

WAIHI BEACH COASTAL PROTECTION CONSEQUENCE OF 1930'S STORMWATER CONTROL MEASURES

Kelvin HILL / Western Bay of Plenty District Council, Glen NICHOLSON / Tonkin and Taylor, Christian DULLNIG / Western Bay of Plenty District Council

ABSTRACT

This paper outlines Western Bay of Plenty District Council's approach in upgrading defunct and ad hoc creek and shoreline protection measures along the Waihi Beach coastline. It also includes community consultation undertaken during design / consenting and construction phases of the project and the "trials and tribulations" in dealing with interested / concerned stakeholders.

The consented coastal protection measures included construction of sandbag groynes to train the stormwater flow through the mouth of Three Mile Creek, removal of 1600m of defunct steel and timber seawall, reconstruction of 1050m of rock revetment and enhanced dune care along 600m of dunes fronting Waihi Beach.

The construction works were split into two major projects:

- Three Mile Creek Protection: construction of two groynes at the creek outlet to restore adjacent foreshore dunes.
- Waihi Beach Shoreline Protection: reconstruction of the rock revetment and dune enhancement works along part of the shoreline to mitigate erosion damage.

Coastal erosion protection measures fronting Waihi Beach were required as a result of land use practices and stormwater control measures in the 1930s. These practices resulted in a change to the coastal environment, lowering beach levels and erosion of the existing dune system.

KEYWORDS

Stormwater issues (man made), creek training, shoreline protection, community consultation

1 INTRODUCTION

The Waihi Beach shoreline was characterised by defunct and ad hoc coastal erosion protection structures, including steel and timber retaining walls, gabion baskets and tipped rocks. These structures had exceeded their useful life and degraded the landscape and amenity values of the beach. The Western Bay of Plenty District Council (Council) engaged Tonkin & Taylor Ltd (T&T) to design coastal protection measures to replace the existing and failing erosion protection structures. Three differing forms of erosion protection measures were proposed for the Waihi Beach coastline:

- Groynes to train the stormwater discharge through the Three Mile Creek mouth.
- Rock revetment erosion protection structures along parts of the Waihi Beach shoreline.
- Enhanced dune care, including beach replenishment to rebuild parts of the frontal dunes.

T&T's engineering solution proposed a protection scheme based on extensive investigations into the coastal processes occurring along Waihi Beach and Council's objective for ongoing use and enjoyment of the reserve

areas and shoreline by both local residents and visitors to the beach. The intended purpose of the designed protection measures was to:

- Protect around 80 properties and 1.6km of reserve from ongoing erosion and loss of land.
- Provide up to 25 beach access points to the foreshore.
- Improve the landscape and natural character values of the Waihi Beach shoreline by renourishing the frontal dunes with appropriate planting.

From the early consultation stage, this project had the Waihi Beach community interested as Council was about to protect private properties against erosion by the sea (a Natural Hazard).

Most of the existing erosion protection structures had been constructed by the former Ohinemuri County Council, over a period from the 1960s to 1980s. This combined with private structures, constructed by property owners, provided a beach with inconsistent and sometimes inappropriate protection. Council inherited the obligation to maintain their function, in order to mitigate shoreline erosion and health and safety issues. The fact that Council was legally responsible to replace dysfunctional protection measures caused some concerns by part of the local community, i.e. no need for any protection measures as the beachfront homes should have not been built (renovated) in the first instance.

This led to some split in community opinion with different interests and views about the proposed works. The beachfront owners wanted their assets protected as soon as possible. However, other parts of the community did not see such a need and wanted the beach to be left alone. The application was appealed to the Environment Court by part of the Waihi Beach community. The Environment Court ruled in Council's favour, providing conditions to mitigate between the parties and incorporate concerns from residents opposed to the proposed project.

2 14 YEARS TO CONSTRUCTION

2.1 HISTORY OF EROSION

Erosion damage to the dunes first came into the spotlight in the late 1950s following severe storm events. While erosion is a natural process along any coastal environment, once people settle in that environment and build on the coastline, it becomes a hazardous zone.

In the late 1950s beachfront properties were already close to the threatened dunes, and wave action erosion was causing property loss. In response to beachfront residents' concerns the former Ohinemuri County Council put property protection schemes in place along the Waihi Beach foreshore and continued to do so over the following 30 years.

Over time these protection measures had fallen into disrepair and it was the responsibility of the controlling local authority – now the Council – to replace those defunct protection structures. Had the Ohinemuri County Council decided to let nature take its course with dune replenishment rather than putting hard protection schemes in place, there would be no onus on the Western Bay of Plenty District Council to build a rock revetment or take any other erosion protection action. However following legal opinion it was confirmed that once protection measures are put in place, the local authority is legally liable to continue to protect the foreshore properties that have historically been protected.

This opinion was combined with evidence from local residents that the beach levels were severely affected following cutting of the creeks, draining the backshore area. The creeks were dug to provide for increased residential development of the backshore area. The somewhat simple stormwater improvement works undertaken in the 1930s have resulted in creek and coastal protection measures over the last 50 years.

Waihi Beach Coastal Protection Timeline

1962: Two Mile Creek was confined between training moles to prevent migration to the mouth.

1969 - 1970: A steel and timber seawall backfilled with small rock was built to the north and south of Two Mile Creek. The wall was combined with 12m long gabion groynes spaced at 40m intervals. Training moles at Three Mile Creek constructed.

1975: Shaw Road seawall was extended north.

1983: Seawall constructed to the south of Three Mile Creek.

1993 – 2004: Western Bay of Plenty District Council undertook a series of assessments to investigate and provide potential options for managing coastal erosion. Public consultation and community workshops discussed several of these options.

2004: Council lodged a resource consent application to both the Western Bay of Plenty District Council and Bay of Plenty Regional Council to undertake protection works.

2005: Application appealed to the Environment Court.

2008: Decision from the Environment Court provided consent to undertake the works, as proposed in the initial application.

2009: Tonkin & Taylor awarded the professional services contract for Waihi Beach coastal protection works.

2009: The first part of the coastal protection measures was successfully completed with the construction of the two training groynes at Three Mile Creek.

2010: Construction of the shoreline protection structures along part of the Waihi Beach shoreline started post Easter with the rock revetment structure fronting The Loop.

2011: Construction of the shoreline protection measures fronting Shaw Road, commencing post Easter, completed by mid September.

2.2 ENVIRONMENT COURT JOURNEY

Following the consent hearing, land use and coastal permits were provided by both the Bay of Plenty Regional Council and Western Bay of Plenty District Council, a recommendation was made to the Minister of Conservation for that portion of the works which was considered to be a restricted coastal activity.

Following release of the decision from the consent hearing, two appeals were lodged with the Environment Court in 1996. The appeals were received from residents of Waihi Beach and the Western Bay of Plenty District Council. The appeal received from the local residents centred on the accuracy and thoroughness of the evaluation of alternative options considered for controlling coastal erosion. The appeal from the Council sought relief for a 35 year term of consent; the decision proposed a consent term expiring on 31 October 2025, the extended term was declined.

The appellants sought that the rock revetment structure be located further inland, on private property being a 'back stop' wall, rather than a 'front stop' wall. This option would be supported by the use of dune enhancement and other potential options such as groynes at the creek mouths or off-shore breakwaters. The option of creek diversion was also discussed. In summary the Court noted the following:

- The appeal essentially sought review of the location of the wall, either as detailed in the application, or located further inland as a 'back stop' wall.

- The location of the wall, detailed in the application, was supported by beach front property owners and Council.
- The construction of a ‘back stop’ wall would require additional protection measures outside the scope of works provided in the application.

The Court noted in their consideration the potential difficulties of constructing a ‘back stop’ wall on private property, though agreed that ongoing review of options for erosion protection along Waihi Beach should be undertaken by Council. The identification of the creeks as a cause of coastal erosion was noted with creek control works being predicated on the appellant’s options for a ‘back stop’ wall. The court provided a consent condition requiring Council to undertake comprehensive investigations to determine the best practicable option for the long term management of the coastal hazard risk at Waihi Beach.

The effects of the stormwater improvements undertaken in the 1930s will continue to be felt as a result of the conditions of consent.

2.3 THE FINAL DESIGN

The final design included three different forms of erosion protection for parts of the Waihi Beach – geosynthetic containers groynes, rock revetment structures and dune enhancement works.

The first part to be constructed was the Coastal and Creek Protection at Three Mile Creek. The **Training Groynes** for the creek were required to train the stormwater discharge through the frontal dunes and foreshore to the Coastal Marine Area (CMA).

The Three Mile Creek outfall was causing ongoing erosion of the adjacent dunes, especially during storm events. The built training groynes effectively relocated the mouth of the creek seaward to ensure an uninterrupted flow of stormwater through the frontal dunes. The physical works for this part of the coastal protection measures were completed in December 2009.

Photograph 1: Three Mile Creek during construction



Each side of Three Mile Creek now has a groyne wall, 12m high and 3.25m wide, constructed of geosynthetic containers filled with 4.5 tonnes locally derived beach sand. Each bag has the dimensions 2.4m long by 1.8m

wide by 0.65m high. This was the first time a specially designed geo-composite container of this size, weight and configuration has been used in New Zealand.

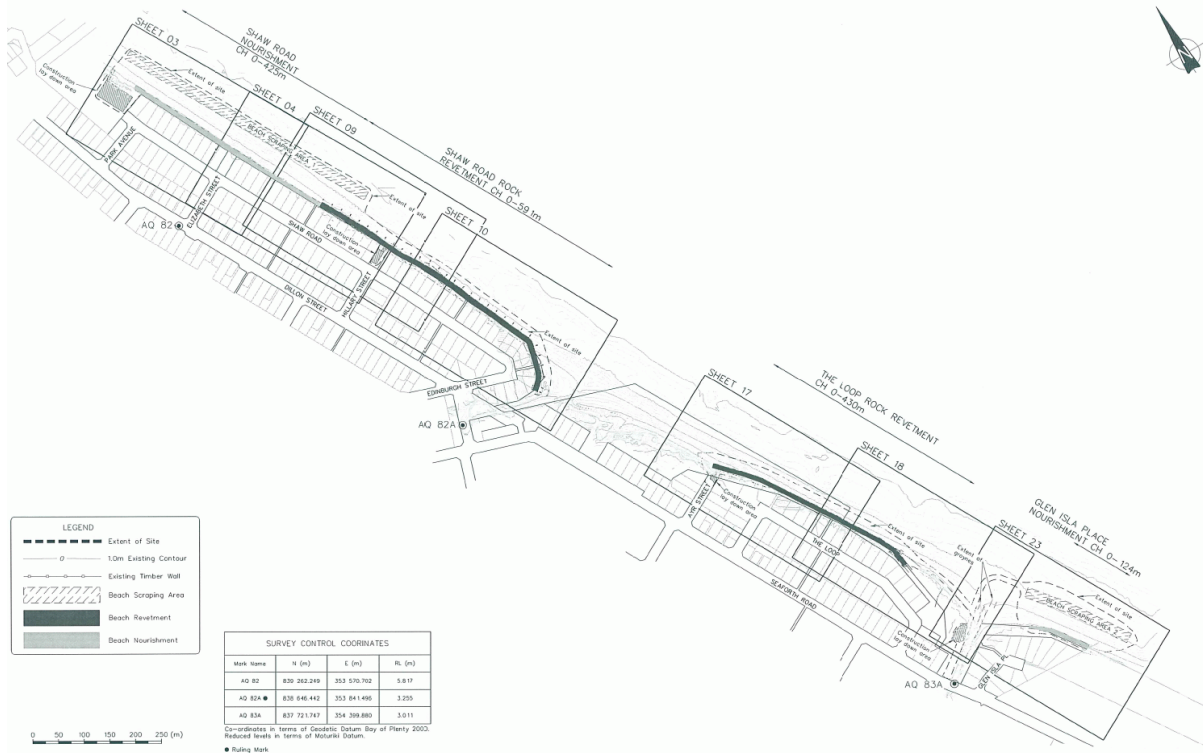
Photograph 2: Three Mile Creek after construction



Excavation of the beach was required to found the bags an adequate depth to minimise the potential risk of underscour. The southern groyne extends a distance of approximately 50m from the former creek mouth and the northern groyne is some 10m shorter (40m long).

The next step and main part of the coastal protection measures for Waihi Beach was the actual Shoreline Protection. This project included construction of a rock revetment along Shaw Road and The Loop as well as dune enhancement fronting Shaw Road and Glen Isla Place.

Figure 1: Overview of Shoreline Protection works at Waihi Beach



The initial construction program indicated as completion date for the constructions works Labour Weekend 2010. Unfortunately a combination of delays including getting suitable rocks for the revetment construction caused deferral of construction along Shaw Road until the 2011 construction period. In order not to disrupt residents and visitors to the beach during the peak summer period, works were restricted to between Easter and Labour Weekend of each year.

The section of shoreline affected by the **Rock Revetment** is approximately 1,050m long and was characterised by the extensive tipped rock situated both seaward and behind a defunct steel and timber seawall. The construction works required the excavation and construction of a rock revetment within the remnants of the existing frontal dune and the rehabilitation of the existing rock wall where no dune existed. The works were located both within Council reserves and private properties.

Figure 2: Typical Detail Rock Revetment Shaw Road

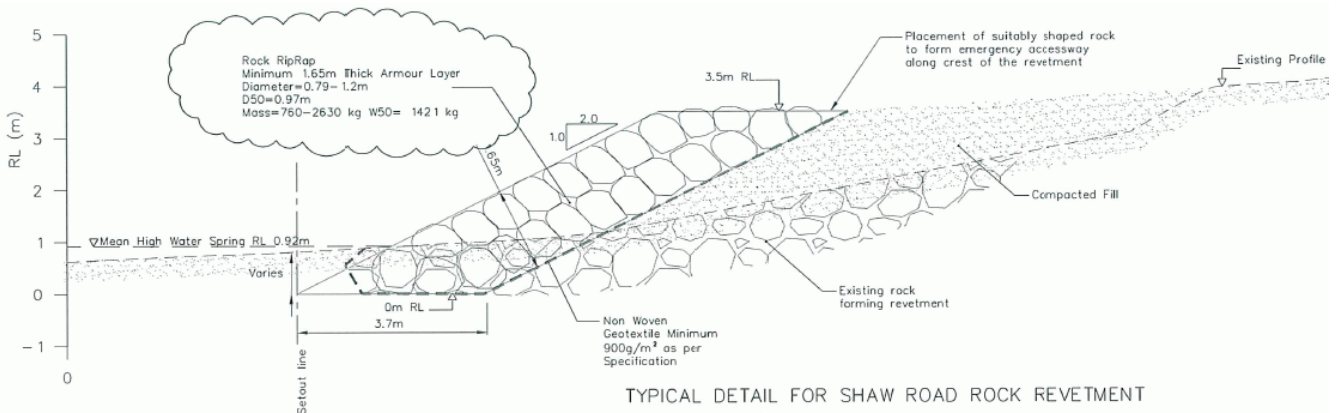
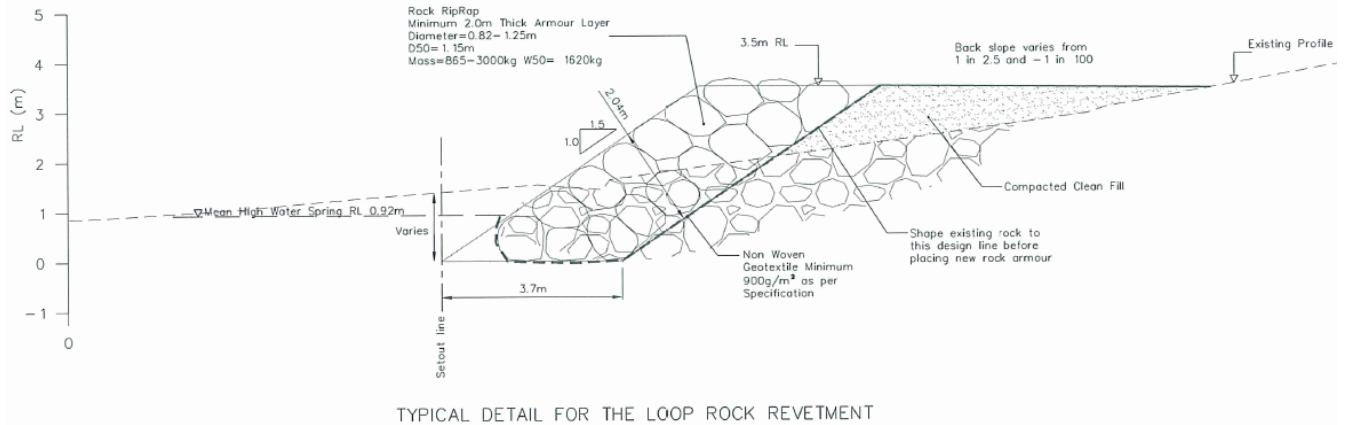


Figure 3: Typical Detail Rock Revetment The Loop



Prior to the works being undertaken the steel and timber seawall, gabion baskets and unsuitable rock were removed from the shoreline. Public access points from reserve areas (timber stairs) and emergency exits (flat rock stairs) were constructed over / through the rock revetment where appropriate.

Photograph 3: The Loop after construction



The rock revetment along The Loop (see photograph 3) was finished at Labour Weekend 2010. By comparing the designed / constructed revetment with the old ad hoc erosion protection (see photograph 4) it becomes obvious that the shoreline protection measures improved the landscape, amenity value of the beach and public safety whilst accessing and enjoying the beach environment.

Photograph 4: The Loop before construction

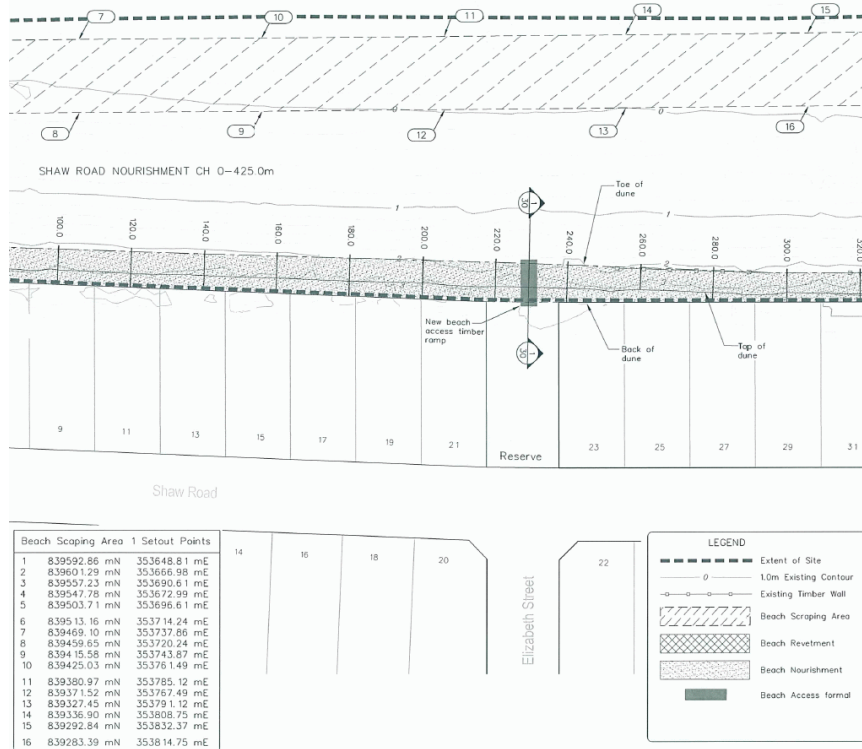


Dune Enhancement works have included beach nourishment by excavating sands from the foreshore area to rebuild approximately 600m of frontal dunes.

The part of the shoreline affected by the beach nourishment still had frontal dunes evident and sufficient reserve land to undertake the dune enhancement works. These works comprised the removal of the remnant steel and timber seawall and other non-suitable material, including small rocks and debris. However, larger pieces of rock were initially left buried within the footprint of the works and covered with sand.

Sand required for the works was partially imported, taken from the creek outlets and / or sourced directly off the beach. The beach scraping of the lower beach system was carried out some 35m to 60m from the toe of the dune, within the intertidal area.

Figure 4: Layout Beach Nourishment Shaw Road



The material imported or obtained from the lower beach / creek mouth was placed on the reserve land approximately between the property boundary and the former alignment of the removed defunct steel and

timber seawall. The front dunes were rebuilt with a crest level of 4.5m RL, generally matching existing ground levels, but sometimes being up to 1m above the existing ground level.

Figure 5: Typical Detail Dune Enhancement Shaw Road

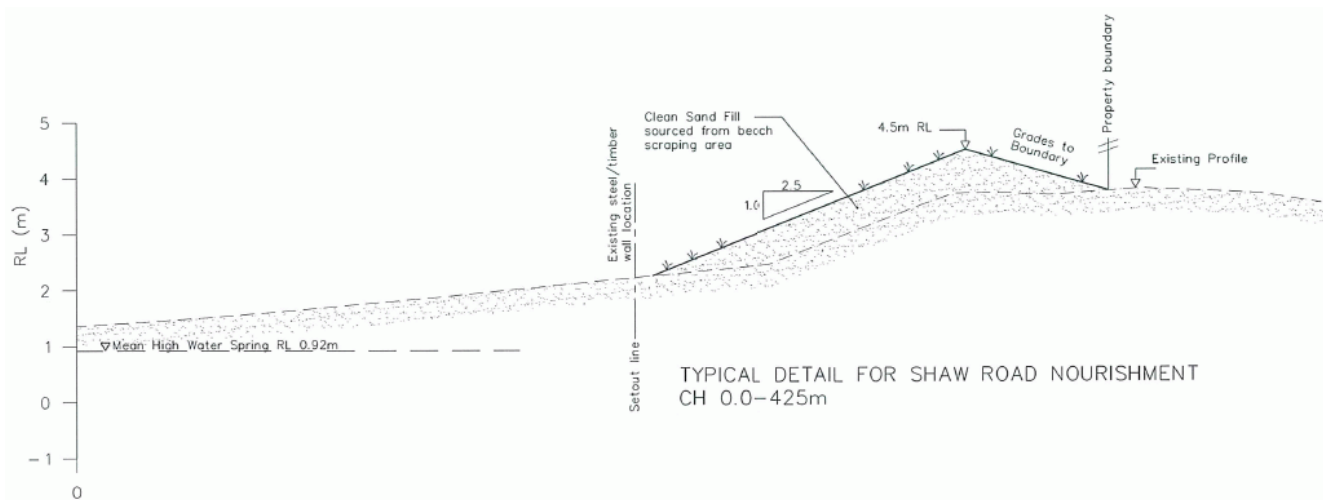
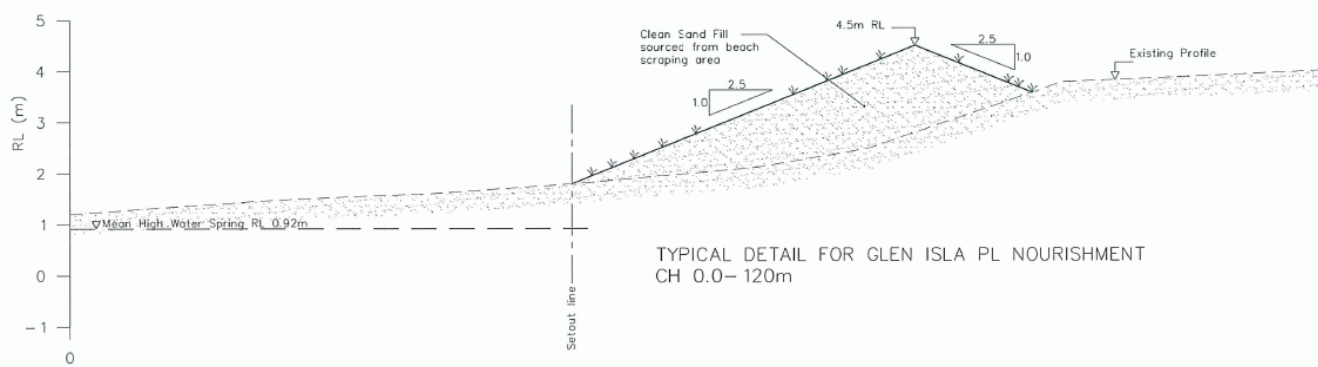


Figure 6: Typical Detail Dune Enhancement Glen Isla Place



Sand fencing and replanting of the dunes took place soon after the enhancement was completed. Spinifex, Pingao, Pohuehue and Wiiiwii were used for the planting, the dominant species being Spinifex.

Photograph 5: Dune replanted during School Planting Day, 18th May 2011



Most of the planting had been completed, when Waihi Beach experienced a series of significant storm events in late June which destroyed more than half of the replenished dunes.

Photograph 6: Dune replanted during School Planting Day after the storm events



This situation raised further questions from the community about the efficiency of and / or the actual need for the chosen measures to protect the Waihi Beach shoreline.

3 TRIALS AND TRIBULATIONS

3.1 STOP DESTROYING THE BEACH!

A low beach and subsequent storm damage to the replenished dunes, provided an opportunity for some members of the Waihi Beach community to question the project's approach. That the storm events and resultant low beach and excessive dune erosion was actually not limited to the Waihi Beach shoreline made no difference.

Photograph 7: Dune erosion near Beach Access 27 (outside work area)



Low beach levels and dune erosion were a common occurrence at that time along the entire Bay of Plenty coastline. The cause for these phenomena was likely to be a combination of a number of factors, including:

- Seasonal variance with the beach being lower in winter than in summer.
- Sand wave mitigation along the Waihi Beach shoreline.
- La Niña climate cycle causing above average easterly winds / waves and increased frequency of storm events.
- Tidal levels near their highest following a natural 18.6 year tidal cycle.

Neither detailed scientific explanations for the sand loss along the Waihi Beach shoreline nor pragmatism mitigated the criticism by some of the community. Their view was that the shoreline protection works had caused the low beach and subsequent dune damage, even without scientific proof at hand.

The low beach levels then caused another issues, exposed rocks previously buried beneath damaged dunes required removal. There was a view held by some members of the community that the previously covered rocks were the main reason for the beach lowering and dune damage.

Photograph 8: Dune erosion at Beach Access 14 (inside work area)



Council's engineering consultants, T&T advised the rocks provided some protection against erosion, though minimal, and should be left on the beach. Even with the rock being of mixed size and generally undersized to provide effective ongoing erosion protection, the rock was noted to provide a marker for coastal erosion and some minor energy dissipation during extreme high tide events. With regard to ongoing management of the shoreline fronting the dune enhancement, T&T suggested:

- Remove any exposed gabion baskets and steel timber retaining structures.
- Retain rock that was originally located behind the steel and timber retaining structure.
- Relocate rock, greater than 200mm, to the base of the dune, should rock be dispersed on the upper beach.

The danger of destabilising the shoreline bank and the subsequent increased risk for further erosion of nearby private properties was considered high compared to the improved aesthetic value of removing all exposed rocks. This explanation however was not satisfactory to some members of the community.

3.2 I HAVE THE RIGHT FOR A PRIVATE BEACH ACCESS!

Not many of the beachfront properties are owned by locals anymore with nearly all of them being holiday homes owned outside the Waihi Beach community. Some residents were concerned they may lose their beach due to the shoreline protection works, opposed to beachfront owners not wanting to say goodbye to their 'private beach accesses'. Their view has always been that the exclusive access to the beach is part of the reasons for the high property prices along the beachfront. That the shoreline is a public area, and Council as asset holder is the decision making authority, did not appear to be at the fore of this debate by some residents.

However, Council removed, along with the construction of the shoreline protection measures, all non-consented private beach accesses encroaching onto Council's beach reserve areas. Some beachfront owners did not appreciate this course of action. In order to establish healthy foreshore reserve areas, Council's general approach is to limit the access from beachfront properties through dune areas to an absolute minimum.

With only public beach access points provided, beachfront owners would certainly start to alter the shoreline area fronting their properties to gain exclusive access to the beach. Council had to agree to allow access to some degree for beachfront owners in order to avoid damage to newly built shoreline protection measures.

Beachfront residents will be able to access the beach in the following ways:

- Property owners adjacent to public beach access points are expected to utilize the formal access structures.
- Along the revetment, beachfront owners can use the emergency exit / informal access points (flat rock stairs) to get off / onto the beach (1 access point per 2 properties).
- Beachfront owners behind the enhanced dunes will share 1 access point between 2 (3) properties with a short fenced walkway to get to the access where required.

Photograph 9: Public Beach Access 21a



Photograph 10: Emergency Exit / Informal Beach Access 85 / 87 Shaw Road



3.3 BOAT RAMP 81 SHAW ROAD - LESSON LEARNED?

When the Waihi Beach Shoreline Protection was first proposed in 2004, Council staff advised the property owner of 81 Shaw Road, that his existing boat ramp can be incorporated into the design. This concrete boat ramp was built around 1970 and approved by Ohinemuri County Council, the local Council at the time.

Western Bay of Plenty District Council however lodged the resource consent application for the protection works with documents that made no mention of the boat ramp structure remaining. The subsequent hearings process remained silent on the boat ramp topic with the property owner not opposing the application as he was of the understanding the boat ramp would remain. The resource consent was subsequently approved with no conditions in relation to the existing boat ramp fronting 81 Shaw Road.

Subsequently in early 2010, Council sought landowner entry consent from the property owner, informing that the boat ramp would be removed and replaced by the rock revetment. The property owner threatened action by way of judicial review process if the boat ramp was removed, quantifying his position by providing previous written confirmation by Council that the boat ramp could remain. The construction team on-site was faced with a dilemma as at present, Council did not have access rights to the property owners land for the purpose of rock revetment construction.

There were limited options for the team, mainly because of the property owner's stance supported by Council's written confirmation for the boat ramp to remain:

- Do nothing and leave the revetment with a gap in it. Council would be in breach of its resource consent, and subject to possible claims by adjoining owners in case of erosion damages. Due to the legal and financial consequences not an option.
- Seek an access easement under the Public Works Act. It would be opposed by the property owner, who might require incorporation of the boat ramp. The legal process would take time and cost, and Council would probably end up in the same place again.

- Install a removable metal ramp over the revetment as done along the rock revetment fronting The Loop. This has been discussed with the property owner but was not accepted as he wants the convenient foot access over the boat ramp to retain.
- Build a wooden stairway over the rock revetment for foot access.
- Payment in lieu to the property owner. However the property owner's focus has always been on retaining the existing ramp and there was not much prospect that he would settle for a cash payment.

The last two points were not really an option due to the considerable adverse precedent value for such an approach, not just vis-à-vis other beachfront owners who have got reduced beach access, but for future Council projects too.

It was subsequently recommended by Council's legal consultant to enter an agreement with the property owner that:

- The owner grants access to his property to construct the rock revetment and an easement for future maintenance access, on the basis that the existing concrete boat ramp be incorporated in the design;
- The property owner provide written consent of his immediate neighbours to the retention of the ramp;
- It be agreed that if the ramp subsequently fails or the revetment becomes at risk because of it, that the property owner would pay for removal of the concrete ramp and Council would install the rock revetment in the format used in the balance of it.

Photograph 11: Boat Ramp and finished revetment at 81 Shaw Road



4 CONCLUSIONS

Decisions taken in the 1930s to address stormwater drainage issues in the backshore area of Waihi Beach, which resulted in the formation of Two and Three Mile Creek, was ultimately the catalyst for the creek and coastal protection measures from 1962. In 1989, after a restructuring of the boundaries and territorial local authorities within New Zealand, Waihi Beach was included in the Western Bay of Plenty District. As part of that process,

the inheritance of the defunct and ad hoc creek and shoreline protection measures provided a dilemma for the Council. The need to manage the long term maintenance of these structures became a topical issue within the community. By 1993, The Western Bay of Plenty District Council was obliged to publically consult on the issues relating to the coastal erosion and how best to manage a long term solution.

The community at Waihi Beach has undergone change since the 1960s with significant construction of beach properties on the old quarter acre sites during the 70s and 80s, given the idyllic holiday location of long sandy beaches and open shoreline. In 2011, approximately 45% of the community is out of town people who generally populate the town over the holiday period and summer weekends. During the last 10 years, the property value market in Waihi Beach has enjoyed considerable growth, with the 1960s type of holiday batch commanding over a million dollars when changing hands. The market has driven people to subdivide these properties, which ultimately increase the “hard stand” areas and stormwater volumes entering the creeks.

The growth trend and the desire to own a holiday home in Waihi Beach has obviously affected the need for improved infrastructure measures, such as water, wastewater and roading. Such expenditure has a seen significant rise in rates for the community, hence the community have a volatile reaction to any unnecessary expenditure prepared by Council. The coastal protection works undertaken in the last two years, is seen as unnecessary by a large group of the community.

The Environment Court concluded that the previous Council had implemented measures to protect property and as such there was an obligation on the part of the Western Bay of Plenty District Council to maintain the structures, or provide alternative protection measures. Faced with such an outcome, the consequences of “doing nothing” was now not an acceptable solution.

The project team faced a significant challenge in trying to construct the coastal protection works in a community that on occasion was polarized. This relationship was further tested during the period of the actual construction, due in part to the simple nature of the works, construction machinery, temporary loss of access and the change that were occurring along the beach. With the completion of the project and the establishment of planting along the section of works, parts of the community have now accepted the works and provided their congratulations on a design and construction methodology that suited the environment.

The legacy of the land use practices and stormwater control measures in the 1930s however will continue to be felt in the Waihi Beach Community for years to come, as further works are required to upgrade the existing reticulated stormwater system, the creeks and outfall structures onto the beach.

ACKNOWLEDGEMENTS

Thank you to all members of Council’s Utilities and Asset Management team.

REFERENCES

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