and abiotic measures, for example:

- uniformly low biodiversity across sampling locations over consecutive sampling periods;
- the nature of species and community composition encountered during sampling;
- the persistent and thin cover of fine silty mobile sediment on intertidal mudflat coupled with extremely anoxic sediments for all locations and surveys;
- an estimated sedimentation rate of around 14 millimetres per year, which while relatively high, is in line with estuaries that have forestry production in their catchment;
- pockets of active erosion and small slips along estuary margins; and
- historical data documenting poor water quality associated with both the Makara and Ohariu streams that feed directly into the estuary.

Any changes to infaunal communities that we have documented have been greatest and reasonably synchronous at Locations 1 and 2 and to a lesser degree at Location 3. Available evidence, however, suggests that factors influencing infaunal community structure are estuary wide rather than location specific.

Infaunal community composition and the abundance of several polychaete species changed (increased and decreased) over the course of monitoring. Differences between pre-construction and construction phase surveys were apparent, but there was no compelling evidence that wind turbine construction significantly altered benthic community composition or accelerated rates of sedimentation within the estuary.

The four main polychaete species identified in the study – *Scolecopides* sp, *Ceratonereis* sp, *Boccardia* sp and *Capitella capitata* are all common to estuaries and harbours throughout New Zealand. Of these, *Scolecopides* sp, *Capitella capitata* and *Boccardia* sp are synonymous with anoxic sediments and organic enrichment. Furthermore, the uniformly low faunal diversity detected in this study parallels similar studies from other sediment-impacted estuaries with relatively high anoxic levels. Unfortunately, due to a lack of long-term monitoring within this estuary, the full extent of habitat degradation or possible change in species diversity and abundance that may have occurred over the last 25+ years remains unknown.

Given the degraded nature of the estuary prior to undertaken monitoring, detecting effects associated with wind farm construction against the background of historical and present-day erosion was always going to be challenging. However, what the monitoring programme has generated is contemporary data on the state of the estuary. This can be used as a baseline for both regulatory authorities and local community conservation groups (such as the Makaracarpas) to target the most vulnerable areas impacting the estuary and to gauge the effectiveness of any restoration efforts, particularly riparian planting.

Erosion has previously been highlighted as being problematic to the estuary (Makaracarpa's Restoration Plan 2007) and since the initiation of the current monitoring programme, erosion mediation, in the form of riparian planting along parts of the southern region of the estuary, has been a directive of the Makara community and Meridian Energy. While such initiatives are worthwhile, they will possibly have limited effect until the most problematic areas of erosion, particularly along the northern bank, are given attention. This will require a mix of fencing to keep stock away from the edges of the waterway, planting of key species to reduce surface flow during extreme rain events, and planting of lowland shrubs and trees with significant root systems tolerant of inundation.

Encouragingly, Meridian Energy has undertaken additional riparian planting within many of the problematic areas above Location 3 in summer 2015. Continued riparian planting throughout the whole catchment would, in our view, lead to improved health and ecological functioning of the estuary through time.

Contributing to Coastal News

We always welcome contributions for forthcoming issues of *Coastal News*. Please contact the Editor, Shelly Farr Biswell, at shelly@biswell.net if you'd like to submit a news in brief, article, or have content suggestions. The submission deadline for the next issue is 9 June 2016.

Chair's message

Building a strong profession

By Rick Liefing

We had our first committee meeting in February with our new members Tom Shand and Paul Klinac, as well as our Student Representative Hannah Berger. Our new recruits have already provided great input and ideas. We are lucky to have a great bunch of people looking after the NZCS for you.

Hopefully you have all had time to read our second special issue – *Adapting to the consequences of climate change: Engaging with communities* – that was just published. It's chock-full of insights and practical ideas for coastal professionals to help communities address the consequences of climate change. I would like to acknowledge our colleagues in New Zealand, Australia and other parts of the world who shared their experiences and knowledge on adapting to climate change at the 2015 Australasian Coasts and Ports conference that was held in Auckland last September – they started an important conversation that we have attempted to continue through this publication. Already one of the articles from the publication was featured in the most recent issue of *Engineering Insight*, and it was also referenced in a wider article about climate change that appears in the April 2016 issue of *Public Sector*.

NZCS Professional Development Award

The purpose of the Professional Development Award is to enhance the ability of our members to contribute to the vision of NZCS – to improve understanding and sustainable management of New Zealand's coastal and marine environment.

Successful applicants will receive a contribution of up to NZ\$10,000 towards the expenses of pursuing a professional development opportunity that is relevant to the achievement of the New Zealand Coastal Society vision.

Applications close 1 May 2016.
coastalsociety.org.nz/Awards/index.cfm

Student Research Scholarship

NZCS offers two scholarships annually to students conducting research that has the potential to contribute towards the aims of the society:

- NZ\$5000 to support PhD research, and
- NZ\$2500 to support Master's research.

Applications close on 1 May each year with announcement of the successful recipient within a month of the closing date. The recipients will also be invited to the annual conference dinner – they will receive a free conference registration and dinner ticket to be present at this occasion.

Applications close 5.00 pm 1 May 2016.
www.coastalsociety.org.nz/Awards/index.cfm

In terms of reaching the wider community, again this year we supported NZAEE Seaweek by sponsoring the Ocean Champion award. The award recognises the efforts of individuals and community groups who look after the marine environment.

We also have been busy supporting our members. Applications for the Professional Development Award and Student Research Scholarship are currently being accepted (see details below). As a society, we are committed to encouraging the capabilities of coastal professions – whether science, planning or engineering. The Professional Development Award and the Student Research Scholarships support that aim. We plan to announce the winners in the next issue of *Coastal News*.

We are planning the 2016 conference, which will be held in Dunedin. We look forward to returning to the Mainland. If you are interested in helping with the conference (living in Dunedin is not required), let us know. Recognising the workloads of many of our members, our goal is to spread the conference planning around a bit this year.



Field trips are always an important (and popular) part of any NZCS conference – and the 2016 conference in Dunedin looks to be no different. Photo: S Biswell (Raglan conference, 2014).

Finally, I would like to thank all of you who participated in the membership survey. We received 39 responses. Overall, respondents are satisfied with the work of the NZCS.

One area we received suggestions on, however, was creating a membership category for those on fixed incomes, particularly retired coastal professionals. An extension of this may be looking at a way to ensure life members are able to attend our annual conferences so that their valuable expertise and knowledge can be shared. We are currently investigating these ideas and hope to present a proposal to NZCS members at the 2016 annual general meeting.

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In brief

Marine Protected Area reform

The Government held a public consultation on a new Marine Protected Areas Act from 12 January to 11 March 2016. The proposed Act would replace the Marine Reserves Act 1971 and includes proposals for recreational fishing parks in the inner Hauraki Gulf and Marlborough Sounds.

The reform proposes four different types of marine protected areas:

- marine reserves would be the same as under the current Marine Reserves Act 1971;
- species-specific sanctuaries would be similar to marine mammal sanctuaries but would also be available to other marine life like albatross or great white sharks;
- seabed reserves would protect areas of the sea floor and would include prohibitions on seabed mining, bottom trawl fishing and dredging;
- recreational fishing parks would recognise that there are areas where the recreational fishing experience could be improved by providing a preference for non-commercial fishing for some species.

As noted in the consultation, “The proposed new law would require an analysis of the economic potential of an area, so the opportunities and costs of any new protected areas are openly considered. It would also encourage a collaborative approach to develop protected areas where iwi/Māori and interested parties, like fishers, conservation interests and industry, get to work together on better management of our marine environment.”

The reforms also address specific proposals as noted below:

- Kermadec Ocean Sanctuary: The Prime Minister announced the 620,000 square kilometre Kermadec Ocean Sanctuary at the United Nations on 29 September 2015. Applications for seabed mining activities requiring decisions meant the Government needed to resolve its position on the future of this area. This sanctuary will be created by separate legislation.

The general marine protection tools in this consultation document do not include the EEZ, with the proposed sanctuary covering 16 per cent of the EEZ. Other EEZ proposals may be considered but, given the size and significance of the EEZ, would need to be advanced by specific legislation.

- Two recreational fishing parks in the inner Hauraki Gulf and Marlborough Sounds: These proposals are to be delivered as part of this legislative reform.

Marine Sciences Conference scheduled

The joint conference of the New Zealand Marine Sciences Society and Australian Marine Sciences Association will be held 4 to 7 July 2016 at Victoria University of Wellington, Kelburn Campus, Wellington.

The conference theme “Sharing Ocean Resources – now and in the future” is highly relevant to New Zealand and Australia. Both countries are grappling with competing demands for marine space and resources and require high-quality scientific investigations to provide the data and analysis to meet the needs of evidence-based decision-making, as well as uncover the fundamentals of how marine systems work now and under future environmental change scenarios.

The conference covers three broad topics: Sustainable Use of Living Resources, Sustainable Use of Natural Non-living Resources and Emerging Challenges.

nzms.org/events

Seaweek

About 200 events were held around the country during NZAEE Seaweek 2016 from February 27 to March 6.

The 2016 “Ocean Champion” is the Taranaki community group the Friends of Waitara River. Ocean Champions are nominated and selected by the public. NZCS sponsors the initiative by donating \$500 prize money for the winner.

NZCS Deputy Chair Hugh Leersnyder presented the prize money during the launch of Seaweek at a Marine Conservation Futures and the Legacy of Bill Ballantine event at the University of Auckland.

NZAEE Seaweek 2016 is coordinated by the New Zealand Association for Environmental Education (NZAEE) and supported by Foundation North, Department of Conservation, Ministry for Primary Industries, University of Otago: NZ Marine Studies Centre, Greater Wellington Regional Council, Environment Canterbury Regional Council, National Aquarium of New Zealand, Napier City Council, DSP Print Group Ltd, New Zealand Coastal Society and many local sponsors.

seaweek.org.nz

NZCS Mission Statement

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 currently has over 400 members, including representatives from a wide range of coastal science, engineering and planning disciplines, employed in the engineering industry; local, regional and central government; research centres; and universities.

Applications for membership should be sent to NZCS Administrator
Renee Coutts (email: nzcoastalsociety@gmail.com).

In the news

Creating a “gamechanger” for climate change policy

Victoria University of Wellington’s New Zealand Climate Change Research Institute (CCRI) focuses on the connection between climate change science, policy development and decision-making. One project CCRI is working on is in collaboration with Deltares, a Netherlands-based applied research institute. Deltares and their partners developed a simulation game – the Sustainable Delta Game – for policy-makers to experience making decisions under uncertain and changing conditions. The game can be used to give decision-makers experience making decisions over long time frames and develop an adaptive plan. Using the dynamic adaptive policy planning (DAPP) approach and a Pathways Generator, they can test the effects of different policy and response options.

Deltares and CCRI, funded by Greater Wellington Regional Council, Wellington City Council, Tasman District Council and Ministry for the Environment, have created two new versions for New Zealand decision settings – a New Zealand River Game and a New Zealand Coastal Game.

Dr Judy Lawrence, CCRI’s project leader for the New Zealand versions of the game, says the objective of the game is to develop an adaptive plan that can accommodate changes that occur due to flood, drought and sea-level rise over a 100-year time frame.

“We know that sea level is rising and flood and storm frequency and intensity is changing, but we do not know with certainty, the rate of change and its magnitude,” she says.

In the game users experience making decisions under conditions of uncertainty and change by developing an adaptive management plan for a river catchment or coastal area. Users then get feedback on what happens over the next 100 years, implementing actions for specified time periods based on environmental, economic and social changes. After each simulation feedback is provided to users on the effectiveness and cost of selected policy decisions.



Image from the New Zealand Coastal Game. Credit: CCRI.



Greater Wellington Regional Council staff at a workshop to learn how to use the simulation game. Credit: Judy Lawrence, CCRI.

Judy says the games and the DAPP have already been used in real-life New Zealand decision settings to assess policy options for flood management in the CBD section of the Hutt River with the objective of maintaining the 1:440 year design flow level as it changes in frequency and magnitude over 100 years.

“We’ve trialled the games and the Pathways Generator with partner local authorities and the Ministry for the Environment,” she says. “We’re now planning a wider roll-out of the games this year across local government and other users for application by decision-makers, including as part of public engagement on specific planning issues.”

Links to the games, the Pathways Generator and user manuals for their use, along with information on the DAPP approach will shortly be available to download from the CCRI website: victoria.ac.nz/sgees/research-centres/ccri.

For further information on use and facilitation of the games contact Dr Judy Lawrence at judy.lawrence@vuw.ac.nz.

New Zealand’s southern little penguins

Following the recent discovery that little penguins in Otago belong to an Australian species, a team of University of Otago researchers from New Zealand and the United States set out to determine when they first arrived.



Researchers have found that the little penguins in Otago belong to an Australian species that arrived between 1500 and 1900 AD. Credit: Stefanie Grosser.

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Researcher Stefanie Grosser with an Otago southern little penguin. Credit: Benedikt Holtmann.

The Marsden and Allan Wilson Centre-funded study was carried out by Dr Stefanie Grosser as part of her PhD research, and led by Professor Jon Waters from Otago's Department of Zoology.

The researchers analysed ancient DNA from the remains of over 100 little penguins: bones dating back to pre-human times, as well as specimens from archaeological deposits and museums.

Dr Grosser says previous studies had concluded that the Australian species has been in New Zealand for hundreds of thousands of years. The new genetic study, however, indicates that the Australian species arrived in New Zealand much more recently.

"Amazingly, all of the bones older than 400 years belong to the native New Zealand species," she says.

"Our results clearly show that the Australian penguin colonised Otago very recently, between 1500 and 1900 AD, apparently following the decline of the native New Zealand little penguin, which was hunted by early human settlers and introduced predators."

The team's findings were published in February 2016 in the international biological research journal *Proceedings of the Royal Society B: Biological Sciences*.

Connected...

Online coastal inundation mapping tool launched

In early March, Waikato Regional Council launched an online tool to help people manage the potential impacts of projected sea-level rise and assess storm effects on Waikato's coastal properties. The tool will be regularly updated as new information becomes available.

Senior Regional Hazards Advisor (and NZCS Chair) Rick Liefing says the online tool has already received a positive response and is seen as a way to help local councils, communities and individual property owners raise the awareness of the risks with current and future projected coastal inundation.

"There's been high demand from local councils and other stakeholders for this type of information and our new tool is in part a response to that. It's also

part of the council's regional hazards programme's general role to provide information to the community about hazards and help people to manage risk," he says.

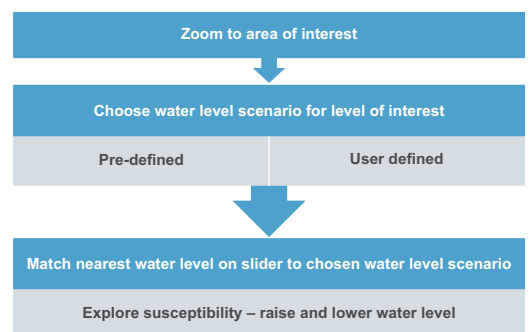
Rick says the information used in the coastal inundation tool has been publicly available for some time.

"What we're doing is making that information more easily accessible in a generalised way for the public and others to use," he says. "The tool is there for people to better understand the 'what if's' and start the conversation about how projected sea-level rise may affect our coastal areas. It's only one part of that conversation; however, users of the tool will still need to assess actual risks posed by various hazards in specific locations before coming to conclusions."

Rick says the council has already received feedback on how to make the tool easier for people to use.

"We'd like to hear from others who have tried the tool to find out what's working and what isn't. Based on that feedback we will update the tool to ensure both the general public and coastal experts can successfully use the tool."

Rick can be contacted at rick.liefing@waikatoregion.govt.nz. The tool is accessible at waikatoregion.govt.nz/coastal-inundation-tool/.



Graphic explaining how to use Waikato Regional Council's online coastal inundation mapping tool. Credit: WRC.

Helping Kiwis discover "Our Estuaries"

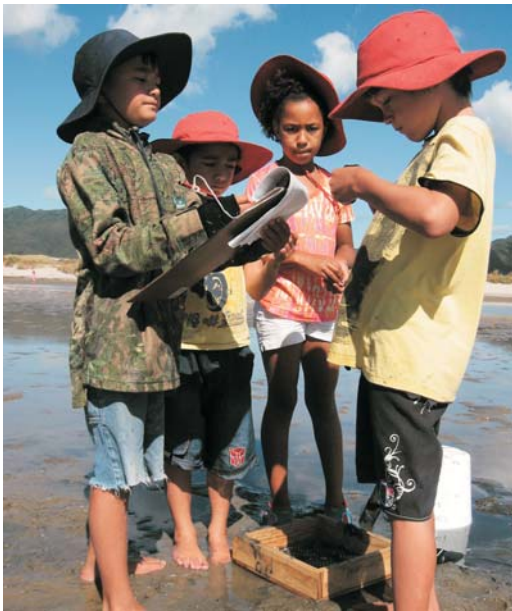
In February, the Department of Conservation (DOC) released a web-based resource to help people explore, monitor and restore New Zealand's estuaries.

The core of the resource is three interactive maps, which show places of interest, along with sites where management agencies and local estuary care groups are active.

Helen Kettles, whose role in DOC is a national overview for estuaries, says the resource is based on a "head, heart, hands" approach to conservation.

There is an experience estuaries interactive map for exploring (the heart), a monitoring estuaries map for an overview of management (the head), and a restoring estuaries map to see what is happening in estuaries around the country (the hands).

Helen says the development of the resource is in response to a growing interest in estuaries restoration.



Okiwi Kura shellfish monitoring. Great Barrier Island. Credit: Rebecca Gibson.

"This is an online resource where people working in their local area can connect and share their expertise with others doing similar work elsewhere. It also shows estuaries where not much conservation activity is going on, or recorded, and provides a nationwide view," she says.

The experience estuaries map includes information on 29 teacher resources and field guides, four kayak trails, 49 walks, and three short documentary videos. The monitoring map currently includes 150 estuaries where the health is measured by councils, four with significant mātauranga Māori initiatives, 11 with DOC involvement and 23 that are assessed by community groups. The restoring map features the work of 50 community groups restoring coastal wetlands and 30 groups focusing on full watersheds. Many of these are large-scale collaborations.

Local councils and care groups can access best practice resources and check to make sure "their" estuaries have been included on the maps. They can also contribute information, such as monitoring and restoration activities, to this interactive resource.

Helen says the resource is proving to be a useful tool. "It's received attention on social media and we're seeing quite a bit of activity on the webpages already, with people notifying us of new information, images and resources on a regular basis," she says.

For DOC, the web-based resource sits well with the department's vision to be an outwardly focused organisation that works as a partner with citizens and others to enhance and maintain New Zealand's natural assets. It is also a key component of DOC's Stretch Goal to "restore 50 freshwater ecosystems from mountains to sea".

Learn more at www.doc.govt.nz/estuaries or email ourestuaries@doc.govt.nz to contribute to this resource. Help celebrate, and build, this community of interest by sharing the website with your networks. Use #OurEstuaries to showcase your work on the social media page in the resource.

Understanding and restoring shellfish beds

Scientists at the Institute of Marine Science are looking at ways to restore shellfish beds around New Zealand's coasts. Professor Simon Thrush, the Institute of Marine Science's director, and his team are developing practical out-planting techniques for ecologically important shellfish. They also aim to develop an educational toolkit to encourage community coastal conservation activities.

The work has been made possible thanks to a donation from the McCrae family.

Living with risk

In December 2015, GNS Science published "I can live with this" The Bay of Plenty Regional Council public engagement on acceptable risk, which reports the results of a public engagement project that ran between January and May 2014.

The project met the Bay of Plenty Regional Council's (BOPRC) need to better understand community views on natural hazard risk and produced a robust response that could be evaluated alongside technical information on risk thresholds.

Co-authors, independent researcher Margaret Kilvington and GNS Science Natural Hazards Planner Wendy Saunders, say the process was based on good public engagement practice and was specifically designed to meet the challenges of communication on risk. They stress that, "In this type of public engagement it's crucial to help people to understand complex risk concepts, and then help them consider the implications of risk for themselves and their community."

The report looks at the way the BOPRC sought the views of their local community in deciding where to draw the line on acceptable risk. It also distils lessons and opportunities for other councils looking to apply a risk-based approach to land-use planning for natural hazards.

The report has five key sections, including:

- an introduction to the challenges associated with talking to communities about natural hazard risk, the issues facing local government agencies in New Zealand, and a summary of current ideas and international best practice on natural hazard risk engagement;
- an outline of the community engagement process used by the BOPRC as part of its preparation of the 2014 variation of the natural hazards section of the Regional Policy Statement;
- an assessment of the validity and robustness of the BOPRC public engagement process;
- an example of the opportunities that exist in the Wellington region for a similar approach to be applied; and
- conclusions and a summary of key points.

The report is one of a series available on the GNS Science website focused on engaging communities in risk-based planning: www.gns.cri.nz/Home/RBP/Risk-based-planning/A-toolbox/Examples/Community-Engagement.

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Case study: Sumner Coastcare Project, Christchurch

Coastal News



As part of the recently published *Adapting to the consequences of climate change: Engaging with communities*, Shane Orchard of the University of Canterbury provided three case studies looking at how, and if, Coastcare groups are addressing issues and opportunities related with sea-level rise. Below is the case study for the Sumner Coastcare Project. The case studies were prepared in collaboration with the Dune Restoration Trust.

Background

The Sumner Coastcare Project began in 2010 when a group of local people established the Sumner Environment Group with the aim of assisting the restoration of natural environments in the area. The key strategy was to tackle one site at a time. Restoring the degraded local dune system and revegetating erosion-prone gullies and riparian areas above the village were the two areas selected for local action. Contact was made with other groups who might be interested in those areas, and with local authorities with management responsibilities and existing work programmes in place. Over time a collaborative but community-led vision for these sites has evolved which has been gaining increasing buy-in from the wider community. Alongside this a shared work programme has developed, particularly between key community groups and the local council, which is underpinning real progress in restoring these sites.

Key objectives and activities

At the local beaches, the Christchurch City Council (CCC) Coastal Park Rangers had already begun dune restoration activities many years prior with considerable progress achieved. The Coastcare project therefore represents extra involvement by the community. Since 2010, the Coastcare project has involved an active council-community partnership approach to the restoration of degraded dune sites in a way that also accommodates a wide range of community interests. This has been important since the beach and dune environments are high-use areas in close proximity to the city.

Changes associated with the project

The initial focus has been dune restoration at Clifton Beach and Taylors Mistake, both sites at which the historical dune system had largely disappeared due to a progression of foreshore developments and exotic plant invasions over several decades. Managing the dunes and their restoration for multiple values has been one of the hallmarks of the project. Some of the aspects to cover off early were to ensure access and also views in some parts of the beach. Positive results were achieved alongside dune restoration by upgrading the existing beach access and selection of appropriate plants for reintroduction. At some sites the backdune area had been relatively neglected for many years. This has been turned into a positive by

including new recreation facilities, such as picnic tables, in the backdune restoration plan. These areas are now getting considerable use by the community whereas not long ago they were largely overlooked.

The restoration plans themselves are an evolving process with the implementation steps being scheduled only when feedback indicates widespread support. This strategy has had the added advantage of promoting collaborative opportunities with other groups who may be developing projects that involve the site. In this case, synergies have been found with both the local surf lifesaving club and Coastal Pathway group. These groups are now assisting the dune restoration effort and conversely, the restored dunes are expected to add value to their initiatives. These are just some of the components that have assisted the project in generating positive outcomes across multiple values important to the community.

Climate change perspectives

To date, restoration of a native dune system to improve biodiversity and cultural values in a way consistent with other values has been the main driver,



Photos taken December 2011 (top) and May 2013 (bottom) showing the successful re-establishment of dunes at Clifton Beach using spinifex. Photos: Shane Orchard.

with climate change considerations being of less importance for current activities. An important strategy, however, has been to ensure consistency with council and iwi management plans that do address climate change. Two key documents that have provided considerable guidance are the *CCC Coastal Parks Strategy 2000* and the *Mahaanui Iwi Management Plan 2013*. On the ground, these aspects have led to an emphasis on mahinga kai values and re-introduction of Ngāi Tahu taonga species, for example. Progress towards the initial restoration goals at the two main sites is also well advanced. Once the dunes have been restored, ongoing management and maintenance will become the key activities.

In relation to climate change, community perspectives on shoreline management are becoming increasingly important in Christchurch and there is considerable

need for strategic planning. An associated aspect is the need to ensure flood management from rain events.

At Clifton Beach there has been periodic flooding of backdune areas associated with the modification of a local stream mouth and lack of a flood path. This would naturally exit through the dune system, but the potential role of a self-maintaining stream mouth versus backdune ponding is unknown. At this site, protection against coastal inundation hazards would be improved by avoiding low spots in the dunes. Some sort of flood engineering or coastal ponding area will continue to be needed, however, to accommodate flood events. Combining these aspects with the benefits of a restored dune system will be an interesting process and will be important to the future of the project over the longer term.

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Wave interactions in Napier

In December 2015, Napier opened a 67-metre-long stormwater outfall and viewing platform on the Marine Parade Reserve. Construction on the structure began in August.

The structure has improved the stormwater network for the Napier CBD. Planning for the outfall and viewing platform began in 1995 to meet design standards and update the stormwater network. As Napier City Council notes on its website, "Flooding problems in the CBD resulting from heavy rainfall

events highlighted the need to upgrade the stormwater network in this area."

Connecting to Napier's foreshore walkway, the viewing platform was built to support and conceal the outfall. It also provides an opportunity to stand at the water's edge and observe the impressive sights of Hawke's Bay.



Construction for Napier's stormwater outfall and viewing platform on the Marine Parade Reserve began in August 2015. Above photos: Napier City Council.



The new viewing platform is already a hit with visitors, and provides a unique opportunity to stand amongst the waves. Above photos: S Biswell, December 2015.

News from the regions

Northland

Michael Day and Laura Shaft, Regional Representatives

Plan Change 4 (Aquaculture)

This plan change to the regional coastal plan sets out the way aquaculture will be managed in Northland. The plan change includes policies and rules for managing existing aquaculture and directing how and where new aquaculture is located.

The Northland Regional Council adopted Plan Change 4 at their September 2015 council meeting. The plan change was then sent to the Minister of Conservation for approval. The Minister of Conservation has now given her approval and the next step is for council to formally declare the plan change operative.

Coastal flood hazard assessment

The project covers 61 coastal areas, including all areas of LiDAR (Light, Detection And Ranging) survey adjoining the open coast, harbour and estuarine areas. This project, undertaken by Tonkin + Taylor, has assessed future storm surge risk in 50 and 100 years' time (2065 and 2115 respectively), and incorporates an allowance for sea-level rise based on the latest available information.

Final review of the coastal flood hazard inundation levels has been completed by regional council staff. Tonkin + Taylor is now progressing the final draft mapping. The deliverables are expected this month. It is proposed to release the mapping outputs as draft in May/June 2016, and invite comment from affected property owners.

CoastCare

There are currently 31 active CoastCare groups in the Northland region. The newest group is at Langs Beach where dune protection and restoration work is planned over the coming months. This will be one of a number of new and continuing sites where dune planting and other work will take place this winter.

Over the summer, CoastCare Northland was involved in a number of beach events to raise awareness of



At the CoastCare SeaweeK Taipa Beach event, Taipa Area School students help sort spinifex seed which they will propagate back at school. Photo: Northland Regional Council.

dune protection and beach driving safety to beach users. CoastCare information signs were installed at two new sites to explain the restoration work that has taken place and how beach users can assist this.

For NZAEE SeaweeK 2016, CoastCare Northland got together with Northland Enviroschools to provide free kits to schools and groups wanting to help clean up their local beach. In total, 45 kits were given away, each containing: a clean-up guide, gloves, sunscreen, rubbish bags, tide tables and educational resources. With these kits over 2000 people have been helping clean up Northland's beaches. As part of this initiative, an online audit is being undertaken of the litter collected.

Also as part of SeaweeK, a CoastCare beach day was held at Taipa in the Far North. About 150 students, teachers and parents from Taipa Area School, Manganui School, NorthTec, and local preschools and play-groups met at Taipa Beach reserve to celebrate the work that has been achieved to restore and protect the Taipa Beach area and to learn more about the coastal and marine environment.

Email coastcare@nrc.govt.nz to be added to the CoastCare Northland mailing list to receive e-newsletters and other updates.

Marine pests

Divers have recently surveyed nearly 700 vessels on Northland's east coast to assess the degree of hull fouling and check for marine pests. Work started in early December 2015 and has so far covered harbours from Whangarei to Whangaroa. The majority of checks have been focused in the Bay of Islands due to the heavy flow of visiting vessels to that area.

Ninety-six vessels had a regional pest management strategy-listed marine pest on their hull – representing 17 per cent of all vessels surveyed. The sea squirt *Styela clava* was the most prevalent and Mediterranean fanworm (*Sabella spallanzanii*) was found on 34 vessels or 5 per cent.

Oil spill preparedness and response

In early December 2015 a heavy oil spill incident occurred in Whangarei Harbour from a vessel (*Ningpo*). Northland Regional Council staff, as well as Northport and North Tugz responded. Council staff recorded observations made during the operation and undertook sediment and water sampling. Repeat observations were carried out after a two-week period and then one month following the spill. These follow-up observations revealed no evidence of oil on the foreshore and oiled seawalls had weathered considerably.

Auckland

Natasha Carpenter, Regional Representative

Coastal management approach for the Auckland Region

Auckland Council in collaboration with Auckland Transport, Civil Defence Emergency Management and

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Panuku Development Auckland have developed an operational approach for coastal management and related decision-making for the Auckland region. To achieve this, a series of objectives and overarching principles have been developed, including appreciation of a systems approach which considers transformative, time-dependent management options. Recognising the need for a consistent and coherent approach, a decision-making framework for further development has been proposed, a key element within which is providing for community, mana whenua and cultural values.

To support the effective implementation of the strategy, Coastal Compartment Management Plans will facilitate the development of sub-regional high-level management approaches (for example, from protect and hold the line, through to managed retreat). Selection of these approaches will be driven by an integrated assessment of the coastal system and will be founded on a series of additional tools identified in the strategy. This includes:

- acquisition of comprehensive asset data,
- development of council operational policy,
- robust technical guidance and associated design standards, and
- continued regional research in relation to coastal hazards and climate change.

Refined coastal inundation mapping for the Auckland region

In 2013, Auckland Civil Defence Emergency Management commissioned NIWA to undertake extreme sea-level analysis for the Auckland region, considering the impact of both storm tides and waves across a range of return periods. The results were mapped across the region using the static inundation technique and further considered the impact of 1 metre and 2 metre sea-level rise. The results have since contributed to the natural hazards provisions within the development of the Proposed Auckland Unitary Plan (PAUP).

To ensure the best data is available for application in future planning decisions, Auckland Council has recently commissioned refined coastal inundation mapping. The refinements include:

1. revised inundation mapping for the small east-coast estuaries to support the revised levels determined as part of the PAUP process through removal of the wave set-up component; and
2. revised inundation modelling for the Parakai/Helensville area using the dynamic modelling technique combined with updated tide gauge data for the area.

Once completed and reviewed, the results will be uploaded onto Auckland Council's GIS viewer.

Waikato

Christin Atchinson, Regional Representative

Saltmarsh relocation

Stage 2 of the Waikato Regional Council Graham's Creek (Tairua) realignment project commenced in

March. Stage 2 of the project includes the translocation of 5410 square metres of saltmarsh to make way for a new floodway that was installed as part of Stage 1. The saltmarsh translocation, also referred to as vegetation direct transfer (VDT), will be undertaken to maximise the extent of saltmarsh within the footprint of works that can be retained on site. It is also expected that there will be cost savings from VDT compared to site restoration using nursery-grown seedlings.

Possible methods for undertaking VDT include the following:

- Specialised, matched buckets with a flat base, matched transport trays, tail gates, and cameras to increase the visibility of the turfs ("Minerals and Environment" MBIE Research Group, n.d.). Back-acters are slower, but "leave a less compacted soil, with many more surviving plants than bulldozers". The use of bulldozers limits the size of the transferred sods to the largest bucket size available.
- An alternative method, suggested by the Waikato Regional Council's earthmoving contractor, would involve undercutting of the turfs, and laying these on a strong synthetic material, which earthmoving machinery would move into place.

The chosen method will be determined by the Waikato Regional Council's construction manager.

Sea Change – Tai Timu Tai Pari

The Sea Change – Tai Timu Tai Pari project is on track to deliver the *Hauraki Gulf/Tikapa Moana Marine Spatial Plan* in 2016. The Stakeholder Working Group (SWG) has met monthly since the refreshed process was announced in September 2015. Together with their Independent Chairman Paul Beverley, the SWG's aim is to focus on a key topic each month that corresponds to the topics of water quality, aquaculture, fish stocks, infrastructure, accessible gulf, biodiversity and biosecurity. Mana whenua representatives, key partners in the project, continue to meet as the Mātauranga Māori Representative Group (MMRG) and work with the SWG to provide a mātauranga Māori context for each topic of the developing plan.

<http://seachange.org.nz>

Bay of Plenty

Mark Ivamy and Kieran Miller, Regional Representatives

Volunteers work hard to protect Ohiwa Harbour

Volunteers, supported by Bay of Plenty Regional Council, have put countless hours into helping look after the harbour and some of the Eastern Bay's most special places – mostly public reserves. They have built boardwalks, erected informational signs, counted birds and removed weeds. About 1000 bait stations were regularly baited by volunteers throughout 2015 to remove rats and possums from bush, beaches and wetlands, and about 800 traps were set with rabbit meat or eggs to remove hundreds of stoats and weasels. The volunteer groups, supported by schools, planted more than 10,000 native trees and shrubs to help restore neglected areas to their former glory.

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Coast Care groups have planted another 23,000 sand dune plants.

Opōtiki Harbour Development receives government support

On 29 October 2015 the Economic Development Minister Steven Joyce and Associate Economic Development Minister Te Ururoa Flavell announced the Government would fund up to \$3 million to finalise geotechnical investigations and design options for a new harbour entrance in Opōtiki. The Opōtiki Harbour Development Project is one of the key initiatives of the *Bay of Plenty Regional Economic Action Plan* designed to lift employment, incomes and investment across the region. The validation study will include a geotechnical investigation and design options to create a year-round navigable harbour entrance. This supports the wider harbour development project to construct a new commercial wharf, which will enable a range of marine industries, including processing facilities for the proposed 3800-hectare offshore marine farm.



Conceptual drawing of Opōtiki Harbour Development Project. Credit: Bay of Plenty Regional Council.

Fifth Coastal Economic Symposium – Treasuring the Bay

Treasuring the Bay, Whakamana te taonga o te Moana a Toi, the annual Coastal Economic Symposium, was held in Tauranga on 12 February. The symposium brings people together to share knowledge on the coastal environment and showcases research by local and international scientists, economists and iwi representatives. The 5th symposium was another great success and provided an opportunity for the community to engage with experts about coastal issues and developments of regional significance. Keynote speakers included Jack Thatcher, chief navigator of the Waka Tapu, which sailed from Aotearoa to Rapanui (Easter Island) in 2012, who presented on traditional Polynesian and Micronesian navigation; and Caine Taiapa, project manager and research leader for Te Manaaki Te Awanui, who discussed Tauranga Harbour health and restoration.

Seventh Annual Intercoast Workshop

The International Research Training Group INTERCOAST is a unique research collaboration between the Universities of Bremen (Germany) and Waikato (UoW). The programme began in November 2009 and will run to 2018 with funding by Deutsche Forschungsgemeinschaft (DFG); Ministry of Business,

Innovation and Employment; UoW; Bay of Plenty Regional Council and Port of Tauranga. The goal of INTERCOAST is to investigate geological and biological coastal processes that have relevance to environmental sustainability.

The 7th Annual Intercoast Workshop was held in Tauranga from 15 to 26 February and included presentations from both keynote speakers and PhD students, as well as field trips to the east of the region. The strength of the programme is a testament to the passion shown by both the students and professors alike founded on the strong relationships built by Professor and New Zealand Coastal Society Life Member Terry Healy who died in 2010.

Living With the Changing Tides

The Western Bay of Plenty District Council is developing a 30-year policy for harbour coastal erosion to specify where and how the council will respond to erosion. This policy is largely based on a technical report produced by Opus and a successful public engagement strategy called Living with the Changing Tides.

The approach is an excellent example of public engagement and encouraging open discussion about coastal hazard issues within the community. WBOPDC is also developing a tool to help guide risk management decision-making.

<http://haveyoursay.westernbay.govt.nz/storm-in-a-teacup1>

Proposed Regional Coastal Environment Plan update

Mediation is currently in progress for the 16 appeals lodged with the Environment Court against the council's decisions on the *Proposed Bay of Plenty Regional Coastal Environment Plan*.



The Proposed Bay of Plenty Regional Coastal Environment Plan promotes sustainable management of the natural and physical resources of the Bay of Plenty's coastal environment. Credit: Bay of Plenty Regional Council.

Biodiversity watch

Styela clava (a type of sea squirt) has been found in live mussels for sale in supermarkets across the Bay of Plenty region. *Styela clava* is an unwanted organism that is not established in the region, and it is illegal under the Biosecurity Act 1993 to move or present it for sale. It is likely to have originated in the Coromandel area. The Bay of Plenty Regional Council is working

with supermarkets and fish markets in the region to raise awareness of this issue and the legal requirements. The supermarkets approached have been very responsive.

Surveillance work with regard to the Mediterranean fanworm continues – this has been an ongoing project since discovery of the fanworm in 2013. Since September 2013 over 6000 boat hulls have been checked. The early detection and removal approach seems to be working – the numbers of fanworms found in both marinas in the Tauranga Harbour appear to have decreased significantly.

Wave buoy

The Bay of Plenty Regional Council wave buoy has recently had its maintenance inspection. Interestingly,



the maintenance programme has been increased from biannual to quarterly due to the levels of marine growth. Is this a good sign for the proposed aquaculture industry planned for Opōtiki?

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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.

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Adapting to the consequences of climate change
Engaging with communities
Special Publication 2016



Adapting to the consequences of climate change: Engaging with communities

In this New Zealand Coastal Society special publication we share insights and practical solutions for engaging with communities about the effects of climate change. The publication is divided into three sections:

- Section 1 provides an overview of the current framework;
- Section 2 includes a discussion on engaging with communities; and
- Section 3 looks at how Coastcare groups and communities are addressing climate change.

To learn more or order copies email nzcoastalsociety@gmail.com.

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