REVERSE CIRCULATION DRILLING OVERVIEW

Introduction

Trans-Tasman Resources (TTR) uses reverse circulation drilling to obtain sediment samples for analysis including iron grade, grain size, chemistry and the depth of the resource.

TTR has developed two different submersible rigs to obtain sediment samples; a versatile shallow system, fitted with drill strings of 5 – 11 m and a separate deep drilling system with a capacity of up to 42 m.

During the February/March/April 2014 campaign TTR will only use the shallow drill rig with a drill string of up to 11 m. This document provides an overview of that shallow drilling system.

2014 Exploration Methodology

TTR's exploration drilling for iron sands involves shallow reverse circulation drilling, into the sediment to a maximum depth of 11 m. The sediment collected at 1 m intervals, is brought to the surface, bagged and transported onshore for analysis. Drilling targets are identified based on 2D seismic surveys and airborne magnetic surveys TTR has previously undertaken. Drilling is undertaken at 1 km intervals in a grid pattern.

The shallow drill rig is controlled directly from a vessel using an electrically powered hydraulic system. A hydraulic ram is used to control the descent of the drill string (Figure 1) and again to recover the drill rig from the seafloor. The whole process is monitored by two cameras stationed on the rig. This is a single pass drilling system, and is limited to a maximum drilling depth of 11 m.

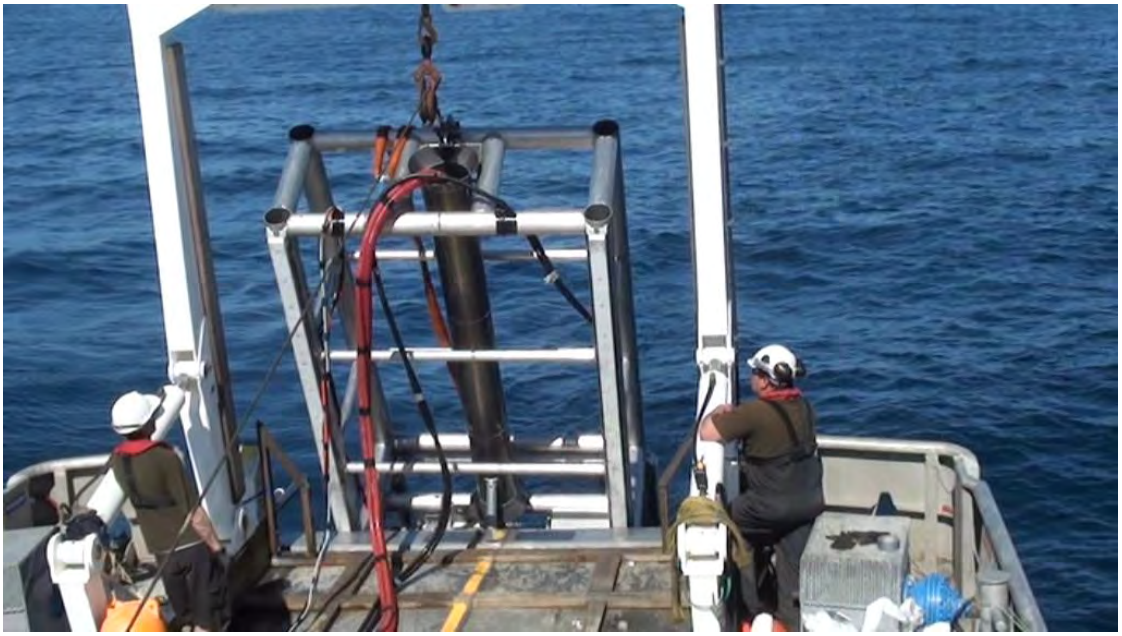

Figure 1 Launch of the drill rig from the vessel

The drill works by using a triple tube system. High pressure water between 160 – 220 psi is pumped down the outer tube, this "jets" out of the end disturbing the sand and creating slurry. High pressure air is pumped down the second tube, creating an air lift for the sand/water mixture, which in turn drags the slurry up the centre tube (Figure 2) and into a cyclone on the deck of the vessel, where it is collected in marked polyweave sacks (Figure 3).

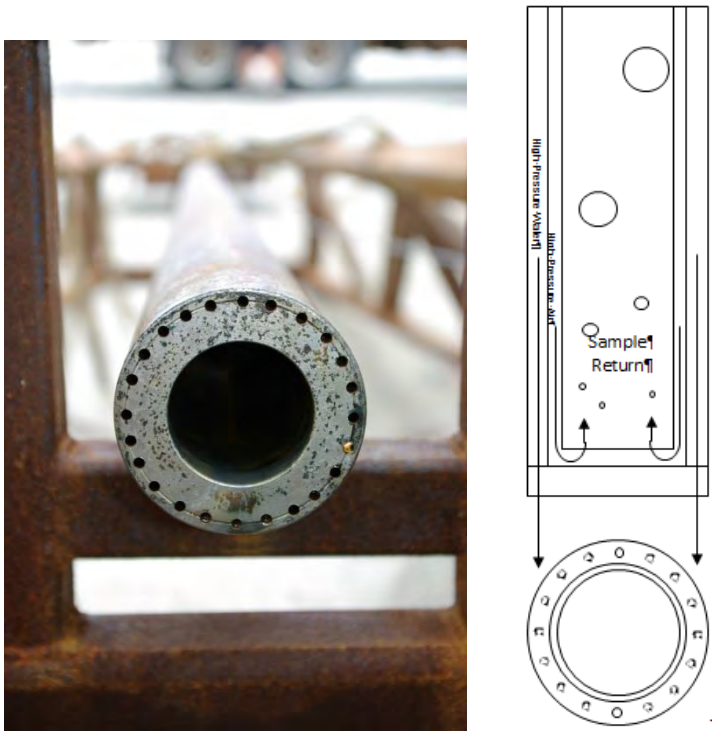

Figure 2 Cross sections of a reserve circulation drilling tube

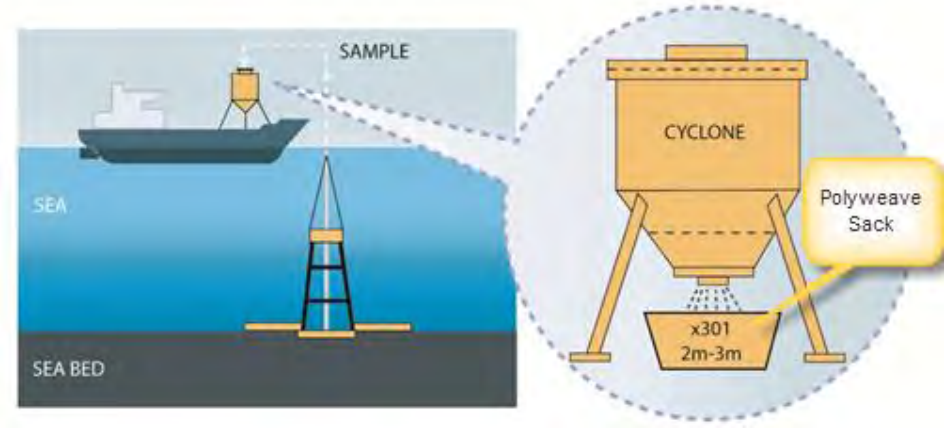

Figure 3 Collection of samples

The process does not involve any chemical discharges or the use of drilling muds. Rather, seawater is used as both a drilling lubricant and as a transport medium for bringing the geological samples to the surface.

Environmental Effects

The physical effects from reverse circulation drilling are minor, leaving a circular indentation of approximately 400 mm in width and a depth of approximately 160 mm (Figure 4) in the seabed. The drill rig has a footprint of 5.3 m^2 and leaves no visible signs of having been on the seafloor.

Figure 4 Photo of the seabed after reverse circulation drilling

With a sample spacing of a 1 km, it is unlikely that the proposed activity will have any significant environmental effects.

A small sediment plume can be created where the water transporting the sediment to the surface for collection is released. This is at the sea surface and, in water generally greater than 15 m depth, by the time it reaches the seabed it is well dispersed and lost in the general background sediment concentration levels. Such plumes are dispersed within 10 min of release.

Very little noise is created during the process and during previous campaigns has not shown to have a detrimental effect on fish, mammals or birds. The proposed area in which the permitted activity will be undertaken consists of highly disturbed shelf environment characterised by rippled sand bedforms, supporting low abundance and limited diversity of benthic flora and fauna as shown the map of benthic habitats (Figure 5).

Benthic studies in the Taranaki Bight do not identify any sensitive environments in the proposed area.[1] NIWA's '*Expert Risk Assessment of Activities in the New Zealand Exclusive Economic Zone and Extended Continental Shelf*'[2] report concluded that the risk to benthic habitats and organisms from obtaining sediment core to better quantify ore concentrations at various depths is likely to be minor and recommended that small scale coring operations should be permitted activity.

[1] http://www.epa.govt.nz/eez/EEZ000004/EEZ000004_Benthic_flora_and_fauna_of_the_Patea_Shoals_region_South_Taranaki_Bight_NIWA_October_2013.pdf

[2] http://www.mfe.govt.nz/publications/oceans/managing-our-oceans/niwa-risk-assessment.pdf

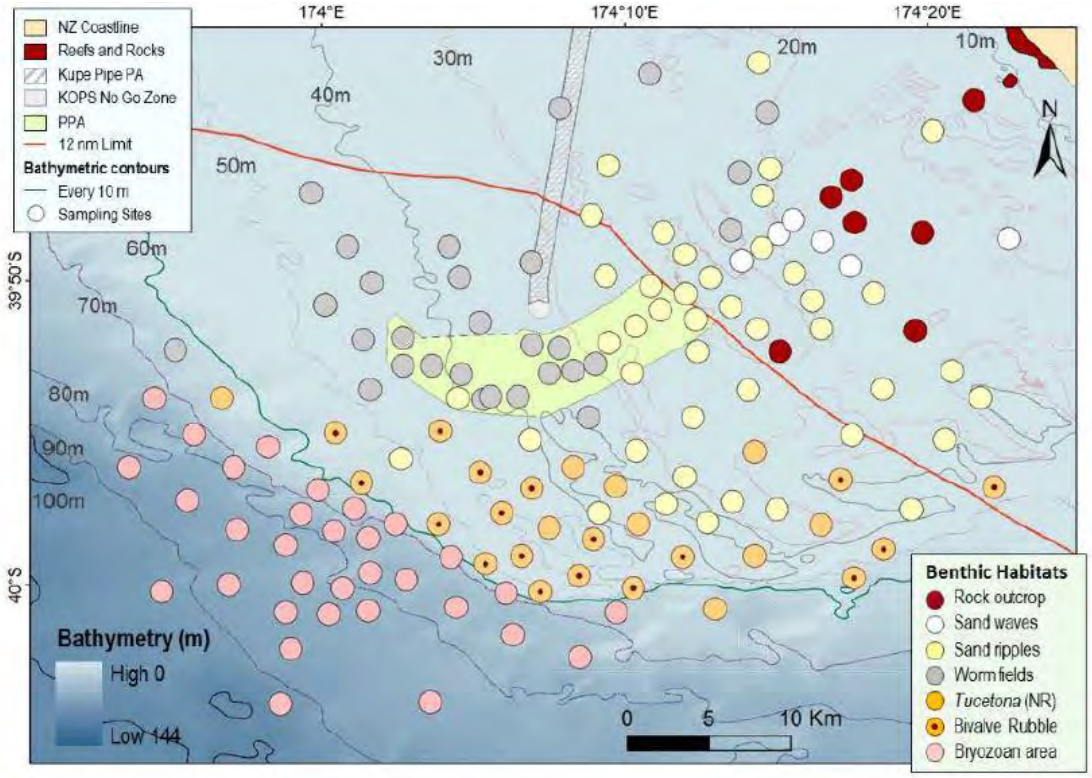

Figure 5 Map of benthic habitats in the South Taranaki Bight[3]

[3] http://www.epa.govt.nz/eez/EEZ000004/EEZ000004_Benthic_flora_and_fauna_of_the_Patea_Shoals_region_South_Taranaki_Bight_NIWA_October_2013.pdf