Appendix H:

WorleyParsons Offshore Disposal Ground Coastal Processes Investigation Preliminary Report

WorleyParsons
resources & energy

EcoNomics

EASTLAND PORT LTD

Maintenance Dredging and Disposal

Offshore Spoil Disposal Ground Coastal Process Investigations

301015-03380 – 301015-03380-CS-REP-0003

3 December 2015

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PROJECT 301015-03380 - MAINTENANCE DREDGING AND DISPOSAL

REV	DESCRIPTION	ORIG	REVIEW	WORLEY-PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Draft	B Williams	L Nielsen	D Aubourg	22-Sep-15	N/A	
B	Draft	B Williams	L Nielsen	D Aubourg	8-Oct-2015		
C	Draft	L Nielsen	D Aubourg	D Aubourg	3-Dec-2015		

SUMMARY

This report outlines the coastal processes studies required under Condition 18 of the coastal permits held by Eastland Port Ltd (Eastland Port) for the Gisborne Port maintenance dredging and disposal operations. It is an accompanying document to WorleyParsons report 301015-03880-CS-REP-0002 (WorleyParsons, 2015) which details prevalent coastal processes within Poverty Bay and Eastland Port in particular.

The remaining areas of knowledge gaps are in coastal process modelling and monitoring within Poverty Bay relevant to dredging and the disposal of dredge spoil material. The following studies are required to better inform Eastland Port, the Gisborne District Council (Council) and the Port Community Liaison Group (Liaison Group) of the consented maintenance dredging and disposal operations over the term of the coastal permits:

1) *Coastal Process Modelling*:

- The application of a state-of-the-art, fully 3D wave-current and sediment transport numerical model to allow a clearer understanding of sediment transport pathways around the harbour entrance at present.
- Simulations would also quantify the effects of increased wave activity through climate change on sediment transport patterns and magnitudes over the lifespan of the proposed long-term maintenance.

2) *Coastal Process Monitoring:*

- A targeted field data campaign to quantify the in-situ settling velocity characteristics of dredge spoil material, which determines the residence time of the dredge spoil plume within the water column and, hence, the transport and fate of spoil material comprising:
  - an Acoustic Doppler Current Profiler (or similar) to assess currents through the water column at spring and neap tides
  - turbidity observations at the Offshore Spoil Disposal Ground (OSDG) associated with currents and wave activity
  - sediment size measurements of material on the OSDG sea floor and within the dredge plume material
  - in-situ settling velocity measurements to determine the suspended sediment settling velocity of the dredge plume.
- A long-term historical photogrammetry analysis (30+ years, dependent upon data availability), would provide information on the shoreline behaviour prior to and since the start of the most recent dredging and disposal activities.

The coastal permits were issued by the Council on 10 August 2015 and have a five year term. Under the Condition 18 Eastland Port are required to submit progress reports on the studies, including findings and recommendations, to the Council and Liaison Group by 10 August 2016, 2017, 2018 and 2019, and then the final report by 10 March 2020.

CONTENTS

ABBREVIATIONS

OSDG	Offshore Spoil Disposal Ground
PNC	Port Navigation Channel

1 INTRODUCTION

This document summarises the coastal processes studies required under Condition 18 of the coastal permits held by Eastland Port Ltd (Eastland Port) for the Gisborne Port maintenance dredging and disposal operations.

This is an accompanying document to WorleyParsons report 301015-03880-CS-REP-0002 (WorleyParsons, 2015), which details prevalent coastal processes within Poverty Bay and Eastland Port in particular.

2 COASTAL PROCESSES AND IMPACTS OF DREDGING AND SPOIL DISPOSAL

2.1 Coastal Processes

The dominant coastal processes with regards to understanding the fate and impact of dredge spoil material at Eastland Port are:

- Delivery of sand, silt and mud to Poverty Bay by the Waipaoa and Turanganui Rivers,
- Resuspension of fine sediments deposited within Poverty Bay during episodic storm events and gradual dispersal to deeper water,
- Onshore transport of sand-sized sediment and subsequent accretion on the beach,
- Northward littoral drift towards Midway and Waikanae Beaches and Eastland Port,
- Interaction between littoral drift and ebb-tidal flows at the mouth of Turanganui River, resulting in deposition of sand at the river entrance as a sub-tidal bank,
- Erosion of sand from Waikanae Beach and the sub-tidal bank during storm events and subsequent deposition in the Port Navigation Channel (PNC).

2.2 Potential Impacts of Dredging and Spoil Disposal on Coastal Processes

2.2.1 Impact of Dredging and Spoil Disposal on Littoral Sand Transport

Sand is lost offshore from Waikanae Beach during wave storms to be deposited within the PNC, beyond the reach of wave energy able to move the sand back onshore. As the direction of net sediment transport at the OSDG is offshore, sand removed from the PNC by dredging and disposed of at the OSDG is removed from the supply of sediment responsible for nourishing the foreshore and dune system at Waikanae Beach.

2.2.2 Impact of Dredging and Spoil Dumping on Fine Sediment Dynamics

The transport and fate of fine sediment within Poverty Bay is not impacted by the dredge spoil disposal at the OSDG. Fine sediment deposited at the spoil ground is ultimately reworked by wave processes and deposited within deeper water. Dispersal of fine sediment may however have an ecological impact if not correctly monitored or disposed of correctly.

3 ADDITIONAL STUDIES REQUIRED

Following from information that is currently known, the remaining areas of knowledge gaps are in coastal process modelling and monitoring within Poverty Bay relevant to dredging and the disposal of dredge spoil material at the Offshore Spoil Disposal Ground (OSDG). The following studies are required to better inform Eastland Port, the Gisborne District Council (Council) and the Port Community Liaison Group (Liaison Group) of the consented maintenance dredging and disposal operations over the term of the coastal permits.

3.1 Hydrodynamic Properties and Settling Rate of Dredge Spoil Material

The settling velocity of dredge spoil material will determine how long the dredge spoil plume will last within the water column. The longer material takes to settle through the water column, the further it is transported and dispersed by tidal currents. None of the studies reviewed as part of the Coastal Process Engineering Report explicitly measured or quantified the in-situ settling velocities of fine sediment within the Poverty Bay marine environment.

A targeted data collection campaign would be required to provide further supporting data to assess the applicability of consent conditions stating that “no conspicuous change in the water column shall be observed after two hours”. This would consist of turbidity, suspended sediment concentrations and sediment size measurements through the water column to determine in-situ suspended sediment settling velocity of the dredge disposal plume. Ideally one campaign would be conducted at spring tide and one at neap tide to assess plume dispersal patterns.

Measurements of waves and currents through the water column, at or near the OSDG, would be taken using a current meter such as an Acoustic Doppler Current Profiler (or similar), capable of measuring waves and currents. This instrument would be deployed at the same time as the turbidity and suspended sediment concentrations are being measured, but for a longer period. Sufficient measurements at the site of the wave/current instrument to allow calibration of acoustic back scatter from the current meter with turbidity and suspended sediment concentrations are required. Information on acoustic back-scatter from the current meter would provide additional, corroborative information on the degree of material settling and dispersing through the water column.

3.2 Wave, Currents and Sand Transport around the PNC and Port Entrance

The potential for the loss of sediment to impact the behavior of the beach requires further investigation. The interaction and pathways of sediment transport with waves, tidal currents and river flows around the entrance to the Port and Turanganui River is also an area requiring further research

using advances in coastal process knowledge, numerical modelling techniques and increases in computational power since the original studies undertaken in 1996/1997 (Black et al., 1997).

Considerable advances have been made in understanding sediment transport processes and techniques in coupled wave-current numerical modelling since the original studies (Black, 1997) were undertaken to support the 2000 consent. Drastic increases in computer power also allow simulations that are spatially detailed and consider a wider range of environmental forcing.

Application of a state-of-the-art, fully 3D wave-current and sediment transport numerical model is required to define better the sediment transport pathways around the harbour entrance at present.

Simulations are required also to quantify the effects of increased wave activity through climate change on sediment transport patterns and magnitudes over the lifespan of the proposed long-term maintenance.

3.3 Bathymetric and Shoreline Monitoring

Hydrographic surveys of the OSDG would need to be continued to be conducted on an annual basis to inform the studies on sediment movements within this site.

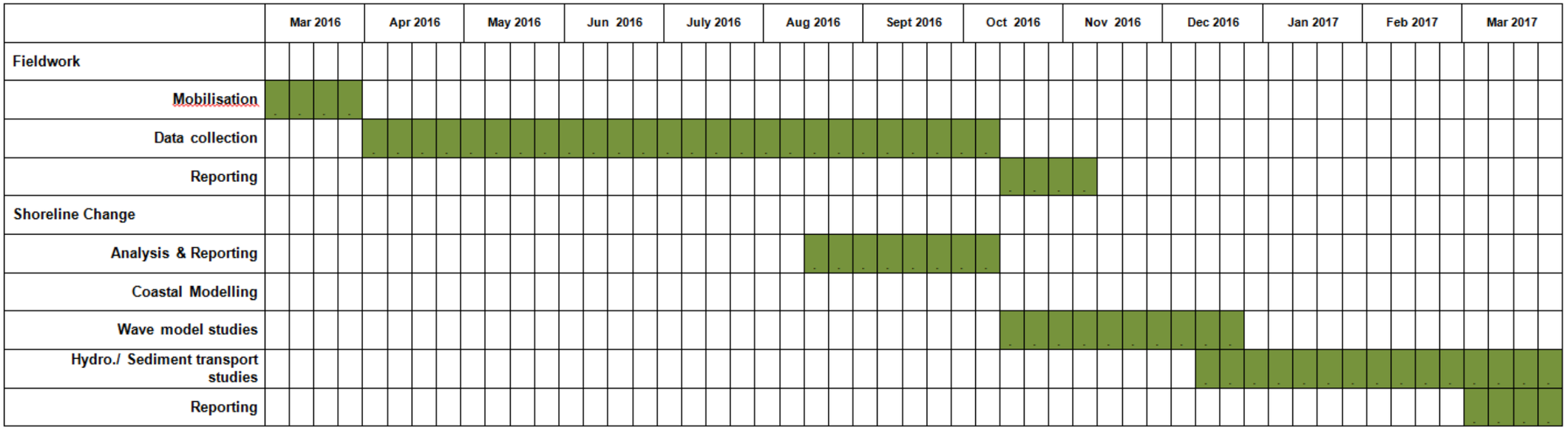
A review of long-term (30+ years, dependent upon data availability) photogrammetry is required to inform the shoreline response since the start of dredging and disposal activities. The long-term photogrammetry would be compared with more recent, detailed trends obtained from available beach profile monitoring undertaken by Gisborne District Council.

4 TIMING AND REPORTING

The consent issue date is 10 August 2015. Annual reporting dates will be no later than 10 August 2016, 2017, 2018, 2019 and then the final report by 10 March 2015, being the required 6 months before the coastal permits actually expire.

However should EPL want to 'preserve' their RMA dredging/disposal 'rights' application for a new permit is required at least 6 months before expiry, which means the final report should be completed by end of 2019..

The timeline below is proposed for this work.


Mar 2016
Apr 2016
May 2016
Jun 2016
July 2016
Aug 2016
Sept 2016
Oct 2016
Nov 2016
Dec 2016
Jan 2017
Feb 2017
Mar 2017
Fieldwork
Mobilisation
Data collection
Reporting
Shoreline Change
Analysis & Reporting
Coastal Modelling
Wave model studies
Hydro./ Sediment transport studies
Reporting

5 REFERENCES

Black, K.P., Gorman, R.G., Stephens, S.A., Beamsley, B.J., Healy,T.R., Bell, R.G., Oldman, J.W., (1997). Numerical modelling for the Port Gisborne Expansion. A report on behalf of Port Gisborne Centre of Excellence in Coastal Oceanography and Marine Geology, incorporating the Coastal Marine Group, Department of Earth Sciences, The University of Waikato and the National Institute of Water and Atmospheric Research, Hamilton, New Zealand, 303 p.

WorleyParsons (2015). Eastland Port Maintenance Dredging and Disposal, Coastal Process Engineering Report. Report to Eastland Port. 301015-03880-CS-REP-0002-0, February 2015.