Coastal Monitoring Review

A report prepared for the South Taranaki District Council

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Reference	2021-9 CRep
Version	1.3 FINAL
Status	For Council
Date	23 June, 2021

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1 INTRODUCTION

1.1 Background

Territorial Authorities carry out coastal monitoring for a range of objectives such as:

- Acquiring baseline (or control) data for use in asset design, hazard assessment or environmental management (proactive environmental monitoring);
- Helping to understand and mitigate an unexpected problem situation that has arisen (reactive environmental monitoring). However, for best results baseline data is also required;
- Resource consent compliance to identify/define coastal structure/activity effects on the environment (adjacent shorelines in particular), or
- Asset management – to identify maintenance requirements.

While environmental change may be a consequence of a structure modifying local coastal processes, there are also several other reasons including a change in sediment supply or weather/wave conditions. Ideally the monitoring regime can separate these factors; however, interpretation will, at times, require coastal expertise.

Coastal monitoring methods typically involve visual inspection or measurement-based surveying (2D profiling, 3D topographic survey or bathymetric survey). Survey technology is also improving in ease of use, quality of data and affordability especially with the advent of drone-based photogrammetry. Output format and ease of analysis/reporting are further monitoring considerations as is sampling frequency.

Some coastal locations may require monitoring for more than one objective and financial advantage may occur where the same method and sampling frequency applies.

1.2 Present coastal monitoring

South Taranaki District Council's (STDC) coastal structures requiring compliance monitoring are listed in Table 1. In the past, such monitoring has involved annual visual monitoring by Taranaki Regional Council (TRC) staff.

The TRC is presently modifying monitoring requirement for its coastal resource consents, with more significant coastal structures having to incorporate measurement-based data acquisition and analysis, in accord with T&T (2001), T&T (2014), and as detailed in the TRC (2019-2020) Annual Compliance Report on Coastal Structures. Measurement-based monitoring (MBM) will be required for the **enbouldened structures** listed in Table 1 with visual inspections for the remainder.

Compliance monitoring is also required for green waste discharge in the Patea dunes for sand stabilization purposes (Consent No 6088-3), and again the TRC carries out a visual inspection annually. However, in this case, the STDC undertakes a measurement-based monitoring (MBM) regime as required under Special Condition 2.

Table 1 Summary of TRC coastal permits for STDC coastal structures

Location	Description	Consent number
Bayly Road	Boulder seawall	5512
Middleton Bay	**Boulder seawall**	**5504**
Opunake headland	**Breakwater and boat ramp**	**6791**
Opunake Beach	Retaining wall and accessway	4578
Kaupokonui	Boulder riverbank protection	5983
Denby Road	Accessway protection	6763
Patea	**Rivermouth structures**[1]	**4573**
Patea	**South Mole reinstatement**[2]	**6839**
Patea	Boat ramp and jetty[3]	4566
Patea	Wharf maintenance	4575
Waverly	Accessways	4579

1 Moles, Mana Bay seawall, wave guidewall, Carlyle Bay rock bank protection.
2 160 m of the existing half tide training wall adjoining the South Mole raised to the level of the mole.
3 Rock protection has been added to the adjacent riverbank.

Environmental monitoring is currently being undertaken by the STDC at Middleton Bay and Ōpunakē Bay – this is because a lack of baseline data somewhat compromised recent hazard and management investigations by Coastal Systems Ltd (CSL 2019a; CSL 2020). In addition, a severe episode of dune instability at Patea over the past 10 years has had the potential to impact on nearby infrastructure and residential property, so this erosion has been tracked using a range of monitoring approaches (CSL, 2019b).

1.3 Terms of Reference

1. Ensure the proposed long-term environmental monitoring programme in the CSL (2020) Middleton Bay management strategy report meets the TRC's measurement-based monitoring (MBM) requirements.
2. Ensure the long-term environmental monitoring programme in the CSL (2019a) Ōpunakē Study meets present and future TRC MBM requirements.
3. Rationalise the monitoring approach used for the Patea dunes/sand stabilization project.

4. Design a long-term monitoring regime for Patea Rivermouth structures that meets the requirements of:
   (i) TRC measurement-based monitoring (MBM) requirements,
   (ii) STDC environmental monitoring, and
   (iii) STDC asset management maintenance planning needs.

5. Describe any other monitoring issues.

1.4 Report layout

The report begins (Section 2) by reproducing parts of the TRC 2019-2020 compliance monitoring report as pertain to forthcoming changes in the programme. Section 3 describes monitoring programmes for Middleton Bay, Ōpunakē Bay and at Patea that meet STDC environmental and asset management information needs and TRC compliance requirements – the latter after consulting with the TRC. Section 4 discusses TRC requirements for (a) the monitoring plan and (b) further aspects of inspections and reporting.

2 TRC PROPOSED MONITORING PROGRAMME CHANGES

(Adapted from Section 3.3 in the TRC's 2019-2020 monitoring report on STDC coastal structures)

Monitoring of environmental effects by a measurement-based approach will be implemented where it is deemed necessary. Because not all of the structures currently included in the coastal structures monitoring programme have the same potential to influence or affect coastal processes, the inclusion of this condition will only pertain to certain structures. Groynes/moles and seawalls, by design, have a measurable influence on coastal processes, whereas smaller structures such as boat ramps and beach access ways are not expected to have significant effects. Accordingly, monitoring is intended to increase for some structures, and decrease for others. Furthermore, the location of the structure (open coast or river mouth) will also determine how it will be monitored going forward.

The aforementioned 'effects-based or measurement-based' conditions will be included in all relevant consents by exercising the resource consent review clause, or during the consent renewal process; whichever occurs first. It is appropriate to exercise these review clauses given that the TRC Council sees the absence of condition-based requirements as being a key reason why adequate (fit for purpose) monitoring has not yet been established, and that without this monitoring, the possibility remains that these structures may be compliant with consent conditions while still causing adverse environmental effects. A summary of proposed changes, to be implemented following consultation with STDC, is provided in Table 2.

Table 2 Summary of TRC proposed monitoring changes

Structure	Proposed monitoring changes
Minor structures, e.g. boat ramps and associated	Decrease frequency of routine Council inspections and reporting to biennial
Protection structures: riverine	Decrease frequency of routine Council inspections and reporting to biennial
Protection structures: open coast	Continue annual Council inspection regime; Undertake an annual (measurement-based) surveys to identify any adverse effects of the structure on the adjacent shoreline position, beach volumes and shore platform at the toe of the structure. Reporting for this monitoring to be 5 yearly.

Unless the Council determines that the effects of structure are likely to be negligible, groynes and rock walls and their surrounding environs in open coast locations will be subjected to annual surveying as these structures can directly influence coastal processes. However, as these effects can be gradual and difficult to discern from natural processes specific surveying methodologies are necessary to determine whether a structure is adversely affecting coastal processes. Additional surveys may therefore need to be undertaken for the collection of 'control or baseline' data as specified by Tonkin and Taylor (2014) and agreed upon by Council.

Annual inspections will still be undertaken for these structures in addition to the surveying component. As per the recommendations outlined by Tonkin and Taylor (2001), reporting frequency will be reduced to five yearly; allowing sufficient survey data to be collected for analysis.

The TRC is/will be requiring measurement-based monitoring (MBM) for the Middleton Bay seawall as of now as this consent was renewed in 2019, the Opunake breakwater and boat ramp as of June 2024, the Patea river mouth structures as of June 2022, and the Patea southern training wall upgrade as of June 2022.

3 STDC PROPOSED FUTURE MONITORING REGIME

This section proposes monitoring regimes for coastal structure sites the TRC require MBM for in the future (i.e. Middle Bay seawall, Ōpunakē headland breakwater, the Patea rivermouth structures), as well as the Patea green waste site and Ōpunakē Bay where a more substantive replacement seawall is likely to be constructed. The following proposals are based on (separate) CSL discussions with TRC and STDC officers, the TRC proposed changes (Section 2), the existing STDC monitoring regimes described in CSL (2015 and 2019b) for Patea dunes, CSL (2019a) for Ōpunakē Bay, and CSL (2020) for Middleton Bay.

3.1 Middleton Bay

To better understand and define future geomorphological changes, associated hazards and risk, and to develop or refine mitigation approaches and management options, the Middleton Bay Long-term Management Strategy (CSL, 2020) included the following a monitoring programme:

- Cross-shore beach/dune profiling along a NW, a central and a SE transect deemed to represent beach behaviour based on shorelines derived from historical aerial photography and satellite imagery and limited topographic data. Sampling to occur in the spring with a second survey in the autumn if resources allow - this to identify short-term beach/dune variation;
- Drone-base photogrammetric survey to provide 3D topographic data with sampling at 5 yearly intervals. This enables revetment structure form and change (disrepair) to be numerically defined for asset management, enables a check that the profiles are adequately defining inter-transect variation, and allows cliff change to be identified, and
- a bathymetric survey of Middleton Bay at about 10 yearly intervals to identify any trends in subtidal bed level as this is indicative of immanent sediment supply change in the beach system and becomes more important given the uncertainties of future climate change and its impact on the littoral sediment system.

The T&T (2001) report to the TRC recommended an annual topographic survey be carried out for consent monitoring, However, this is more expensive than profiling, and most of the extensive data set is discarded when number crunching to derive just a few key numbers for plotting, analysis and reporting. For example, if the MHWS (MSL +1.5 m) level is found to represent beach variation this means each profile can be represented by a single number and the sampling time-series shows how that profile is behaving over time. This approach was acceptable to the TRC officers and will also be used at the other monitoring locations. Note that where profiling is used we are using distance to the contour level of interest to represent the profile (referred to as excursion behaviour). While beach volume (derived from the area under the profile) can also be used, this parameter contains less morphological information.

At Middleton, two further transects were agreed upon with TRC officers – these to provide more detailed coverage of that area immediately beyond the NW terminus of the rock revetment. It is in this area that shoreline impacts are most likely to eventuate when maintenance/strengthening works are carried out as detailed in the 2019 resource consent reapplication. In the meanwhile these additional profiles provide baseline data. The location of the 5 Middleton transects are shown in Figure 1. This monitoring is already underway to meet special condition 3 in resource consent 5504-2.

Figure 1 Middleton Bay where transects 1,2 and 5 are used for environmental monitoring and the additional transects 3 and 4 are required to identify any adverse effects from future modification (repair, strengthening) of the revetment structure – the existing structure is shown in black.

3.2 Ōpunakē Bay

As with the 2020 Middleton Bay report, the CSL 2019 Ōpunakē Bay report contained a similar monitoring programme. In particular:

- Cross-shore beach/dune profiling along a NW, a central and a SE transect at representative locations deemed to represent beach behaviour based on analysis of historical bathymetric, survey, and photo-based shorelines. Sampling to occur in the spring with a second survey in the autumn if resources allow, to identify short-term beach/dune variation;
- Drone-base photogrammetric survey to provide 3D topographic data with sampling at 5 yearly intervals. This enables form and change (disrepair) of the rock revetment at the NW end of the beach and the retaining wall at the SE end to be numerically defined for asset management, enables a check that the

profiles are adequately defining inter-transect variation, and also allows cliff change to be identified, and

- a bathymetric survey at about 10 yearly intervals. This is particularly important at Ōpunakē Bay as the CSL study indicates the breakwater may have some control over the landward sediment behaviour so it is to be included in the survey with LIDAR/drone photogrammetry) being used above water. TRC officers considered this monitoring as also appropriate for the breakwater resource consent (6791).

While monitoring is not necessitated by the current resource consent conditions for the present beach structures , TRC officers are supportive of the collection of such baseline information which will assist not only in the design and consenting of a more robust replacement structure. To that end a further two transects will now be monitored to provide more detailed coverage of the SE end where the replacement structure will be positioned. The location of the 5 transects are shown in Figure 2.

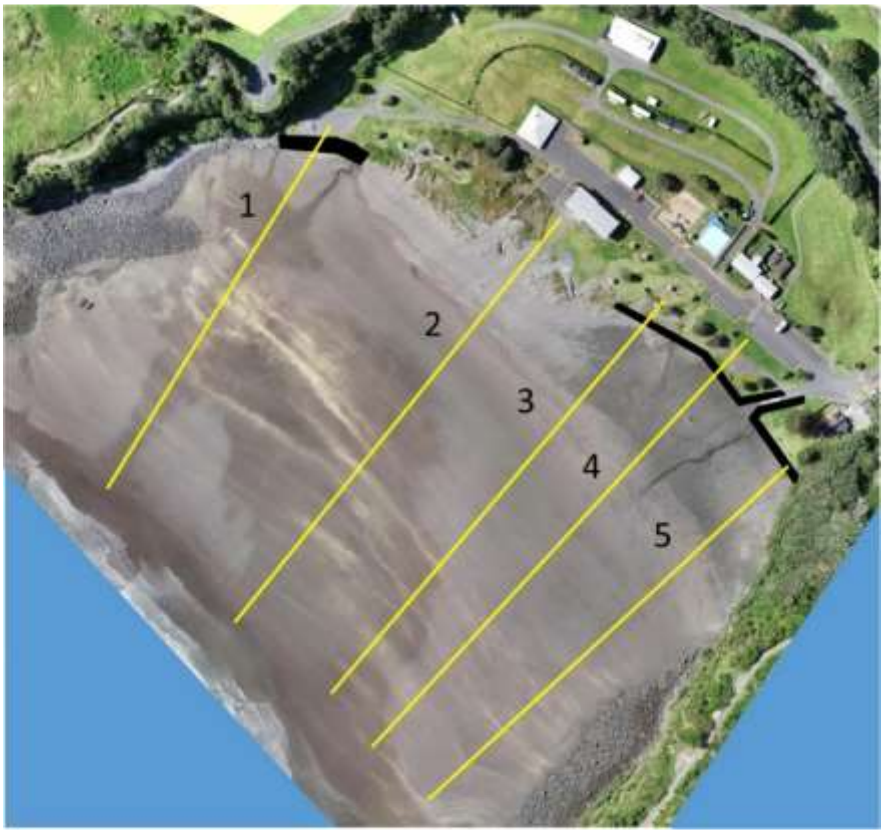


Figure 2   Ōpunakē Bay where the black lines locate existing structures, lines 1, 2 and 4 are representative profiling transects for environmental monitoring, and lines 3 and 5 are to provide baseline profile data for replacement structure design and to subsequent identify any adverse effects on the adjacent shoreline.

3.3 Patea

3.3.1 Northern Coast

The Patea Rivermouth moles were constructed in the late 19th /early 20th century with the north mole extending seaward from the North Head cliff base (beginning in 1905) to reach 325 m when completed in 1919 (Figure 3). The structure trapped SE travelling littoral drift which caused the NW shoreline to build seaward and the resulting "fillet" pinching out against the cliff some 1 km updrift. As illustrated in Figure 4 (lower graph), the high water shoreline closer to the mouth (200 m) had prograded over 100 m by 1949 and while fluctuating thereafter, has remained relatively stable overall. By contrast at 700 m updrift from the mouth the progradation maximized at ~75 m in 1949, underwent large fluctuations thereafter and a substantial erosive episode has occurred over the past ten years (the extreme data point on right hand side of the graph is now ~30 m landward of the 1949 maxima.

Conservation works were required to control wind-blown sand which in the 1950s and 1980s affected residences and infrastructure in Carlyle Bay. To maintain stability thereafter green waste was strategically placed and this activity required a TRC discharge permit (6088), for which Special Condition 2 (in the 2007 renewal) required the consent be undertaken in accordance with the South Taranaki District Council's *Patea Beach Management Plan: 2007*. Section 2.4 and 2.5 of this plan requires profile surveys every 2 years and aerial imaging every 5 years. However, the unprecedented erosion from 2010 until 2019 resulted in more frequent (yearly) monitoring and

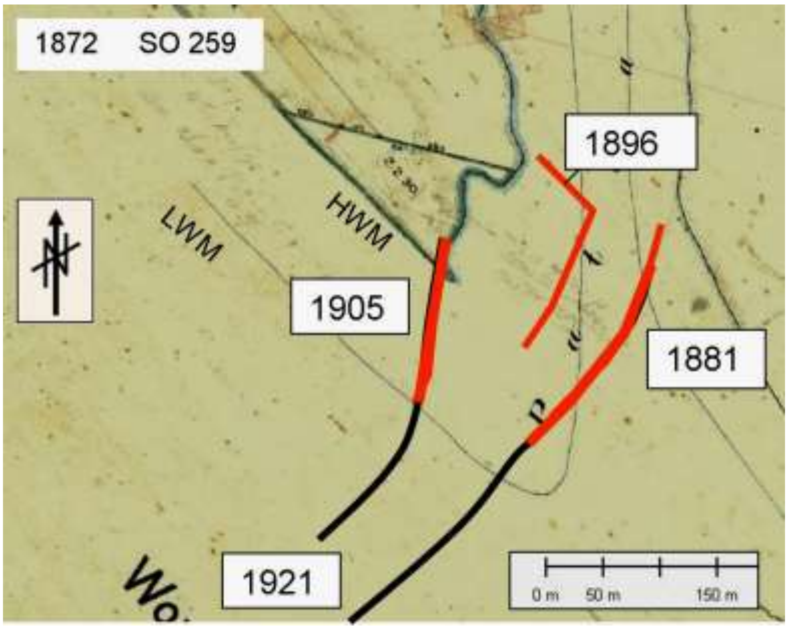


Figure 3 Historical development stages of Patea Rivermouth structures superimposed upon on an original inlet plan.

Source CSL (2015)

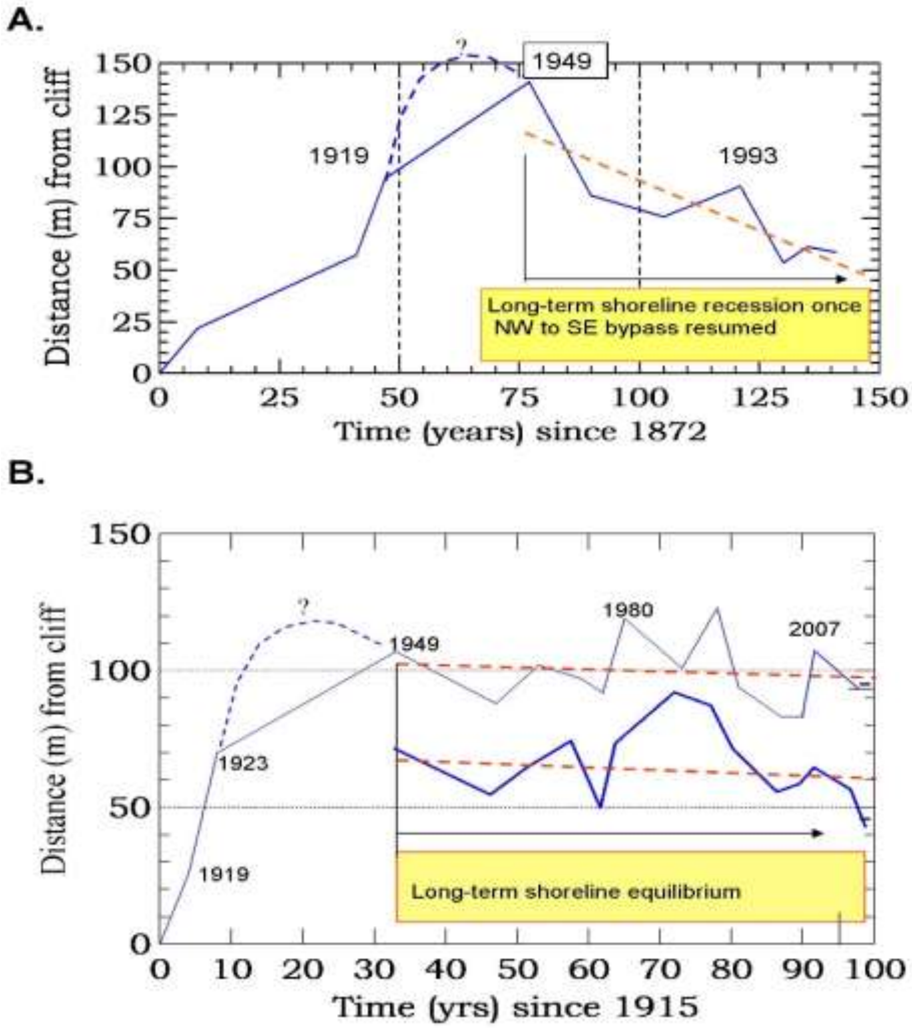
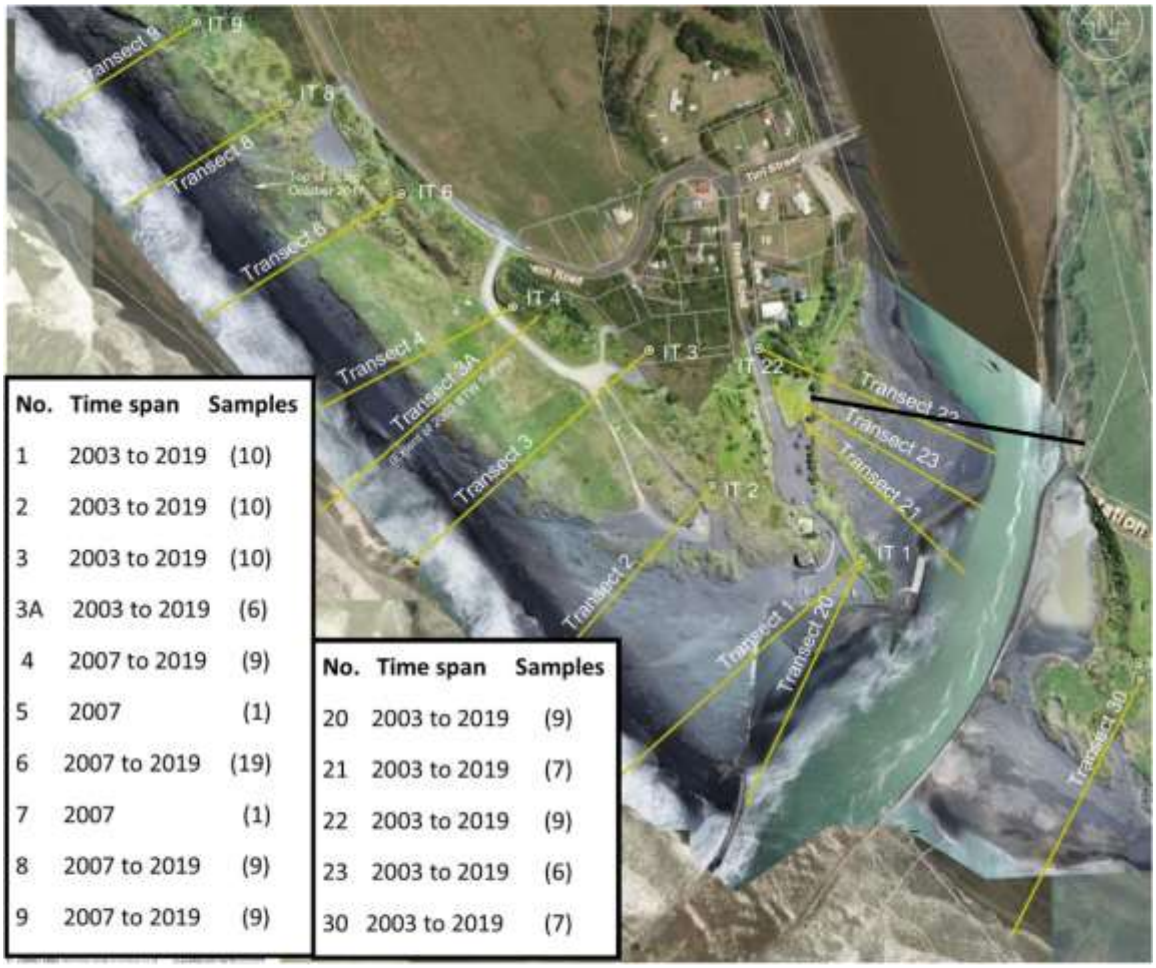


Figure 4 Shoreline responses to the rivermouth moles. Upper graph shows a South Beach transect 100 m SE of the South mole. Lower graph shows North Beach transect 250 m NW of the North Mole (thin line) and the bold line at a transect 700 m to the NW.

additional sites inside the mouth were also established as well as one on the South Beach; these additions were to better track the episode and to identify and, if necessary, manage its impacts. The monitoring programme is described in CSL (2014 and 2015). This erosion episode is now passing so two yearly profile monitoring and five yearly aerial/drone photography will resume in 2021.

The profiling transects are depicted in Figure 5 and the years of survey and number of samples have also been listed. All metadata, data, time-series graphs etc have been provided in an Excel spreadsheet by the surveyor (TPL) and results summarized in CSL (2019b); all of which are available from STDC Records.

It is proposed that at least transects 2, 3, 4, and 8 be retained for environmental and green waste consent monitoring, with 6 and 9 to be included if significant instability occurs again.



No.	Time span	Samples
1	2003 to 2019	(10)
2	2003 to 2019	(10)
3	2003 to 2019	(10)
3A	2003 to 2019	(6)
4	2007 to 2019	(9)
5	2007	(1)
6	2007 to 2019	(19)
7	2007	(1)
8	2007 to 2019	(9)
9	2007 to 2019	(9)

No.	Time span	Samples
20	2003 to 2019	(9)
21	2003 to 2019	(7)
22	2003 to 2019	(9)
23	2003 to 2019	(6)
30	2003 to 2019	(7)

Figure 5 Patea green waste/sand stabilization transect locations with the profile survey record listed. The black line marks the natural gas pipeline river crossing.
TPL drone photo 1-11-2019

For the Patea Structures consent monitoring, T&T (2001) recommended 500 m of beach north of the rivermouth be topographically monitored for consent compliance plus 10 yearly aerial surveys for one km each side of the mouth. However, continued profiling of green waste transects 1, 2, 3 and 4 (Figure 5) coupled with 5 yearly topo survey, is an acceptable alternative with transects 2, 3 and 4 being common to both the green waste and structure consents.

Finally, while river mouth structure consent monitoring is not yet necessitated by existing consent conditions, it will be included when the review clause is exercised in June 2022. TRC officers thus highly recommended that this monitoring is implemented in 2021 to avoid a three year gap in the record as surveying these sites ceased in 2019.

3.3.2 Southern Coast

The southern mole was constructed in two stages between 1881 and 1920 and extended seaward some 450 m long when completed. The landward section diverted the river from a southern orientation a shore-normal alignment (Figure 3). The long-term southern shoreline behaviour contrasted with the northern coastal response with significant erosion occurring after the initial accretional phase (Figure 4, upper graph).

As noted earlier, a profile (Transect 30 in Figure 5) some 100 m south of the mole has been surveyed for several years as part of the northern dunes/green waste projects monitoring of the 2010-2019 erosion phase; it is proposed that this site be retained.

The STDC is also interested in monitoring the southern cliff (which is subject to long-term erosion – potentially at an increasing rate in the future with the Patea dam intercepting sediment (Hayward et al., 1977) given its proximity to the railway line and natural gas pipeline. It is proposed that this be achieved by surveying along the cliff base.

With the addition of a further representative profile (one or two) fronting the cliffs, the TRC requirement (from T&T, 2001) to monitor the East Beach and out to 500 m along the adjacent cliff would also be achieved by the proposed monitoring regime. The 5 yearly aerial/topo survey for the north coast and inlet will provide overlap data for the South coast at least closer to the river and this would satisfy the T&T (2001) requirement as that area more distant cannot influence processes in an updrift direction and there is little with asset value further south.

While river mouth structure consent monitoring is not yet necessitated by existing consent conditions, it will be included when the review clause is exercised in June 2022. TRC officers thus recommend that this monitoring be implemented in 2021 and continued for several years to understand shorter term variation before reducing to bi-annual sampling. Surveys in 2021 are also recommended by CSL for STDC environmental monitoring continuity.

3.3.3 Inlet

Development and morphological response

Harbour development within the inlet began in 1896, after the first section of the south mole was constructed (1881) but before any construction of the north mole (1905 to 1921). The initial works comprised the 140 m wave guide wall (pier), and a 60 m long seawall joining the guide wall to the western riverbank (see Figure 3). Protection works would later fix and protect the back of the two bays (Manu and Carlyle) from wave erosion. These structures are covered by TRC consent 4573 and are marked on Figure 6

Additional structures in the vicinity of the rivermouth consist of the boat ramp and jetty (consent 4566) which are also marked in Figure 6. The concrete pad was established in the 1990s, extended further into the river in the early 2000s (2002 to 2005) and the jetty constructed about 2009 resulting in a structure projecting some 30 m into the river. At the time of these works the STDC undertook boulder placement along the adjacent bank for erosion protection purposes (TRC, 2019); this now extends ~45 m upstream and ~90 m downstream of the boat ramp/jetty. It is unclear as to whether the bank protection comes under consent 4566, but it seems that it should. Finally, in 2007 the half tide wall adjacent to the South Mole was raised to mole height along a 160 m length (consent 6839) as marked in Figure 6. The consent refers to this work as river training wall "reinstatement" but "modification" would better describe raising of the structure.

The historical structures have dramatically modified the inlet morphology and the shoreline responses are summarized in Figure 6. This behaviour highlights various trends and indicates where future monitoring should focus. Of note is the relatively stable (between 1949 and 1988) upstream end of Carlyle Bay as defined by a point bar. Morphological signatures infer underlying processes – in particular that wave action within Carlyle Bay eroded the seaward end and deposit sediment at the point bar end with river flow maintaining the upstream side of the point bar.

By the early 2000s, however, it can be seen (Figure 6) that Carlyle Bay morphology had changed considerably with the point bar migrating downstream and the size of the embayment reducing substantially. Furthermore, dunes are now developing on the sand/driftwood infill where there was once a popular and sheltered recreational beach (Figure 7).

With the downstream migration of the point bar, the natural gas pipeline has become vulnerable to flood flows (Figure 6) which can be extreme judging by the size and shape of bed forms exposed at low tide.

However, the sand infill has meant that the cycle of erosion that had plagued the back of Carlyle Bay threatening property and infrastructure (e.g. Holmes 1972, Parker 1979, Smith 1987) have ceased to be an issue.

Providing a definitive explanation with high certainty for such morphological change is not perused here as this was beyond the scope and needs of the present report. However, it is noted that the types of changes observed may, conceptually, be expected by anthropogenic interventions. In particular, the increase in duration of low river flow caused by the Patea Dam and its operation (DSIR 1987, Torrance, 1993) would result in an increase in the duration of tidal flood (incoming) flows which would consequently increase wave penetration and hence the volume of littoral sediment reaching the inlet and Carlyle Bay. The potential for changing flow patterns was noted by Hayward et al. (1978) in their assessment of environmental impacts at the original Taranaki Catchment Commission water right hearing for the dam.

And other more recent environmental changes may be related to additional rivermouth structures such as boat ramp's jetty and associated bank protection wall as these could potentially redirect flows during river floods thereby inducing channel/bank erosion, for example on the upstream side of the point bar.

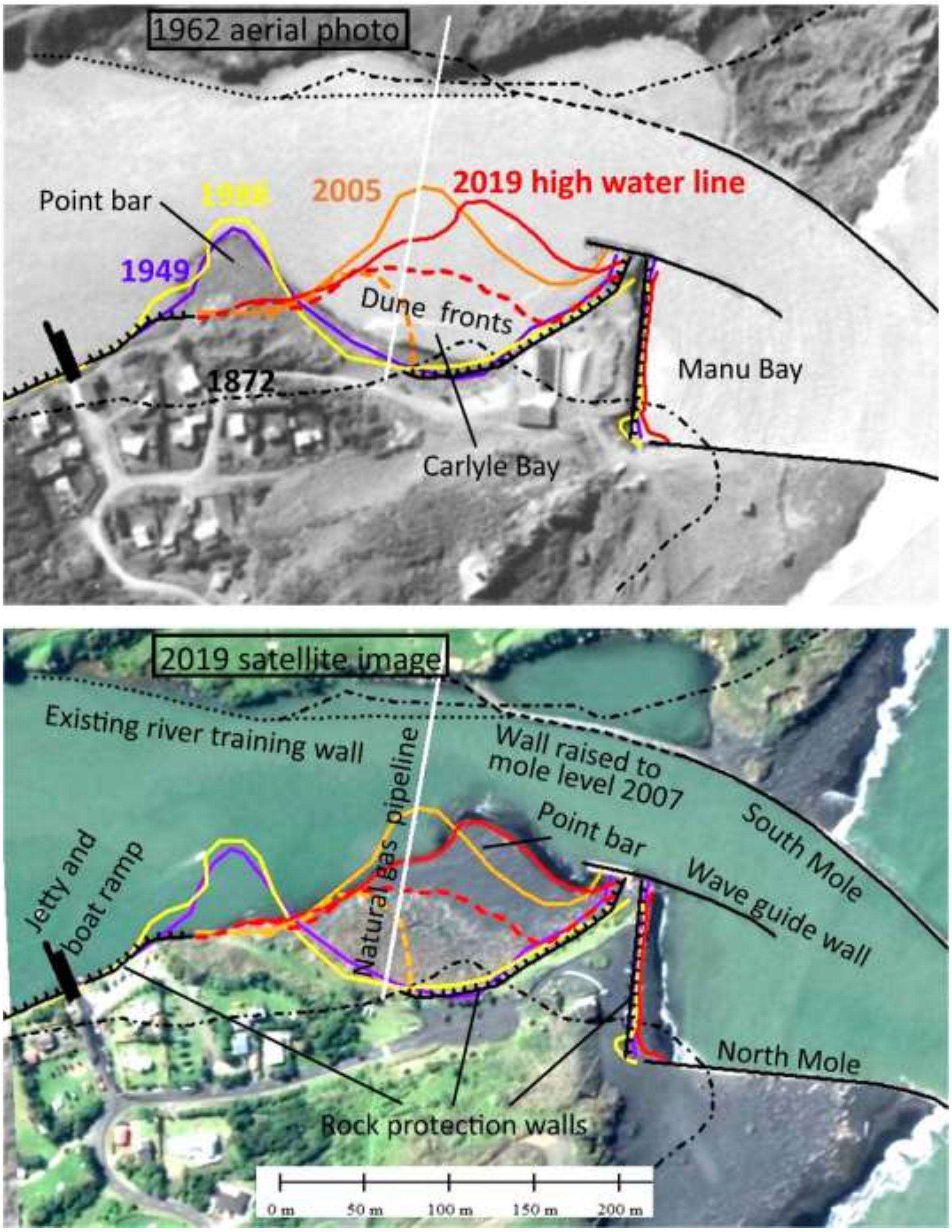


Figure 6 Shoreline responses to inlet structures in Manu and Carlyle Bays marked on and early (1962) and recent (2020) images

Inlet monitoring

As these morphological changes appear to be systematic, future monitoring needs to focus on the present bay area and profiling the existing transects 21, 22 and 23 will assist in achieving this objective.

Given the erosional trend on the upriver side of the point bar, one or two carefully located transects should also be established here.

Figure 7 Carlyle Bay in 1990 (upper photo) with water, waves, a sandy beach and backed by an erosion scarp which was subsequently infilled with boulders. By 2020 (lower photo) the bay had filled with sand, dunes and vegetation. Red ellipses mark the upstream end of the wave guide wall. Photos

The uniform nature of Manu Bay means that the single existing profile transect (20) should be adequately representative. However, a further one or two carefully located transects will be required to monitor about the guide wall.

Profiling at yearly intervals to begin is recommended so background fluctuations and be defined for the new transects involved. However, in the future 2 yearly sampling should suffice unless dramatic changes occur. TRC officers are keen for this monitoring to be implemented forthwith rather than when the existing consent conditions are revised in 2022, so the first sampling could occur in the spring of 2021.

With the down-stream migration of the point bar and the raising of the training wall opposite, the channel and South Mole opposite Carlyle Bay may be being subjected to increasing tractive force during river floods. There may thus be localised bed scouring and additional loading along parts of the South Mole. It is therefore recommended that a bathymetric survey be carried out forthwith, comparable with the 2003 BTW Hydrographic survey, and repeated as often as finances and detected change dictate - ideally 5 to 10 years.

In addition, the adjoining intertidal and terrestrial surfaces be surveyed at 5 yearly intervals and this would include the structures themselves for asset management purposes. A drone-based approach should suffice, although we understand bathymetric surveyors now carry a LIDAR unit which can cover the adjacent intertidal and terrestrial areas at the same time as the bathymetry is sampled. These high resolution 3D surveys can be utilized by and integrated into all types of monitoring (environmental, asset management and consent compliance).

The above monitoring regime will meet the annual topographic consent compliance requirement outlined in T&T (2001), the newly proposed measurement based requirements outlined in TRC (2019) and summarized in Section 2, and STDC environmental and asset monitoring needs.

3.3.4 Summary

The main monitoring attributes for each of the locations where the STDC will collect measurement-based data (environmental or for TRC resource consent compliance) are summarized in Table 3. In some cases transect location for profile surveying have yet to be identified – this will be based on consideration of variability and representativeness.

Table 3 Summary of key monitoring attributes at each location

Location	Profiling N** freq (y)	Topographic* frequency (y)	Bathymetric frequency (y)	Further detail
Middleton	5 1(0.5)# Spring 2020	5 Spring 2019	10 2021-2022	Section 3.1 and Figure 1
Ōpunakē	5 1 (0.5) Spring 2020	5 Spring 2019	10 2021-2022	Section 3.2 and Figure 2
Patea north: **Dune- greenwaste**	4 (6) 2 (1) Spring 2021	5 Spring 2021	-	Section 3.3.1 and Figure 5
Patea north: **Structures**	4 2 (1) Spring 2021	5 2020-21 Sum	-	Section 3.3.1 and Figure 5
Patea south	2(3) ^ 2(1) Spring 2021	-	-	Section 3.3.2 and Figure 5
Patea inlet	6 (8) ^ 2 (1) Spring 2021	5 2020-21 Sum	10 (5) 2020-21 sum	Section 3.3.3 and Figure 5

* from drone photography or LIDAR ** N = number of transects to be profile surveyed

1 (0.5) First number is default (eg yearly sampling), Bracketed number if practicable or necessitated such as by an erosion episode (eg ½ yearly sampling) ^ additional transects yet to be identified.

Time/date is for commencement of monitoring regime. Bi-annual sampling in Spring and Autumn, annual and longer sampling intervals to be in the Spring to incorporate the effect of winter storms (wind and waves). Bathymetric sampling more suited to summer (Sum).

4 MONITORING PLAN AND REPORTING

The following text in italics are from TRC notes of the meeting 9-10-2020 between Thomas McElroy (TRC) and Roger Shand (CSL).

Review comment on the following by TRC is attached as Appendix B (not implemented).

"A brief monitoring plan should be produced which includes the details of the monitoring and reporting requirements for all structures. The monitoring plan will be submitted to TRC for approval. If circumstances change which require the monitoring to change (e.g. increase or reduce effort), this can be revised within the monitoring plan. The monitoring plan will be included as a consent requirement for the Patea Mole structures when their consents come up for review in June 2022. It is recommended that the monitoring plan is developed now".

It is usual practice to report on monitoring output following each survey. However, the TRC indicate a longer reporting period could be adopted for sites requiring MBM. As noted above in Section 2 "*…as per the recommendations outlined by T&T (2001), STDC reporting frequency will be reduced to five yearly; allowing sufficient survey data to be collected for analysis (of underlying trends". The TRC are now proposing 3 to 5 years.*

In addition to the STDC providing a MBM report for major structures, TRC officers would like to see "*…the STDC to undertake annual visual inspections for all consented coastal structures and provide the TRC with a summary report (by 30 June). The intent here is for STDC to commit to their own asset management/compliance inspection regime. TRC will still carry out inspections and reporting, but this will be in more of a compliance auditing role (which is more appropriate) and can be reduced to biennial (as noted in Table 2). The annual STDC report should conclude whether the structures are complying with consent conditions in terms of having adverse effects on adjacent shorelines. In addition, a summary of any MBM monitoring should also be included in the annual summary report - briefly including what was done, the results, and any erosion issues/adverse effects that may have been identified*".

The STDC have already made some progress by developing a 'Coastal Structures Inspection Sheet Template' (see Appendix A). This form is aimed at providing guidance to staff making the regular visual inspections for coastal structure resource consenting and asset management.

However, the detail required in some template fields means officers will need to have a technical background to satisfactorily complete the task. These forms will meet the TRC requirement for regular inspection/reporting, and also provide useful background for the less regular, but more comprehensive MBM reporting: the latter will most likely require expert interpretation.

Finally, to most expediently report on profile data, (excursion) distance change to key morphological features should be used over volume change if appropriate (as described in Section 3.1), and for 3D topo data by comparing key contour locations. For example see the Patea Beach sand management project annual report (CSL 2019b)

5 RECOMMENDATIONS

1 That the proposed monitoring programmes (profiling) for Middleton Bay and Ōpunakē Bay proceed forthwith (2020) as this information is required by the STDC for environmental management and Middleton for the existing TRC consent conditions;

2 That the proposed programmes for the Patea structures be finalized with the TRC, additional profile transects be identified, and that the profiling-based MBM programme being implemented the following (2021) Spring. The green waste monitoring (two yearly) will also be next carried out in the Spring of 2021;

3 That the topo/bathymetric survey at Patea replicating the 2003 *BTW Hydrographic* survey, be undertaken as soon as possible. Note that this is being organized at the present time;

4 That the proposed bathymetric surveys of Middleton and Ōpunakē Bays be carried out this financial year if resources permit, otherwise in the 2021-2022 year, and

5 That the STDC laisse with the TRC in preparing the monitoring plan and inspection/reporting regime.

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Any recommendations, opinions or findings are based on circumstances and facts as they existed at the time CSL performed this work. Subsequent changes in such circumstances and facts may adversely affect the recommendations, opinions or findings, and CSL assumes no consequential responsibility.

COASTAL SYSTEMS LTD

……………………………………

Dr Roger Shand
Senior Coastal Scientist

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APPENDIX A STDC coastal structures inspection sheet

South Taranaki District Council	**Coastal Structures** Inspection sheet

Resource Management Act

The purpose of the Resource Management Act is to promote the sustainable management of natural and physical resources. **Sustainable management** means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—

(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

Resource Consent

Choose an item.

Inspection Date

10/07/2020

Purpose of current inspection

Choose an item.

Review

☐ Review the Resource Consent Permit to determine the scope of inspection being undertaken

☐ Review previous inspection report and photographs

☐ Review TRC Officer report if available

Record observations

Comment on the structural integrity (are any repairs needed, check the length and width of the structure) …

Comment on the structure’s foundational material, is there any settlement or loss that will affect the stability of the structure, consider the “slope” of the structure …
Comment on the integrity of the “surrounding areas” of the structure which could include areas directly in front/adjacent to the structure. i.e is the structure affecting the surrounding areas? …
Comment on any detrimental effects to the environment or people associated with the structure (access, infrastructure network, erosion and build-up of sand and matter) …
Photos
Insert photos of the structure and surrounding areas to document changes.
Action Plan
Is remedial work needed on the structure? If so, what is the plan to have the issues addressed.
Inspection completed by:
Choose an item.
Click or tap to enter a date.

APPENDIX B

TRC comment on Section 4: MONITORING PLAN AND REPORTING

From Thomas McElroy 25 November, 2020
To Roger Shand

I'm just wondering whether your two paragraphs (below, in itelics) are clear enough. I feel like they could be simplified for easier understanding of reporting requirements, e.g.:

1. Annual summary report (comprising a + b + c…)
2. Less frequent (3 to 5 yearly) MBM report assessing trends and reviewing monitoring programme structure.

If you think it wouldn't be much more onerous/expensive for the STDC, I'd be in favour of sticking to the one annual summary report (as described below) but which also includes the typical MBM analysis that you would include in other similar reports (i.e. following a similar reporting structure as you've done for the green waste consents). That way the reporting requirements would be less complicated and still cover everything off. Just remember, the recommendations that you've lifted from the compliance report were just recommendations, to be refined in consultation with STDC. Just like we've done with the MBM details, I'm happy to consider other reporting options with you/STDC. Open to your opinion on this given your experience with analysing and reporting this type of data.

It is usual practice to report on monitoring output following each survey. However, the TRC indicate a longer reporting period could be adopted for sites requiring MBM. As noted above in Section 2 "…as per the recommendations outlined by T&T (2001), STDC reporting frequency will be reduced to five yearly; allowing sufficient survey data to be collected for analysis (of underlying trends". The TRC are now proposing 3 to 5 years.

In addition to the STDC providing a MBM report for major structures, TRC officers would like to see "…the STDC to undertake annual visual inspections for all consented coastal structures and provide the TRC with a summary report (by 30 June). The intent here is for STDC to commit to their own asset management/compliance inspection regime. TRC will still carry out inspections and reporting, but this will be in more of a compliance auditing role (which is more appropriate) and can be reduced to biennial (as noted in Table 2). The annual STDC report should conclude whether the structures are complying with consent conditions in terms of having adverse effects on adjacent shorelines. In addition, a summary of any MBM monitoring should also be included in the annual summary report - briefly including what was done, the results, and any erosion issues/adverse effects that may have been identified ".

Thanks
Thomas McElroy
Environmental Scientist - Marine Biology