







## **ENVIRONMENTAL IMPACT STATEMENT**

Nautilus Minerals Niugini Limited

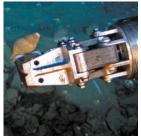
## **Solwara 1 Project**

Volume A **Main Report** 

**Figures and Plates** 

September 2008 CR 7008\_9\_v4













# ENVIRONMENTAL IMPACT STATEMENT

Solwara 1 Project

**VOLUME A: MAIN REPORT** 

**FIGURES AND PLATES** 

CR 7008\_09\_v4 September 2008



Project director	David Gwyther	David Gwyther		
Project manager	Michael Wright			
Version:	Details:	Approved:		
CR 7008_09_v1	Initial draft to client	July 2008		
CR 7008_09_v2	Second draft to client	August 2008		
CR 7008_09_v3	Third draft to client	September 2008		
CR 7008_09_v4	Final for exhibition	September 2008		

#### Environmental Impact Statement Solwara 1 Project

#### CONTENTS

- 1.1 Project location
- 1.2 Solwara 1 Project areas
- 1.3 Project area: Barge corridor, crew transfer route and Port of Rabaul
- 3.1 EIA process under PNG Environment Act 2000
- 4.1 Areas visited as part of the Project's stakeholder consultation program
- 5.1 Proposed Mining Lease Boundary
- 5.2 General arrangement of offshore Project activities
- 5.3 Port of Rabaul proposed Project infrastructure
- 5.4 Mineralised zone at Solwara 1
- 5.5 Solwara 1 proposed mining area
- 5.6 Seafloor Mining Tool with drum cutter
- 5.7 Seafloor Mining Tool cutting
- 5.8 Riser and Lift System
- 5.9 Mining Support Vessel
- 5.10 Proposed Solwara 1 mining area pre and post mining
- 5.11 Unconsolidated sediment at Solwara 1
- 5.12 Schematic of the ore dewatering process Part A
- 5.13 Schematic of the ore dewatering process Part B
- 6.1 Solwara 1 development schedule
- 7.1 Simplified plate configuration of the Papua New Guinea region
- 7.2 Distribution of earthquake epicentres and active volcanoes (1900 2008)
- 7.3 Seismic hazard zones in PNG
- 7.4 Rabaul Caldera
- 7.5 Global hydrothermal vents
- 7.6 Back-arc basin formation
- 7.7 Formation of chimneys and seafloor massive sulphide mounds
- 7.8 Wind roses for the Bismarck Sea
- 7.9 Plume of ash and steam from Tavurvur Volcano, 29 May 2008
- 7.10 Regional currents
- 7.11 Oceanographic profiles of temperature and salinity from 83 casts within 65 km of Solwara 1 in the Bismarck Sea 1985 2005
- 7.12 Current meter and sediment trap deployment locations
- 7.13 Progressive vector diagram of net horizontal water movement over 12 months at Solwara 1
- 7.14 Naturally occurring particulate plumes in the vicinity of Solwara 1
- 7.15 Current roses for water 6 m above Solwara 1 mound

#### Environmental Impact Statement Solwara 1 Project

- 7.16 Regional setting and geology of the eastern Manus back-arc basin
- 7.17 Solwara 1 proposed mining area, locations of sediment cores and profile lines, photographs and composition of sediment cores
- 7.18 Images of faecal pellets in volcaniclastic sediments of Solwara 1
- 7.19 Distribution of Cu in sediments of Solwara 1 in profiles I, II, III (A) and surface sediments (B)
- 7.20 Depth zones
- 7.21 Trophic webs and vertical migration of organisms in the water column
- 7.22 Zones of mineralisation and locations of artive vents observed in 2006, 2007 and 2008
- 7.23 Solwara 1 dead snail patches
- 7.24 Sediment sample sites on the abyssal plain west of Solwara 1
- 7.25 Port of Rabaul water sampling locations
- 7.26 Measurement of SO<sub>2</sub> concentrations using satellite spectrometers after an eruption of Tavurvur Volcano on 7 October 2006
- 8.1 Tuna fishing efforts within the PNG Exclusive Economic Zone
- 9.1 Popability of return water plume exceeding ANZECC/ARMCANZ (2000) suspended solids target at Solwara 1
- 9.2 Dipositional footprint from unconsolidated sediment disposal and compotent waste material side casting, post-mining at Solwara 1
- 9.3 Sources of potentail impact from offshore mining processes
- 13.1 Nautilus management structure

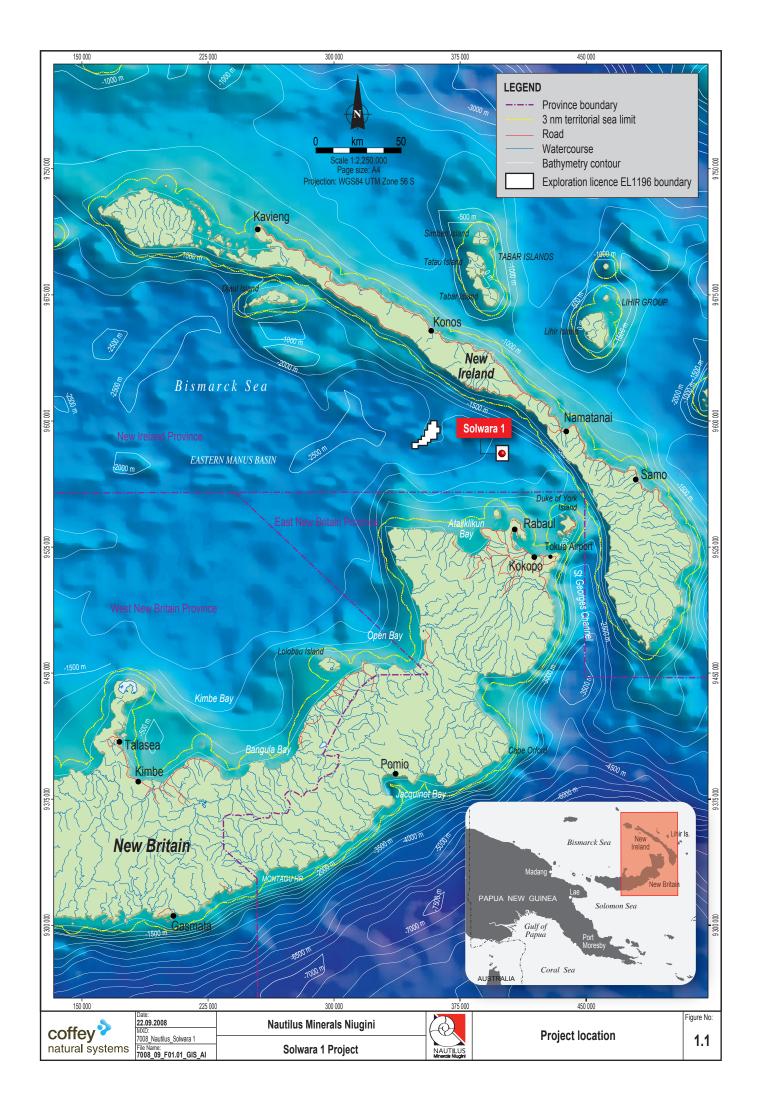
#### **Plates**

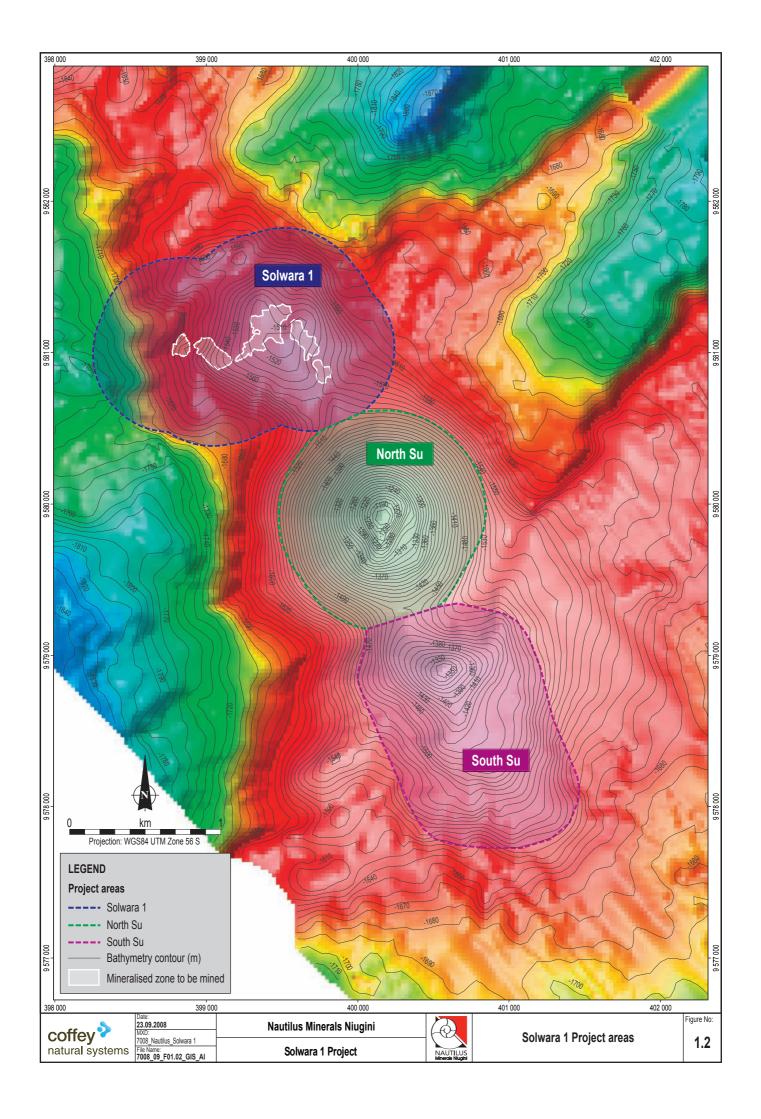
- 5.1 Tug boat
- 5.2 Shuttle barge
- 5.3 Mobile stacker
- 5.4 Stockpile storage area
- 5.5 Mobile ship loader
- 7.1 Eruption of Tavurvur Volcano, Rabaul, 25 February 2008
- 7.2 Eruption of Tavurvur Volcano, Rabaul, 12 March 2008. Port of Rabaul is located in the middle foreground
- 7.3 Formation of chimney lattice in Solwara 1 West Zone:
  - A. Formation of 58 cm of new chimney lattice over 12 months following the removal of the top part of an existing chimney
  - B. Formation of 60 cm of new chimney lattice over two days from the top of a drill hole
- 7.4 75 kHz ADCP current meter and flotation collar
- 7.5 300 kHz ADCP current meter deployed by ROV on the Solwara 1 mound
- 7.6 Skipjack tuna at Solwara 1 at 172 m water depth
- 7.7 Squid at 16 m water depth
- 7.8 Venting chimney at Solwara 1
- 7.9 Outcrop of dacite

#### Environmental Impact Statement Solwara 1 Project

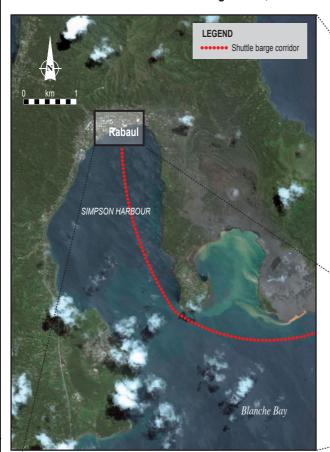
- 7.10 Dead snails
- 7.11 Dead snails
- 7.12 Actively venting chimney with high biomass
- 7.13 Actively venting chimney with low biomass
- 7.14 Chimney actively venting clear hot fluid
- 7.15 Chimney actively venting plumes of sediment
- 7.16 Active (venting) sites at both Solwara 1 and South Su were dominated by three habitat zones defined by their biomass-dominant species:

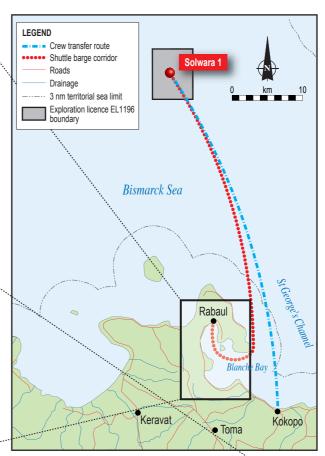
  Habitat A closest to the vent: *Alviniconcha sp.* (Hairy Snails), Habitat B middle zone: *Ifremeria nautilei* (Black Snails) and Habitat C outer zone: *Eochionelasmus ohtai* (Barnacles).
- 7.17 Deep-sea mussel (Bathymodiolus manusensis) at South Su
- 7.18 Vestimentiferan tube worm (Arcovestia ivanovi) at South Su
- 7.19 Bamboo coral (Keratoisis sp.)
- 7.20 Stalked barnacles (Vulcanolepas parensis)
- 7.21 Hydroids
- 7.22 Carnivorous sponges (Abyssocladia sp.)
- 7.23 Push-core being used from ROV arm
- 7.24 Sediment samples taken on the abyssal plain 10 km west of Solwara 1 using multicorer
- 7.25 Ash plume from Tavurvur Volcano over Rabaul, 26 October 2006
- 7.26 Fishing boats at Port of Rabaul
- 7.27 Passenger boats at Port of Rabaul
- 7.28 Container ship at Berth 2 Port of Rabaul
- 7.29 Berth 2 and Shed 10
- 7.30 Berth 1 and Shed 1
- 9.1 Probability of return water plume exceeding ANZECC/ARMCANZ (2000) suspended solids target at Solwara 1
- 9.2 Depositional footprint from unconsolidated sediment disposal and competent waste material side casting, post mining at Solwara 1
- 9.3 Sources of potential impact from offshore mining operations
- 11.1 Ash accumulation on the road in front of Rabaul Hotel, 29 December 2006
- 11.2 Overnight ash accumulation on a vehicle at Rabaul Hotel, 27 October 2006





### Shuttle barge route, bulk carrier corridor and crew transfer route





### Proposed temporary storage facilities at Port of Rabaul







Nautilus Minerals Niugini

Solwara 1 Project



Project area: Barge corridor, crew transfer route and Port of Rabaul

No Figures or Plates for this Chapter

