BEFORE THE OTAGO REGIONAL COUNCIL

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of an application for resource consents for Project Next Generation
BY	**PORT OTAGO LIMITED**
	Applicant

SUPPLEMENTARY STATEMENT OF EVIDENCE OF
LINCOLN MURRAY COE
ON BEHALF OF PORT OTAGO LIMITED

19 April 2011

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SCOPE OF SUPPLEMENTARY EVIDENCE

1. There have been a number of technical or port operational matters that have been raised during the course of the hearing. In order to be of assistance to the hearing panel I have prepared this supplementary statement to address them.

2. I will specifically address the following issues:

- The relationship between widening the Swinging Basin and the adjacent Shell Bank;
- Te Rauone Beach issues;
- Conditions regarding the Long Mac Groyne;
- The turbidity – suspended sediment concentration relationship;
- When access to the Fishing Jetty might need to be suspended;
- Alternatives to marine disposal of dredged material; and
- Operation of the proposed "Technical Group".

EXTENT OF SWINGING BASIN WIDENING AND EFFECTS ON EXISTING SHELL BANK

3. Dr Stewart (Ryder Consulting) referred to the Shell Bank adjacent to the Port Chalmers Swinging basin in his evidence prepared on behalf of Southern Clams Ltd, and suggested that no assessment of effects had been offered by the applicant in relation to this particular feature.

4. That is incorrect. The reason that this matter was not specifically articulated within my evidence or the evidence of other experts, is because there have been no effect identified from the widening on that Shell Bank, due to its distance from the proposed works. In that regard, I refer to a series of 4 drawings 11150/1-4 that were appended to the report "Information on key species of interest to Ngai Tahu – Supplementary paper for Next Generation" prepared by Dr James, Mr Boyd and Dr Probert, dated 4 May 2010. This report was referred to and included in the original bundle of reports attached with the Application and AEE.

5. On these drawings the top of the batter slope of the proposed dredging is shown. The low tide line identified in white was measured on the ground with the tide between 0.0m and 0.1m by myself and Mr Allan Sutherland with a handheld GPS. Of specific note and interest is the top of the batter slope being a distance of approximately 70m to the west of the closest point of the shell bank.

6. The drawings also show the total area of approximately 8,000m^2 of low intertidal area that will be directly affected and has been described in the evidence of both Dr Mark James and Mr Rick Boyd. (It should be noted that there is an error on drawing 11150/3 in the note on the bottom left hand corner with the this note referring to the shaded area denoting the area lost above **0.0m Chart Datum** not 0.6m Chart Datum.)

7. I further note that I hand delivered a copy of this report to Mr Roger Belton of Southern Clams Ltd, during May 2010 after the report had been finalised. As such, I would have expected Dr Stewart to have been aware of it.

TE RAUONE BEACH

8. I specifically referred to Te Rauone Beach in paragraphs 241 to 247 in my evidence but because of the attention this has received during the hearing I will provide additional information to assist a better understanding of what is proposed. Firstly, I will explain the natural environmental factors which affect the beach and nearshore then secondly provide further details of the proposed solution.

Natural Environmental Factors Affecting the Beach

9. The nearshore environment and beach at Te Rauone are both affected by natural environmental conditions that occur from time to time. In particular longer wave NE swells that penetrate the harbour entrance reach the beach and suspend sediment in the shallower nearshore as well as attacking the dune face over the top parts of the tidal cycle. Similarly strong SW or Westerly winds fetching across the harbour cause a short but aggressive wind chop wave that also attack the dune and beach. Once mobilised the beach sands are then available to be transported by any currents flowing along the beach. In that regard, I attach 8 photographs which show 2 separate such events, one a NE event and the other a SW event.

Details of Proposed Solution

10. Dr Martin Single has been involved in all stages of the design works since first completing his report "Te Rauone Beach – Coastal Resource Management Options" in 2007 which included a description of his preferred option. This

preferred option (from p15 of that report) is appended and shows as well as describes what was developed in 2007.

11. Dr Single's involvement has continued with the project through the more detailed design stages and community consultation that has been undertaken. The attached drawings 11103_1_b and 11103_3 accompany the AEE that is to be lodged with the consent application necessary to implement that solution. As I outlined in my evidence this is expected to be lodged in the near future.

12. The following text is taken from the Introduction section of the AEE document and provides a good overview of the project.

- Port Otago Ltd and Te Rauone Beach Coast Care Committee (the applicant) are seeking resource consents from Otago Regional Council (ORC) and Dunedin City Council (DCC) to construct a new rock breakwater and introduce sand at the northern end of Te Rauone Beach in Otago Harbour.

- Coastal erosion at the northern end of Te Rauone Beach has been an issue for some time. A 1948 survey of the Te Rauone Reserve shows that at that time, the edge of the sand hills had moved inland from the coastline shown on the 1902/04 survey plan of Block A2 (ML 145). The 2008 survey of the top of the dunes overlaid on the March 2000 aerial photograph and the property boundaries, demonstrates the scale of the coastal erosion that has taken place.

- The erosion along the unprotected north end face of the Te Rauone Reserve is the most dramatic, while protective works by property owners to the north of the reserve have had various degrees of success. The uncoordinated prior efforts of property owners at their individual properties has also potentially contributed to accelerating erosion in the area.

- The proposal has been designed to firstly minimise the erosive wave patterns from the northerly swells that penetrate through the entrance of the harbour by placement of the physical barrier (the rock breakwater). The aggressive wind waves from the southwest that cause erosion can still approach the beach however the introduced additional sand will dissipate the waves as they break up onto the raised beach profile and the breakwater will have the effect of reducing the longshore transportation of sediment by reducing the tidal flows at the tide-line. This type of work has worked well at both the MacAndrew Bay and Broad Bay beaches, subject to periodic replenishment following the lowering of the beach profile by particularly severe westerly winds. This type of management may also be necessary at Te Rauone.

- The proposal has significant local community support, for it represents the best option for addressing the coastal erosion issue. The proposal is assessed as being worthy of being granted consent.

13. Given all the above, I am satisfied that Port Otago is taking a very community-focussed approach to an issue that is of concern locally, notwithstanding that it arises due to natural causes.

LONG MAC GROYNE

14. I refer to the additional condition that has been inserted into consent 2010.193 in relation to assessing the role or function as well as current state of Long Mac Groyne. This condition is supported by Port Otago.

TURBIDITY BASELINE – SSC vs NTU RELATIONSHIP

15. There has been discussion and some suggestions regarding the need to better understand the relationship between NTU and SSC or suspended sediment concentrations. As presented earlier in the hearing, NTU is proposed to be measured continually for the early stages of Incremental Capital Dredging as well as throughout Major Capital Dredging works,

16. I would like to clarify the origin of information Dr Chris Hickey provided by email (dated 7 April 2011) and which was given to the Panel on 11 April. Dr Hickey provided a graph showing the relationship between NTU and SSC which identified a near 1:1 relationship between the two. This graph is attached.

17. The data on which the graph was based was the 3 months of Turbidity monitoring that Port Otago Ltd had NIWA Dunedin collect and report upon. The report they produced was titled "Turbidity Monitoring in Otago Harbour - Data Report",

prepared by Evan Baddock, December 2008. A copy of the full report is appended. The key data regarding the relationship between NTU and SSC is contained in Table 1 on page 6 of that report, this being 10 measurements over a 3 month period.

18. This report and the measurements were referred to in the evidence of Dr Mark James and clearly show the derivation of the 1:1 relationship between NTU and SSC within Otago Harbour.

OCCASIONS POTENTIALLY REQUIRING CLOSURE OF THE FISHING JETTY FOR SAFETY OR SECURITY REASONS

19. To assist in understanding occasions in which the fishing jetty may require to be closed, and hence public access restricted, I offer the following examples:

- Safety 1 - During strong winds the Boiler Point Walkway is sometimes closed due to the potential risk of wind-blown containers to users of the walkway. By necessity if the walkway is temporarily closed to the public, then the Fishing Jetty is no longer accessible via that walkway. In my experience I can only recall 2 occasions when this walkway has been closed, but if it is, access to the Fishing Jetty would not be possible/appropriate.

- Safety 2 – If there was hazardous substances incident or event in the container storage area adjacent to the jetty an exclusion zone may be necessary that included the Fishing Jetty and walkway area.

- Security 1 – There is the possibility that the Port Security status is raised from the standard MarSec 1 level to either level 2 or level 3 when the Police and/or Customs and/or Maritime NZ have reason to suspect there is a security threat to the port area or vessels. In these cases parts of the port area may need to be evacuated, including the fishing jetty.

ALTERNATIVES TO DISPOSAL

20. Port Otago has in the past, and will continue to do so, keep an open mind regarding alternative methods of dredge material disposal. However, as outlined

in my evidence, and although beach replenishment initiatives have been supported in the past, the sheer volume of material and lack of other viable disposal options of sufficient scale, necessitate disposal to the open ocean.

21. It has been suggested that harbour islands be created in preference to marine disposal of dredged material. This would be a significant and potentially contentious undertaking with its own suite of engineering and environmental issues, as well as requiring its own resource consents.

22. I also note the iwi view put forward by Mr Edward Ellison that they are not supportive of large scale reclamation of any sort in the harbour.

TECHNICAL GROUP

23. The formation and inclusion of a Technical Group to support the EMP is an important step in providing openness and transparency to the monitoring, review and updating of the EMP. Provision of the right information early in order to be able to actively manage dredging and disposal operations to minimise and mitigate effects is essential.

24. The group is modelled on an existing and similar group that has been operating successfully for the past 9 years in relation to the existing consent for the inshore maintenance disposal grounds. The existing "Maintenance Working Party" meets on an annual basis to review monitoring and consent specific work that has been undertaken in the previous period. That Working Party has offered observations and made recommendations to Port Otago over the course of this consent.

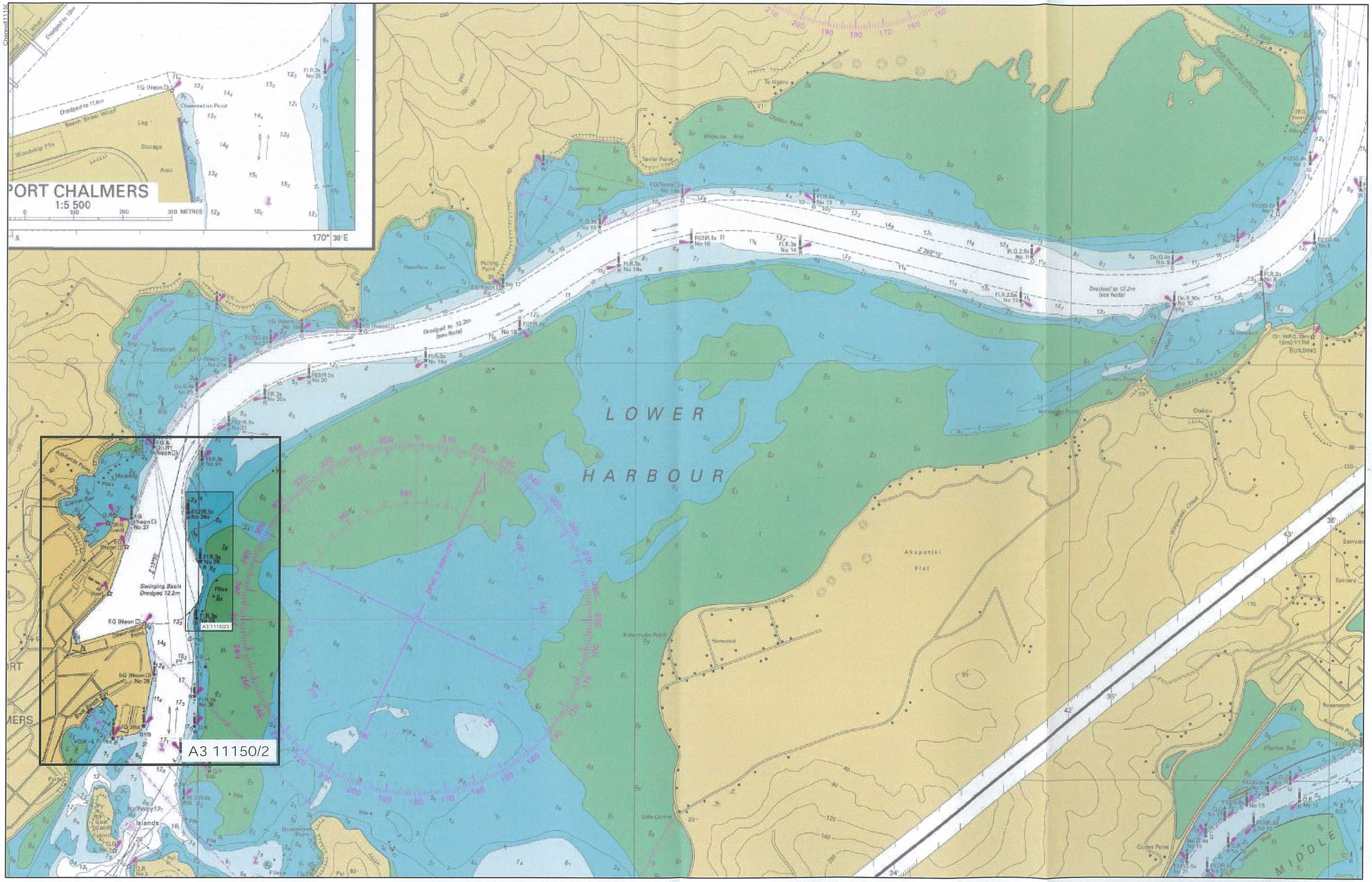
25. As an example, 3 years ago a concern was raised that the Spit disposal ground was still preferred and receiving the greater portion of annual disposal, with this potentially not being sustainable in the long term. The suggestion made was to focus more of the disposal to the Heywards disposal ground and reduce the volume going to Spit. This active management step was implemented by Port Otago, and to this day Heywards remains the preferred disposal site. This example demonstrates the ability to use monitoring information, reviewed and critiqued by knowledgeable and experienced individuals with a history associated with the activities, to adaptively manage disposal activities.

26. In our view the key to the Technical Group is to make sure it has the expertise necessary to be able to make informed decisions. In this regard, we believe it is appropriate to include Otakou Runaga, Puketeraki Runaga, the Department of Conservation, as well as the Otago Regional Council in that group.

27. It is acknowledged that there is some cross-over and duplication in the roles of the Manawhenua Consultative Group and the Technical Group. At this stage however we believe it is important to have a consultative group that specifically exists to deal with Manawhenua matters. We believe that as the project progresses and develops, the two groups will develop their own identities and provide different forums for different issues. We therefore strongly support the inclusion of both in the conditions of consent.

SUMMARY

28. I trust that this additional information is of assistance in better understanding some aspects of the project, and I am happy to answer any questions that the hearing panel may have. Thank You.

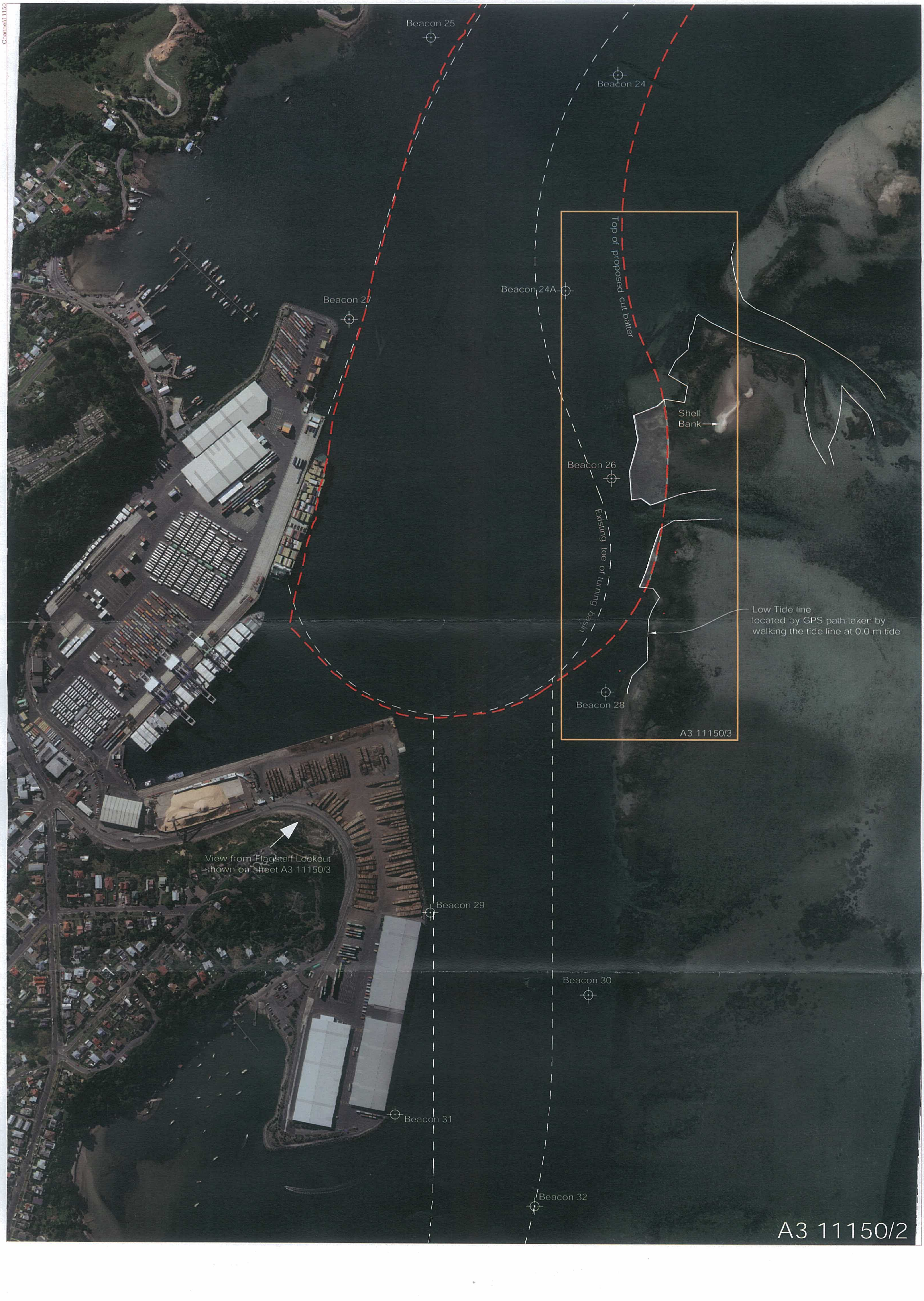


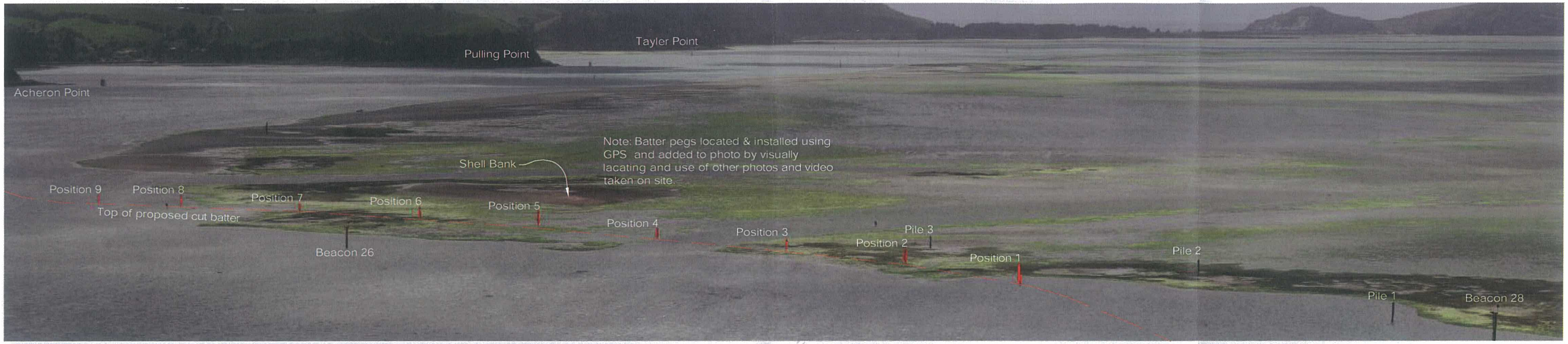
Portion Of Otago Harbour Chart (NZ 6612)

Annexure 1

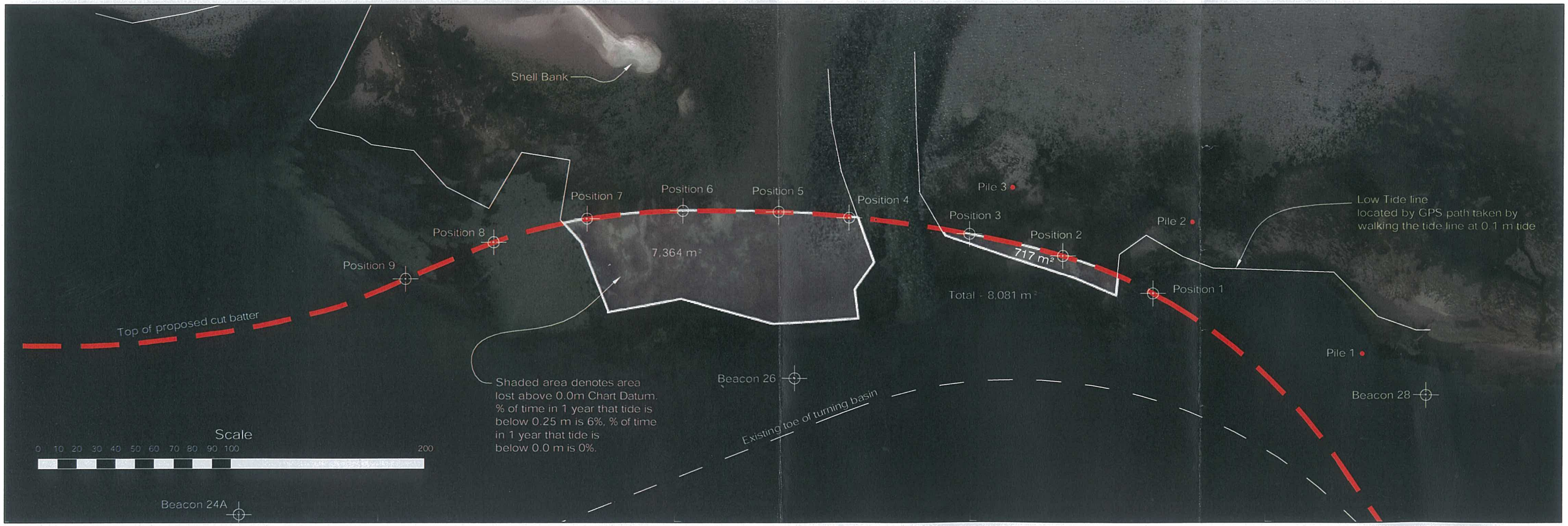
Scale 1:20,000

A3 11150/1

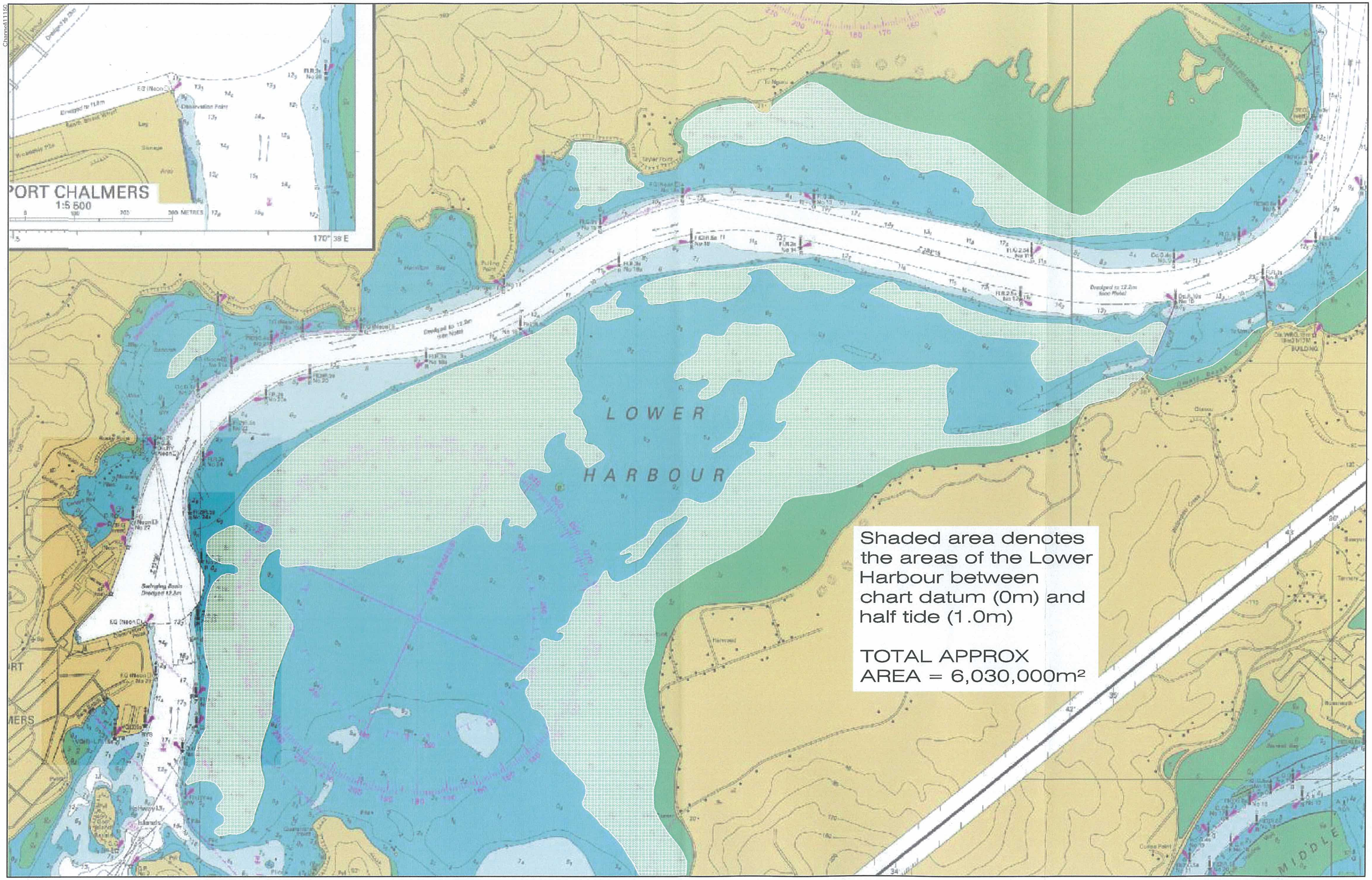

Beacon 25
Beacon 24
Top of proposed cut batter
Beacon 24A
Beacon 27
Shell Bank
Beacon 26
Existing toe of turning basin
Low Tide line located by GPS path taken by walking the tide line at 0.0 m tide
Beacon 28
A3 11150/3
View from Flagstaff Lookout shown on sheet A3 11150/3
Beacon 29
Beacon 30
Beacon 31
Beacon 32
A3 11150/2



As Viewed From Flagstaff Lookout



A3 11150/3



Portion Of Otago Harbour Chart (NZ 6612)

Scale 1:20,000

A3 11150/4

Annexure 2

PHOTO 1

South Side Broad Bay – natural conditions strong NE having overtopped the road.

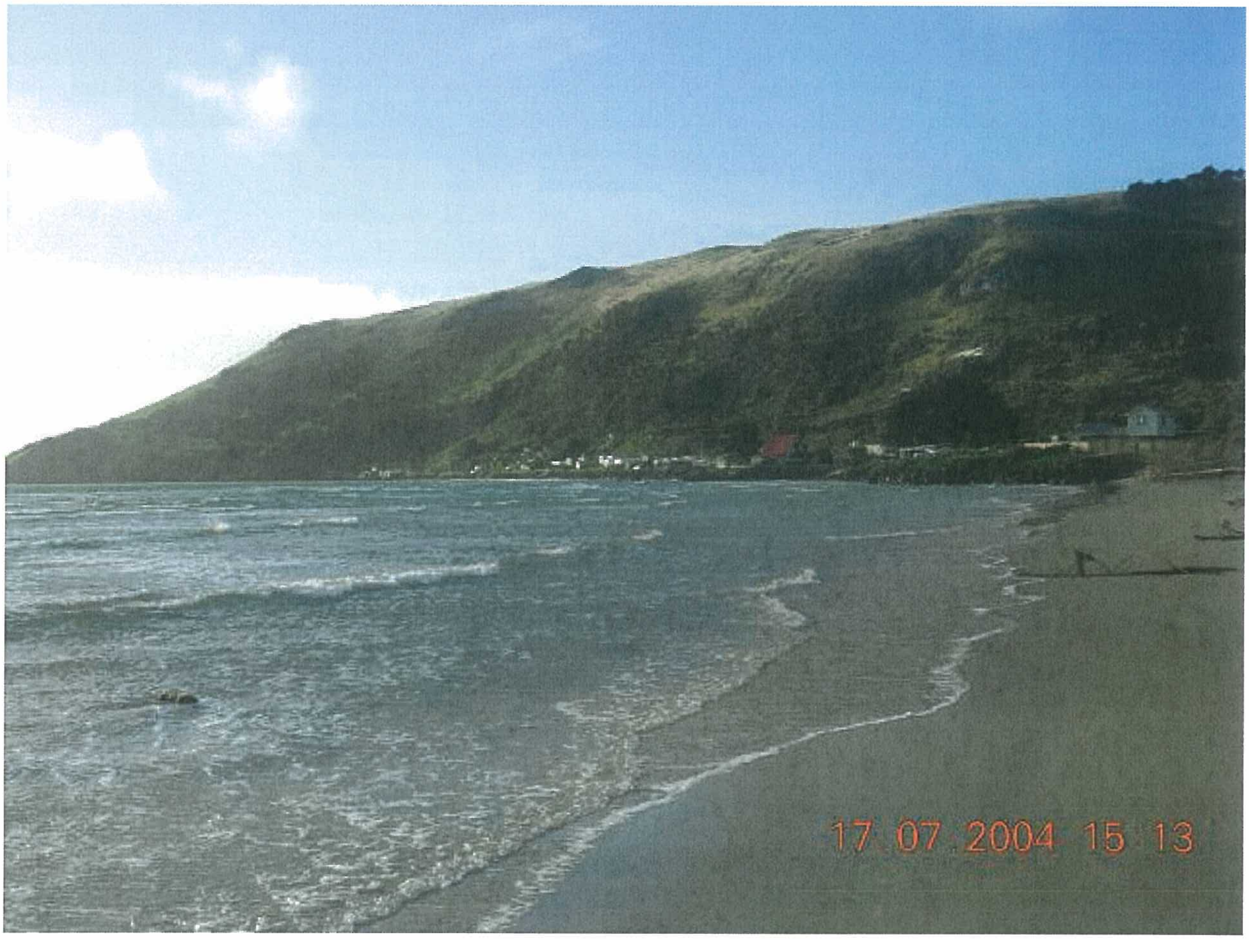


Photo 2
Central Te Rauone Beach Looking North – Tide ebbing. Strong NE wind.

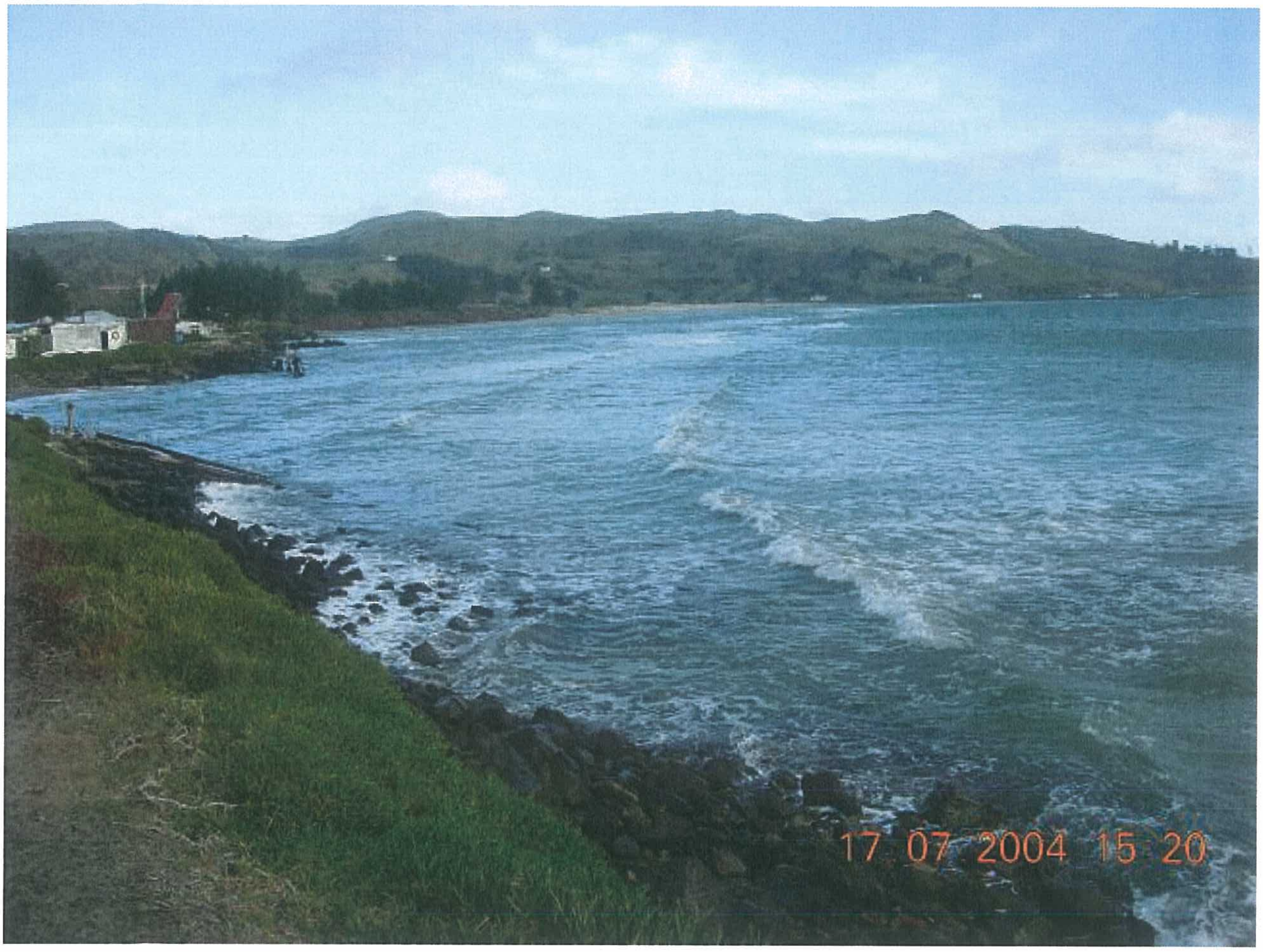


Photo 3

Looking South from Harington Point Rd down to Te Rauone Beach. NE swell wrapping towards rock protection in front of cribs and the beach beyond.

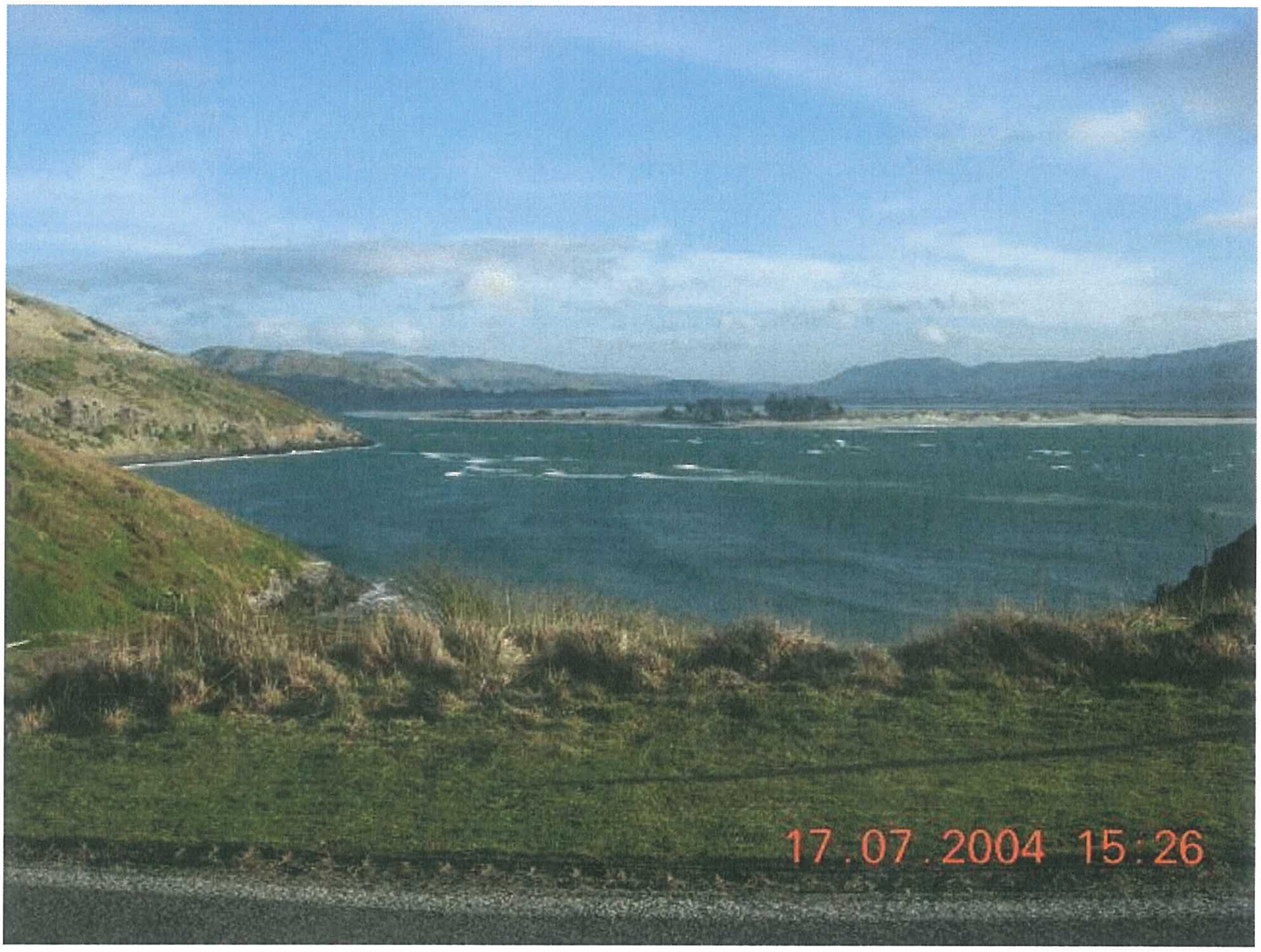


Photo 4

Albatross Colony Carpark looking SW with NE swell rolling in through the Entrance

Photo 5 – 8/6/2008

Te Rauone Dune just after high tide. Strong WSW wind blowing across harbour. Looking North towards entrance.

Photo 6 – 8/6/2008

Te Rauone Dune just after high tide. Strong WSW wind blowing across harbour. Looking South along beach. Previous high tide having reached and attacked the base of the dune.

Photo 7 – 8/6/2008

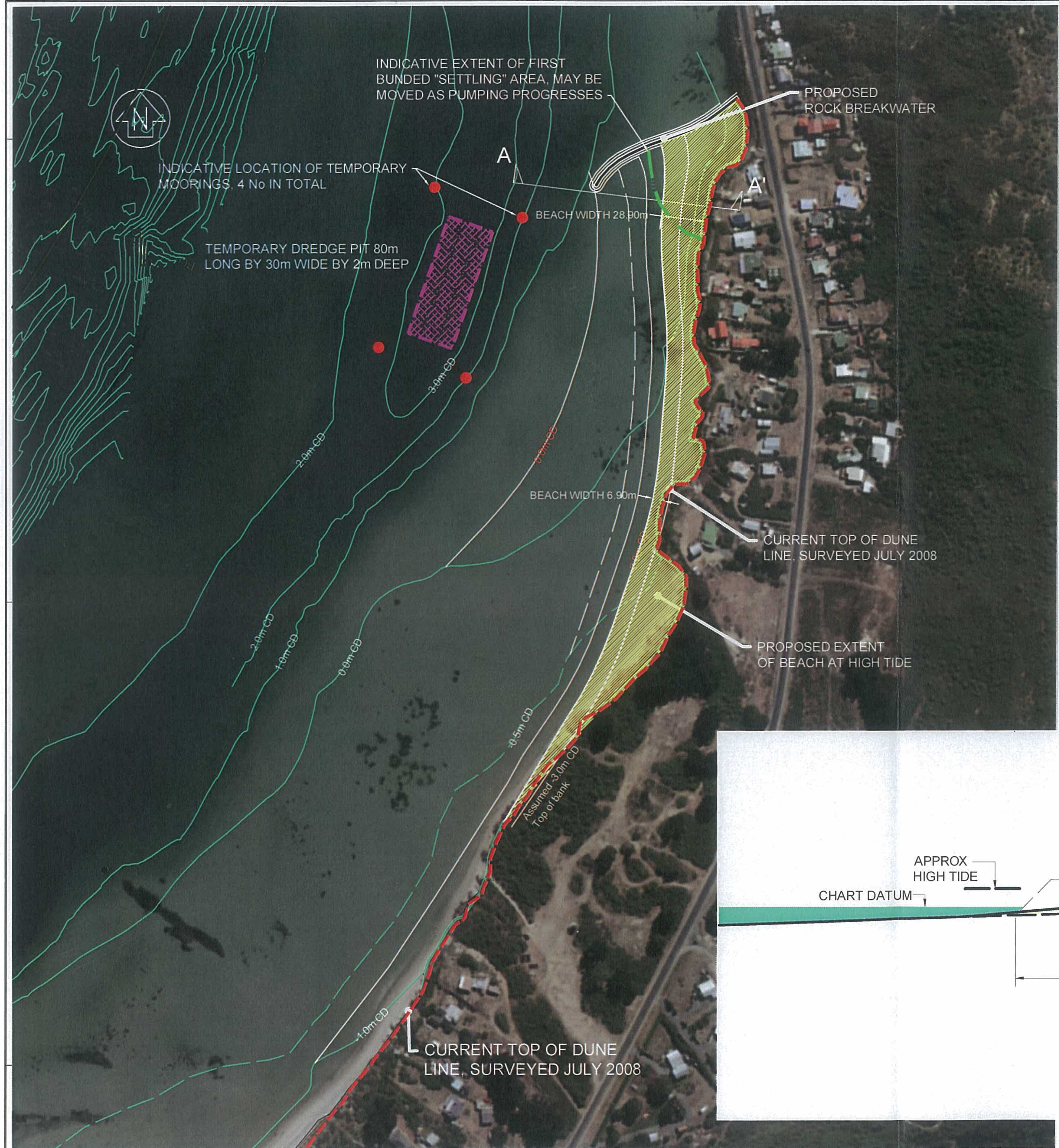
Te Rauone Dune just after high tide. Strong WSW wind blowing across harbour. Looking South along beach. Previous high tide having reached and attacked the base of the dune.

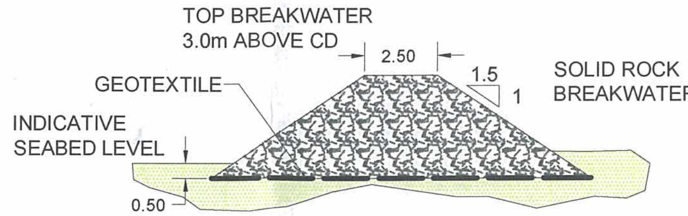
Photo 8 – 8/6/2008

Te Rauone Dune just after high tide. Strong WSW wind blowing across harbour. Standing on the Dune looking north towards cribs protected by rockwork.

APPENDIX A

Suggested Option for Shoreline Restoration at Te Rauone Beach



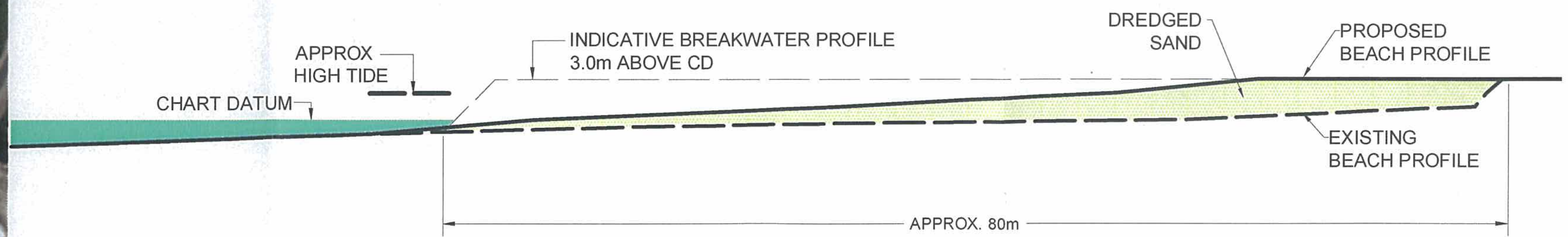


TYPICAL BREAKWATER SECTION

SCALE 1:125

APPROXIMATE VOLUMES

- Rock 3,000m³
- Sand 45,000m³



SECTION A - A'

SCALE 1:250

	INITIALS	DATE
DESIGNED:	ACP	26/05/09
DRAWN:	ACP	26/05/09
CHECKED:		
APPROVED:		

PLOT DATE: 09/06/2009

ISSUE DATE:

SCALES: 1:3000 @ A3 1:1500 @ A1

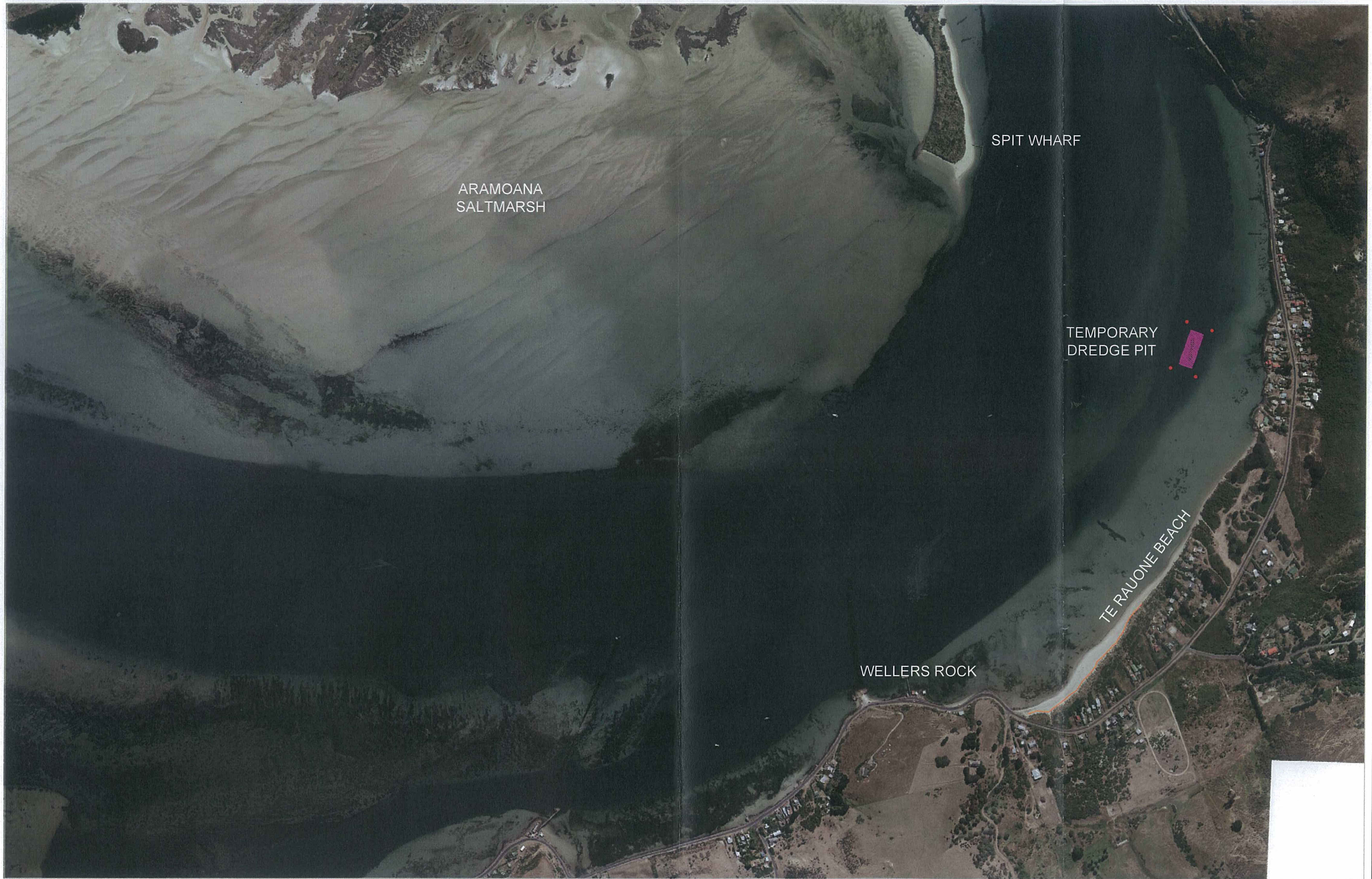
PORT OTAGO LTD P.O. Box 8, Port Chalmers, N.Z.

Te Rauone Beach Nourishment
Concept Design for Consent

PORT OTAGO LIMITED

ACAD FILE NAME: /projects/6002/11103

DWG No: A1.11103_1_b



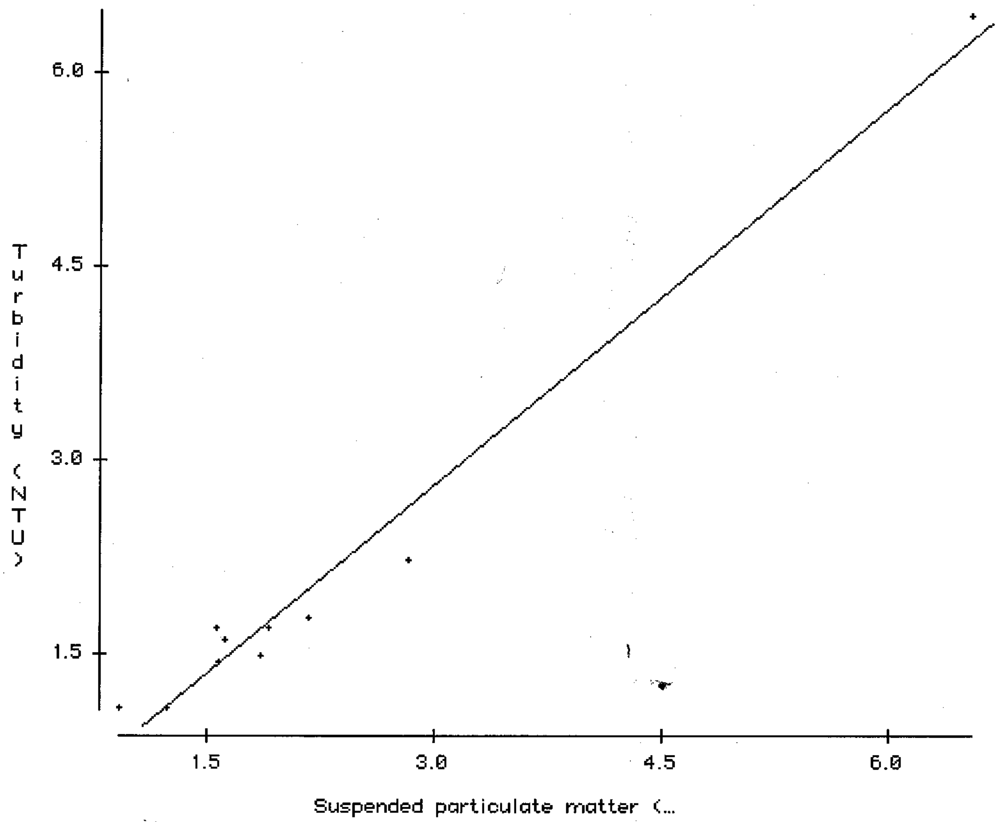
	INITIALS	DATE			
DESIGNED:	ACP	26/05/09	PLOT DATE: 09/09/2010	SCALES: 1:8000 @ A3 1:4000 @ A1	PORT OTAGO LTD P.O. Box 8, Port Chalmers, N.Z.
DRAWN:	ACP	26/05/09	ISSUE DATE:		Te Rauone Beach Nourishment
CHECKED:					Preliminary Design - Overview of Te Rauone Bay
APPROVED:					

PORT OTAGO LIMITED

ACAD FILE NAME: /projects/6002/11103

DWG No: A1.11103_3

Port Otago data



Dependent variable is: **Turbidity (NTU)**
No Selector
R squared = 97.8% R squared (adjusted) = 97.5%
s = 0.2484 with 10 - 2 = 8 degrees of freedom

Source	Sum of Squares	df	Mean Square	F-ratio
Regression	21.8978	1	21.8978	355
Residual	0.493446	8	0.0616808	

Variable	Coefficient	s.e. of Coeff	t-ratio	prob
Constant	-0.107835	0.1392	-0.775	0.4607
Suspended p...	0.972959	0.05164	18.8	≤ 0.0001

A very good near 1:1 relationship between SS and turbidity. Can then use either NTU or Rob's incremental SS to predict clarity change in harbour using the Ravensdown relationship. This assumes that the fines are of similar composition.

Annexure 6

NIWA
Taihoro Nukurangi

Turbidity monitoring in Otago Harbour Data Report

NIWA Client Report: CHC2008-171
December 2008

NIWA Project: POL09501

NIWA
Taihoro Nukurangi

Turbidity monitoring in Otago Harbour data report

Evan Baddock

Prepared for

Port Otago Ltd

NIWA Client Report: CHC2008-171
December 2008
NIWA Project: POL09501

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Contents

Reviewed by:

Approved for release by:

Mark James

Dennis Jamieson

1. Background

Port Otago Ltd. (POL) wishes to increase the capacity of Port Chalmers to receive larger container ships. To achieve this, a capital works dredging programme would be required to deepen the approach channel to Port Chalmers. Increased turbidity during dredging operations has been raised as having a potential effect on the ecology of the harbour. In order to put the potential effects into context necessitates an understanding of the natural background levels. Efforts to measure turbidity levels in the harbour have been ad-hoc, mostly arising from consent monitoring conditions for various other operations.

There is therefore a need to have a consistent baseline time series which covers natural events and provides average background levels. This baseline dataset will also be a useful basis to compare turbidity levels obtained during the dredging operation.

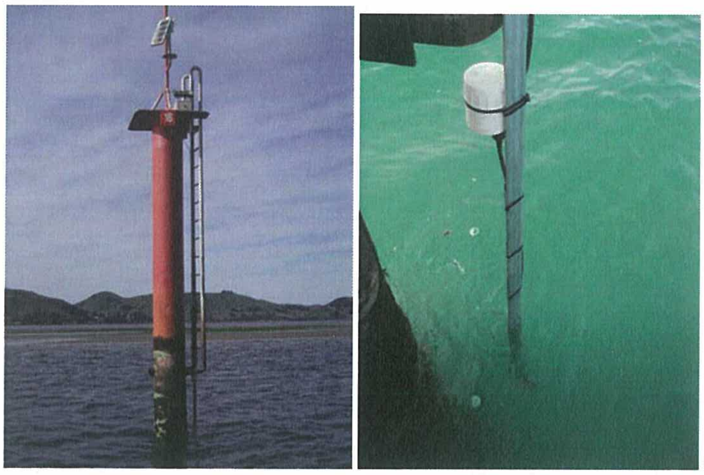
2. Field work

NIWA installed two Seapoint Turbidity sensors to monitor in-situ turbidity levels in August 2008. These sensors were mounted on existing channel makers in the vicinity of Blanket Bay (marker 6) and Hamilton Bay (marker 18), (Figure 1).

Figure 1: Location map.

The sensors logged every 15 minutes and the data was telemetered to the NIWA office in Dunedin daily for checking. Five sets of grab samples were taken at each location during site visits over the 3 month period and lab tested for total suspended solids, turbidity, and salinity were carried out. Secchi disk measurements were also taken and Kd (light attenuation through the water column) measured (see table below) using a Licor LI1000 meter and QSP-200 4pi sensor.

The marine environment caused more difficulty than expected, with the main problem coming from drifting sea lettuce catching on the sensor and wiper (Figure 2). We trialled several different mount setups over the period and have come up with the best solution so far to deal with this issue.



Initial Install Site 18

Example of fouling – sea lettuce

Mark shroud over sensor for protection

Figure 2: **Site photos.**

Regular visits had to be made to clean the probes and change the mounting variations. The record has many spikes due to these issues and would have been difficult to interpret without these frequent visits.

The sensors were removed after the 3 months for servicing and recalibration at NIWA Instrument Systems in Christchurch. In discussion with Port Otago the decision has been made to not reinstall the instrument, but any events are to be sampled if they occurr.

3. Results

The turbidity record from both sensors contained many spikes due to the floating weed problem, but with some filtering of the data showed an obvious trend. The data presented below has had data filtered where biofouling was evident.

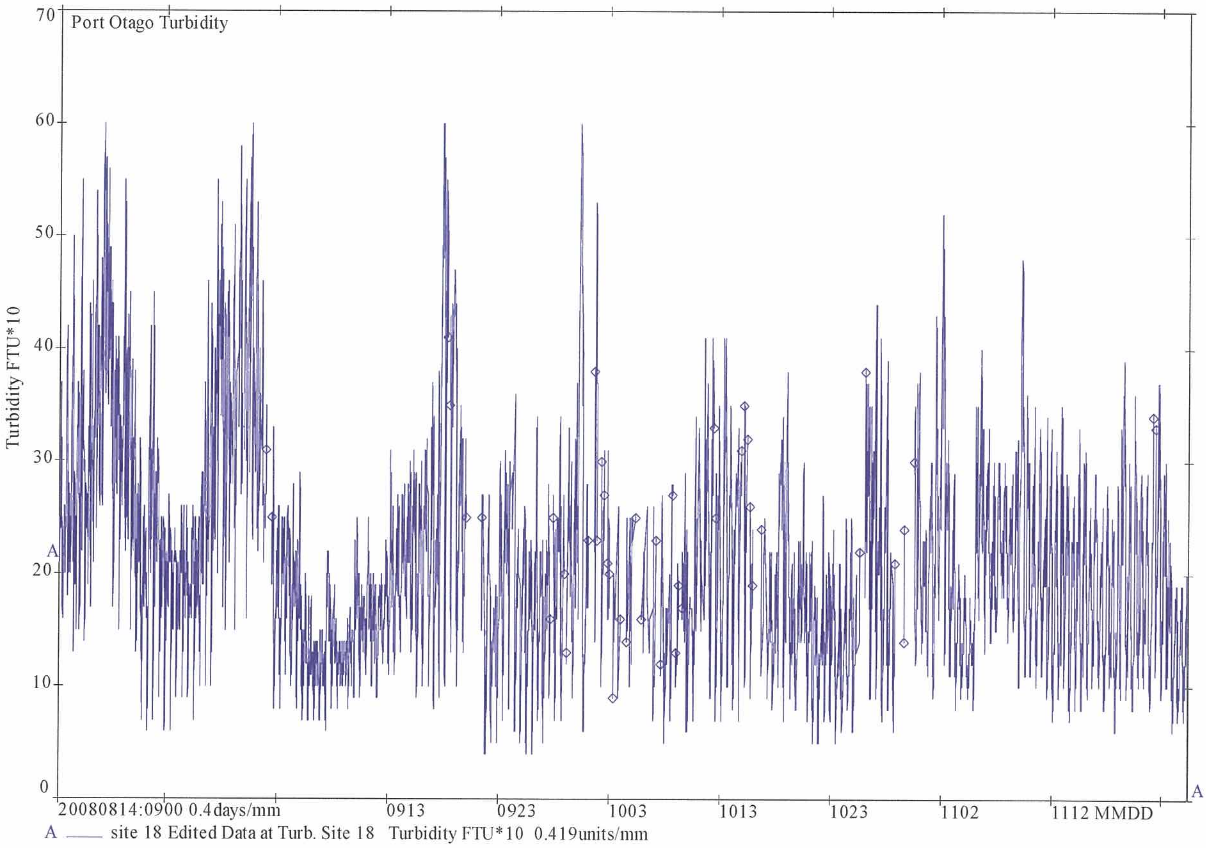


Figure 3: Site 18 turibidyt data

Site 18 data shown in Figure 3 above shows a general trend around 2 FTU (note x10 scale) with some higher spikes which are possibly real and occur at slack tide when the currents stop and debris in the water floats around the sensor. Figure 4 shows a shorter period with tides over plotted (in red).

Site 6 data shown in Figure 5 has a similar record for Site 18 over the period with slightly higher average values between 2-4 FTU. Gaps in the data are due to periods when the sensor was covered in weed until the site was visited and cleaned.

Figure 6 shows another shorter period with tides over plotted.

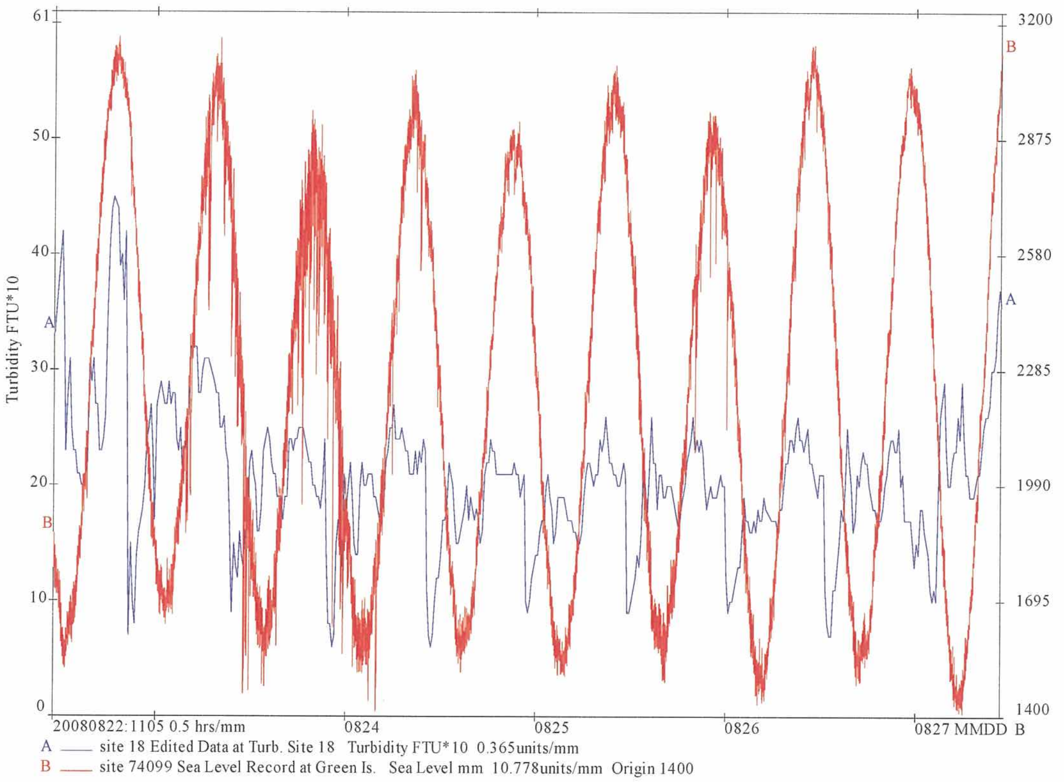


Figure 4: **Site 18 turbidity data and Green Island sea leve.**

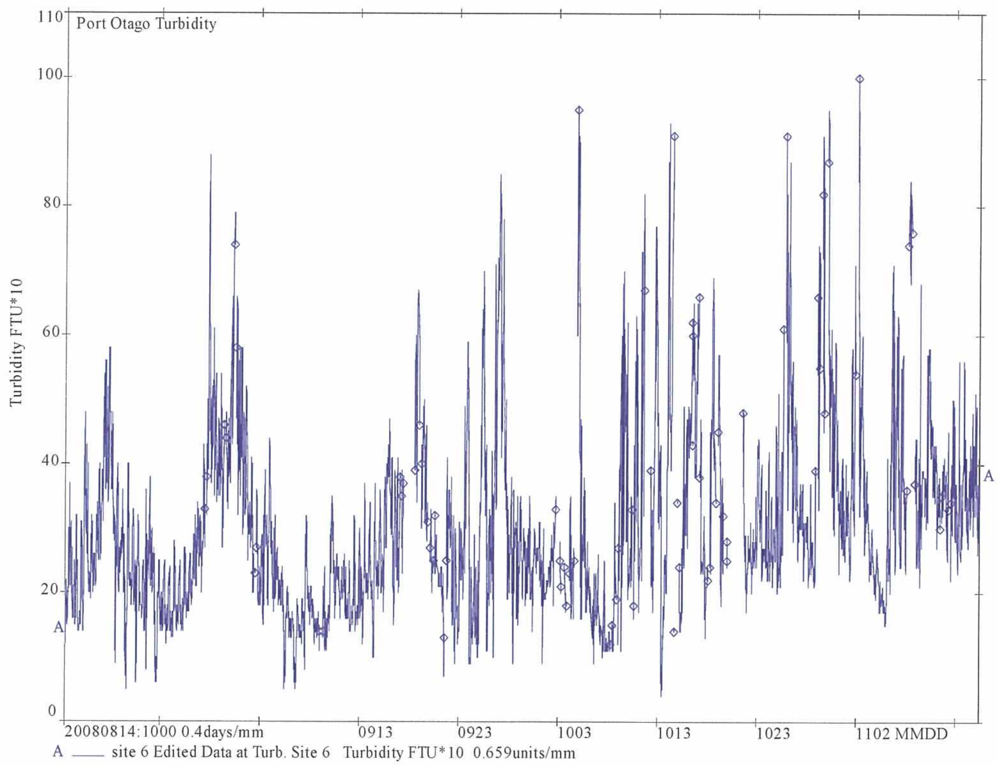


Figure 5: **Site 6 turbidity data.**

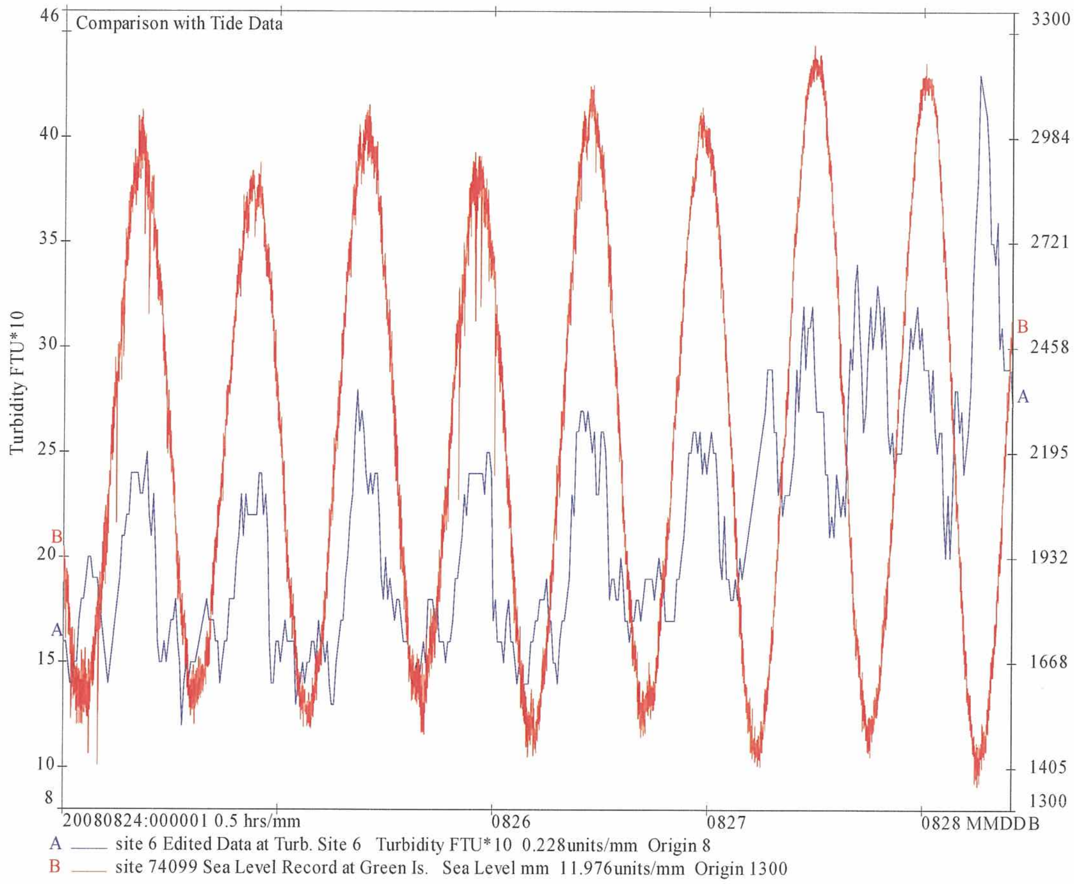


Figure 6: Site 6 turbidity data and Green Island sea level.

Results from the grab samples are shown in Table 1.

Note that the last samples were taken during a NE storm event with strong winds stirring up the harbour. Due to these strong winds we couldn't access the sites for safety reasons, so samples were taken as near as we could to site 6 (Outer) and also at the Dunedin end of the Inner harbour, at the channel edge, under similar depths as the sites, and where things were more turbid.

Table 1: Results from the grab samples:

SampleID	Time sampled	Date sampled	Turbidity (NTU)	Sensor (FTU Ave at time	Suspended particulate matter (mg/L)	Salinity (pp thousand) at 25°C	Secchi disk (m)	Kd (m)	Comments	Conditions
6	1015	14/08/2008	1.08	1.4	0.91	32.5	N/A	N/A	No Light sensor	Low + calm
18	1030	14/08/2008	1.43	2.5	1.58	33.1	N/A	N/A	No Light sensor	Low + calm
6	1130	02/09/2008	1.71	2	1.92	33.1	4.1	0.1344		Spring low tide – calm
18	1100	02/09/2008	1.48	2	1.86	34.0	4.25	0.133		Spring low tide - calm
6	1020	17/10/2008	1.71	2.3	1.57	34.3	3.5	0.1135		
18	1145	17/10/2008	1.08	2	1.23	34.3	3.9	N/A	*	
6	1230	30/10/2008	2.24	3.6	2.83	34.2	2.95	0.3319		Windy
18	1200	30/10/2008	1.79	4	2.18	34.5	2.7	N/A	*	Windy + strong current
Outer	1245	21/11/2008	1.61	Site 18 = 2.0	1.63	34.6	2.2	0.2456	Near Site 6	Storm event – sampled where possible
Inner	1325	21/11/2008	6.44	N/A	6.54	34.3	1.1	2.1352	Slightly turbid water	Storm event – sampled where possible

* Meter problems prevented measurements

The following photos (Figure 7) were taken during the strong NE storm event on 21 November 2008. The channel is clearly defined with the sand bars either side being stirred up.

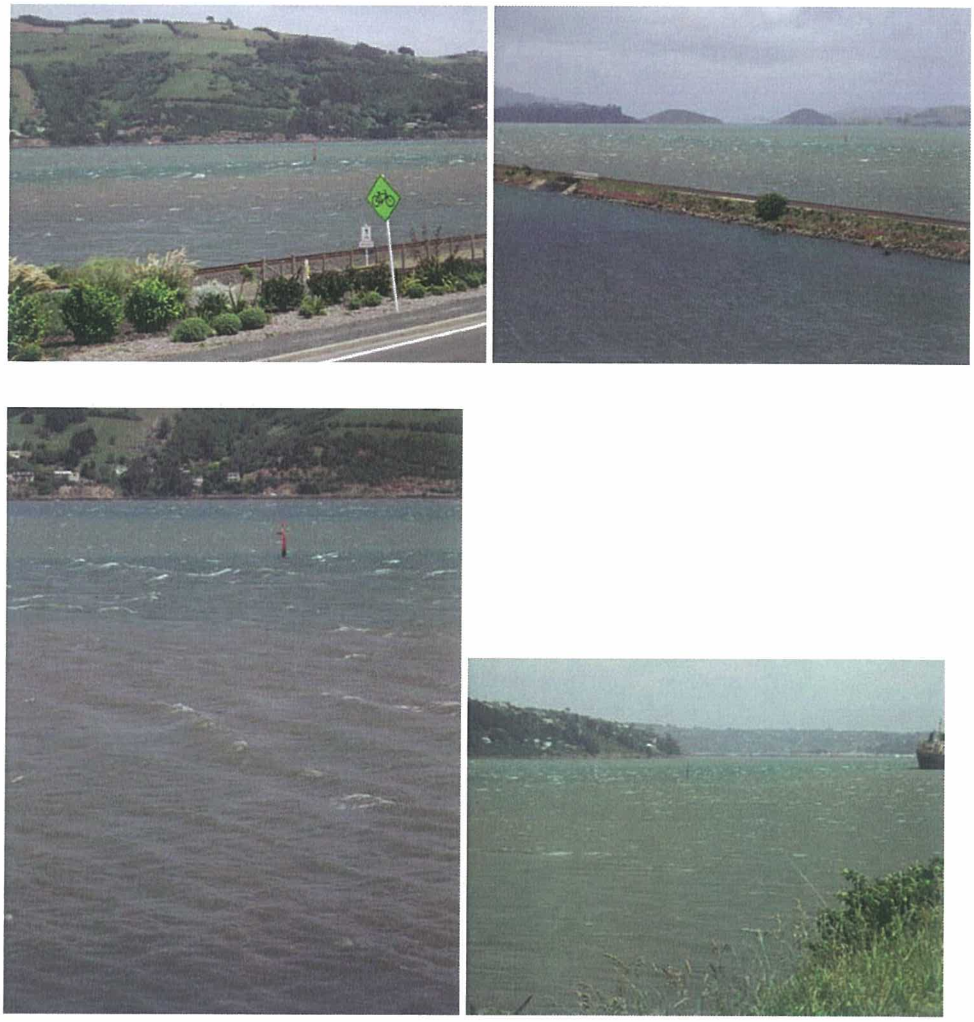


Figure 7: Photographs taken during NE storm on 21 November 2008.

4. Conclusion

The initial 3 month period has given us a baseline time series of average background levels. Levels were generally low (2-4FTU) with slightly higher levels during storm events.

Due to a lack of a major rainfall event (see attached rainfall record for Dunedin) over the period, there was no significant inflows to the harbour.

We recommend that the grab samples and light measurements be continued in the future whenever a major event takes place to build up this series of data.

Appendix 1: Rainfall Record for Dunedin:

Rainfall record for Dunedin over the period. Values are adaily totals in mm.

Day	August	September	October	November	
1	1	0	1	0	
2	0	0	0	0	
3	0	8	0	0	
4	0	0	0	1	
5	0	0	0	7	
6	1	0	0	4	
7	2	0	4	1	
8	5	0	1	0	
9	2	14	0	0	
10	0	3	0	0	
11	0	0	0	0	
12	5	0	0	0	
13	0	0	0	0	
14	3	0	0	0	
15	0	0	0	0	
16	3	0	0	0	
17	7	0	0	7	
18	5	0	3	0	
19	1	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	1	0	0	0	
23	0	7	0	0	
24	0	1	0	0	
25	1	0	3	4	
26	0	0	1	0	
27	0	4	0	0	
28	0	0	0	0	
29	0	5	0	0	
30	0	0	0	0	
31	0		0	0	
Min	0	0	0	0	0
Mean	1	1	0	1	1
Max	7	14	4	7	14