

Solwara 1 mitigation strategies

The operational mitigation strategies described below are aimed at reducing our impact on the marine environment. These strategies have been developed in consultation with an international team of marine science experts. The objectives of these mitigation strategies are to protect biodiversity and maintain nearby communities of animals to enhance the rate of post production recovery. The proposed mitigation strategies are as follows:

Seafloor

1. Reference area at South Su:

South Su, located about 2 kilometres up current from Solwara 1, is proposed to remain as a reference area until the completion of production operations and confirmation that the rehabilitation techniques are effective at Solwara 1. It is expected to provide a source of recruitment to excavated areas and provide a reference location to monitor natural variation in vent activity and communities over time.

Biological comparisons of the two areas have shown that the samples taken from the active sites at both Solwara 1 and South Su share the same biomass-dominant species and generally similar indices of diversity and community structures. Where there are significant differences, South Su generally has higher abundances of secondary species and higher dominance of some groups. Some recruitment may also come from North Su (active subsea volcano), where extraction is not currently planned. However, because of the continuous active conditions and sediment-occluded visibility at North Su at the times of survey, it has not been possible to characterise its vent communities to the same extent as at Solwara 1 and South Su.

2. Limitation of plume area

The mine design and production methodology has been used to complete detailed hydrodynamic modelling of the plume that is likely to be generated by the seafloor mining tools. This modelling indicates that the major impacts associated with the plume (that is, significantly increased sedimentation rates) will be restricted to the mining area. Sedimentation above background rates will continue outside of the mining area, and studies planned for 2015 will confirm the extent of this impact in relation to the natural variation in sedimentation rates caused by the adjacent North Su volcano. The hydrodynamic modelling also allows Nautilus to fix a boundary of impacts, outside of which it commits to have no impact on water quality, which will be monitored in real time under the EMMP and reported to the Conservation and Environment Protection Authority. In addition, the modelling confirms that the South Su reference area will not be impacted by mine derived plumes.

3. Temporary refuge areas with Solwara 1:

Not all of the resources can be extracted simultaneously. Some of the areas which will be excavated at later stages of the mine plan may function as temporary refuge sites for fauna that may assist with early recolonisation. Detailed hydrodynamic modelling was completed in 2014 to identify potential refuge locations at different stages of the mine plan.

Progress against criteria will be examined through monitoring to determine if the major community elements (i.e. the three biomass-dominant species) have re-established at active chimneys in the earliest mined area.

4. Transplant of animals:

The loss of animals in the path of the Seafloor Production Tools can be minimised. Where feasible, an ROV will be used to remove large clumps of rock substrates with biology intact and relocated them to appropriate areas within Solwara 1 that have been excavated, or to temporary refuge areas. These clumps will be targeted to maximise the biomass-dominant species and any other associated attached or sessile fauna. Monitoring will be undertaken to confirm the successful of this strategy.

5. Artificial substrates:

Hard substrate animals (e.g. coral) and their associated fauna in inactive areas away from the vent ecosystems are expected to recover more slowly (compared with animals located in active vent areas). The same mitigation strategies employed for vent fauna will also be employed for hard substrate fauna where it is feasible to do so. Where feasible, animals will also be removed from the path of operations and repositioned in structures such as crates, where they might reform attached colonies. The survival and growth of such transplants will be monitored, with continued relocation if successful.

6. Dewatering discharge:

- Return water (water generated as part of the ore dewatering process) will be filtered to 8 microns prior to return to the seafloor. This is expected to significantly reduce the quantities of sediment lost in the dewater discharge.
- Discharging of filtered return water will occur at depths between 25 to 50 metres above the seafloor to confine all impacts to the bottom zones from where the water/sediment originated. Hydrodynamic modelling investigated the most appropriate direction for discharge in order to minimise the resultant plume, and this directional discharge will be implemented at all times.
- The exposure time of the return water to surface temperatures and oxygenation will be limited, thereby reducing potential for geochemical changes. The pipes used to transport the return water to the seafloor will allow for cooling to minimise the temperature differential between the return water and the water on the seafloor.

Mid-Ocean and Surface

As a result of the closed ore transfer system between the seafloor and the Production Support Vessel, and the return of dewatered ore to the seafloor, there are limited impacts in the mid-ocean and surface areas. Mitigation strategies include:

- Compliance with the International Convention for the Prevention of Pollution From Ships (MARPOL) and a commitment to limit surface water discharges to treated sewage (in compliance with MARPOL treatment limits);
- Limiting launch and recovery of seafloor production tools when there are whales or large cetaceans in the vicinity, including the use of observers to determine the presence of these species during such operations;

- Directional lighting on the Production Support Vessel, and the restriction of engagement of lighting on seafloor production tools until the tools reach the vicinity of the seafloor, to ensure marine animals such as tuna are not attracted by artificial light in the surface and mid-water column;
- Speed limits for support barges to minimise the risk of collisions with whales, turtles and other marine mammals;
- Implementation of a detailed emergency response and spill management plan to minimise the impact of any spills from the Production Support Vessel.

Published literature on turtle migratory pathways indicates there are no major routes between New Ireland and New Britain. Although it is expected that most species may migrate between these islands, the operations present no threat or obstacle to normal migration that would be materially different from normal shipping and commercial fishing activities.

The result of these strategies is that the Solwara 1 Project will cause no harm to fisheries, coral reefs, whales, turtles or other pelagic animals.

Noise

Noise from ship thrusters will be audible underwater for several hundreds of kilometres, as is the case for most large ships and other man-made and natural sources. However, noise at levels that may cause harm is limited to within tens of metres of the Production Support Vessel. Some behavioural avoidance and attraction (by some proportion of whales) is likely to happen within 15 kilometres of the vessel, but once established, familiarization with this new 'landmark' is likely to occur. The annual humpback whale migrations have continued off the east and west coasts of Australia notwithstanding the extensive shipping and oil and gas activities.

Further noise modelling of surface and seafloor noise is planned for 2015, in order to determine the impact of natural noisy features (such as the North Su volcano), and mitigation strategies required (if any) on the seafloor.