South Port capital dredging campaign 2020

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Background

The Bluff Harbour entrance is renowned as one of the most challenging port entrance channels in New Zealand. Currently South Port New Zealand Ltd (South Port) is at the limit of its capacity for larger vessels to safely navigate in and out of the harbour. In order to future-proof the port, allow for ongoing shipping services from Bluff, and increase the safety of the shipping vessels, South Port is proposing to increase the depth of the existing Bluff Harbour entrance channel to between 9.45 m and 9.7 m target depths.

The capital dredging operation will involve removing outcrops of rock within the harbour entrance by drilling and blasting, dredging sediment from the berth pockets and swinging basin, and disposing of sediment and rock to sea. Total cut volumes of sediment and rock are estimated to be 120,000 m^3 and 40,000 m^3 respectively.

Sediment dredging methods

The soft sediment dredging will be undertaken using a Trailer Suction Hopper Dredger (TSHD). The TSHD is a self-propelled vessel equipped with one suction pipe, designed to trail along the side of the vessel when on the seabed. At the lower end of the suction pipe, a draghead is attached; suction is provided by an engine-driven dredge pump. The suction created by this pump is sufficient to dislodge and then transport a mixture of seabed materials and water through the draghead and suction pipe. The TSHD unloads by opening the doors that close the hopper. Once opened the contents will drop to the seabed as a result of gravity. During disposal the water is pumped onto the load by means of a sand pump.

It is estimated that the removal of 120,000 m^3 as part of the proposed capital dredging works will take four to six weeks of continuous dredging.

The dredge spoil will be deposited at a disposal site utilised by South Port that is located offshore to the south of Tiwai Peninsula and east of the harbour entrance. This site has been used for the disposal of dredging spoil since 1933 and has been the sole dredge spoil disposal location since 1979.

Figure 1: South Port NZ Ltd and Bluff Harbour entrance (Photo:South Port NZ Ltd).

Drilling and blasting methods

The rocky outcrops present in the Bluff Harbour shipping channel that are proposed to be blasted and removed primarily consist of dense basalt bedrock, overlain by fragmented sections from previous channel deepening and blasting campaigns in the 1980s. The subtidal section of underlying bedrock on the northern (Tiwai) side of the harbour entrance is approximately 350,000 m^2 in extent. This section of bedrock extends from Tiwai Rocks to the commencement of a sandy shore on the northern side of the inner harbour entrance. The rock dredging will be carried out by a specialist backhoe dredging barge fitted with spud piles. The backhoe dredge would first cover the areas to be dredged to remove any material that does not require blasting – doing this will confirm the areas that require drilling and blasting.

It is proposed that the drilling will be undertaken using a hydraulic drill rig mounted on the dredge's excavator arm. The drilling operation is currently proposed to be diverless and therefore would be independent of the tidal currents. Placing the charges and connecting them up to a detonating cord circuit will require diver intervention at slack water, however it is likely that a pneumatic system will be developed and attached to the excavator arm to enable the charges to be placed diverless. It is estimated that 7,000 holes will

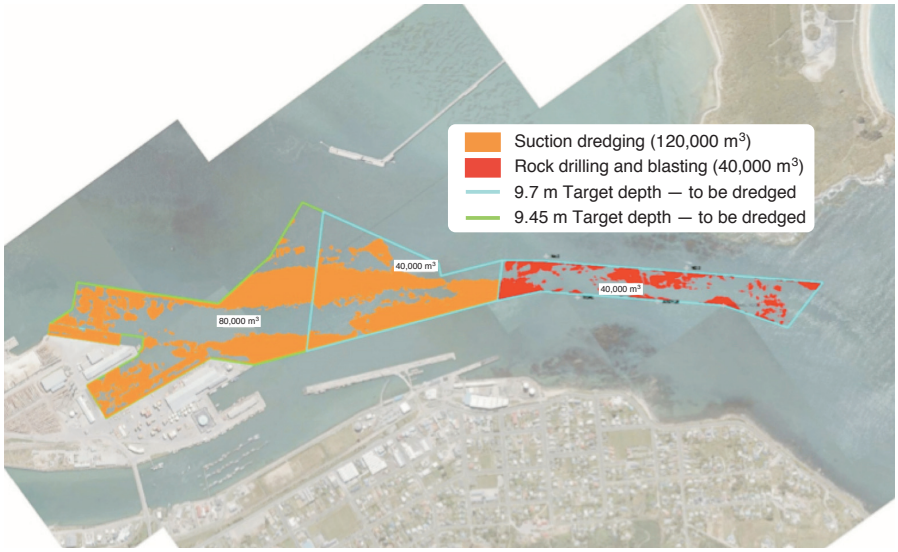

Figure 2: Proposed dredging and blasting locations, Bluff Harbour(South Port NZ Ltd).

be required and approximately 50 holes spaced 2 m apart and drilled to a 2.5 m depth. Diverless blast placement is important in this challenging channel due to swift currents and only a 15 to 20 minute slack tide.

Locating a site for the disposal of the marine rock fragments

Historically, blasted rock fragments from capital dredging operations have been disposed to land and helped build South Ports' Island Harbour rock wall armouring. However, with land storage space at a premium, South Port also wishes to investigate the option of rock disposal to sea. South Ports' current dredge spoil ground is primarily a sandy benthic habitat and is not considered an appropriate habitat to receive marine rock fragments from the blasting. Therefore, a new, more appropriate location was required.

e3Scientific Ltd carried out a marine assessment of effects report that aimed to identify an appropriate area for the rock disposal and to assess the effects of the Capital Dredging Programme on the ecology of the marine area. This was achieved by collating historic data, sediment distribution mapping, a comprehensive desktop assessment, video benthic drags, and epifauna and infauna dive assessments.

Video benthic drags and epifauna and infauna dive assessments – methods

Initial ground-truthing field work was carried out on 14 August 2020. A video sled methodology was utilised as a further precautionary measure, as opposed to a research trawl, to ensure that during ground-truthing the benthic habitat assessed was not adversely impacted.

An underwater video 'sled' with mounted GoPro was deployed and bottom-towed the length and breadth of the two potential sites including a control site located east of the sediment disposal site. A total of nine video tows, varying from 800 m to 100 m in length, were made through the two sites (n = 9). Sled video footage was briefly reviewed onboard and it was discovered that one site exhibited unfavourable characteristics for a rock deposition site while the other site showed favourable thick shell hash habitat. Sled video footage was thoroughly reviewed following the field work and adjustments to the most favourable proposed site were made based on the habitats found.

Following the underwater sled initial ground-truthing, SCUBA diving investigations were carried out on 21 August 2020 to further characterise areas of the favourable site identified via the sled video footage. Four dive transects of approximately 200 m across the width of the site were carried out and a total of four infaunal cores were taken along each dive transect, one core every 65 m interval (n = 16). Dive video footage was thoroughly reviewed, and a generalised habitat map was created based on both the sled and dive video footage and cored substrate.

Video benthic drags and epifauna and infauna dive assessments – results

An appropriate rock disposal site was identified through video benthic drags and video dive epifauna and infauna assessments and lies adjacent to the Tiwai Peninsula. This site has a depth of 13 to 15 metres, is predominantly thick (10 cm) shell hash with little infaunal abundance and diversity, and minimal epifauna. In contrast, a nearby Control Site further to the north, contained a coarse sand habitat containing brachiopod beds, bryozoans, sea tulips and sand dollars. All species identified were sessile ranging from sensitive (brachiopods) to resilient (sea tulips), indicating the habitat at this site is favourable for a wide range of species and provides for habitat complexity. Wave action calculations found the proposed rock fragment sizes would not be mobilised at this site and would provide a stable rocky reef habitat. Therefore, it was considered that the identified site is an appropriate location for the deposition of marine rock fragments to the seabed.

Sediment distribution mapping illustrated that the risk of sedimentation effects on nearby high value environments such as the Awarua Bay Ramsar site and the Motupōhue mātaitai is low, providing appropriate mitigation measures are implemented and turbidity monitoring is carried out.

The site to be blasted is a highly modified environment from previous blasting works, however it has since been recolonised to create a productive and diverse rocky reef habitat. Therefore, despite this habitat again being highly disturbed, it is likely that this site will recolonise to a similar extent over time and the subsequent deposition of the rock spoil to the seabed is expected to create a productive rocky reef habitat in a highly disturbed area with a low level of biodiversity.

A number of high value marine species such as white sharks, numerous seabirds, and marine mammals frequent this area therefore substantial avoidance and mitigation options are being adopted by South Port, who aim to carry out this capital dredging programme in order to future-proof the port operations and do so with minimal impacts on the surrounding natural marine environment.

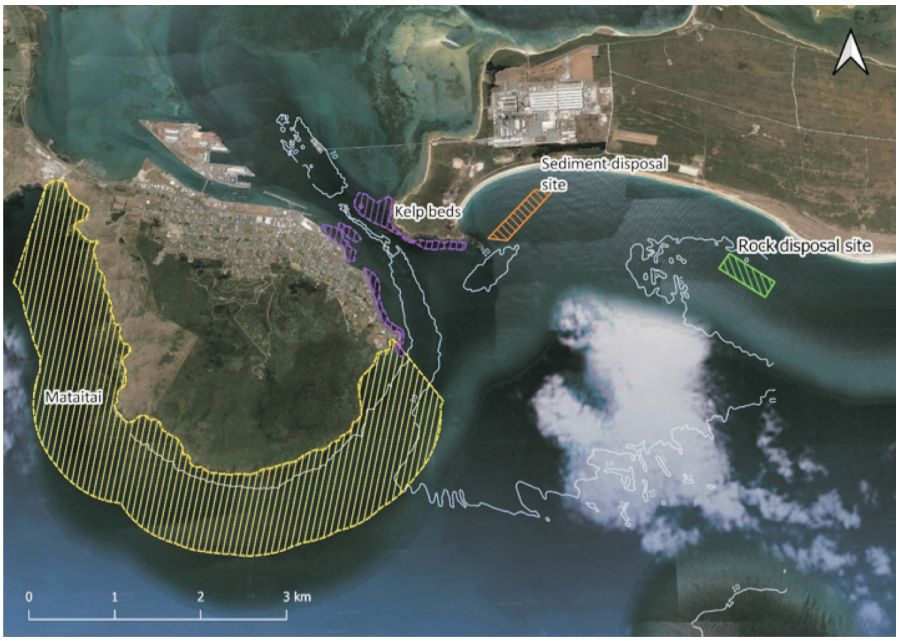

Figure 3: Locations of the finalised proposed rock disposal site, nearby sediment disposal site at Tiwai Peninsula, Motupōhue mātaitai, and South Port NZ Ltd (e3Scientific Ltd).