

Nautilus Minerals - Early Results from the Effort to Commercialize Seafloor Massive Sulphides

Jamaica - March 2011

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#### **Nautilus Mission**



 To create sustainable value for stakeholders through the discovery and development of mineral resources on the ocean floor











#### Nautilus Key Corporate Facts



#### Company

- US\$165 million in cash (as of Dec 31, 2010)
- World class partners and investors





Gazmetall

#### Focus on Seafloor Massive Sulphides

- >500,000 km<sup>2</sup> exploration tenements western Pacific (as of Sept 30,2010)
- Large known mineral belts
- High-grade copper, gold, silver and zinc
- High discovery rates 35 systems to date

#### Near Term Production from Solwara 1, Bismarck Sea, PNG

- Target production 30 month project build from board sanction
- Engineering well advanced (24 months work)
- Located in PNG with established regulatory regime
- Approx 1.5 million t/year yielding 80,000-100,000te Cu and approx 150,000 – 200,000oz gold

#### Talk Outline



- 1 Why go to the sea?
- **2** What are SMS systems?
- **3** The business case
- 4 The challenges
- 5 How are we going to do it
- 6 Obtaining AND maintaining a license to operate

#### The Challenge for the Mining Industry





www.blog.lessrain.com/open-pit-mine-in-russia

- Quality of resource grades are dropping
- Most belts are maturing
- Rate of discovery is dropping
- Average discovery costs are rising
- Quality acreage is very hard to find

#### Why Go to the Sea?







- World's demand for metals continues to rise
- Every human activity impacts on the environment
- Land resources are stretched
- The seafloor hosts significant resources of minerals.

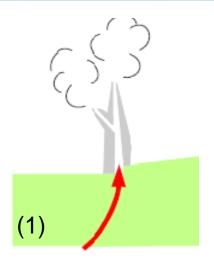
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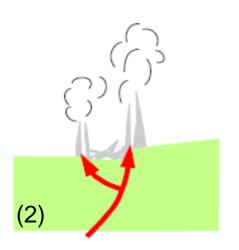


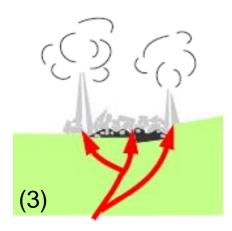
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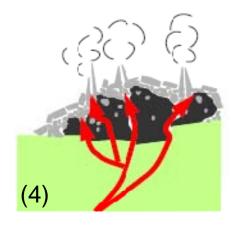
# Seafloor Massive Sulphides (SMS)



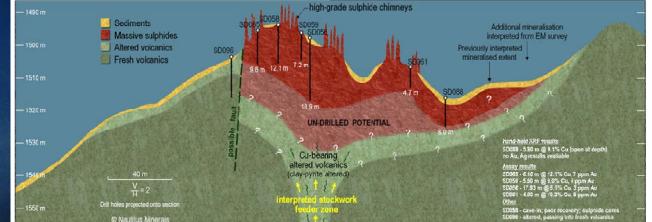








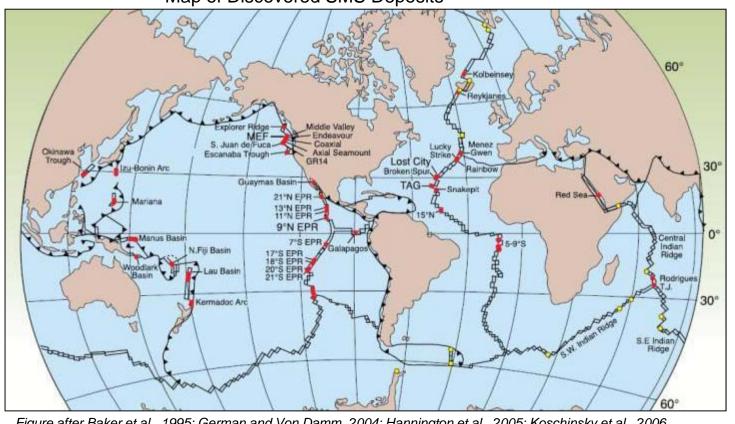




#### Known Seafloor Massive Sulphides (SMS)



#### Map of Discovered SMS Deposits



- Known SMS sites
- Areas of activity as indicated by mid-water chemical anomalies

Figure after Baker et al., 1995; German and Von Damm, 2004; Hannington et al., 2005; Koschinsky et al., 2006

- Estimated potential 3,000 4,000 sites worldwide (Dr Steve Scott, 2008)
- Land fossil record indicates typical size of 2 Mte commercially viable material

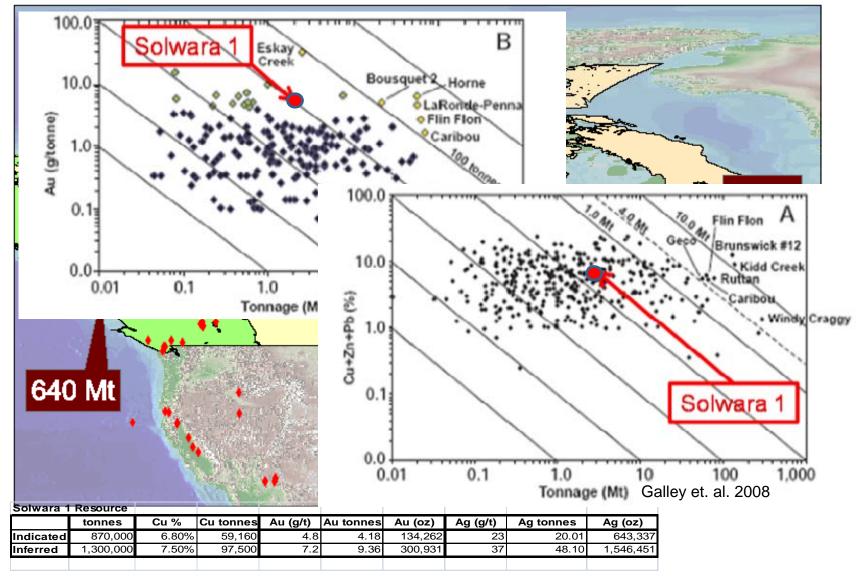
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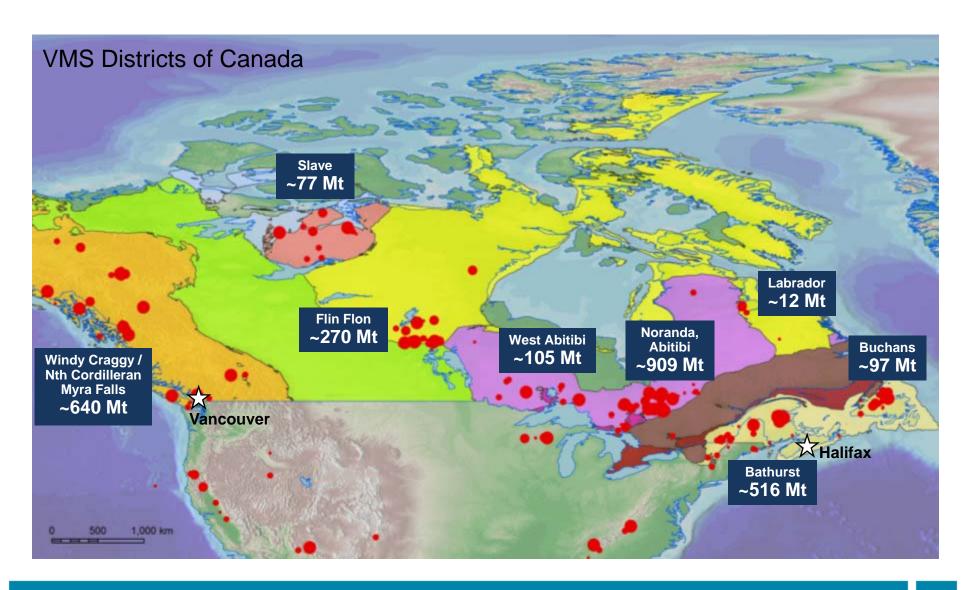
#### Canadian VMS Deposits -Tonnes Versus Grade





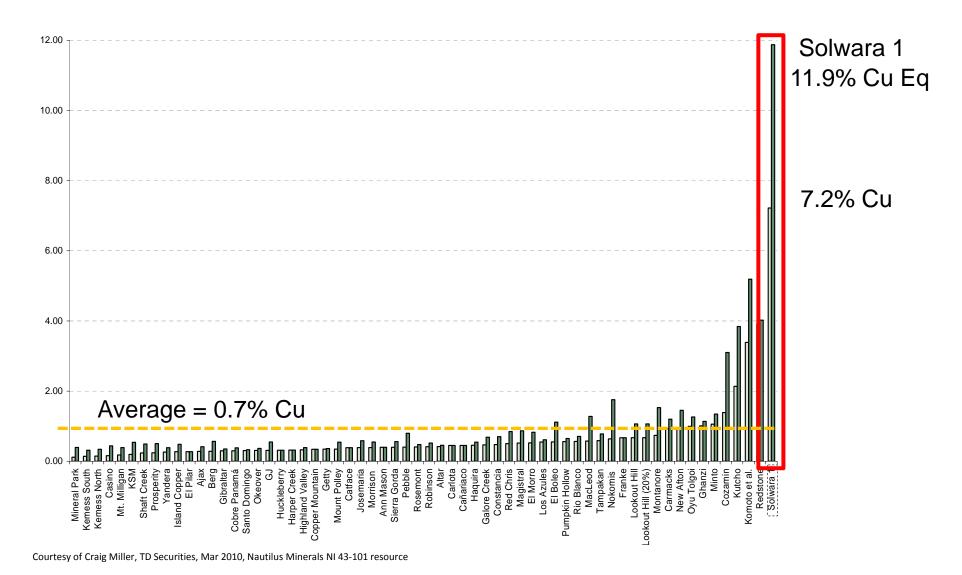
#### VMS deposits – occur in "camps"





## Solwara 1 – High Grade Deposit

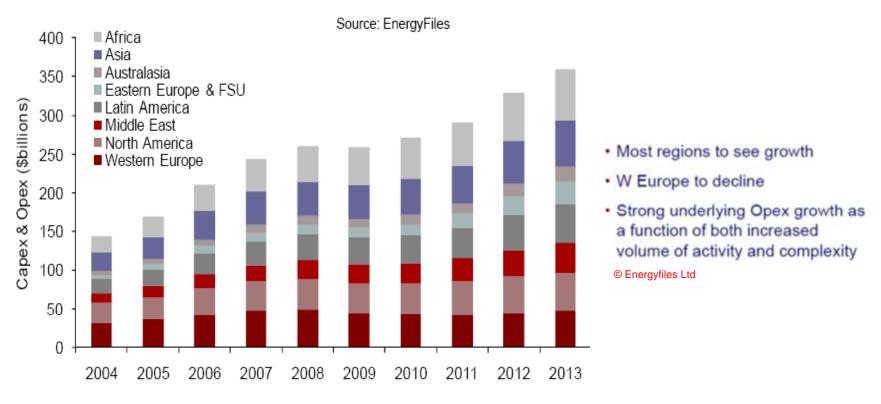




New Vision • New World • New Resources

## Offshore Oil & Gas Production & Spend to Grow





Source Douglas Westwood - Global FPS Prospects - World FPS Congress 2009, London

- Main growth area within the upstream offshore oil and gas division are:
  - Deepwater (greater than 500m) due to shallow water decline
  - Floating production mainly deep water
  - Subsea production both deepwater and many shallow-water tiebacks
  - Maintenance, modifications and operations to existing fields.

#### Small Environmental and Social Footprint





Minimal infrastructure

Limited social disturbance



Minimal overburden or stripping



Increased worker safety



Minimal waste



**Environmental Permit Granted from Papua New Guinea Authorities December 2009** 

# Single Offshore SMS Vessel: Significant Amounts of Copper and Gold



#### **Illustrative Single SMS Mining Vessel Potential**

Element	Illustrative Value*	
Annual Production	1.5 million tons ore	
Assumed Copper / Gold Recovery**	90% / 80%	
Annual Copper Production	95,000 t/y Cu	
Annual Gold Production	220,000 Oz/yr	
Annual Copper Revenue @ \$1.80/lb - \$3.00/lb	\$320 – \$540 million	
Annual Gold Revenue @ \$700 - \$1000 / Oz	\$180 – \$250 million	
Annual Total Revenue	\$500 - \$790 million \$330 - \$530 per ton ore	

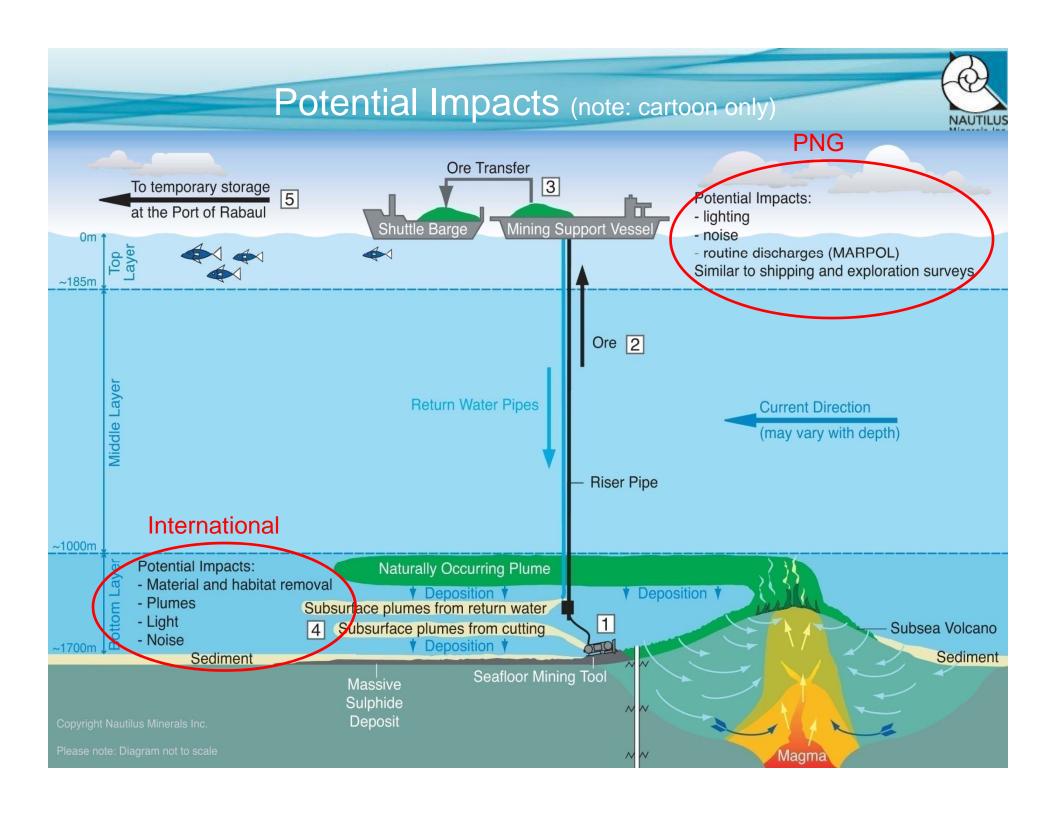
<sup>\*</sup> Values are for illustration of the potential of seafloor mining equipment and are not necessarily representative of the Solwara 1 project

<sup>\*\*</sup> Copper and gold recovery are assumed here for illustrative purposes. Solwara 1 recoveries will depend on the treatment.

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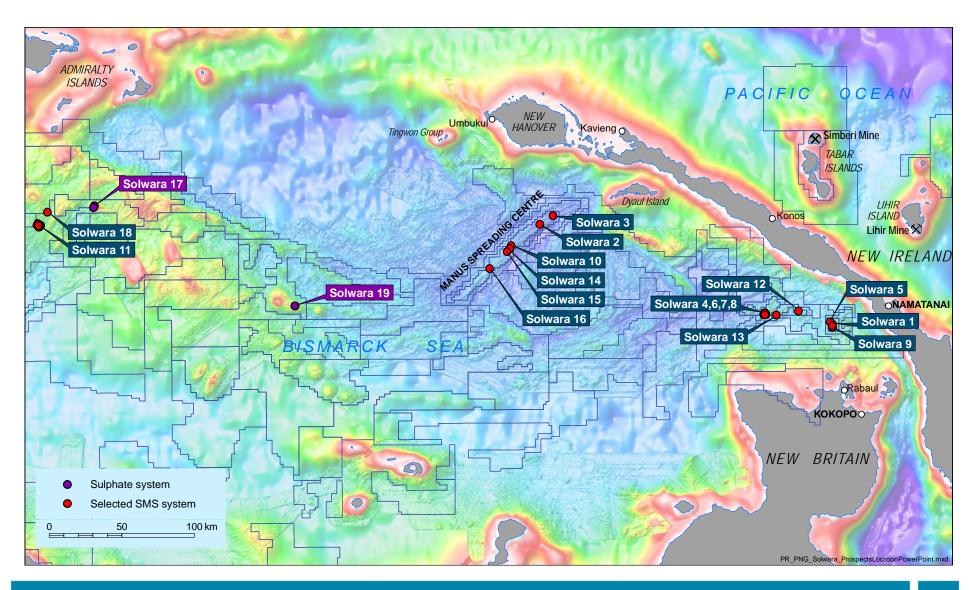
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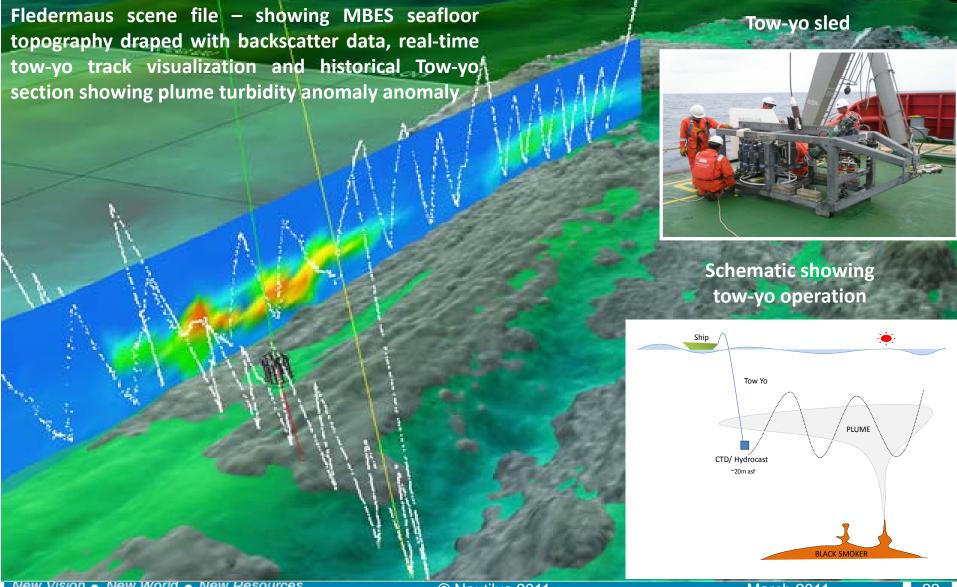
# Bismarck Sea, Papua New Guinea





# Project/Target Generation: Tow-yo





# Bismarck Sea High Grade Pipeline



Prospects	Cu % *	Zn %*	Au g/t*	Ag g/t*	Grab Sample Count
Solwara 2	1.1	24.2	10.8	345	67
Solwara 3	0.5	11.0	30.6	3375	2
Solwara 4 (+8)	11.1	23.0	14.9	259	54
Solwara 5	6.0	8.3	14.6	282	12
Solwara 6	11.7	18.4	16.1	203	7
Solwara 7	5.1	21.5	15.0	359	8
Solwara 9	6.3	10.6	19.9	296	17
Solwara 10	7.7	15.2	2.5	165	12
Solwara 11	1.6	16.9	1.2	180	26
Solwara 12	7.0	22.6	13.7	425	10
Solwara 13	9.1	30.7	4.7	546	7
Solwara 14	1.4	19.2	3.3	97	14
Solwara 16	2.1	18.6	2.8	105	6
Solwara 18	0.3	19.6	0.2	110	2

Figures current as of March 2010

Solwara 15 not sampled. Solwara 17 and 19 are sulphate systems and only weakly mineralised at surface. All three systems require additional evaluation to assess their true potential.

<sup>\*</sup> Note -mean values of surface grab samples

# 2010/2011 Drilling Campaign



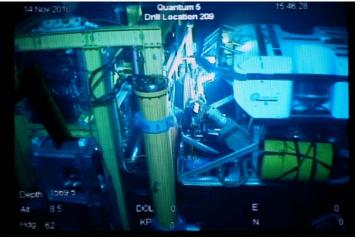








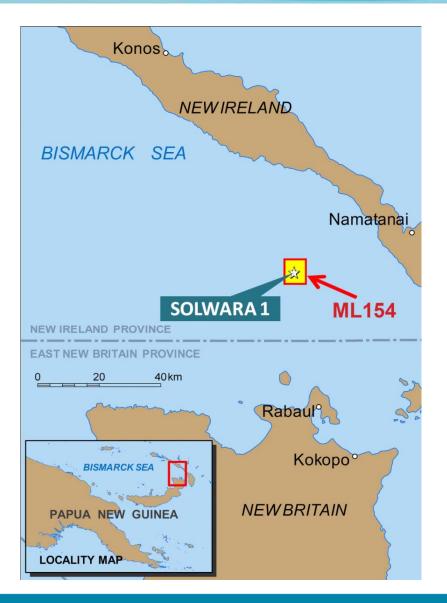




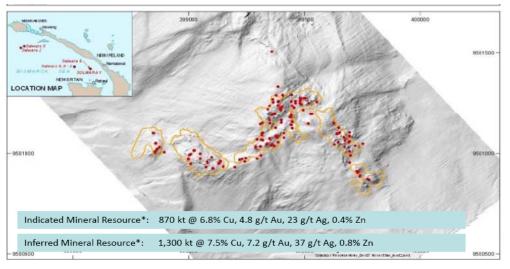


#### Solwara 1 Project



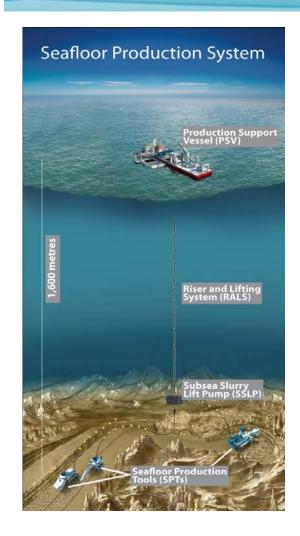


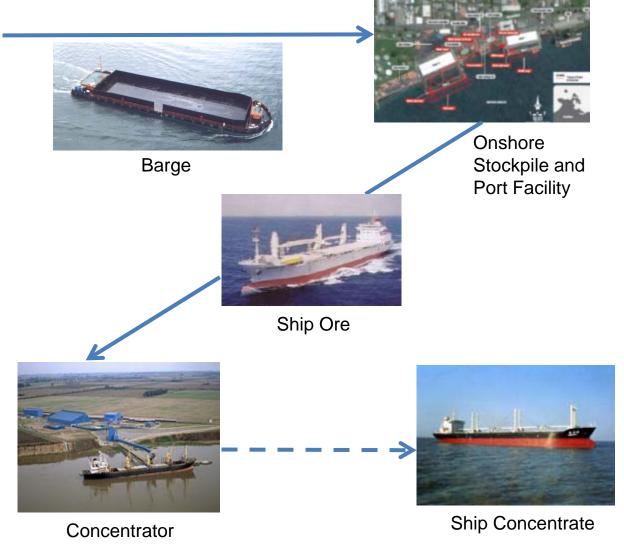
- Located in the Bismarck Sea, PNG, at 1600m water depth
- 43-101 Resource: 1300 kt Inferred. 870kt Indicated\*
- Environmental permit granted Dec 2009
- Mining lease granted Jan 2011
- Production plan 1.3 million t/year containing 80,000 tonnes Cu and approx 150,000 – 200,000oz gold



# Plan Overview



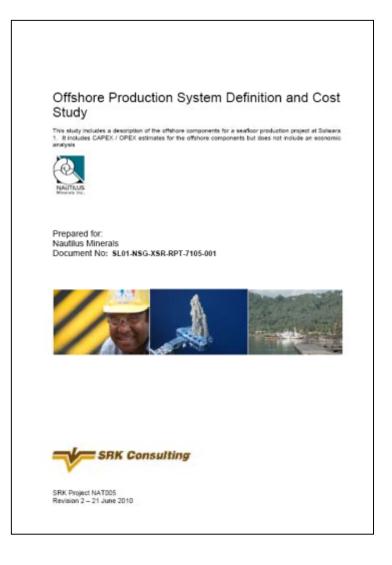




#### **Definition and Cost Study**



- Competitive operating cost and low capital cost
  - ➤ US\$70 per tonne offshore production cost (to Port of Rabaul with 10% contingency)
  - ➤ US\$383 million CAPEX (for offshore equipment with 17.5% contingency)
- 30 month build schedule
  - SMD contract suspension released April 2010
  - Variation Order issued for revised seafloor tool configuration June 2010



#### Seafloor Production Tools (SPTs)



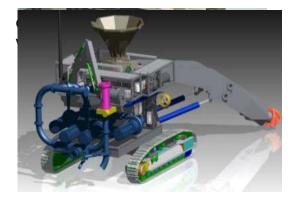
- Soil Machine Dynamics (UK) contract to design and build
  - Experts in deep sea ROV and trenching machine design
  - US\$84 million contract for three specialised machines
  - Includes control systems and associated umbilicals, handling, and deck equipment
- Engineering has been underway for over two years



Auxiliary Cutter— cuts ore on uneven surfaces; benching the site



**Bulk Cutter**– cuts ore at high rates on areas benched by Auxiliary Cutterr



**Collecting Machine** – creates slurry of ore with seawater and transfers to RALS

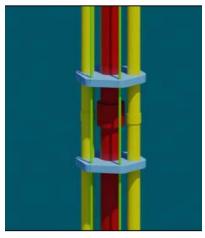
# Riser and Lifting System (RALS)



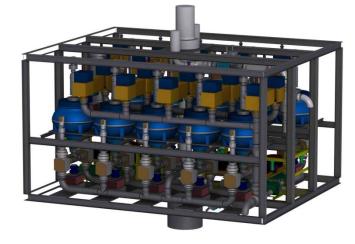
- Awarded a US\$116 million target price EPCM contract to Technip USA in 2008
  - World leaders in their field
  - Ready for procurement
- Riser pipe handling equipment off the shelf
- Riser pipe design includes straking and a flexible joint at the vessel interface
- Pump by GE Hydril



Derrick and Draw Works (riser handling equipment)



Streaked and Unstraked Riser Pipes (avoids current induced vibrations)



GE Hydril Slurry Lift Pump Image courtesy of GE Hydril Inc

#### Production Support Vessel (PSV)

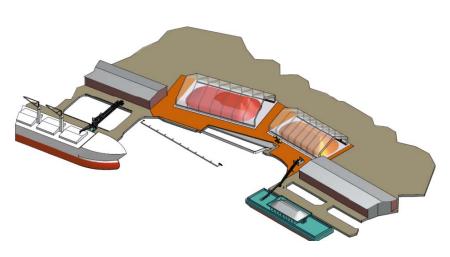


- Platform to support production operations
- DP vessel class 2
- Large deck space
- 28 MW power
- 140 personnel accommodation
- Typical of large offshore construction vessel



#### Port and Materials Handling

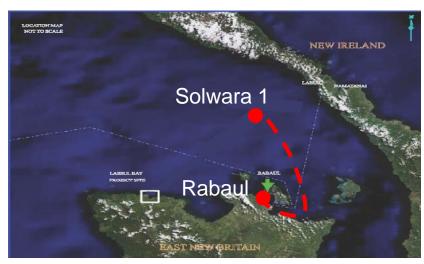




Draft engineering layout for ore storage, loading and unloading



Rabaul; deepwater, protected active port facility



Solwara 1 to Rabaul barging route - 40km

- Barges transport ore to Rabaul
  - Chartered or purchased TBD
- Unloading, stockpile and export loading
  - Covered stockpile and material handling equipment
- Agreement in place with PNG Port Authority
- Improvements to existing berths

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#### **Permitting Status**



- Environmental Impact Statement (EIS)
  - Submitted Q3 2008
  - PNG Govt. independent review by Australian consultant
  - Statutory public consultation completed
- Environmental Permit
  - Granted December 2009
- Mining Lease (ML)
  - Submitted in Q3 2008
  - Wardens Hearing completed Q2 2009
  - Granted January 2011
- Community Engagement
  - Village roadshows
  - Town hall meetings
  - Key stakeholder workshops





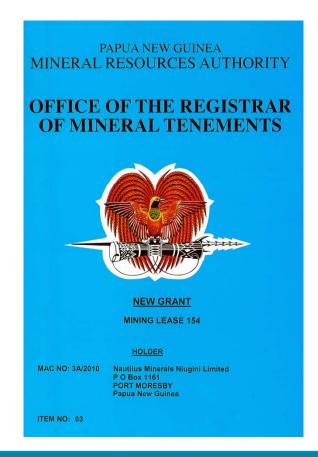
#### **Granted Permits**

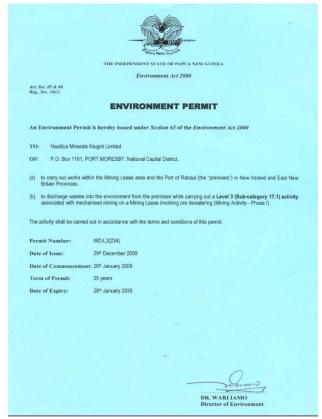


#### Governed by 2 Principle Acts:

➤ ML: Mining Act 1992

> EP: Environment Act 2000





#### Community Awareness - ongoing



# SOLWARA 1 PAPUA NEW GUINEA PROJECT COMMUNITY CONSULTATION PROGRAM **Major focus** DMIRALTY ISLANDS LAND BISMARCK SEA INSET EAST NEW BRITAIN SOLOMON SEA Gulf of Papua EAST NEW BRITAIN **Torres Strait** Areas visited for stakeholder consultation UTM Projection, WGS84 Datum

#### **Consultation Methods**











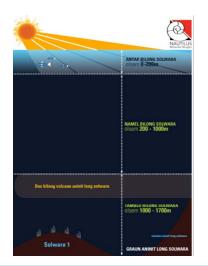
#### NAUTILUS MINERALS Toksave buk















### Training and Up-Skilling PNG



#### **Employment**

- Currently ~20% of Nautilus full time employees – PNG Nationals (May 2010)
- Nautilus' ultimate goal is for project workforce to be PNG Nationals
- Currently engaged in programs to encourage skill and capacity building in PNG

#### Supporting Education

- Nautilus-Duke Opportunity Bursary
- Training in state-of-the-art techniques under supervision of world renowned deep sea ecologists
- Initiative short-listed for an Asian
   Mining Congress Sustainability Award





#### Community Assistance in Tonga



#### Health

- Dental equipment
- Equipment/supplies that will improve delivery of service in the A&E/Casualty/Outpatients ward

#### Education

- provision of marine scholarships and participation of trainees in exploration cruises
- Sponsorship of the University of Canterbury's EcoCare Pacific Trust National High School Science Competition



2009 Suction Units - Dental Vaiola Hospital



Teachers and Students who participated in the EcoCare Project

# Case for Deep Sea Mining



- ✓ Resources on land are becoming "lower quality" and/or have significant environmental/social/cultural issues.
- ✓ Technology is available now.
- Metal prices support development.
- Permitting is possible.
- ✓ Will "benefit mankind" if done properly.

# A New Industry, Not Just a Project





All directions point to Nautilus Minerals. We're using proven offshore oil and gas technologies to extract high-grade copper and gold from the ocean floor. To learn how we're doing it visit us at www.nautilusminerals.com.

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