

APPENDIX 1 - WATER COLUMN AND SEDIMENTARY ENVIRONMENT

1.5 Project Execution Plan: Core Sampling MV *Snowgoose*

NAMIBIAN MARINE PHOSPHATE

VERIFICATION SURVEY

GRAVITY CORING

PROJECT EXECUTION PLAN

Prepared for:

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SECTION D, APPENDIX 1 - WATER COLUMN AND SEDIMENTARY ENVIRONMENT
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1 PURPOSE AND SCOPE

Namibian Marine Phosphate (NMP) is proposing to extract marine pelletal phosphate ore from deposits on the Namibian continental shelf. The phosphate will be extracted by dredging and the assessment of the environmental impacts associated with the project is therefore strongly reliant on a sound understanding of the sediment properties of the dredge area.

The purpose of the gravity coring survey is to confirm the sediment properties of the seafloor (to a maximum depth of ~ 2 m) within the proposed dredge area. This information will then be used, in conjunction with previous scientific investigations of the region as well as those from the verification survey, to further inform the assessment of impacts on the marine environment as a result of the proposed dredging operations. This will aid in the final assessment of the impacts as detailed in the EIA / EMPR.

The gravity coring survey will include the collection of seafloor sediments using a drop or gravity corer from aboard the MV *Snowgoose*. The collected sediment samples will be frozen on board the vessel and then transported in a frozen state back to South Africa for various analyses.

The focused survey area is defined as mine area SP-1, which is within MLA 170 (Figure 1-1), and is situated south west of Walvis Bay, directly offshore of Conception Bay and Meob Bay. The Sandpiper Phosphate licence area (MLA 170) includes mine target areas; SP-1, SP-2 and SP-3 (Figure 1-2). SP-1, where the verification survey will take place, is the primary dredging target area of the project (a 20-year mine plan is established for this site), while the dredging of SP-2 and SP-3 will take place subsequently. The gravity coring sites will match those to be sampled during the verification survey which will take place between 24 July and 8 August.

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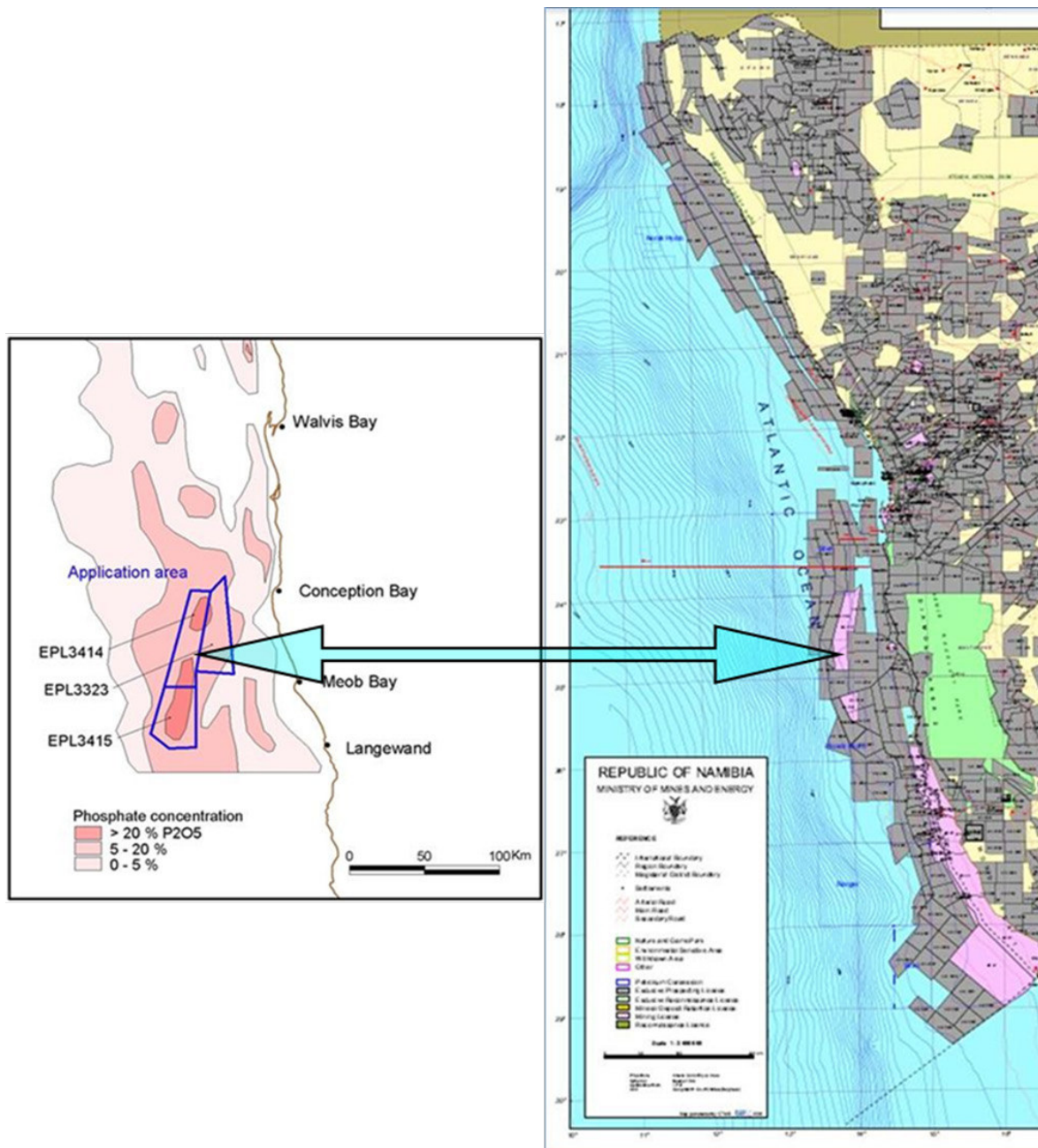


Figure 1-1: Location of Mining Licence Area (MLA) 170 offshore central Namibia.
MLA 170 is a consolidation of EPLs 3414 and portions of EPLs 3323 & 3415.

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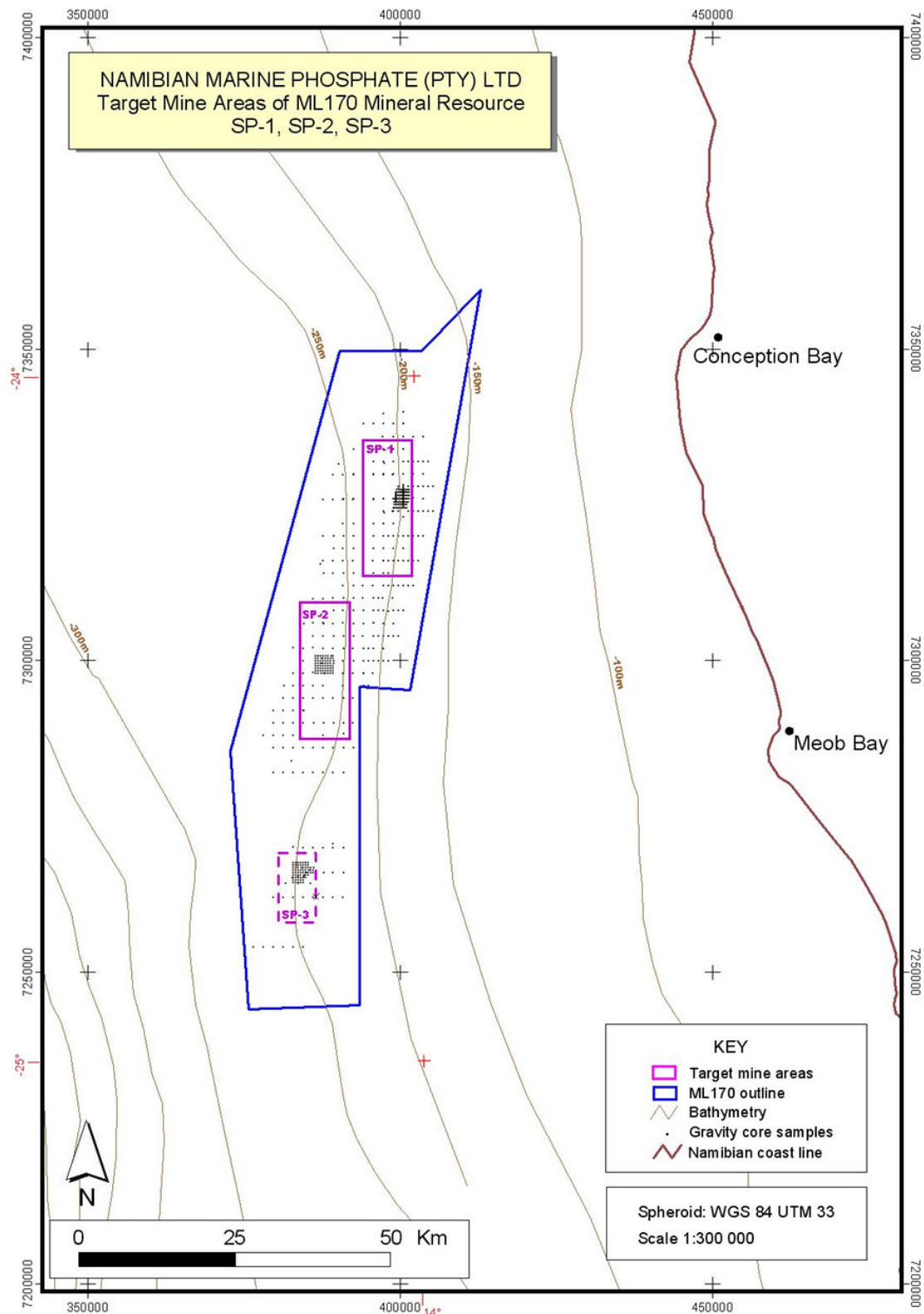


Figure 1-2: Location of the proposed target dredging sites MLA 170. SP-1 (20 year mine plan established), SP-2 and SP-3 within the three resource areas of the Sandpiper Phosphate licence area.

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A grid of sampling sites will be placed across SP-1 such that the broad distributions of sediment properties across the entire mine site can be determined. Figure 1-3 shows the sampling station layout (large black open squares).

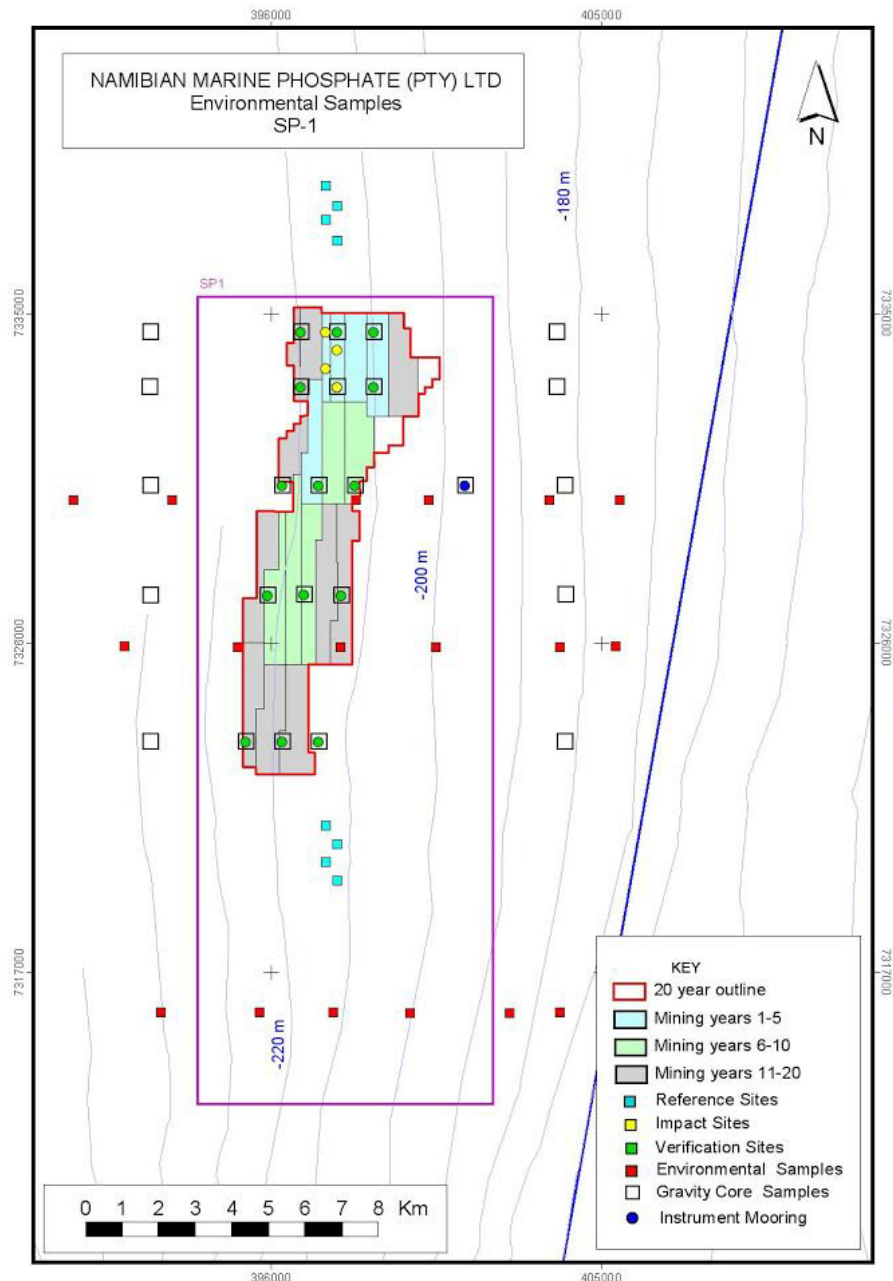


Figure 1-3 : Gravity coring and verification sampling sites in target dredge site SP-1. Note that the gravity coring/verification survey sites are represented by black open squares. Green squares represent sites identified for benthos verification sampling (Steffani); additional sampling sites for the macro benthos, meiofauna and sediment properties monitoring programme are shown in yellow (impact) and blue (reference). The blue square shows the provisional moored instrumentation site. Only the gravity coring/verification sites will be sampled during this survey.

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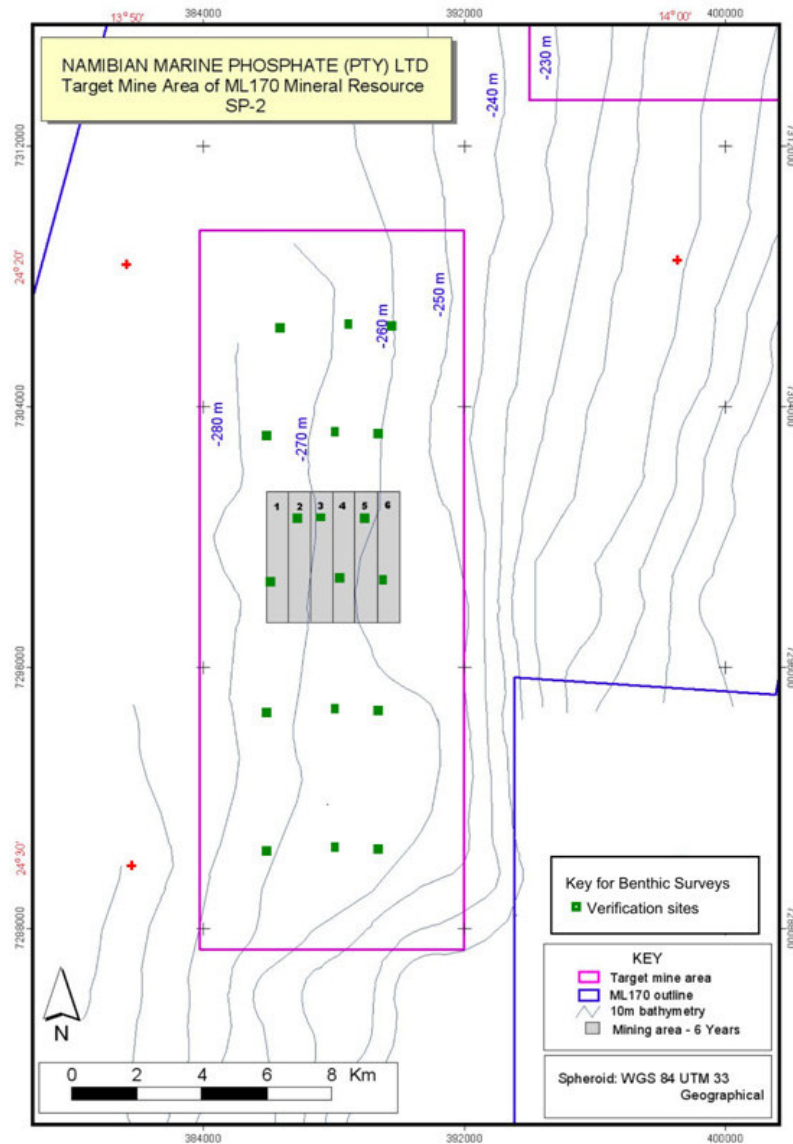


Figure 1-4: The verification sites for SP-2.

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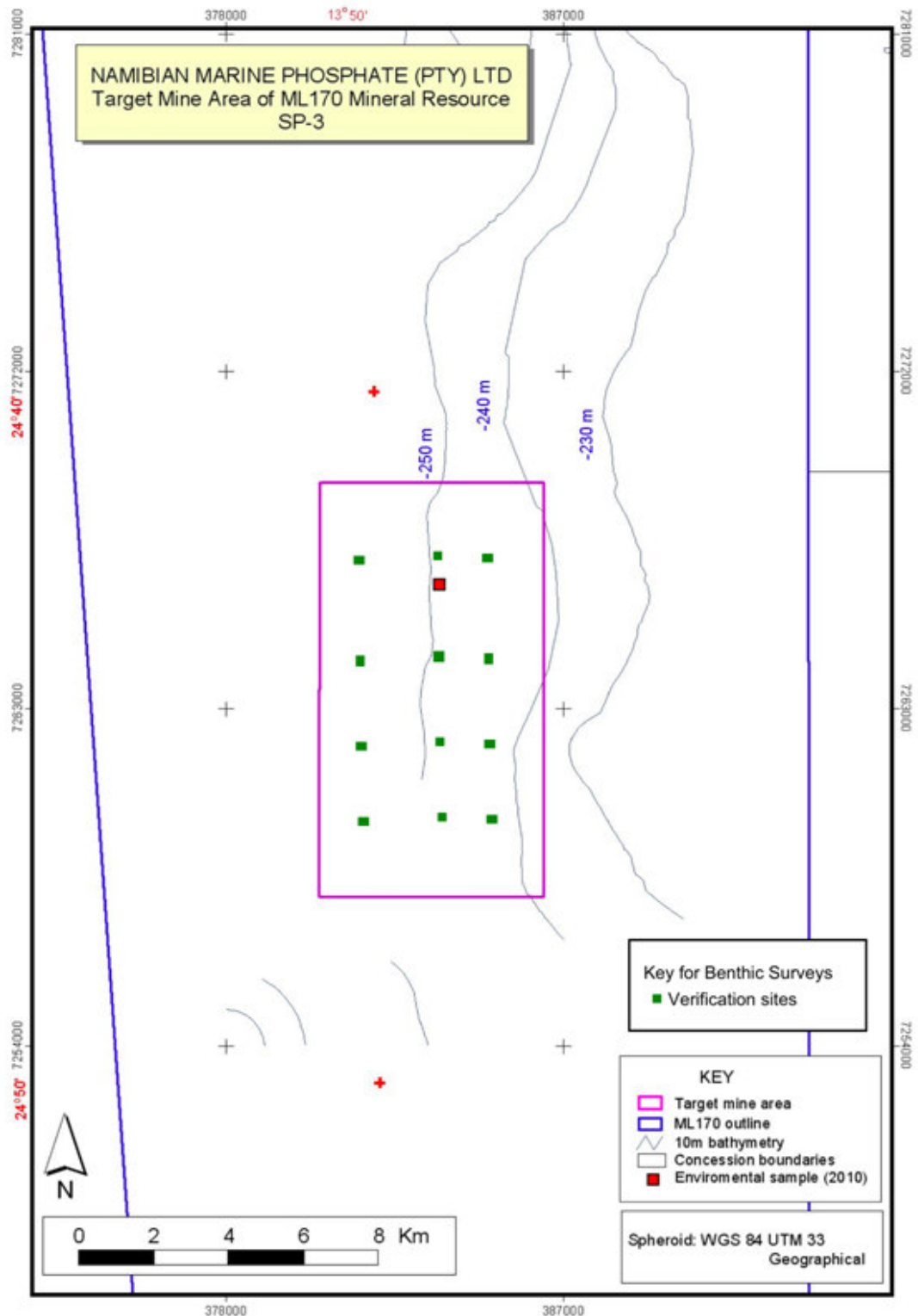


Figure 1-5: The verification sites in SP-3.

2 WORK PROCEDURE

2.1 SURFICIAL SEDIMENT AND WATER COLUMN FEATURES

Equipment and personnel will be mobilised to the port of embarkation (Walvis Bay). Following loading of the survey vessel, equipment will be carefully unpacked and assembled. Electronic equipment will be powered up and tested to determine whether any breakages have occurred during transit. Repairs or replacements will be made if and where necessary.

2.2 MOBILISATION

It is assumed that all coring equipment will be provided on board the MV *Snowgoose* and that this will be deployed by the ship's crew. The MV *Snowgoose* will mobilise out of Lüderitz, Namibia, for this survey.

2.3 SAMPLING

The ship's crew will conduct a test run of the sampling equipment before the vessel leaves the port area. This will allow the repair or modification of any equipment or deployment and recovery techniques before the cruise gets underway.

Once the testing has been completed; the vessel will progress to the relevant sampling locations and carry out the following procedures:

2.3.1 *Sediment Properties*

A gravity core is required to determine the subsurface particle size and texture distribution to a depth of ~3 m into the seabed, optimally terminating into footwall clay. Gravity core samples will be collected in similar locations to where box core samples are to be collected during the verification survey in the target dredge area SP-1.

All procedures are to be conducted by the officers and crew of the *Snowgoose*; there will be no Lwandle company representative on board during the survey.

There may be instances where the gravity core is unable to penetrate the surface of the seafloor, or where the core does not close correctly as a result of shelly bottom and/or debris becoming trapped in the sealing device. In such a case, the core attempt will be repeated a maximum of three times. In the event of no successful core being completed in any of the three attempts, the sampling site will be abandoned.

Following retrieval of the gravity core to deck the inner plastic liner (inner core tube) will be capped (top and bottom), cut in half and re capped at the open ends. The core reference number and sampling data are to be written on the subsample and these data logged on the data sheets. Each capped core section is to be directly placed in a chest freezer operating at -18 °C or lower. The core samples are to remain in the freezer until reaching CSIR Stellenbosch, where the analyses will take place.

2.4 BIOGEOCHEMICAL ANALYSIS

Analyses will be conducted under subcontract by CSIR, Stellenbosch. Variables will include AVS, POM, POC and PON, and particle size distributions.

Refer to: Gravity core analysis requirements (Appendix 1.6).

3 SAMPLE PRESERVATION AND CURATION

The preservation and curation of all samples collected while on board the vessel will be the responsibility of the ship's crew. It is very important that the samples are preserved and stored correctly to avoid any loss of data while the vessel is underway, or during transportation back to South Africa.

All permissions, authorisations and permits required for transporting the chemical/biological samples and any associated sampling equipment back into South Africa will need to be organized by NMP.

On board:

- All sample containers to be clearly labelled with the relevant station number, date etc. This information is to match that in the sample record data sheets.
- Check sample conditions in freezer daily. Ensure power connection to all fridges / freezers containing samples remains stable.
- Check integrity of biological samples daily (i.e. no leaks/drying etc.).

During transport back to South Africa:

- Ensure sufficiently inert packing material to safeguard samples and increase insulation.
- Add an operating temperature logging device (TidBit) to each of the freezers.
- Ensure the freezers are secured correctly and are not able to be opened.
- Ensure there is a continuous power source to the freezers so that the internal temperature remains below 18 °C.
- Clearly label the freezers with number and type of samples and destination.
- These samples must be transported back to South Africa overland via Swift Air or other courier to be arranged by the client.

4 SAMPLING ANALYSIS

Sediment samples will then be analysed back in Cape Town, the following analyses will be carried out:

- Organic content, POC and PON concentrations;
- Heavy metal concentrations;
- AVS and SEM;
- ORP.

5 HEALTH AND SAFETY

Mr Jeremy Midgley (NMP's representative) will be responsible for the overseeing of health and safety aspects for the duration of the trip.

5.1 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) must be worn on the vessel as directed by the vessel master.

The following general offshore PPE should be provided to personnel on board the MV *Snowgoose*:

- Bright Coveralls or at least long working pants with a reflective vest
- Safety footwear
- Safety helmet (as required during lift operations)
- Gloves
- Masks, safety glasses and nitrile gloves for working with formalin
- Self-inflatable life jackets
- Safety harnesses

5.2 WORK ON DECK

Particular care is required when handling any over-side equipment, each member of the field team is to ensure that the correct and safe procedures are understood and implemented for all work taking place on the deck of the vessel. The field team should ensure their safety harnesses are properly secured for any work undertaken near the gunwale of the vessel.

If the weather conditions begin to deteriorate, the field team should continually assess the situation and stop work whenever necessary. This is especially true in conditions where equipment becomes unstable, or instrumentation begins swaying excessively on the winch.

All the members on the field team will have the full authority to issue a "Stop work" command if anyone perceives a hazard during work operations. Most technical/manual activities are to be undertaken by trained boat crew.

A toolbox meeting should be held prior to any new tasks and or beginning of every shift being undertaken, and a refresher meeting should occur whenever necessary.

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5.3 RISK ANALYSIS

A number of risk assessments have been carried out in alignment with the tasks that the field team will be carrying out. The risk assessments have been prepared on the basis of the risk factor table presented in Figure 5-1. The risk assessment tables should be read in conjunction with the associated deployment and recovery procedures.

		Hazard				
		1 - negligible	2 - slight	3 - moderate	4 - high	5 - very high
		Negligible injury, no absence from work	Minor injury requiring first aid treatment	Injury leading to a lost time incident	Involving a single death or serious injury	Multiple deaths
Risk	1 - very unlikely A freak combination of factors would be required for an incident to result	1	2	3	4	5
	2 - unlikely A rare combination of factors would be required for an incident to result	2	4	6	8	10
	3 - possible Could happen when additional forces are present otherwise unlikely to occur	3	6	9	12	15
	4 - likely Not certain to happen but an additional factor may result in an accident	4	8	12	16	20
	5 - very likely Almost inevitable that an accident would result	5	10	15	20	25

Figure 5-1: Risk factor table taken from OGP *HS&E Guidelines for Metocean Surveys*¹..

¹ International Association of Oil and Gas Producers. <http://www.ogp.org.uk/pubs/348.pdf>

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Table 5-1: RA for the mobilisation of equipment and loading of ship

Risk	H	R		Mitigation	H	R	
Theft/loss of valuables/ equipment/ personnel	4	3	12	<ul style="list-style-type: none"> Keep all valuables out of sight while travelling. Ensure equipment is securely packaged before transportation. Be vigilant when travelling. 	2	3	6
Scratches from securing equipment/moving/carrying boxes	2	3	6	<ul style="list-style-type: none"> Use of PPE. Ensure all boxes/crates are properly secured. Ensure vessel crew is responsible for hoisting. 	1	2	2
Injury to personnel and / or damage to equipment from uncontrolled lifting/dropping of boxes/equipment	4	3	12	<ul style="list-style-type: none"> Use of PPE Lift carefully, bend knees and not back. 	1	2	2

Table 5-2: RA for work on vessel deck

Risk	H	R		Mitigation	H	R	
Personal injury due to Slips/trips/falls	4	3	12	<ul style="list-style-type: none"> Use of PPE, especially safety shoes when on deck Ensure deck is cleared of potential trip hazards 	1	2	2
Personal injury due to falling over gunwale	5	3	15	<ul style="list-style-type: none"> Use of PPE, especially life jackets and safety harnesses when working near the gunnel. Work close to the gunnel only when it is safe to do so, if weather conditions are not favourable –Stop work. 	3	2	6

Table 5-3: RA for the handling and analysis of sediment samples

Risk	H	R		Mitigation	H	R	
Injury to personnel/equipment from mishandling samples/grabs	4	3	12	<ul style="list-style-type: none"> Use of PPE Be vigilant when handling equipment and samples Ensure no one puts their fingers close to the jaws of either grab. 	1	2	2
Personal injury due to exposure to formalin	4	2	8	<ul style="list-style-type: none"> Use of PPE Use supplied gas mask Only use formalin in well ventilated areas Wash hands after work with formalin 	3	1	3

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Table 5-4: RA for the deployment and recovery of Rosette and CTD

Risk	H	R		Mitigation	H	R	
Personal (hands/head/feet) injury or damage to equipment due to mishandling of rosette	3	3	9	<ul style="list-style-type: none"> Use of PPE, especially hardhats, safety boots Ensure care is taken when setting up Niskin bottles, keep fingers away from the tops/bottoms of open bottles Ensure care is taken when hoisting/lowering rosette unit. 	3	2	6

Table 5-5: RA for the packaging and unloading of samples

Risk	H	R		Mitigation	H	R	
As per table 5-1	0	0	0		0	0	0

5.4 EMERGENCY PROCEDURES AND CONTACT NUMBERS

In the case of any emergency the following numbers are to be called either from a satellite phone, local sim card, or on board telephone (Table 5-6). Please ensure that this list of numbers is placed in an area visible to all field staff during work on board the vessel and while travelling.

Table 5-6: Emergency contact details:

Name	Position	Email	Phone number
Jeremy Midgley	NMP representative	mwjmidg@mweb.co.za	+ 27 21 7886212 +27 832649484
Bill Ludick	NMP representative	bludick@mweb.co.za	0814822386 (Namibian number)
Mike Woodborne	NMP land project coordinator	mike.woodborne@uclresources.com.au mike.woodborne@gmail.com	+61 410307205 / +37281054658
Hospital	Walvis Bay Medipark T/a Welwitchia Hospital	Street Address: Gertrude Rikumba Kandanga Hilukilwa Street, Walvis Bay	+26 464 21 8911
Police Station	Walvis Bay Police Station	Walvis Bay, Namibia	+264 64 21 9048 / 64 202 055 / 10111/
Sea Rescue	Namibian Sea Rescue		208 2221 or 081 129 6295

While on board, the vessel staff will be required to follow and adhere to all health and safety requirements/instructions given to them by the vessel captain.

5.5 TOOLBOX MEETING TEMPLATE

Toolbox Meetings

A toolbox meeting will be held prior to each operation, inclusive of Client rep, Party chief, technicians and divers discussing the following:

- Anticipated operations to be undertaken
- Any hazards that have not been actioned
- Individual concerns of employees

The toolbox meeting will be documented according in the following format:

Date & time of meeting		Date & time of report	
Location		Vessel	
List of attendees		Present weather conditions	

Matters for discussion

Scope of work summary		Comments	
Review and acceptance of JSA		Signed	

Signatures

Party Chief		Dive Master	
Client Rep			