Seabed Minerals Authority
Runanga Takere Moana
COOK ISLANDS

EXPLORATION LICENCE

CIIC Seabed Resources Limited
EL2

Licence Compendium Contents

Note each section in this compendium has its own table of contents.

Published by Seabed Minerals Authority, Avarua, Cook Islands, 2022

Exploration Licence

Seabed Minerals Authority
Runanga Takere Moana
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Licence number— EL2

1. Introduction

This is a Licence granted by the responsible Minister on behalf of the Crown authorising the Licence Holder to carry out exploration activities for which a Licence is required under Part 4 of the Act.

1.1 Licence number

The licence number for this Licence is **EL2**

1.2 Licence Holder

The Licence Holder is the company set out below:

Company name	CIIC Seabed Resources Limited
Company registration number	C3710
Registered address	P.O Box 51 Avarua, Rarotonga
E-mail address	eusenio.fatialofa@cookislands.gov.ck
Designated representative	Eusenio David Fatialofa
Position within company	General Manager

1.3 Licence Term

Version	EL2
Licence start date	23 February 2022
Licence end date	23 February 2027
Date of original issue	23 February 2022
Date of variation issue	

1.4 Licence validity

(a) This version of this Licence is valid from this Licence's start date until this Licence's end date.

(b) This version of this Licence supersedes any earlier version of this Licence.

1.5 Licence Holder rights

During the term of this Licence, the Licence Holder, subject to the Act and the Regulations, has the exclusive right to:

(a) conduct exploration over the Licensed Area;

(b) apply for successive renewals of the Licence;

(c) request a retention in respect of specified blocks; and

(d) apply for a mining licence over the Licensed Area.

1.6 Specified seabed minerals covered by this Licence

This Licence authorises exploration for polymetallic nodules in the Licensed Area.

2. General

2.1 Interpretation

(a) In this Licence, terms are as defined in section 6 of the Act and the Regulations and—

Act means the Seabed Minerals Act 2019.

Annexures means the documents listed at clause 12 of this Licence.

Application means the application submitted to and approved by the Authority on 8 February 2022 and/or as varied with the Authority's approval in writing.

Approved Work Plan means the summary work plan annexed to this Licence. If any inconsistency arises between the terms of the Licence Holder's Application and its Approved Work Plan, the terms of the Licence Holder's Application prevail.

Licence means this Licence.

Licensed Activities means the exploration activities and associated regulated activities set out in the Annexures to this Licence and the terms of the Licence Holder's Application. If any inconsistency arises between the terms of the Licence Holder's Application and the Annexures to this Licence, the terms of the Licence Holder's Application prevail.

Licensed Area means the area allocated to the Licence Holder under this Licence, i.e., the area defined by the coordinates listed in Annexure 1 to this Licence but excluding all Relinquished Areas.

Licence Holder means the company named in clause 1.2 above to whom this Licence is granted.

Regulations means the Seabed Minerals (Exploration) Regulations 2020.

Relinquished Areas means all areas relinquished in accordance with the schedule set out in Annexure 7 to this Licence.

(b) All geographical co-ordinates in this Licence are in WGS84 format (latitude and longitude degrees and minutes to three decimal places) unless stated otherwise.

3. Authority contact

Except where otherwise indicated, the Authority's address for email and postal correspondence and the serving of notices under the Act and the Regulations is:

Attention— Seabed Minerals Commissioner

The Cook Islands Seabed Minerals Authority

Avarua, Rarotonga, Cook Islands PO Box 733

Tel— (+682) 29 193

Email— sbma@cookislands.gov.ck

4. Licensed Activities

4.1 Licensed Activities authorised

The Licensed Activities under this Licence must be carried out in accordance with this Licence, and only in the Licensed Area.

5. General Licence conditions

5.1 General duties and responsibilities of Licence Holders

(a) The general duties of Licence Holders set out in Schedule 2 of the Act are incorporated by reference in this Licence.

(b) The Licence Holder, its employees and agents, and its affiliates and associates must comply with:

(i) the Act, Regulations and all applicable laws of the Cook Islands;

(ii) the terms and conditions of this Licence, including all Annexures;

(iii) all standards the Authority has issued or issues during the term of this Licence;

(iv) the Licence Holder's Application in all respects.

(c) With respect to all of the Licence Holder's obligations in paragraphs (a) and (b) above, the Licence Holder is responsible for:

(i) all of its affiliates' and associates' compliance with their obligations; and

(ii) all acts and/or omissions of its affiliates and associates.

(d) The Licence Holder is not discharged from any obligation arising under this Licence by contracting a third party to perform the relevant obligation.

5.2 Commencement of activities

Unless a variation is applied for and agreed in writing with the Authority, the Licence Holder must:

(a) commence exploration in accordance with the time schedule stipulated in the Approved Work Plan annexed to this Licence, and

(b) adhere to any time periods or modifications to time periods provided for by this Licence.

5.3 Implementation of Approved Work Plan

(a) The Licence Holder must continuously and actively conduct exploration in accordance with the Approved Work Plan, the Licence Holder's Application and good industry practice.

(b) The Licence Holder must also comply with the following documents annexed to this Licence:

(i) the incident response and management plan;

(ii) the occupational health and safety plan;

(iii) the environmental management programme; and

(iv) the local engagement, training and business development plan.

5.4 Expenditure commitments

In carrying out the Approved Work Plan and its activities, the Licence Holder must, in each Licence year, spend at least the amount specified in the Approved Work Plan in actual and direct exploration spending, unless otherwise approved by the Authority.

5.5 Notification of commencement

(a) The Licence Holder must notify the Authority before any Licensed Activities commence.

(b) The Authority must receive notice under paragraph (a) above at least twenty (20) days before any Licensed Activities commence.

5.6 Security deposit or financial guarantee

(a) The Authority may require the Licence Holder to lodge a security deposit or financial guarantee at any time during the term of this Licence.

(b) The form, amount, subject-matter, timing of lodgement, terms of release, and other conditions of the security deposit or financial guarantee will be recorded in a separate document as appropriate but will form a specific condition of this Licence.

(c) Where applicable, no Licensed Activities may commence or continue unless the Licence Holder has provided any security deposit or financial guarantee required in accordance with this Licence, the Act and the Regulations.

(d) The Licence Holder must notify the Authority as soon as practicable of any material change in the Licence Holder's financial capacity as submitted in its Application.

5.7 Vessels

(a) The Licence Holder must notify the Authority in writing of any vessel being used to carry out any Licensed Activities under this Licence on behalf of the Licence Holder.

(b) The Authority must receive notice under paragraph (a) above at least twenty (20) days before each cruise commences. Notification must include:

(i) the master's name;

(ii) vessel type;

(iii) vessel IMO number;

(iv) vessel flag;

(v) vessel owner or operating company;

(vi) dates of entry and departure from Cook Island's jurisdiction;

(vii) any scheduled port of call; and

(viii) details of all persons aboard.

(c) The Licence Holder must ensure that a copy of this Licence and any subsequent revision or amendment is read and understood by the master of any vessel being used to carry out any Licensed Activities and that a copy of this Licence is held on board any such vessel.

5.8 Notification of material matters

(a) The Licence Holder must notify the Authority if the Licence Holder becomes aware of any new information or change in circumstances which materially affects or is likely to materially affect:

(i) the basis for granting this Licence;

(ii) the viability and appropriateness of the Approved Work Plan; and/or

(iii) the Licence Holder's ability to comply with the obligations under this Licence.

(b) Further to paragraph (a) above, the Licence Holder must notify the Authority at the earliest opportunity, and within no more than five (5) days of becoming aware of the relevant information or circumstance. Failure to do so may lead to enforcement action, including cancellation or suspension of this Licence.

5.9 Samples: licence quantities

(a) This Licence authorises the removal of material from the seabed or subsoil in the Licensed Area but only in such quantity as is reasonably necessary for the exclusive purpose of sampling, assaying, and analysis of the specified seabed mineral as provided for in the Approved Work Plan or as stipulated in this Licence's conditions.

(b) The Licence Holder must not sell and must ensure that no person with whom it has any connection, sells or attempts to sell, any material that was removed from the seabed or subsoil.

5.10 Project permit or consent under the Environment Act 2003

This Licence, and the conduct of all Licensed Activities under it, is subject to the Licence Holder obtaining and complying with any environmental approval required and granted under the Environment Act 2003, including any condition attached to any environmental approval.

5.11 Surrender, cancellation or expiry of this Licence

Upon any surrender, cancellation or expiry of this Licence, all rights granted to the Licence Holder under this Licence cease, but the Licence Holder will remain subject to any continuing obligations arising out of this Licence at the date of surrender, cancellation or expiry.

5.12 Review of Approved Work Plan

Subject to the Act and Regulations, within six (6) months of the Licence Holder's submission of its annual report to the Authority, the Authority and the Licence Holder, will undertake a joint review of the:

(a) Approved Work Plan;

(b) the Licensed Activities conducted under the Approved Work Plan; and

(c) this Licence's conditions.

6. Specific Licence conditions

(a) The Licence Holder must ensure that it has appropriate and sufficient insurance for any expedition before the expedition's commencement and that the Licence Holder maintains its insurance throughout the expedition and afterwards as appropriate.

(b) The Licence Holder must comply with all arrangements set out in its Application.

(c) If there is any change or proposed change to the directors, management or control of the Licence Holder:

(i) the Licence Holder must notify, seek and obtain the Authority's approval in writing before any such change is made, insofar as it is practicable to do so;

(ii) if it is not practicable to notify, seek and obtain the Authority's approval in writing before any such change is made, the Licence Holder must notify the Authority as soon as practicable of the relevant change; and

(iii) the Authority may request any further information to determine whether the change affects the Licence Holder's compliance with the qualification criteria and/or evaluation criteria.

(d) If there is any change or proposed change, direct or indirect, to any of the Licence Holder's financing arrangements set out in the Application:

(i) The Licence Holder must notify, seek and obtain the Authority's approval in writing before any such change is made, insofar as it is practicable to do so;

(ii) if it is not practicable to notify, seek and obtain the Authority's approval in writing before any such change is made, the Licence Holder must notify the Authority as soon as practicable of the relevant change; and

(iii) the Authority may request any further information to determine whether the proposed change affects the Licence Holder's compliance with the qualification criteria and/or evaluation criteria.

(e) If there is any change or proposed change of any associate or affiliate who is carrying on Licensed Activities on behalf of the Licence Holder:

(i) the Licence Holder must notify, seek and obtain the Authority's approval in writing before any such change is made, insofar as it is practicable to do so;

(ii) if it is not practicable to notify, seek and obtain the Authority's approval in writing before any such change is made, the Licence

Holder must notify the Authority as soon as practicable of the relevant change; and

(iii) the Authority may request any further information to determine whether the proposed change affects the Licence Holder's compliance with the qualification criteria and/or evaluation criteria.

(f) If there is any change or proposed change to the directors, management or control of any associate or affiliate who is carrying on Licensed Activities on behalf of the Licence Holder:

(i) The Licence Holder must notify, seek and obtain the Authority's approval in writing before any such change is made, insofar as it is practicable to do so;

(ii) if it is not practicable to notify, seek and obtain the Authority's approval in writing before any such change is made, the Licence Holder must notify the Authority as soon as practicable of the relevant change; and

(iii) the Authority may request any further information to determine whether the proposed change affects the Licence Holder's compliance with the qualification criteria and/or evaluation criteria.

(g) None of the above conditions in any way limit or negate the Licence Holder's requirement to satisfy all qualification criteria and evaluation criteria on a continuous basis throughout the term of this Licence and/or to comply with all requirements under the Act and Regulations.

7. Relinquishment conditions

(a) The Licence Holder will relinquish blocks in the Licensed Area according to section 78 of the Act and the terms and schedule of relinquishment annexed to this Licence.

(b) The schedule of relinquishment may be varied from time to time with the approval of the Authority. Any variation to the schedule of relinquishment must be annexed to this Licence.

8. Compliance and enforcement

(a) This Licence and its terms and conditions are issued under and subject at all times to the Act and the Regulations, as amended from time to time.

(b) Any breach of the Act, the Regulations and/or this Licence's terms and conditions may lead to enforcement action being taken by the Authority. This may include the issuing of written warnings or directions by the Authority under the Act, the variation, suspension or cancellation of this Licence under section 117 of the Act, the imposition of penalties, and/or criminal proceedings.

9. Force majeure

(a) If the Licence Holder or the Authority is prevented from complying with this Licence, in whole or in part, by an event or circumstance of force majeure, it must give written notice to the other as soon as practicable after its occurrence.

(b) Any notice issued further to paragraph (a) above must specify:

(i) the nature of the event or circumstance;

(ii) what is required to remedy the event or circumstance – if remedy is possible;

(iii) the estimated time to cure or overcome the event or circumstance; and

(iv) the obligation(s) that cannot be performed in a properly or timely manner due to the event or circumstance.

(c) If for any reason the party which receives a force majeure notice under paragraph (a) above disagrees with any aspect of the notice, the receiving party must notify the other party in writing within ten (10) days of receiving the notice.

(d) The Licence Holder and Authority must attempt to resolve any dispute about the occurrence of a force majeure event or circumstance by mutual agreement before either party commences Court proceedings.

(e) Apart from any payment of money due, the Licence Holder's performance of any obligation prevented by the force majeure event or circumstance is suspended during the continuance of any force majeure event or circumstance.

(f) The term of this Licence will be automatically extended for the period of the force majeure.

(g) If an obligation is suspended by reason of force majeure for more than one (1) year, the Licence Holder and the Authority will enter into good faith negotiations to vary the terms and conditions of this Licence to reflect the changed circumstances.

10. Governing language

This Licence is provided and executed in the English language only.

11. Governing law

The Cook Islands' laws govern this Licence. This Licence is to be construed in accordance with the laws of the Cook Islands in all respects.

12. Annexures to this Licence

(a) The Annexures to this Licence may be varied from time to time with the Authority's approval.

(b) The Annexures to this Licence are:

Annexure 1: coordinates and illustrative chart of the Licensed Area:

Annexure 2: the approved work plan reflecting the current five (5)-year programme of activities:

Annexure 3: the approved environmental management programme:

Annexure 4: the approved incident response and management plan:

Annexure 5: the approved occupational health and safety plan:

Annexure 6: the approved local engagement, training and business development plan:

Annexure 7: the approved terms and schedule of relinquishment

IN WITNESS WHEREOF the undersigned, being duly authorised thereto by the respective parties, have signed this Licence in two (2) originals, at Rarotonga, Cook Islands, on 23 February 2022.

FOR AND ON BEHALF OF THE CROWN

_____

Honourable Mark Brown
Prime Minister, Minister for Seabed Minerals

FOR AND ON BEHALF OF CIIC SEABED RESOURCES LIMITED

_____

Mark Short
CIIC-SR Director,
for and on behalf of
Kris Van Nijen
CIIC-SR Director

_____

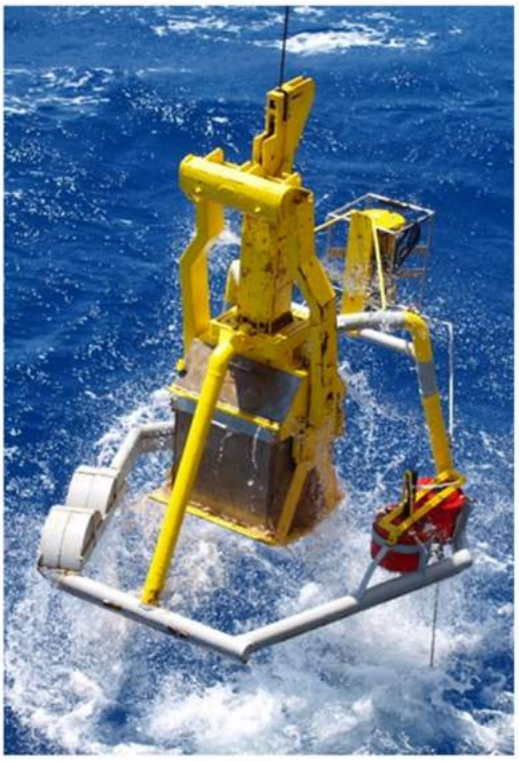
Michael Henry
CIIC-SR Director

CIIC SEABED RESOURCES LTD

Annexes of the CIIC-SR License for Exploration Activities

Annex 01

Coordinates and illustrative chart of the licensed area



Title:	Annex 01 of the License for Exploration Activities
Author:	François Charlet – GSR Exploration Manager
Checked by:	Eusenio Fatialofa – CIIC-SR General Manager
	Samantha Smith–Head of Sustainability & External Relations
Date:	10/01/2022
Reference:	P03-CIICSR-EV-RPT-00001_Annex 01
Version:	1

Signed: ..... On Behalf of: CIIC-SR

Name: Eusenio Fatialofa..... Date: 10 January 2022

Background Information

The Licensed Area is approximately 500-700km North of the main island Rarotonga, at water depths between 4,800 m and 5,300 m (Figure I-01). The approximate center of the area is 15.5° S, 159.4° E (Table I-1). The area is near the CI EEZ eastern boundary and includes samples collected within international waters. However, the license assessed for seabed manganese/polymetallic nodules and associated minerals are located wholly within the CI EEZ.

The closest land is Aitutaki Island, 200 km south of the Area under application. The study area is also well outside the 50-mile exclusion radius of the Marae Moana Marine Park. It is only accessible via ship. Exploration operations are conducted by ocean-going vessel and there are no restrictions of access to the site.

The area is approximately 3,400 km from Auckland, New Zealand; 7,000 km from Los Angeles, USA; 5,000 km from Brisbane, Australia and 9,500 km from Shanghai, China.

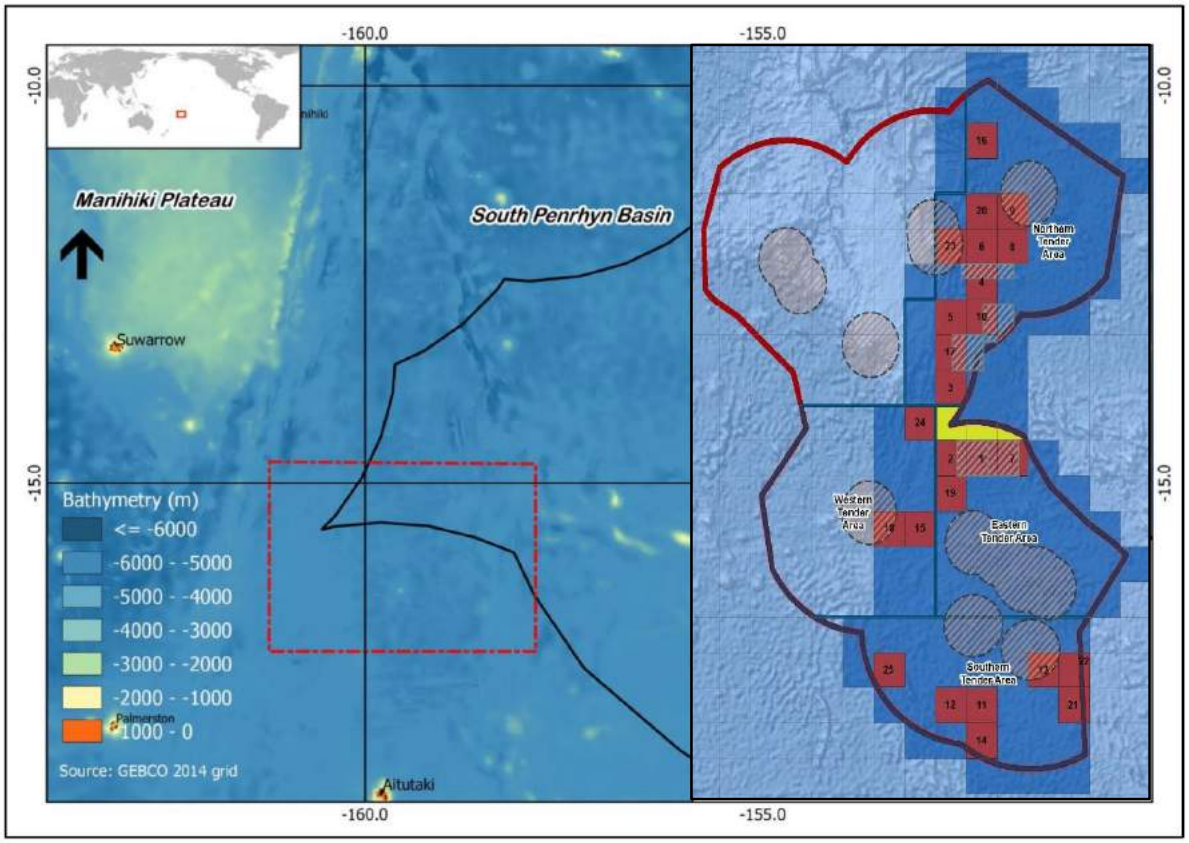


Figure I- 1: Location of the CIIC-SR Research Area (left) in the CI EEZ (right)

Table I- 1: Coordinates of the CIIC-SR Research Area.

	Latitude	Longitude
Minimum coordinates	-17.1° S	-161.2° E
Maximum coordinates	-14.9° S	-157.9° E

Coordinates and illustrative Chart of the Licensed Area

The entire Cook Islands EEZ has been divided into blocks of 5 minutes by 5 minutes, approximately 84-86 km², depending on where its located (section 41 of the Seabed Mineral Act). The blocks are located outside the Morae Moana 50 NM exclusion zones around islands and outside the OML and CIIC-SR reserved areas.

The licensed area is composed by **262 blocks**, with the total surface area estimated to be 19,471.51 km² (Figure I-2). The list of blocks is available in Table I-3 and has also been provided to the Seabed Mineral Authority in ESRI shapefiles, as required in the **Exploration Application Guidelines**.

The coordinates delimiting the area under application have also been listed in Table I-2.

Table I- 2: Informative table with approximative coordinates of the area under application (projection: Lat/long WGS84)

Reservation Area Coordinates		
Vertice #	**Longitude (dd)**	**Latitude (dd)**
1	-160.09531	-15.00000
2	-160.19065	-15.14938
3	-160.29049	-15.28896
4	-160.39368	-15.41865
5	-160.51019	-15.55045
6	-160.25305	-15.50647
7	-159.95908	-15.47918
8	-159.61855	-15.47756
9	-159.33503	-15.50074
10	-159.01103	-15.55512
11	-158.69366	-15.63853
12	-158.45354	-15.72278
13	-158.12806	-15.86889
14	-158.06461	-16.00000
15	-159.00000	-16.00000
16	-160.00000	-16.00000
17	-161.00000	-16.00000
18	-161.00000	-16.00000

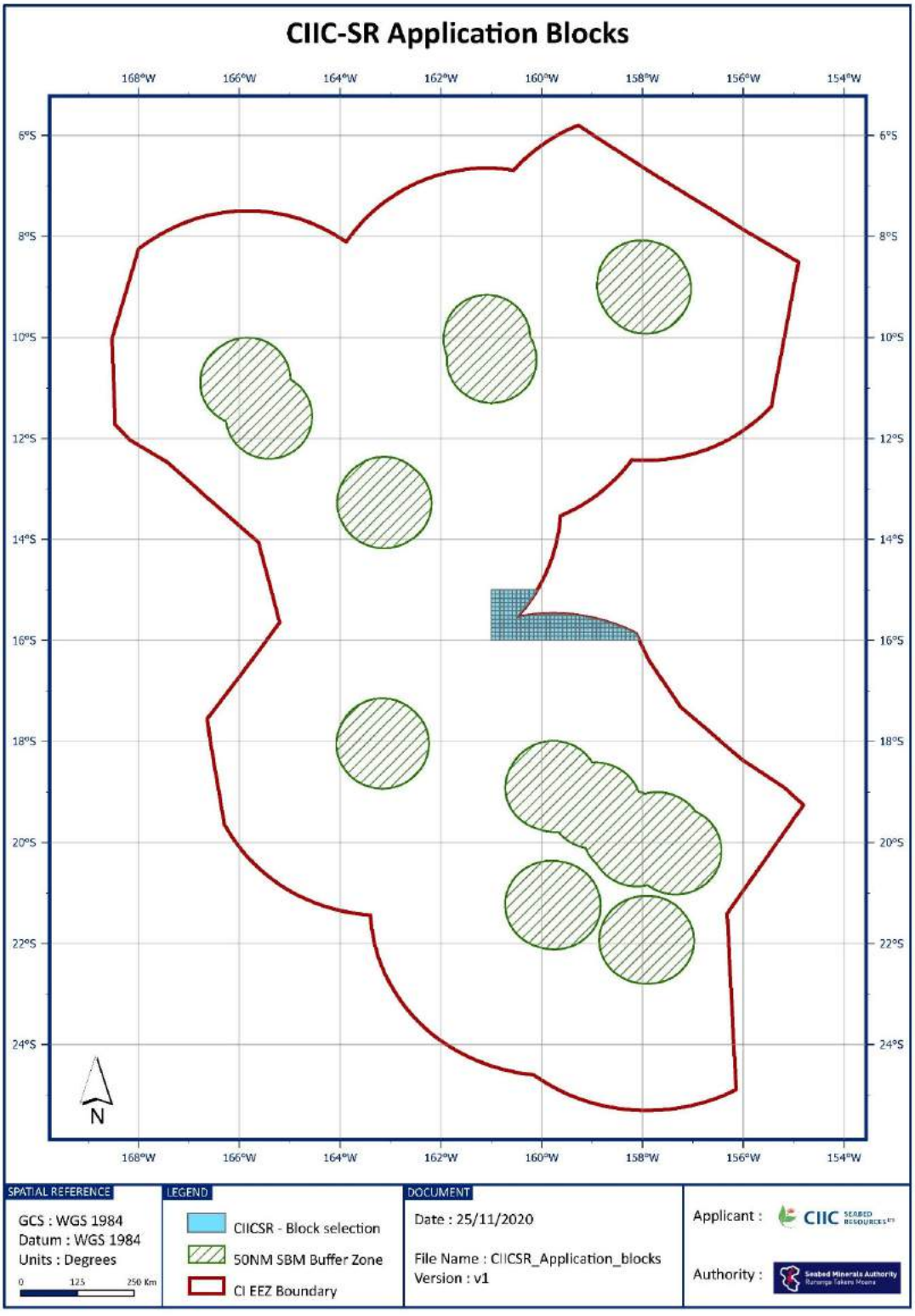


Figure I- 1: Map of the Cook Islands Exclusive Economic Zone, including the CIIC-SR Application Blocks.

Table I- 3: Informative table with approximative coordinates of the area under application (projection: Lat/long WGS84)

	OID_	OBJECTID_1	BlocName	BlocStatus	Location	Coord1	Coord2	Coord3	Coord4
1	19520	25271	015S159W-100	Not Vacant		158.45 W 15.40 S	158.40 W 15.40 S	158.40 W 15.45 S	158.45 W 15.45 S
2	19521	25493	015S159W-101	Not Vacant		158.40 W 15.40 S	158.35 W 15.40 S	158.35 W 15.45 S	158.40 W 15.45 S
3	19522	25128	015S159W-102	Vacant		158.35 W 15.40 S	158.30 W 15.40 S	158.30 W 15.45 S	158.35 W 15.45 S
4	19523	25440	015S159W-103	Vacant		158.30 W 15.40 S	158.25 W 15.40 S	158.25 W 15.45 S	158.30 W 15.45 S
5	19524	25192	015S159W-104	Vacant		158.25 W 15.40 S	158.20 W 15.40 S	158.20 W 15.45 S	158.25 W 15.45 S
6	19525	25462	015S159W-109	Not Vacant		159.00 W 15.45 S	158.55 W 15.45 S	158.55 W 15.50 S	159.00 W 15.50 S
7	19526	25144	015S159W-110	Not Vacant		158.55 W 15.45 S	158.50 W 15.45 S	158.50 W 15.50 S	158.55 W 15.50 S
8	19527	25135	015S159W-111	Not Vacant		158.50 W 15.45 S	158.45 W 15.45 S	158.45 W 15.50 S	158.50 W 15.50 S
9	19528	25012	015S159W-112	Not Vacant		158.45 W 15.45 S	158.40 W 15.45 S	158.40 W 15.50 S	158.45 W 15.50 S
10	19529	25074	015S159W-113	Not Vacant		158.40 W 15.45 S	158.35 W 15.45 S	158.35 W 15.50 S	158.40 W 15.50 S
11	19530	25337	015S159W-114	Not Vacant		158.35 W 15.45 S	158.30 W 15.45 S	158.30 W 15.50 S	158.35 W 15.50 S
12	19531	25394	015S159W-115	Not Vacant		158.30 W 15.45 S	158.25 W 15.45 S	158.25 W 15.50 S	158.30 W 15.50 S
13	19532	25412	015S159W-116	Not Vacant		158.25 W 15.45 S	158.20 W 15.45 S	158.20 W 15.50 S	158.25 W 15.50 S
14	19533	25328	015S159W-117	Vacant		158.20 W 15.45 S	158.15 W 15.45 S	158.15 W 15.50 S	158.20 W 15.50 S
15	19534	25354	015S159W-118	Vacant		158.15 W 15.45 S	158.10 W 15.45 S	158.10 W 15.50 S	158.15 W 15.50 S
16	19535	25372	015S159W-121	Not Vacant		159.00 W 15.50 S	158.55 W 15.50 S	158.55 W 15.55 S	159.00 W 15.55 S
17	19536	25460	015S159W-122	Not Vacant		158.55 W 15.50 S	158.50 W 15.50 S	158.50 W 15.55 S	158.55 W 15.55 S
18	19537	25413	015S159W-123	Not Vacant		158.50 W 15.50 S	158.45 W 15.50 S	158.45 W 15.55 S	158.50 W 15.55 S
19	19538	25278	015S159W-124	Not Vacant		158.45 W 15.50 S	158.40 W 15.50 S	158.40 W 15.55 S	158.45 W 15.55 S
20	19539	25029	015S159W-125	Not Vacant		158.40 W 15.50 S	158.35 W 15.50 S	158.35 W 15.55 S	158.40 W 15.55 S
21	19540	25415	015S159W-126	Not Vacant		158.35 W 15.50 S	158.30 W 15.50 S	158.30 W 15.55 S	158.35 W 15.55 S
22	19541	25392	015S159W-127	Not Vacant		158.30 W 15.50 S	158.25 W 15.50 S	158.25 W 15.55 S	158.30 W 15.55 S

23	195 42	25351	015S159W -128	Not Vacant		158.25 W 15.50 S	158.20 W 15.50 S	158.20 W 15.55 S	158.25 W 15.55 S
24	195 43	25004	015S159W -129	Not Vacant		158.20 W 15.50 S	158.15 W 15.50 S	158.15 W 15.55 S	158.20 W 15.55 S
25	195 44	25256	015S159W -130	Not Vacant		158.15 W 15.50 S	158.10 W 15.50 S	158.10 W 15.55 S	158.15 W 15.55 S
26	195 45	25023	015S159W -131	Vacant		158.10 W 15.50 S	158.05 W 15.50 S	158.05 W 15.55 S	158.10 W 15.55 S
27	195 46	25099	015S159W -133	Not Vacant		159.00 W 15.55 S	158.55 W 15.55 S	158.55 W 16.00 S	159.00 W 16.00 S
28	195 47	25445	015S159W -134	Not Vacant		158.55 W 15.55 S	158.50 W 15.55 S	158.50 W 16.00 S	158.55 W 16.00 S
29	195 48	25179	015S159W -135	Not Vacant		158.50 W 15.55 S	158.45 W 15.55 S	158.45 W 16.00 S	158.50 W 16.00 S
30	195 49	25106	015S159W -136	Not Vacant		158.45 W 15.55 S	158.40 W 15.55 S	158.40 W 16.00 S	158.45 W 16.00 S
31	195 50	25381	015S159W -137	Not Vacant		158.40 W 15.55 S	158.35 W 15.55 S	158.35 W 16.00 S	158.40 W 16.00 S
32	195 51	25425	015S159W -138	Not Vacant		158.35 W 15.55 S	158.30 W 15.55 S	158.30 W 16.00 S	158.35 W 16.00 S
33	195 52	25027	015S159W -139	Not Vacant		158.30 W 15.55 S	158.25 W 15.55 S	158.25 W 16.00 S	158.30 W 16.00 S
34	195 53	25307	015S159W -140	Not Vacant		158.25 W 15.55 S	158.20 W 15.55 S	158.20 W 16.00 S	158.25 W 16.00 S
35	195 54	25067	015S159W -141	Not Vacant		158.20 W 15.55 S	158.15 W 15.55 S	158.15 W 16.00 S	158.20 W 16.00 S
36	195 55	25451	015S159W -142	Not Vacant		158.15 W 15.55 S	158.10 W 15.55 S	158.10 W 16.00 S	158.15 W 16.00 S
37	195 56	25007	015S159W -143	Not Vacant		158.10 W 15.55 S	158.05 W 15.55 S	158.05 W 16.00 S	158.10 W 16.00 S
38	195 57	25030	015S159W -144	Vacant		158.05 W 15.55 S	158.00 W 15.55 S	158.00 W 16.00 S	158.05 W 16.00 S
39	195 58	25492	015S159W -73	Vacant		159.00 W 15.30 S	158.55 W 15.30 S	158.55 W 15.35 S	159.00 W 15.35 S
40	195 59	25364	015S159W -74	Vacant		158.55 W 15.30 S	158.50 W 15.30 S	158.50 W 15.35 S	158.55 W 15.35 S
41	195 60	25134	015S159W -85	Not Vacant		159.00 W 15.35 S	158.55 W 15.35 S	158.55 W 15.40 S	159.00 W 15.40 S
42	195 61	25312	015S159W -86	Not Vacant		158.55 W 15.35 S	158.50 W 15.35 S	158.50 W 15.40 S	158.55 W 15.40 S
43	195 62	25387	015S159W -87	Vacant		158.50 W 15.35 S	158.45 W 15.35 S	158.45 W 15.40 S	158.50 W 15.40 S
44	195 63	25084	015S159W -88	Vacant		158.45 W 15.35 S	158.40 W 15.35 S	158.40 W 15.40 S	158.45 W 15.40 S
45	195 64	25315	015S159W -89	Vacant		158.40 W 15.35 S	158.35 W 15.35 S	158.35 W 15.40 S	158.40 W 15.40 S
46	195 65	25313	015S159W -97	Not Vacant		159.00 W 15.40 S	158.55 W 15.40 S	158.55 W 15.45 S	159.00 W 15.45 S

47	195 66	25298	015S159W -98	Not Vacant		158.55 W 15.40 S	158.50 W 15.40 S	158.50 W 15.45 S	158.55 W 15.45 S
48	195 67	25344	015S159W -99	Not Vacant		158.50 W 15.40 S	158.45 W 15.40 S	158.45 W 15.45 S	158.50 W 15.45 S
49	195 68	25346	015S160W -100	Not Vacant		159.45 W 15.40 S	159.40 W 15.40 S	159.40 W 15.45 S	159.45 W 15.45 S
50	195 69	25047	015S160W -101	Not Vacant		159.40 W 15.40 S	159.35 W 15.40 S	159.35 W 15.45 S	159.40 W 15.45 S
51	195 70	25405	015S160W -102	Not Vacant		159.35 W 15.40 S	159.30 W 15.40 S	159.30 W 15.45 S	159.35 W 15.45 S
52	195 71	25402	015S160W -103	Not Vacant		159.30 W 15.40 S	159.25 W 15.40 S	159.25 W 15.45 S	159.30 W 15.45 S
53	195 72	25373	015S160W -104	Not Vacant		159.25 W 15.40 S	159.20 W 15.40 S	159.20 W 15.45 S	159.25 W 15.45 S
54	195 73	25365	015S160W -105	Not Vacant		159.20 W 15.40 S	159.15 W 15.40 S	159.15 W 15.45 S	159.20 W 15.45 S
55	195 74	25498	015S160W -106	Not Vacant		159.15 W 15.40 S	159.10 W 15.40 S	159.10 W 15.45 S	159.15 W 15.45 S
56	195 75	25018	015S160W -107	Not Vacant		159.10 W 15.40 S	159.05 W 15.40 S	159.05 W 15.45 S	159.10 W 15.45 S
57	195 76	25263	015S160W -108	Not Vacant		159.05 W 15.40 S	159.00 W 15.40 S	159.00 W 15.45 S	159.05 W 15.45 S
58	195 77	25155	015S160W -109	Not Vacant		160.00 W 15.45 S	159.55 W 15.45 S	159.55 W 15.50 S	160.00 W 15.50 S
59	195 78	25432	015S160W -110	Not Vacant		159.55 W 15.45 S	159.50 W 15.45 S	159.50 W 15.50 S	159.55 W 15.50 S
60	195 79	25191	015S160W -111	Not Vacant		159.50 W 15.45 S	159.45 W 15.45 S	159.45 W 15.50 S	159.50 W 15.50 S
61	195 80	25360	015S160W -112	Not Vacant		159.45 W 15.45 S	159.40 W 15.45 S	159.40 W 15.50 S	159.45 W 15.50 S
62	195 81	25292	015S160W -113	Not Vacant		159.40 W 15.45 S	159.35 W 15.45 S	159.35 W 15.50 S	159.40 W 15.50 S
63	195 82	25028	015S160W -114	Not Vacant		159.35 W 15.45 S	159.30 W 15.45 S	159.30 W 15.50 S	159.35 W 15.50 S
64	195 83	25073	015S160W -115	Not Vacant		159.30 W 15.45 S	159.25 W 15.45 S	159.25 W 15.50 S	159.30 W 15.50 S
65	195 84	25168	015S160W -116	Not Vacant		159.25 W 15.45 S	159.20 W 15.45 S	159.20 W 15.50 S	159.25 W 15.50 S
66	195 85	25306	015S160W -117	Not Vacant		159.20 W 15.45 S	159.15 W 15.45 S	159.15 W 15.50 S	159.20 W 15.50 S
67	195 86	25075	015S160W -118	Not Vacant		159.15 W 15.45 S	159.10 W 15.45 S	159.10 W 15.50 S	159.15 W 15.50 S
68	195 87	25181	015S160W -119	Not Vacant		159.10 W 15.45 S	159.05 W 15.45 S	159.05 W 15.50 S	159.10 W 15.50 S
69	195 88	25424	015S160W -120	Not Vacant		159.05 W 15.45 S	159.00 W 15.45 S	159.00 W 15.50 S	159.05 W 15.50 S
70	195 89	25002	015S160W -121	Not Vacant		160.00 W 15.50 S	159.55 W 15.50 S	159.55 W 15.55 S	160.00 W 15.55 S

71	19590	25162	015S160W-122	Not Vacant		159.55 W 15.50 S	159.50 W 15.50 S	159.50 W 15.55 S	159.55 W 15.55 S
72	19591	25216	015S160W-123	Not Vacant		159.50 W 15.50 S	159.45 W 15.50 S	159.45 W 15.55 S	159.50 W 15.55 S
73	19592	25269	015S160W-124	Not Vacant		159.45 W 15.50 S	159.40 W 15.50 S	159.40 W 15.55 S	159.45 W 15.55 S
74	19593	25404	015S160W-125	Not Vacant		159.40 W 15.50 S	159.35 W 15.50 S	159.35 W 15.55 S	159.40 W 15.55 S
75	19594	25016	015S160W-126	Not Vacant		159.35 W 15.50 S	159.30 W 15.50 S	159.30 W 15.55 S	159.35 W 15.55 S
76	19595	25188	015S160W-127	Not Vacant		159.30 W 15.50 S	159.25 W 15.50 S	159.25 W 15.55 S	159.30 W 15.55 S
77	19596	25156	015S160W-128	Not Vacant		159.25 W 15.50 S	159.20 W 15.50 S	159.20 W 15.55 S	159.25 W 15.55 S
78	19597	25129	015S160W-129	Not Vacant		159.20 W 15.50 S	159.15 W 15.50 S	159.15 W 15.55 S	159.20 W 15.55 S
79	19598	25193	015S160W-130	Not Vacant		159.15 W 15.50 S	159.10 W 15.50 S	159.10 W 15.55 S	159.15 W 15.55 S
80	19599	25115	015S160W-131	Not Vacant		159.10 W 15.50 S	159.05 W 15.50 S	159.05 W 15.55 S	159.10 W 15.55 S
81	19600	25017	015S160W-132	Not Vacant		159.05 W 15.50 S	159.00 W 15.50 S	159.00 W 15.55 S	159.05 W 15.55 S
82	19601	25142	015S160W-133	Not Vacant		160.00 W 15.55 S	159.55 W 15.55 S	159.55 W 16.00 S	160.00 W 16.00 S
83	19602	25095	015S160W-134	Not Vacant		159.55 W 15.55 S	159.50 W 15.55 S	159.50 W 16.00 S	159.55 W 16.00 S
84	19603	25237	015S160W-135	Not Vacant		159.50 W 15.55 S	159.45 W 15.55 S	159.45 W 16.00 S	159.50 W 16.00 S
85	19604	25288	015S160W-136	Not Vacant		159.45 W 15.55 S	159.40 W 15.55 S	159.40 W 16.00 S	159.45 W 16.00 S
86	19605	25053	015S160W-137	Not Vacant		159.40 W 15.55 S	159.35 W 15.55 S	159.35 W 16.00 S	159.40 W 16.00 S
87	19606	25204	015S160W-138	Not Vacant		159.35 W 15.55 S	159.30 W 15.55 S	159.30 W 16.00 S	159.35 W 16.00 S
88	19607	25116	015S160W-139	Not Vacant		159.30 W 15.55 S	159.25 W 15.55 S	159.25 W 16.00 S	159.30 W 16.00 S
89	19608	25209	015S160W-140	Not Vacant		159.25 W 15.55 S	159.20 W 15.55 S	159.20 W 16.00 S	159.25 W 16.00 S
90	19609	25010	015S160W-141	Not Vacant		159.20 W 15.55 S	159.15 W 15.55 S	159.15 W 16.00 S	159.20 W 16.00 S
91	19610	25130	015S160W-142	Not Vacant		159.15 W 15.55 S	159.10 W 15.55 S	159.10 W 16.00 S	159.15 W 16.00 S
92	19611	25353	015S160W-143	Not Vacant		159.10 W 15.55 S	159.05 W 15.55 S	159.05 W 16.00 S	159.10 W 16.00 S
93	19612	25289	015S160W-144	Not Vacant		159.05 W 15.55 S	159.00 W 15.55 S	159.00 W 16.00 S	159.05 W 16.00 S
94	19613	25068	015S160W-61	Vacant		160.00 W 15.25 S	159.55 W 15.25 S	159.55 W 15.30 S	160.00 W 15.30 S

95	196 14	25352	015S160W -62	Vacant		159.55 W 15.25 S	159.50 W 15.25 S	159.50 W 15.30 S	159.55 W 15.30 S
96	196 15	25477	015S160W -63	Vacant		159.50 W 15.25 S	159.45 W 15.25 S	159.45 W 15.30 S	159.50 W 15.30 S
97	196 16	25245	015S160W -64	Vacant		159.45 W 15.25 S	159.40 W 15.25 S	159.40 W 15.30 S	159.45 W 15.30 S
98	196 17	25148	015S160W -65	Vacant		159.40 W 15.25 S	159.35 W 15.25 S	159.35 W 15.30 S	159.40 W 15.30 S
99	196 18	25275	015S160W -66	Vacant		159.35 W 15.25 S	159.30 W 15.25 S	159.30 W 15.30 S	159.35 W 15.30 S
100	196 19	25043	015S160W -67	Vacant		159.30 W 15.25 S	159.25 W 15.25 S	159.25 W 15.30 S	159.30 W 15.30 S
101	196 20	25416	015S160W -68	Vacant		159.25 W 15.25 S	159.20 W 15.25 S	159.20 W 15.30 S	159.25 W 15.30 S
102	196 21	25273	015S160W -73	Not Vacant		160.00 W 15.30 S	159.55 W 15.30 S	159.55 W 15.35 S	160.00 W 15.35 S
103	196 22	25003	015S160W -74	Not Vacant		159.55 W 15.30 S	159.50 W 15.30 S	159.50 W 15.35 S	159.55 W 15.35 S
104	196 23	25119	015S160W -75	Not Vacant		159.50 W 15.30 S	159.45 W 15.30 S	159.45 W 15.35 S	159.50 W 15.35 S
105	196 24	25390	015S160W -76	Not Vacant		159.45 W 15.30 S	159.40 W 15.30 S	159.40 W 15.35 S	159.45 W 15.35 S
106	196 25	25235	015S160W -77	Not Vacant		159.40 W 15.30 S	159.35 W 15.30 S	159.35 W 15.35 S	159.40 W 15.35 S
107	196 26	25125	015S160W -78	Not Vacant		159.35 W 15.30 S	159.30 W 15.30 S	159.30 W 15.35 S	159.35 W 15.35 S
108	196 27	25478	015S160W -79	Not Vacant		159.30 W 15.30 S	159.25 W 15.30 S	159.25 W 15.35 S	159.30 W 15.35 S
109	196 28	25340	015S160W -80	Not Vacant		159.25 W 15.30 S	159.20 W 15.30 S	159.20 W 15.35 S	159.25 W 15.35 S
110	196 29	25467	015S160W -81	Not Vacant		159.20 W 15.30 S	159.15 W 15.30 S	159.15 W 15.35 S	159.20 W 15.35 S
111	196 30	25242	015S160W -82	Not Vacant		159.15 W 15.30 S	159.10 W 15.30 S	159.10 W 15.35 S	159.15 W 15.35 S
112	196 31	25310	015S160W -83	Vacant		159.10 W 15.30 S	159.05 W 15.30 S	159.05 W 15.35 S	159.10 W 15.35 S
113	196 32	25112	015S160W -84	Vacant		159.05 W 15.30 S	159.00 W 15.30 S	159.00 W 15.35 S	159.05 W 15.35 S
114	196 33	25383	015S160W -85	Not Vacant		160.00 W 15.35 S	159.55 W 15.35 S	159.55 W 15.40 S	160.00 W 15.40 S
115	196 34	25261	015S160W -86	Not Vacant		159.55 W 15.35 S	159.50 W 15.35 S	159.50 W 15.40 S	159.55 W 15.40 S
116	196 35	25325	015S160W -87	Not Vacant		159.50 W 15.35 S	159.45 W 15.35 S	159.45 W 15.40 S	159.50 W 15.40 S
117	196 36	25318	015S160W -88	Not Vacant		159.45 W 15.35 S	159.40 W 15.35 S	159.40 W 15.40 S	159.45 W 15.40 S
118	196 37	25243	015S160W -89	Not Vacant		159.40 W 15.35 S	159.35 W 15.35 S	159.35 W 15.40 S	159.40 W 15.40 S

11	196		015S160W	Not		159.35 W	159.30 W	159.30 W	159.35 W
9	38	25033	-90	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
12	196		015S160W	Not		159.30 W	159.25 W	159.25 W	159.30 W
0	39	25031	-91	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
12	196		015S160W	Not		159.25 W	159.20 W	159.20 W	159.25 W
1	40	25398	-92	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
12	196		015S160W	Not		159.20 W	159.15 W	159.15 W	159.20 W
2	41	25050	-93	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
12	196		015S160W	Not		159.15 W	159.10 W	159.10 W	159.15 W
3	42	25185	-94	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
12	196		015S160W	Not		159.10 W	159.05 W	159.05 W	159.10 W
4	43	25350	-95	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
12	196		015S160W	Not		159.05 W	159.00 W	159.00 W	159.05 W
5	44	25443	-96	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
12	196		015S160W	Not		160.00 W	159.55 W	159.55 W	160.00 W
6	45	25464	-97	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
12	196		015S160W	Not		159.55 W	159.50 W	159.50 W	159.55 W
7	46	25442	-98	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
12	196		015S160W	Not		159.50 W	159.45 W	159.45 W	159.50 W
8	47	25330	-99	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
12	196		015S161W	Not		161.00 W	160.55 W	160.55 W	161.00 W
9	48	24910	-1	Vacant		15.00 S	15.00 S	15.05 S	15.05 S
13	196		015S161W	Not		160.15 W	160.10 W	160.10 W	160.15 W
0	49	24584	-10	Vacant		15.00 S	15.00 S	15.05 S	15.05 S
13	196		015S161W	Not		160.45 W	160.40 W	160.40 W	160.45 W
1	50	25283	-100	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
13	196		015S161W	Not		160.40 W	160.35 W	160.35 W	160.40 W
2	51	25086	-101	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
13	196		015S161W	Not		160.35 W	160.30 W	160.30 W	160.35 W
3	52	25049	-102	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
13	196		015S161W	Not		160.30 W	160.25 W	160.25 W	160.30 W
4	53	25258	-103	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
13	196		015S161W	Not		160.25 W	160.20 W	160.20 W	160.25 W
5	54	25336	-104	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
13	196		015S161W	Not		160.20 W	160.15 W	160.15 W	160.20 W
6	55	25347	-105	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
13	196		015S161W	Not		160.15 W	160.10 W	160.10 W	160.15 W
7	56	25270	-106	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
13	196		015S161W	Not		160.10 W	160.05 W	160.05 W	160.10 W
8	57	25210	-107	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
13	196		015S161W	Not		160.05 W	160.00 W	160.00 W	160.05 W
9	58	25223	-108	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
14	196		015S161W	Not		161.00 W	160.55 W	160.55 W	161.00 W
0	59	25286	-109	Vacant		15.45 S	15.45 S	15.50 S	15.50 S
14	196		015S161W	Not		160.10 W	160.05 W	160.05 W	160.10 W
1	60	24845	-11	Vacant		15.00 S	15.00 S	15.05 S	15.05 S
14	196		015S161W	Not		160.55 W	160.50 W	160.50 W	160.55 W
2	61	25453	-110	Vacant		15.45 S	15.45 S	15.50 S	15.50 S

14 3	196 62	25207	015S161W -111	Not Vacant		160.50 W 15.45 S	160.45 W 15.45 S	160.45 W 15.50 S	160.50 W 15.50 S
14 4	196 63	25080	015S161W -112	Not Vacant		160.45 W 15.45 S	160.40 W 15.45 S	160.40 W 15.50 S	160.45 W 15.50 S
14 5	196 64	25311	015S161W -113	Not Vacant		160.40 W 15.45 S	160.35 W 15.45 S	160.35 W 15.50 S	160.40 W 15.50 S
14 6	196 65	25447	015S161W -114	Not Vacant		160.35 W 15.45 S	160.30 W 15.45 S	160.30 W 15.50 S	160.35 W 15.50 S
14 7	196 66	25215	015S161W -115	Not Vacant		160.30 W 15.45 S	160.25 W 15.45 S	160.25 W 15.50 S	160.30 W 15.50 S
14 8	196 67	25021	015S161W -116	Not Vacant		160.25 W 15.45 S	160.20 W 15.45 S	160.20 W 15.50 S	160.25 W 15.50 S
14 9	196 68	25009	015S161W -117	Not Vacant		160.20 W 15.45 S	160.15 W 15.45 S	160.15 W 15.50 S	160.20 W 15.50 S
15 0	196 69	25176	015S161W -118	Not Vacant		160.15 W 15.45 S	160.10 W 15.45 S	160.10 W 15.50 S	160.15 W 15.50 S
15 1	196 70	25495	015S161W -119	Not Vacant		160.10 W 15.45 S	160.05 W 15.45 S	160.05 W 15.50 S	160.10 W 15.50 S
15 2	196 71	25448	015S161W -120	Not Vacant		160.05 W 15.45 S	160.00 W 15.45 S	160.00 W 15.50 S	160.05 W 15.50 S
15 3	196 72	25098	015S161W -121	Not Vacant		161.00 W 15.50 S	160.55 W 15.50 S	160.55 W 15.55 S	161.00 W 15.55 S
15 4	196 73	25309	015S161W -122	Not Vacant		160.55 W 15.50 S	160.50 W 15.50 S	160.50 W 15.55 S	160.55 W 15.55 S
15 5	196 74	25333	015S161W -123	Not Vacant		160.50 W 15.50 S	160.45 W 15.50 S	160.45 W 15.55 S	160.50 W 15.55 S
15 6	196 75	25085	015S161W -124	Not Vacant		160.45 W 15.50 S	160.40 W 15.50 S	160.40 W 15.55 S	160.45 W 15.55 S
15 7	196 76	25248	015S161W -125	Not Vacant		160.40 W 15.50 S	160.35 W 15.50 S	160.35 W 15.55 S	160.40 W 15.55 S
15 8	196 77	25225	015S161W -126	Not Vacant		160.35 W 15.50 S	160.30 W 15.50 S	160.30 W 15.55 S	160.35 W 15.55 S
15 9	196 78	25024	015S161W -127	Not Vacant		160.30 W 15.50 S	160.25 W 15.50 S	160.25 W 15.55 S	160.30 W 15.55 S
16 0	196 79	25280	015S161W -128	Not Vacant		160.25 W 15.50 S	160.20 W 15.50 S	160.20 W 15.55 S	160.25 W 15.55 S
16 1	196 80	25184	015S161W -129	Not Vacant		160.20 W 15.50 S	160.15 W 15.50 S	160.15 W 15.55 S	160.20 W 15.55 S
16 2	196 81	24706	015S161W -13	Not Vacant		161.00 W 15.05 S	160.55 W 15.05 S	160.55 W 15.10 S	161.00 W 15.10 S
16 3	196 82	25110	015S161W -130	Not Vacant		160.15 W 15.50 S	160.10 W 15.50 S	160.10 W 15.55 S	160.15 W 15.55 S
16 4	196 83	25468	015S161W -131	Not Vacant		160.10 W 15.50 S	160.05 W 15.50 S	160.05 W 15.55 S	160.10 W 15.55 S
16 5	196 84	25343	015S161W -132	Not Vacant		160.05 W 15.50 S	160.00 W 15.50 S	160.00 W 15.55 S	160.05 W 15.55 S
16 6	196 85	25048	015S161W -133	Not Vacant		161.00 W 15.55 S	160.55 W 15.55 S	160.55 W 16.00 S	161.00 W 16.00 S

16	196		015S161W	Not		160.55 W	160.50 W	160.50 W	160.55 W
7	86	25305	-134	Vacant		15.55 S	15.55 S	16.00 S	16.00 S
16	196		015S161W	Not		160.50 W	160.45 W	160.45 W	160.50 W
8	87	25473	-135	Vacant		15.55 S	15.55 S	16.00 S	16.00 S
16	196		015S161W	Not		160.45 W	160.40 W	160.40 W	160.45 W
9	88	25230	-136	Vacant		15.55 S	15.55 S	16.00 S	16.00 S
17	196		015S161W	Not		160.40 W	160.35 W	160.35 W	160.40 W
0	89	25120	-137	Vacant		15.55 S	15.55 S	16.00 S	16.00 S
17	196		015S161W	Not		160.35 W	160.30 W	160.30 W	160.35 W
1	90	25264	-138	Vacant		15.55 S	15.55 S	16.00 S	16.00 S
17	196		015S161W	Not		160.30 W	160.25 W	160.25 W	160.30 W
2	91	25434	-139	Vacant		15.55 S	15.55 S	16.00 S	16.00 S
17	196		015S161W	Not		160.55 W	160.50 W	160.50 W	160.55 W
3	92	24637	-14	Vacant		15.05 S	15.05 S	15.10 S	15.10 S
17	196		015S161W	Not		160.25 W	160.20 W	160.20 W	160.25 W
4	93	25484	-140	Vacant		15.55 S	15.55 S	16.00 S	16.00 S
17	196		015S161W	Not		160.20 W	160.15 W	160.15 W	160.20 W
5	94	25056	-141	Vacant		15.55 S	15.55 S	16.00 S	16.00 S
17	196		015S161W	Not		160.15 W	160.10 W	160.10 W	160.15 W
6	95	25421	-142	Vacant		15.55 S	15.55 S	16.00 S	16.00 S
17	196		015S161W	Not		160.10 W	160.05 W	160.05 W	160.10 W
7	96	25037	-143	Vacant		15.55 S	15.55 S	16.00 S	16.00 S
17	196		015S161W	Not		160.05 W	160.00 W	160.00 W	160.05 W
8	97	25189	-144	Vacant		15.55 S	15.55 S	16.00 S	16.00 S
17	196		015S161W	Not		160.50 W	160.45 W	160.45 W	160.50 W
9	98	24819	-15	Vacant		15.05 S	15.05 S	15.10 S	15.10 S
18	196		015S161W	Not		160.45 W	160.40 W	160.40 W	160.45 W
0	99	24634	-16	Vacant		15.05 S	15.05 S	15.10 S	15.10 S
18	197		015S161W	Not		160.40 W	160.35 W	160.35 W	160.40 W
1	00	24946	-17	Vacant		15.05 S	15.05 S	15.10 S	15.10 S
18	197		015S161W	Not		160.35 W	160.30 W	160.30 W	160.35 W
2	01	24545	-18	Vacant		15.05 S	15.05 S	15.10 S	15.10 S
18	197		015S161W	Not		160.30 W	160.25 W	160.25 W	160.30 W
3	02	24681	-19	Vacant		15.05 S	15.05 S	15.10 S	15.10 S
18	197		015S161W	Not		160.55 W	160.50 W	160.50 W	160.55 W
4	03	24783	-2	Vacant		15.00 S	15.00 S	15.05 S	15.05 S
18	197		015S161W	Not		160.25 W	160.20 W	160.20 W	160.25 W
5	04	24881	-20	Vacant		15.05 S	15.05 S	15.10 S	15.10 S
18	197		015S161W	Not		160.20 W	160.15 W	160.15 W	160.20 W
6	05	24700	-21	Vacant		15.05 S	15.05 S	15.10 S	15.10 S
18	197		015S161W			160.10 W	160.05 W	160.05 W	160.10 W
7	06	24549	-23	Vacant		15.05 S	15.05 S	15.10 S	15.10 S
18	197		015S161W	Not		161.00 W	160.55 W	160.55 W	161.00 W
8	07	24727	-25	Vacant		15.10 S	15.10 S	15.15 S	15.15 S
18	197		015S161W	Not		160.55 W	160.50 W	160.50 W	160.55 W
9	08	25137	-26	Vacant		15.10 S	15.10 S	15.15 S	15.15 S
19	197		015S161W	Not		160.50 W	160.45 W	160.45 W	160.50 W
0	09	25458	-27	Vacant		15.10 S	15.10 S	15.15 S	15.15 S

19	197		015S161W	Not		160.45 W	160.40 W	160.40 W	160.45 W
1	10	25446	-28	Vacant		15.10 S	15.10 S	15.15 S	15.15 S
19	197		015S161W	Not		160.40 W	160.35 W	160.35 W	160.40 W
2	11	25164	-29	Vacant		15.10 S	15.10 S	15.15 S	15.15 S
19	197		015S161W	Not		160.50 W	160.45 W	160.45 W	160.50 W
3	12	24925	-3	Vacant		15.00 S	15.00 S	15.05 S	15.05 S
19	197		015S161W	Not		160.35 W	160.30 W	160.30 W	160.35 W
4	13	25040	-30	Vacant		15.10 S	15.10 S	15.15 S	15.15 S
19	197		015S161W	Not		160.30 W	160.25 W	160.25 W	160.30 W
5	14	25302	-31	Vacant		15.10 S	15.10 S	15.15 S	15.15 S
19	197		015S161W	Not		160.25 W	160.20 W	160.20 W	160.25 W
6	15	25496	-32	Vacant		15.10 S	15.10 S	15.15 S	15.15 S
19	197		015S161W			160.15 W	160.10 W	160.10 W	160.15 W
7	16	25201	-34	Vacant		15.10 S	15.10 S	15.15 S	15.15 S
19	197		015S161W	Not		161.00 W	160.55 W	160.55 W	161.00 W
8	17	25061	-37	Vacant		15.15 S	15.15 S	15.20 S	15.20 S
19	197		015S161W	Not		160.55 W	160.50 W	160.50 W	160.55 W
9	18	25079	-38	Vacant		15.15 S	15.15 S	15.20 S	15.20 S
20	197		015S161W	Not		160.50 W	160.45 W	160.45 W	160.50 W
0	19	25272	-39	Vacant		15.15 S	15.15 S	15.20 S	15.20 S
20	197		015S161W	Not		160.45 W	160.40 W	160.40 W	160.45 W
1	20	24720	-4	Vacant		15.00 S	15.00 S	15.05 S	15.05 S
20	197		015S161W	Not		160.45 W	160.40 W	160.40 W	160.45 W
2	21	25022	-40	Vacant		15.15 S	15.15 S	15.20 S	15.20 S
20	197		015S161W	Not		160.40 W	160.35 W	160.35 W	160.40 W
3	22	25113	-41	Vacant		15.15 S	15.15 S	15.20 S	15.20 S
20	197		015S161W	Not		160.35 W	160.30 W	160.30 W	160.35 W
4	23	25252	-42	Vacant		15.15 S	15.15 S	15.20 S	15.20 S
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5	24	25161	-43	Vacant		15.15 S	15.15 S	15.20 S	15.20 S
20	197		015S161W	Not		160.25 W	160.20 W	160.20 W	160.25 W
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20	197		015S161W	Not		160.20 W	160.15 W	160.15 W	160.20 W
7	26	25342	-45	Vacant		15.15 S	15.15 S	15.20 S	15.20 S
20	197		015S161W	Not		161.00 W	160.55 W	160.55 W	161.00 W
8	27	25169	-49	Vacant		15.20 S	15.20 S	15.25 S	15.25 S
20	197		015S161W	Not		160.40 W	160.35 W	160.35 W	160.40 W
9	28	24508	-5	Vacant		15.00 S	15.00 S	15.05 S	15.05 S
21	197		015S161W	Not		160.55 W	160.50 W	160.50 W	160.55 W
0	29	25158	-50	Vacant		15.20 S	15.20 S	15.25 S	15.25 S
21	197		015S161W	Not		160.50 W	160.45 W	160.45 W	160.50 W
1	30	25257	-51	Vacant		15.20 S	15.20 S	15.25 S	15.25 S
21	197		015S161W	Not		160.45 W	160.40 W	160.40 W	160.45 W
2	31	25266	-52	Vacant		15.20 S	15.20 S	15.25 S	15.25 S
21	197		015S161W	Not		160.40 W	160.35 W	160.35 W	160.40 W
3	32	25227	-53	Vacant		15.20 S	15.20 S	15.25 S	15.25 S
21	197		015S161W	Not		160.35 W	160.30 W	160.30 W	160.35 W
4	33	25200	-54	Vacant		15.20 S	15.20 S	15.25 S	15.25 S

21	197		015S161W	Not		160.30 W	160.25 W	160.25 W	160.30 W
5	34	25092	-55	Vacant		15.20 S	15.20 S	15.25 S	15.25 S
21	197		015S161W			160.20 W	160.15 W	160.15 W	160.20 W
6	35	25297	-57	Vacant		15.20 S	15.20 S	15.25 S	15.25 S
21	197		015S161W	Not		160.35 W	160.30 W	160.30 W	160.35 W
7	36	24789	-6	Vacant		15.00 S	15.00 S	15.05 S	15.05 S
21	197		015S161W	Not		161.00 W	160.55 W	160.55 W	161.00 W
8	37	25329	-61	Vacant		15.25 S	15.25 S	15.30 S	15.30 S
21	197		015S161W	Not		160.55 W	160.50 W	160.50 W	160.55 W
9	38	25487	-62	Vacant		15.25 S	15.25 S	15.30 S	15.30 S
22	197		015S161W	Not		160.50 W	160.45 W	160.45 W	160.50 W
0	39	25065	-63	Vacant		15.25 S	15.25 S	15.30 S	15.30 S
22	197		015S161W	Not		160.45 W	160.40 W	160.40 W	160.45 W
1	40	25382	-64	Vacant		15.25 S	15.25 S	15.30 S	15.30 S
22	197		015S161W	Not		160.40 W	160.35 W	160.35 W	160.40 W
2	41	25483	-65	Vacant		15.25 S	15.25 S	15.30 S	15.30 S
22	197		015S161W	Not		160.35 W	160.30 W	160.30 W	160.35 W
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4	43	25034	-68	Vacant		15.25 S	15.25 S	15.30 S	15.30 S
22	197		015S161W	Not		160.30 W	160.25 W	160.25 W	160.30 W
5	44	24865	-7	Vacant		15.00 S	15.00 S	15.05 S	15.05 S
22	197		015S161W			160.15 W	160.10 W	160.10 W	160.15 W
6	45	25348	-70	Vacant		15.25 S	15.25 S	15.30 S	15.30 S
22	197		015S161W			160.10 W	160.05 W	160.05 W	160.10 W
7	46	25490	-71	Vacant		15.25 S	15.25 S	15.30 S	15.30 S
22	197		015S161W			160.05 W	160.00 W	160.00 W	160.05 W
8	47	25399	-72	Vacant		15.25 S	15.25 S	15.30 S	15.30 S
22	197		015S161W	Not		161.00 W	160.55 W	160.55 W	161.00 W
9	48	25206	-73	Vacant		15.30 S	15.30 S	15.35 S	15.35 S
23	197		015S161W	Not		160.55 W	160.50 W	160.50 W	160.55 W
0	49	25470	-74	Vacant		15.30 S	15.30 S	15.35 S	15.35 S
23	197		015S161W	Not		160.50 W	160.45 W	160.45 W	160.50 W
1	50	25409	-75	Vacant		15.30 S	15.30 S	15.35 S	15.35 S
23	197		015S161W	Not		160.45 W	160.40 W	160.40 W	160.45 W
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23	197		015S161W			160.25 W	160.20 W	160.20 W	160.25 W
6	55	25471	-80	Vacant		15.30 S	15.30 S	15.35 S	15.35 S
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7	56	25293	-81	Vacant		15.30 S	15.30 S	15.35 S	15.35 S
23	197		015S161W	Not		160.10 W	160.05 W	160.05 W	160.10 W
8	57	25190	-83	Vacant		15.30 S	15.30 S	15.35 S	15.35 S

23	197		015S161W	Not		160.05 W	160.00 W	160.00 W	160.05 W
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24	197		015S161W	Not		161.00 W	160.55 W	160.55 W	161.00 W
0	59	25441	-85	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
24	197		015S161W	Not		160.55 W	160.50 W	160.50 W	160.55 W
1	60	25236	-86	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
24	197		015S161W	Not		160.50 W	160.45 W	160.45 W	160.50 W
2	61	25497	-87	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
24	197		015S161W	Not		160.45 W	160.40 W	160.40 W	160.45 W
3	62	25463	-88	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
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4	63	25290	-89	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
24	197		015S161W	Not		160.20 W	160.15 W	160.15 W	160.20 W
5	64	24649	-9	Vacant		15.00 S	15.00 S	15.05 S	15.05 S
24	197		015S161W	Not		160.35 W	160.30 W	160.30 W	160.35 W
6	65	25481	-90	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
24	197		015S161W	Not		160.30 W	160.25 W	160.25 W	160.30 W
7	66	25299	-91	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
24	197		015S161W	Not		160.25 W	160.20 W	160.20 W	160.25 W
8	67	25089	-92	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
24	197		015S161W	Not		160.20 W	160.15 W	160.15 W	160.20 W
9	68	25001	-93	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
25	197		015S161W	Not		160.15 W	160.10 W	160.10 W	160.15 W
0	69	25145	-94	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
25	197		015S161W	Not		160.10 W	160.05 W	160.05 W	160.10 W
1	70	25320	-95	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
25	197		015S161W	Not		160.05 W	160.00 W	160.00 W	160.05 W
2	71	25045	-96	Vacant		15.35 S	15.35 S	15.40 S	15.40 S
25	197		015S161W	Not		161.00 W	160.55 W	160.55 W	161.00 W
3	72	25051	-97	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
25	197		015S161W	Not		160.55 W	160.50 W	160.50 W	160.55 W
4	73	25276	-98	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
25	197		015S161W	Not		160.50 W	160.45 W	160.45 W	160.50 W
5	74	25295	-99	Vacant		15.40 S	15.40 S	15.45 S	15.45 S
25	200		015S161W	Not		160.15 W	160.10 W	160.10 W	160.15 W
6	63	24748	-22	Vacant		15.05 S	15.05 S	15.10 S	15.10 S
25	200		015S161W	Not		160.25 W	160.20 W	160.20 W	160.25 W
7	64	25475	-56	Vacant		15.20 S	15.20 S	15.25 S	15.25 S
25	200		015S161W	Not		160.30 W	160.25 W	160.25 W	160.30 W
8	65	25247	-67	Vacant		15.25 S	15.25 S	15.30 S	15.30 S
25	200		015S161W	Not		160.35 W	160.30 W	160.30 W	160.35 W
9	66	25082	-78	Vacant		15.30 S	15.30 S	15.35 S	15.35 S
26	200		015S161W			160.30 W	160.25 W	160.25 W	160.30 W
0	67	25138	-79	Vacant		15.30 S	15.30 S	15.35 S	15.35 S
26	200		015S161W	Not		160.15 W	160.10 W	160.10 W	160.15 W
1	68	25071	-82	Vacant		15.30 S	15.30 S	15.35 S	15.35 S
26	200		015S161W	Not		160.20 W	160.15 W	160.15 W	160.20 W
2	69	25221	-33	Vacant		15.10 S	15.10 S	15.15 S	15.15 S

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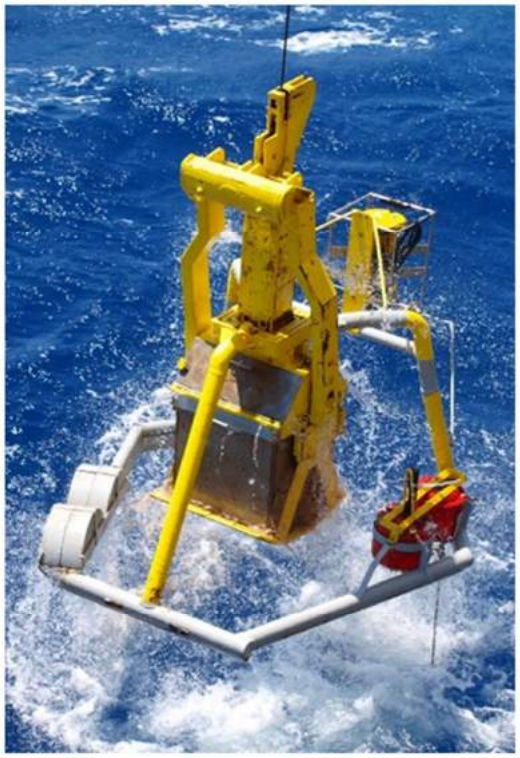
Annexes of the CIIC-SR License for Exploration Activities

Annex 02

The approved Work Plan reflecting the five-year Programme of Activities



Title:	Annex 02 of the License for Exploration Activities
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Checked by:	Eusenio Fatialofa – CIIC-SR General Manager
	Samantha Smith–Head of Sustainability & External Relations
Date:	24/01/2022
Reference:	P03-CIICSR-EV-RPT-00001_Annex 02
Version:	3

Signed: ..... On Behalf of: CIIC-SR

Name: Eusenio Fatialofa .....Date: 24 January 2022

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Abbreviations

AOI	Area Of Interest
AUV	Autonomous Underwater Vehicle
BC	Box-corer
CCOP/SOPAC	Committee for Coordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas
CCZ	Clarion-Clipperton Zone
CIICSRNOD	Label used for the CIIC-SR Offshore Campaigns
CI	Cook Islands
CIIC	Cook Islands Investment Corporation
CIIC-SR	CIIC-Seabed Resources (Joint Venture between CIIC and GSR-CI)
CIICSRNOD	Label used for the CIIC-SR Offshore Campaigns
CRM	Certified Reference Material
DEME	Dredging, Environment & Marine Engineering
EEZ	Exclusive Economic Zone
FFG	Free-Fall Grab
GEBCO	General Bathymetric Chart of the Oceans
GIS	Geographic Information System
GSR	Global Sea Mineral Resources
GSR-CI	GSR - Cook Islands
MMR	Ministry of Marine Resources
MUC	Multi-corer
PMN	Polymetallic Nodules
PPV	Pre-prototype Vehicle
QHSE	Quality Health Safety Environment
ROV	Remotely Operated Vehicle
RSC	René Sterk Company
SBMA	Seabed Minerals Authority

1. Introduction

This Annex 02 provides a description of the 5-year plan of work developed by CIIC-SR, including the program of activities to be undertaken with respect to the geological, resource definition, environmental and technical work that CIIC-SR will need to achieve, in view of developing responsible deep seabed mining of polymetallic nodules in the Exclusive Economic Zone (EEZ) of the Cook Islands, aligned with the principles of Marae Moana Act 2017.

The program will be updated regularly, in coordination with the Authority, in order to keep pace with the state-of-the-art available equipment and as required to ensure the program remains aligned with and respects the principles of Marae Moana Act 2017. Three conceptual phases have been identified (Figure II-1). Each phase builds on the work of the previous, ensuring a methodical and step-by-step programme easing the understanding and the adaptive management.

The objectives of the Work Plan are to develop a coherent and dense research framework focused on the collection and processing of baseline information related to the geological, oceanographical and environmental conditions of the area under application. All work shall contribute to the end goals which are:

- the characterization, understanding and mapping of the benthic and pelagic environment,
- the evaluation of the available polymetallic nodule (PMN) resources to a decent level of confidence,
- the test of the mining technology in the license area under application and,
- the assessment of the mining impacts on the surrounding environment and ways that these impacts can be avoided or reduced and monitored, while ensuring alignment with the principles of Marae Moana Act 2017.

The logic behind this three-phased approach is to first define high level environmental baseline conditions, with a focus on resource definition and oceanography studies (phase 1). This will be developed over the initial offshore expeditions and shall inform the subsequent detailed baseline characterization (phase 2) and the optimization and monitored trial of the pre-prototype mining technology (phase 3).

Through the second and third phases of exploration, further detailed information shall continually be gathered to build a sound baseline data set of information and supporting scientific studies. This detailed programme shall feed into both the technological design and development processes and into the understanding of potential environmental impacts and effects of the proposed seabed mining operation. If each defined milestone is successfully achieved by the end of the 5-year exploration period, CIIC-SR intends to have the technology, the environmental knowledge and the operational know-how and methods which will bring us closer to a possible exploitation phase. If by contrast the knowledge is deemed insufficient, CIIC-SR would adapt its program accordingly.

CIIC-SR wishes to emphasize that the scope of the program of activities for the next five-year period and the projected concomitant investment presented in the indicative expenditure's section (Part 4) are contingent on:

- satisfactory progress of the regulations on exploitation.
- PMN resource availability and quality.
- COVID19 restrictions in place.
- sufficient technology advancements.
- the strategic partnership of CIIC-SR and its affiliates.

- the metals market within the next coming years.

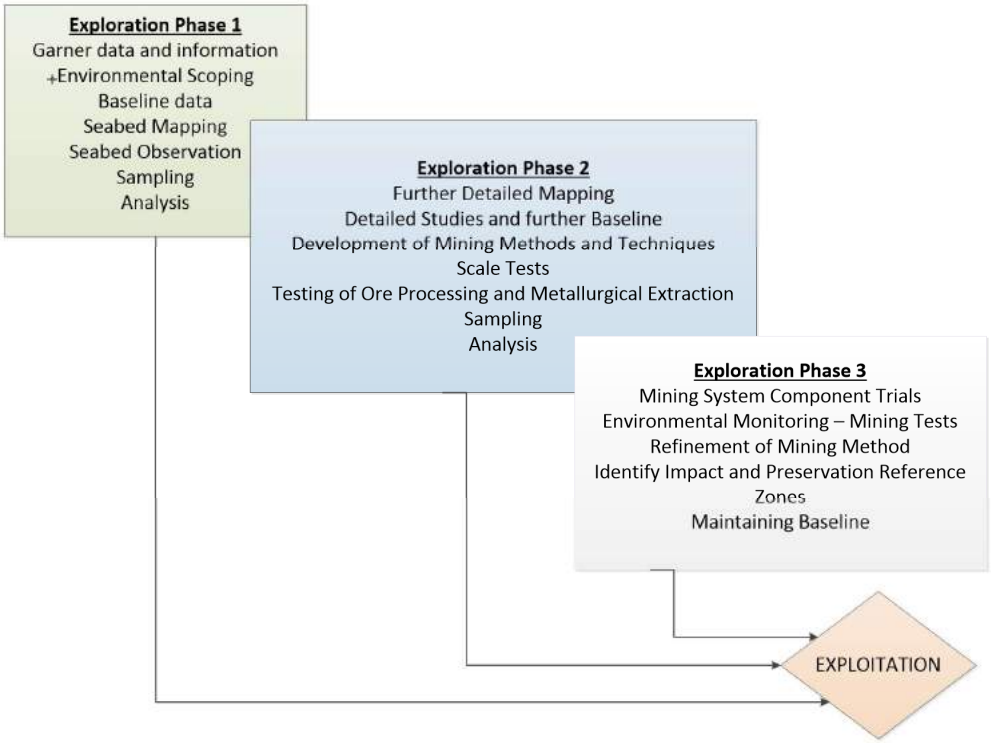


Figure II- 1: Three conceptual phases of the CIIC-SR 5-year Exploration program.

2. Approach to establish environmental baseline & biological reference areas

CIIC-SR will comply with the recommendations established by the International Seabed Authority (ISA) and the Cook Islands Seabed Mineral Authority (CI SBMA) to study all environmental-related topics composed by:

- Physical Oceanography
- Chemical Oceanography
- Geological and geotechnical Properties
- Sediment Properties
- Biological Communities
- Bioturbation activities in the sediments
- Sedimentation

Each of these studies requires specific equipment, protocols, and effort requirements that are summarized in Section 6 “Narrative of Environmental Component” of the CIIC-SR Application. The purpose of this part is to show that each of these environmental-related topics have been incorporated and spread over the offshore expeditions that CIIC-SR is planning to perform in the licensed area during the 5-year exploration period. As such, CIIC-SR hopes to fulfill all the conditions established in the laws of the Cook Islands, and more specifically regarding the Environment Act 2003 and Marae Moana Act 2017. At the time of writing, the ISA’s guidance document entitled *Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration of marine minerals in the Area* (See

ISBA/25/LTC/6/Rev.1 and /Corr.1 for the most recent updates) seems to be, currently, the most complete document related to baseline characterization and environmental impact assessment expectations. As such, the scope of work described here aligns with these recommendations which have been developed through a transparent process and multi-stakeholder approach, including scientific experts, regulators, Sponsoring States, Contractors (developers), NGOs.

It is generally recognized that a key environmental management strategy for polymetallic nodule provinces is the establishment of a network of set-aside areas across the provinces that contain representative habitats and biota of that which will be impacted by mining. CIIC-SR will establish one or more biological reference areas within the license area with the aim of preserving habitats and biota representative of what will be impacted by mining. How many and how large these reference areas are will be determined during the exploration program.

3. General Description of the Exploration Program

The exploration program focuses on a multidisciplinary approach combining multiple activities at sea. The plan of work is based on technical, environmental and geological requirements to develop an Environmental Impact Statement (EIS) and an Environmental Management and Monitoring Plan (EMMP) during the course of the 5-year exploration work. It will also incorporate a part of the ongoing GSR technical development executed in the CCZ, as the benefits will also contribute to the milestones achieved in the proposed plan of work.

The 5-year exploration program proposed by CIIC-SR is based on clear topics and objectives, already applied in the past but including newly developed and innovative technology. The program will allow CIIC-SR to:

- Improve confidence in the PMN resource, from the “inferred” level as concluded by the mining expert RSC (Section 2 of the CIIC-SR Application), to an “indicated” level for a large part of the available resource, up to a maximum confidence level (measured) locally, in areas where extensive studies have been carried out using geophysical information (side-scan sonar, multibeam/backscatter…), HD imagery from the seabed, and physical samples collected with adequate spacing ensuring strong statistical power. An estimate of those samples is given in the Section below dedicated to the resource assessment.
- Apply a high environmental standard – at least as high as that requested by the CI SBMA (and aligned with the ones already defined by the International Seabed Authority for the Area) to study the baseline environmental conditions and conduct an Environmental Impact Assessment (EIA);
- Develop a sediment plume model and evaluate the sediment plume dispersion.
- Collect enough geotechnical and engineering information to evaluate the feasibility of future mining in the area under application, by deploying unique tools, as the GraviProbe.
- Operate the GSR mining pre-prototype collector PATANIA II to validate mining efficiency/workability and the related environmental impacts that will be monitored.

The five-year CIIC-SR program is based on the execution of the equivalent of five (5) offshore expeditions spread over three different years [2023, 2024, 2026]:

- Year 1: Preparation of and planning for the EEZ offshore campaigns with scientific partners.
- Year 2: Execution of an offshore campaign [CIICSRNOD23] dedicated to the resource definition (using multibeam, backscatter, AUV data, physical samples) and the

commencement of initial and longer-term environmental studies (deployment of oceanographic moorings, environmental sampling).

- Year 3: Execution of an offshore campaign [CIICSRNOD24], constituted by 2 legs with very different environmental objectives and scientific expertise, both focusing on the environmental baseline studies within “areas of interest”, defined with the results of the first expedition, and the continuation of the BC collection for resource definition. The acquisition geophysical data (especially AUV imagery) will also help to better assess the resource of polymetallic nodules.
- Year 4: Intensive scientific laboratory and desk study and submission of the Environmental Impact Statement (EIS) for mining trials in the CI EEZ with GSR pre-prototype seafloor nodule collector PATANIA II.
- Year 5: Execution of an offshore campaign [CIICSRNOD26] dedicated, in the first leg, to continuing the environmental studies and resource definition and, in a second leg, to the execution of a mining trial with the GSR pre-prototype vehicle PATANIA II and environmental monitoring of the trial.

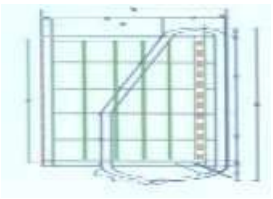
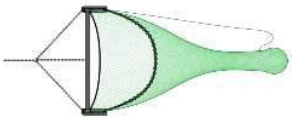
Table II- 1: CIIC-SR Schedule of the proposed 5-years Exploration Plan.

4. Exploration tools

As part of CIIC-SR exploration program, specific tools are required for oceanographic, geological, chemical and biological measurements. The present section describes the equipment, methods and techniques that will be used for measurements and monitoring based on existing deep-sea equipment. Of course, in addition to all these devices, associated deck equipment (laboratory, filtering units, etc.) on board for offshore sample processing, preservation and analysis of biological and chemical samples, before subsequent analysis onshore.

Table II- 2: CIIC-SR Schedule of the proposed 5-years Exploration Plan.

Vessels		
Research vessels		Scientific research vessels are usually the best option to fulfill the proposed scope, combining baseline study, technology trials and environmental monitoring.
Multi-function vessels		Due to the lack of available research vessels, or limited deck space for a multidisciplinary offshore expedition involving many pieces of equipment and containers, multi-function support vessels are often used to perform exploration works.
Geophysical devices		
Multibeam echosounder		MBES Kongsberg Simrad EM120 (or EM122), powerful enough to perform detailed bathymetric of large areas.
Autonomous underwater vehicles (AUV)		6000 m rated Autonomous Underwater Vehicle (REMUS, HUGIN…) equipped with multibeam, sub-bottom profiler, camera still…
Remotely Operated Vehicle (ROV)		ROV is a remotely controlled instrument for visual surveys, biota and sediment sampling and/or static and punctual oceanographic measurements (currents, geochemical, particle transport…).
Graviprobe		Innovative and In-house developed tool composed by modular weights on top, a 4m long rod and an accelerometer cone able to deduce the shear strength of the upper soft sediment layer in an undisturbed manner, in-situ and without need of co-axial cable.
Sediment / Water & Nodule sampler (lowered by plasma cable, steel wire or fiber optic cable)		
Box-corer [undisturbed]		The box-corer samplers are used to fulfil several objectives: (1) resource definition for the estimation of the nodule abundance (kg/m²), (2) the biological study and most specifically the study of macrofauna (retained on 300 µm sieve), and (3) geotechnical and geochemical measurements (...)

Multi-corer [undisturbed]		The device is a deep ocean sediment core sampler composed by a series of PVC-cores, specifically designed to minimize disturbance of the surface layer. It is lowered into the sea, up to the seabed, by a cable. This device can be used to study local fauna variations. Samples of the sediment/water interface can also be taken.
Water column analysis: CTD Carousel		Marine CTD sensor (Conductivity, Temperature, and Depth) is the primary tool for determining essential physical properties of sea water. The water sampling carousel allows water samples to be taken and analysed for various constituents (including metals, nutrients, etc.).
PMN Dredger		To collect large quantities of polymetallic nodules, GSR uses a large dredger, first deployed in a singly and then doubled to optimize the collection of polymetallic nodules. The two dredge units were combined to form only one big unit with larger capacities.
Plankton nets		Characterizing the upper water column communities with respect to plankton is part of the environmental baseline characterization.
Benthic Trawl		Benthic trawls, such as epibenthic sledge, can be used to collect megafaunal individuals. Despite the high potential that individuals will be damaged with this sampling procedure, some organisms will still be recognizable even to species level. Moreover, this technique will provide biological tissues for DNA analysis that visual analysis does not allow.
Cold Laboratories and cold-water supply		Depending on the cold storage capacities on board of the research vessel chartered and/or on the availability of cold laboratory, processing and storing of the samples may require additional chilled laboratories to keep the temperature near 4 °C.
Additional sensors installed on the BC/MUC frames & moorings		

USBL Transpoder		A transponder is a device that, upon receiving a signal, emits a different signal in response. Offshore, they are used to allow geo-positioning of devices.
ADCP		An Acoustic Doppler Current Profiler (ADCP) is a hydroacoustic current meter, used to measure water current velocities over a depth range using the Doppler effect of sound waves scattered back from particles within the water column.
Fluorometer		A fluorometer or fluorimeter is a device used to measure parameters of visible spectrum fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light.
Turbidity meter		Turbidity, the measure of suspended solids in liquids, is utilized as a measure of water quality and can be leveraged as a way for processors to slash waste, improve sustainability and control consumables.

4.1 Research or multi-function vessels

The general requirements with regards to the vessel are guided by the main objectives of the offshore campaign, mostly devoted to the scientific and technical research, including geophysical survey, sampling and post-processing on board. Scientific research vessels (Figure II-2) are usually the best option to fulfill the proposed scope, combining baseline study, technology trials and environmental monitoring. It should be noted that the deployment of the Patania II and all the auxiliary equipment requires a large deck space.

Box 1 - Research vessel requirement for the first campaigns:

- DP-1 (or DP-2) vessel;
- Length: +80m;
- Deck space: +500m² ;
- Vessel autonomy: 30 to 40 days;
- USBL equipment (type HiPAP 501) and transducer/beacons rated to 6,000 m;
- Hull-mounted multibeam echosounder (type Kongsberg EM122 or EM120);
- Geo-positioning system;
- Survey room with acquisition & processing computers;
- Cabins able to accommodate approx. 30 client representatives (+ crew);
- A-frame on the aft deck with a capacity of 15 to 20 tons;
- Hydraulic winch with a dyneema rope of about 9,000m-long (steel wire is also an option).
- Expected winch speed: 90m/min;
- Small Tugger winches (2 to 3 units) to control devices or equipment deployed at sea;
- Hull-mounted ADCP (for surface currents) - Optional;
- Seismic equipment for deep-waters (type airgun) - Optional;

Due to the lack of available research vessels, or limited deck space for a multidisciplinary offshore expedition involving many pieces of equipment and containers and scientific teams, multi-function support vessels are sometimes used to perform exploration works.

4.2 Geophysical devices

Bathymetric survey (Multibeam echosounder)

Before any seafloor sampling activity, a detailed bathymetric survey needs to be carried out. For that purpose, research vessels are typically equipped with a hull-mounted MBES Kongsberg Simrad EM122 (or equivalent), powerful enough to perform detailed bathymetric mapping of the seabed at great water depths.

The backscatter information (which gives intensity of the reflection of the signal) can be used to characterize the seabed; e.g. soft sediment, rocky seabed or sediment with nodules on top. The latter seabed facies are found to have high to intermediate impedance values (in dB). In any case, ground truthing through visual surveys and sampling using box corers is needed to validate the backscatter data.

The methodology and scope to complete the multibeam survey in the area under application is described in Section 5.1, describing the scope of the 2023 CIICSR proposed offshore expedition CIICSRNOD23.

Geophysical exploration technology

Deep towed vehicles

Towed devices have been developed for seabed exploration. It often consists of ballasted metal chassis towed from the surface vessel at a few meters off the seafloor, and remotely controlled. Monitoring instruments are mounted on the frame such as photographic equipment (cameras, flash etc), biological samples nets, water sampling devices, chemical probes, sonars, and depth-meter and altimeter for real-time control from surface.

It is noted CIIC-SR is not considering deep tow as a first option this kind of device to be deployed during the CIIC-SR offshore expeditions in the Cook Islands EEZ.

Autonomous underwater vehicles (AUV)

Different types of 6000 m rated Autonomous Underwater Vehicle (AUV) can be considered for these campaigns, such as the Hydroid REMUS 6000 or the Kongsberg HUGIN 6000. Depending on the selected equipment, autonomy and sensors will have a significant impact on the productivity and the optimization of the ship time. The autonomy will vary between 15 hrs (REMUS 6000) and 90 hrs (HUGIN 6000 modified). Several sensors are being considered for use:

1) a multibeam profiler (400 kHz), to allow bathymetric survey at a cm scale resolution,
2) a side-scan sonar dual frequency (120-410 kHz & 230 – 540 kHz);
3) a sub-bottom profiler (10-60 kHz);
4) a digital still camera (resolution: 3384 x 2704 - 9.2MPixel) used for resource definition & megafauna survey;
5) a light-scattering sensor (WETLabs BBD) for background turbidity

Box 2 – Plan of work for AUV operations:
For safety reasons and space optimization, the AUV is deployed from a Launch And Recovery System (LARS). It is usually common to have the entire system, including the AUV, contained and transported into a 20 ft container. The AUV team is composed of 5 - 6 technicians.

1) Based on the ship-based acoustic survey (see section 3.2), study areas of interest will de delineated, to be further investigated;
2) For each study area (about 200 km²), a low-resolution side-scan sonar and multibeam survey will be first executed in the entire study area, 60 m above the seabed in order to confirm the exact absolute depth and morphology, at a higher spatial resolution. This survey will also allow to detect steep slopes and punctual geological anomalies who could be a hazard for the following deployments closer to the seabed;
3) Within the study area, a smaller area of interest ("high-resolution area"), presenting contrasted acoustic facies, will be entirely covered using very high-resolution side-scan sonar (at about 15 m above seabed). This specific survey may be cancelled if we consider that the side-scan sonar cannot be used as an efficient tool to assess the resources (as it is the case for the nodule found in the CCZ). If this is confirmed during the first deployment at 15 m, the imagery survey will be preferred and executed after the survey at 60 m above seabed, as detailed in the point 4 below;
4) After data processing, an ultimate imagery survey (3 to 7 m above seabed) will be performed in some specific areas, with contrasted amplitudes. 2 options are envisaged for this last survey: (1) a complete photo mosaic at a specific very small box or (2) perform longer lines spread in the entire 200 km² area of interest (but not a 100 % coverage).

Remotely Operated Vehicle (ROV)

ROV is a powerful instrument for biota study and sampling. In benthic ecology, benthic fauna is categorized based on size classes: (1) megafauna (> 2 cm), sampled with photography/ROV and trawling methods, (2) macrofauna (retained on 300 µm sieve), sampled with box core, (3) meiofauna (retained on 32 µm sieve) sampled with multicorer.

Here, for ROV, the focus is set on larger organisms, the megafauna. The use of an ROV will allow targeted megafauna sampling directly from the seabed for analysis of metal levels in tissues for example.

The use of ROV during the exploration phase will allow real time scientific operation at the seafloor, such as:

- Punctual sampling using manipulators (biology, geology, etc);
- Observation and documentation of biological communities as well as geological and geomorphologic characteristics (nodules size and abundance) by various digital video and still cameras;
- Placement of sensors, camera traps, monitoring stations etc., on the seabed;
- Various additional measurements integrated in the ROV.

The ROV will also provide an opportunity to measure in a static mode the sediment plume generated by the GSR pre-prototype vehicle PATANIA II during the proposed mining trials (CIICSRNOD26) through visual surveys and targeted placement of monitoring stations on the seafloor.

4.3 Sediment, water & Nodule Sampler

Sediment Sampler: box-corer

The box-corer (BC) samplers are used to fulfill several objectives: (1) resource definition for the estimation of the nodule abundance (kg/m²), (2) the biological study and most specifically the study of macrofauna, and (3) the geotechnical and geological description of the upper sediment (usually restricted to 40 cm below seabed surface).

Sediment Sampler: Multi-corer

A multi-corer (MUC) is a deep ocean sediment core sampler specifically designed to minimize disturbance of the surface layer, when the sampling device comes into contact with the seafloor. MUCs is typically able to obtain 8 to 12 (sometimes up to 20) separate cores for each deployment using the 10 cm x 70 cm polycarbonate tubes. The system is usually deployed through an A-frame, using the same sample procedure as for the box-corers.

The device is primarily used to obtain samples for biological purposes, specifically meiofauna studies, as it results in an undisturbed sediment sample of the first 40 cm below the seabed. The core samples are usually sub-sampled on board of the vessel and preserved inside Petri boxes. They will be processed in laboratory for meiofauna and microbial observations.

Additionally, MUC are also used for geochemical analysis of the surface sediment, including pore water analysis and metal profiles.

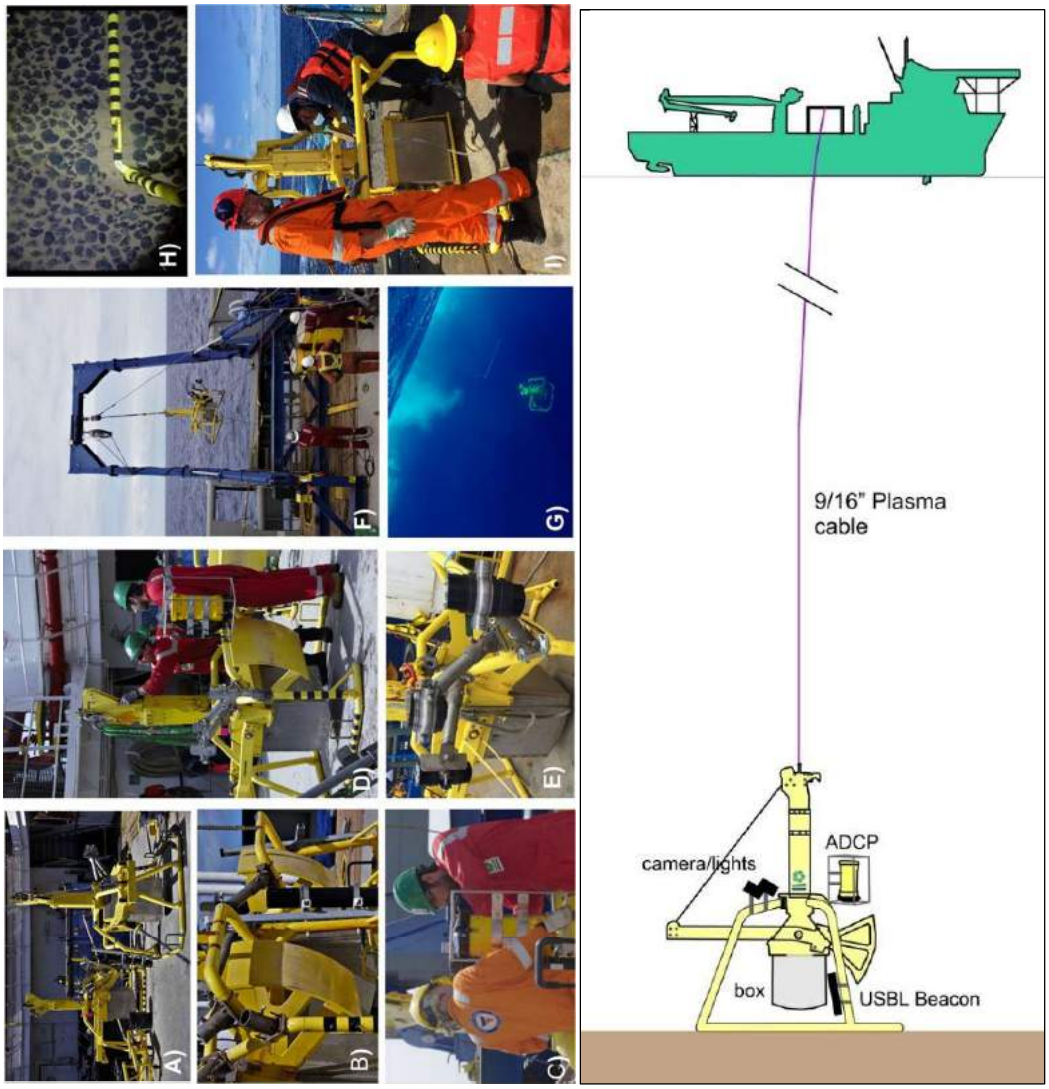


Figure II- 2: Details of the operation with the 0.25 m² box-corer (BC) sampler: A) BC units built by Ocean Instruments (San Diego); B) Trigger of the BC sheave and location of the beacon/transducer for geo-positioning; C) Installation of the ADCP on its frame; D) Safety pin set-up before deployment; E) Mount of the deep-sea camera and lights; F) BC deployment using A-frame and tugger lines; G) Descending the BC unit until touch down; H) BC touch-down on the seabed; I) BC recovery and switch to scientists. Right) Box-core setup during deployment.

Water column analysis: CTD Carousel

Marine CTD sensor (Conductivity, Temperature, and Depth) is the primary tool for determining essential physical properties of sea water. It gives a precise and comprehensive charting of the distribution and variation of water temperature, salinity, and density that helps to understand how the oceans affect life. The shipboard CTD is made up of a set of small probes attached to a large metal rosette wheel. The rosette is lowered on a cable down to the seafloor, and scientists observe the water properties in real time via a conducting cable connecting the CTD to a computer on the ship. A remotely operated device allows the water bottles to be closed selectively as the instrument ascends.

The CTD carousel is a fully autonomous water sampling system, which can take water samples at prescribed depths, without the need for real-time telemetry. The device contains typically 12 to 36 Niskin bottles with UV Chlorophyll Fluorometer, Dissolved Oxygen Sensor and CTD sensor. The system is deployed through the A-frame using the same sample procedure as for the box-corer.

Additionally, the equipment below can be installed on the frame of the CTD rosette if needed:

Fluorometer

Phytoplankton biomass can be estimated by the photosynthetic pigment, chlorophyll a, which is found in all phytoplankton cells. It is possible to measure in-situ the chlorophyll a from phytoplankton cells using a fluorometer, which detects the fluorescence of the chlorophyll molecule. The SEA TECH Model ST0250 fluorometer is an oceanographic data acquisition system that allows in-situ measurements of chl-a fluorescence in salt-water environment. This device can be mounted along with other instruments to measure conditions in upper-layer of the water-column.

Video Plankton Recorder (VPR)

The VPR is an underwater video microscope system that that takes images of plankton and particulate matter as small as 50 microns and up to a few centimeters in size. The instrument is used to get quick measures of the distributional patterns of plankton without destroying their delicate forms, as can happen when using nets and bottles to sample.

A combination of the two above mentioned systems will allow CIIC-SR to get an accurate picture of the planktonic communities in the application area.

PMN sampler: Dredger

CIIC-SR expects to use two dredge units to collect larger quantities of polymetallic nodules for three main reasons:

- Engineering and technological development;
- Future metallurgical tests;
- Study of megafauna associated with nodules.

The GSR/CIIC-SR dredgers were designed by GLOBAL SEAS LLC (Seattle, USA). The shape of the dredger is similar to an epibenthic sled, designed to minimize the removal of sediment (Figure II-3). A 2 inch mesh is fixed inside the frame to avoid small nodules to escape from the cage. In order to apply more weight during the dredging operation and avoid the device to “float” above the seabed, additional weights will be fixed on each side of the dredge, as a 6 m-long steel chain at the front of the dredger. To optimize the collection of polymetallic nodules, the two dredge units will be combined to form one big unit with larger capacities (Figure II-4). The expected recovery per deployment will thus be multiplied by two.

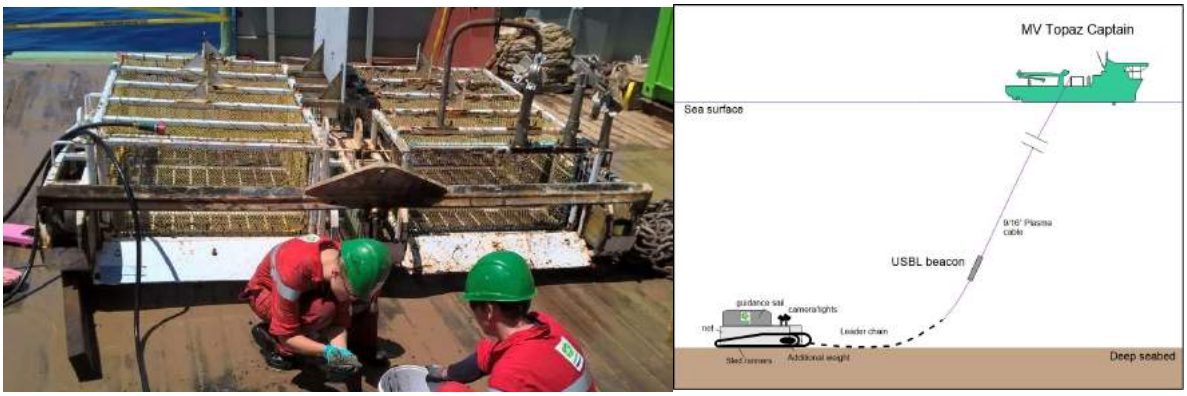


Figure II- 3: Dredge (DR) deployment set-up. Two dredge units will be combined together during the CIICSRNOD23 campaign to optimize the nodule collection.

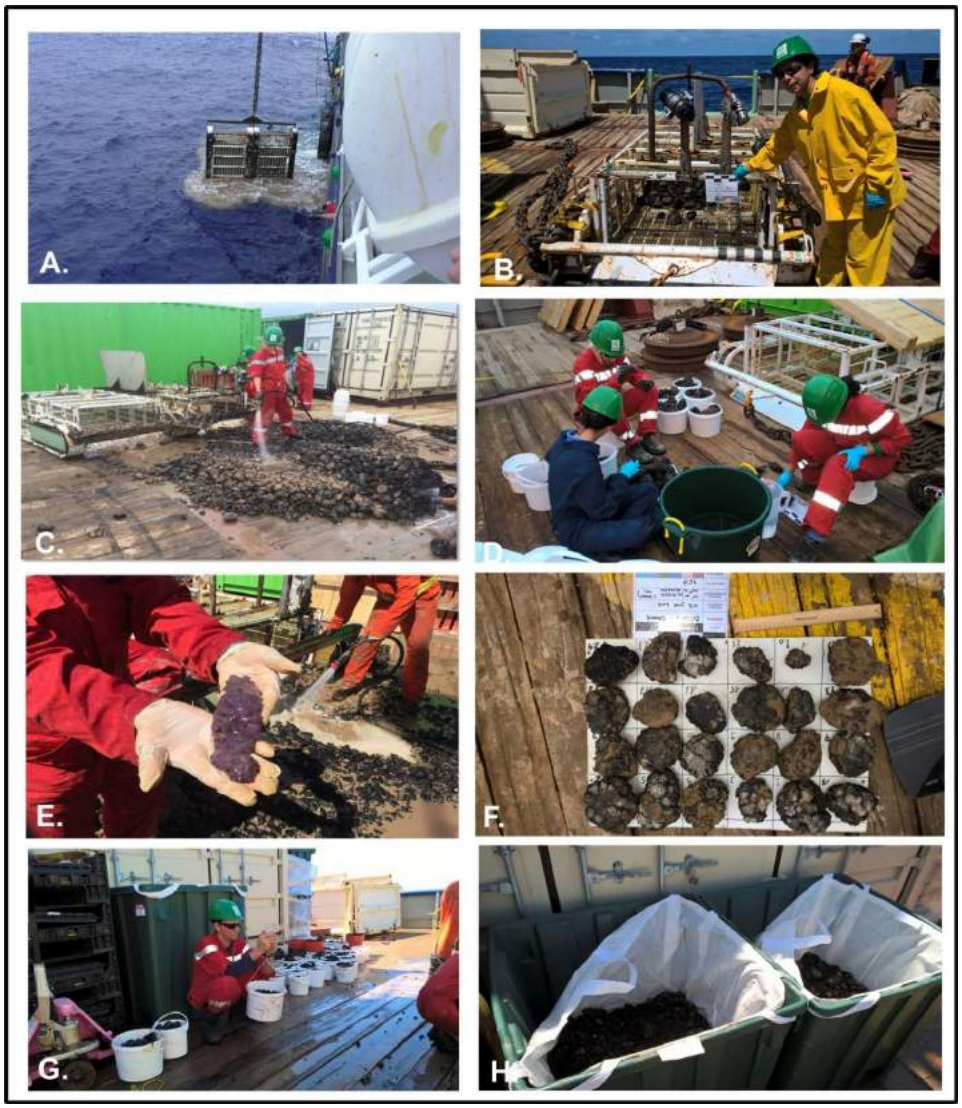


Figure II- 4: Major steps of the Dredge Procedure: (A) Dredge operation, (B) Picture with ID label, (C) Washing of the nodule from the sediment, (D) Nodules checked by biologists, (E) Weighting buckets of nodules after washing to determine wet weight, (F) Geological description of a representative sample, (G) Storage of nodules in hermetic plastic totes preserving nodule from drying.

4.4 Environmental moorings

"Long" mooring:

The long mooring will be designed to characterize the entire water column. The long mooring will be composed of sediment traps, as prescribed in ISBA/25/LTC/6/Rev.1, to capture the Particulate Organic Matter fluxes to the seabed (a key driver for benthic communities). Single-point current meters will be located regularly along the mooring. A CTD-Tu will be placed mid-water, for water masses characterization. Various ADCPs will be mounted in floatation buoys, with Metocean satellite beacon and flashing light, to measure current profiles in the entire water column (from surface to seafloor). Extra buoys will be required to ensure adequate buoyancy. Near the seabed, higher frequency instruments will be used to better capture the low backscatter levels expected to be present near the sea-bottom. Finally, a Dual Acoustic Release (Benthos 865A) will be fixed to the anchor. The battery life of such acoustic unit is estimated at 2 years. As such, the entire water column can be characterized, over a time period of several years, to allow the investigation of interannual and seasonal variability.

Benthic moorings

For the shorter moorings, ADCPs will be mounted in buoys and positioned above the seabed, one looking downward and one upward looking. A higher frequency ADCP will be installed, looking downward, to provide some overlapping measurements from the ADCPs. Back-up buoyancy will be attached to the mooring line just above the ADCP cage. Conductivity, temperature, pressure, and turbidity sensors will be mounted on a side cage bolted to the acoustic releases approximately 3 m above the seabed, to have a really good temporal resolution close to the seabed. More turbidity sensors will be mounted at various elevations, to allow also optical/acoustic calibration.

Alternatively, even shorter moorings could be used, typically for seafloor sediment dispersion monitoring, with simply 2 ADCPs mounted on it, and turbidity sensors.

Box 3 - Operation for deployment:

Simply explained, the procedure begins by placing the top buoy in the water first, towing it behind the vessel as the mooring wire is off-spooled through the stern to stretch the mooring string out along the sea surface. The vessel then drags the mooring string through the water slowly (~2-3 knots) to the target location where the anchor is deployed from the stern at the precise location, allowing the anchor to free fall to the seabed, standing the string upright. The technique is easy and intrinsically safe for the instrumentation and personnel, minimizing tensile strains on the mooring components and deployment lines. It also minimizes any potential for wire entanglement.

4.5 Additional equipment & sensors

Cold Laboratories and cold-water supply

Depending on the cold storage capacities on board the research vessel chartered and/or on the availability of cold laboratory, processing and storing of the samples may require additional chilled laboratories to keep the temperature near 4 °C. To accommodate this requirement, CIIC-SR will look at supplying additional labs. One will be dedicated to the processing of Box-corer samples with a sieving station, 4°C cold filtered seawater and basins for sieving of the sediment. The second lab will be set up for biological sample processing of MUC and water samples of CTD.

Plankton nets

Characterizing the water column communities of plankton will be part of the environmental baseline characterization achieved by CIIC-SR.

MOCNESS (Multiple Opening and Closing Net, with an Environmental Sensing System) is particularly adapted for sampling in open ocean at various depths under strict control of sensors (Salinity, temperature, depth, chlorophyll, oxygen and light levels). MOCNESS can sample as deep as 6,000 meters.

Benthic Trawl

Benthic trawls, such as epibenthic sledge, can be used to collect large samples for biological studies, allowing characterisation of a larger area. Despite the high potential that individuals will be damaged with this sampling procedure, some organisms will still be recognizable even to species level. Moreover, this technique will provide biological tissues for DNA analysis that visual analysis does not allow.

Geotechnical device: Deep-sea GraviProbe

The GraviProbe is an innovative geotechnical device developed by the Belgian company DotOcean (Automate Your Boat • dotOcean) and GSR, consisting of a modular heavy-weight body, a 4 m-long shaft terminated by a cone with a strain gauge that penetrates into the sediment. The entire system is battery driven and collect all the data in a memory card located inside the e-pod. This way, the GraviProbe can be deployed with a plasma cable or steel wire, without any need of communication or power from the surface.

The aim of the GraviProbe is to collect in-situ geotechnical data over a relatively large area, up to 4m-deep below seabed. Ideally penetrations “pokes” are relatively close to each other, to make interpolations from one point to another. As the first half meter is usually not well measured by the device, the shear strength can be evaluated with geotechnical measurement taken inside undisturbed physical samples (box-core) with the electronic vane equipment.

The device contains two sensors (accelerometer and pressure sensor), electronics for logging the sensor values, battery pack and a pressure valve. The main objective of this device is to define *the in-situ* static bearing strength (shear strength C_u) of the upper sediment, up to 4 meters below the seabed level, by performing *in-situ* multi-analyses. The applied weight of the body can be variable (from 550 kg up to 2 tons).

This device was successfully tested in the CCZ in 2015 already.

Box 4 – Operation & considerations for the GraviProbe:

- Preferably in the area where high-resolution geophysical survey (SSS/MBES/Photos) are available. This is required to decrease the risk to encounter outcropping hard rock or other obstacles who can damage the sensitive cone.
- Preferably close to a location where a box core sample has been taken (for the reason mentioned above);
- Good weather conditions for the over boarding and recovery of the device and then data;
- Planning optimization, in parallel of the AUV dive;
- The dynamic positioning system DP-1 or DP-2, coupled with a beacon mounted on the device, will provide the exact positioning of the device;
- 4km-straight line with 12 to 15 stations, distant of ± 250 m from each other. For each station, five penetrations, at very short distances from each other. This should result in similar strength profiles and confirm the results for the same station.

For deployment, a launching system (Figure II-5) was designed to safely deploy and recover the device from the back-deck. Additional camera and light can also be fixed on a fixed frame, on top of the device.

Figure II- 5: (Left) GraviProbe device ready for deployment – (Right) In-situ GraviProbe measurement at 4,500m-deep.

Additional sensors installed on the BC/MUC frames

The following equipment is also being considered for installation on the samplers or to be used once the samplers are recovered during the offshore expeditions:

- Lowered Acoustic Doppler Current Profiler (L-ADCP) – mounted on box-corers and CTD, to have Lowered ADCP profiles;
- Beacon unit (rated @6000 m) – mounted on all samplers, to have an exact location of the BC when coming into contact with the seafloor;
- Subsea Camera and associated LED lighting housings www.wassoc.com – mounted on the multi-corer/box-corer and dredger, to relate the nodule abundance visible in the picture and the nodule abundance measured in the BC;
- Point-load device to measure nodule strength directly after sampling;
- Optical microscope (max. magnification: x2000) with integrated camera for biological and geological observations;
- Camera support to optimize nodule pictures by using a frame, a reflex camera and spotlights;
- Electronic vane tester, penetrometer, steel ring (density) for field geotechnical studies;
- Laboratory oven to dry out sediment and nodule samples (dry density, water content);
- Automatic weight balance, collecting multiple measurements during a very short period, allows defining average weight values, without too much influence from the waves.
- Data analysis, integration of sample working sheets and mapping were performed with ArcGIS Desktop 10.2.2 and its extensions Spatial Analyst and 3D Analyst.

4.6 GSR's Pre-prototype Seafloor Nodule Collector (Patania II)

GSR has developed a pre-prototype seafloor nodule collector named 'Patania II' (Figures II-6), to test *in situ* the hydraulic head design developed in laboratory.

Figure II- 6: Photograph of the pre-prototype vehicle (PPV) Patania II and associated Launch and Recovery System, developed and built by GSR.

The pre-prototype vehicle has been successfully tested during mining trials that took place during the 2021 GSR offshore expedition to the Clarion-Clipperton Zone, at 4,500 m water depth. In parallel, an independent environmental monitoring has been also successfully achieved to better evaluate the impact of the mining system on the surrounding environment and deep-sea habitat. Several scientific activities were conducted by independent scientists from the European project JPI-Oceans/MiningImpact2 and MIT (Massachusetts Institute of Technology). The monitoring operation involved many different types of equipment directly mounted on the pre-prototype collector (Figure II-7) or deployed in the surrounding areas (landers, environmental moorings, ROV, AUV, etc.).

Based on the knowledge acquired in the CCZ, the Patania II is expected to be (re-)deployed in the Cook Island EEZ as part of the CIIC-SR Plan of Work, at the end of the 5-year exploration program.

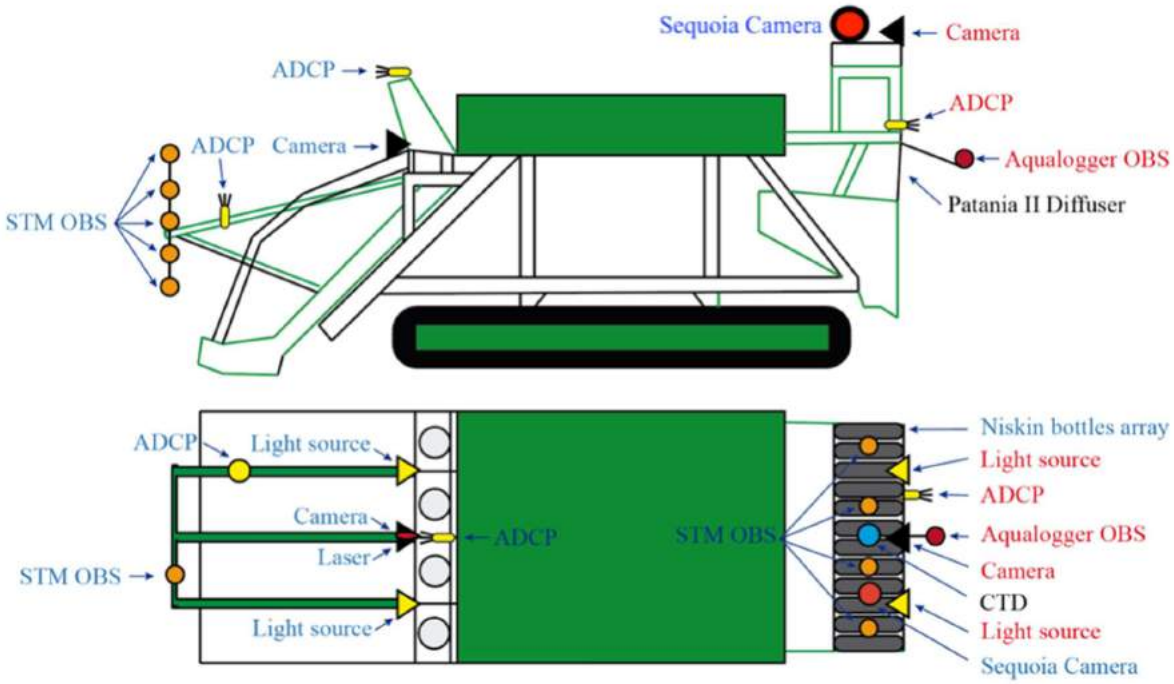


Figure II- 7: Environmental instrumentation installed on the PPV Patania II. (1) Niskin bottle array: custom-built array of 20 Niskin bottles for water and sediment plume sampling; (2) Turbidity sensor: Optical Backscatter Sensor (OBS) – point data; (3) Aqua logger: Turbidity sensors capable of measuring concentrations up to 50 g/l in the marine ecosystem; (4) ADCP's: ADCP will be used to measure the suspended particles in the water column. Acoustic turbidity measurements are based on signal strength losses due to attenuation, absorption and scattering that occurs with change of sediment load distance away from the unit. Two ADCPs have been planned on Patania II; (5) Multibeam: The Norbit long-range WBMS, a light and compact multibeam system that will be used to detect the seabed altitude from a distance of 200 m and detect changes on the seabed.; (6) Camera with light and lasers: A high-definition camera has been placed in the front of the vehicle, primarily for operational purposes to have a visual on the surroundings, during the descent and ascent of the PATII as well as a visual of the plume if present. (7) Conductivity, Temperature, Depth (CTD) sensor to measure salinity of the water. Figure provided by MIT (T. Peacock).

5. CIIC-SR Offshore campaigns

5.1 2023 Offshore Expedition [CIICSRNOD23]

Proposed Scope & Milestones

Resource definition:

- Acquire a complete and detailed mapping of the seabed topography and backscatter signal using hull-mounted multibeam echosounder system.
- Collect High Resolution (HR) geophysical data (by using an Autonomous Underwater Vehicle (AUV) at specific Areas of Interest (AOI).
- Collect AUV imagery of the seabed that will be analyzed for nodule abundance.
- Collect physical samples (box-corer) at regular spacing to validate and aligned nodule abundance deduced from the AUV imagery analysis.
- Correlate and extrapolate HR study to lower resolution areas.
- Develop a resource model to quantify wet tons of polymetallic nodules.

Engineering:

- Collect the first in-situ geotechnical data of the sediment strength, up to 4m below seabed using a unique geotechnical tool named GraviProbe;

- Conduct additional geotechnical tests on the sediment recovered with box-corers.
- Conduct point load tests on nodules to determine their shear strength (crushing test).

Environmental studies:

- Collect seabed samples for preliminary micro-, meio- and macrofauna analyses and study.
- Visual mapping and quantification of megafauna using AUV Imagery.
- Biological analysis of water samples.
- Collect baseline data on the physical and chemical oceanographic environment.
- Deploy environmental moorings for oceanographic studies.

Areas of Interest (AOI)

The objective of this survey is to generate a bathymetric map of the entire license area, to ensure that this part of the EEZ has been entirely mapped. Backscatter values, slopes and topographical contrasts will be considered to determine the Areas of Interest (AOIs). The aim is to focus on different types of areas, with contrasted bathymetry and backscatter values.

The 2023 offshore expedition will focus on the acquisition of high to very high-resolution geophysical imagery, geotechnical profiling, and additional physical samples inside two to three 200 sq. kilometer AOIs located inside the 19,000 sq. meter of the area under application. These AOIs will be selected together with our scientific partners and experts, using the historical data and the results of the bathymetric survey performed during the first part of the expedition.

On Figure II-8, three potential AOIs have been pre-identified based on historical information, publicly available information and the data collected by CIIC-SR in 2019. The exact location of the AOI will be refined after the CIICNOD23 bathymetric and backscatter survey has been interpretated, during the offshore expedition.

1) The first area of interest (AOI 01) is an area presenting a very high nodule abundance (25 to 35 kg /m²). Based on the existing low-resolution bathymetry data, the seafloor appears to be relatively flat in this location. The average water depth at this location is 5,100 m.
2) The second area of interest (AOI 02) is an intermediate area located towards the Western part of the license area under application. This intermediate zone should present low to

intermediate backscatter values. The deep-seabed topography seems to present more contrast. The nodule abundance should also be contrasted.

3) A third area of interest (AOI 03) may also be included to the scope of work. Historical information shows several contrasted areas in terms of topography, which may mean contrasts in nodule abundances and possibly biological habitats.

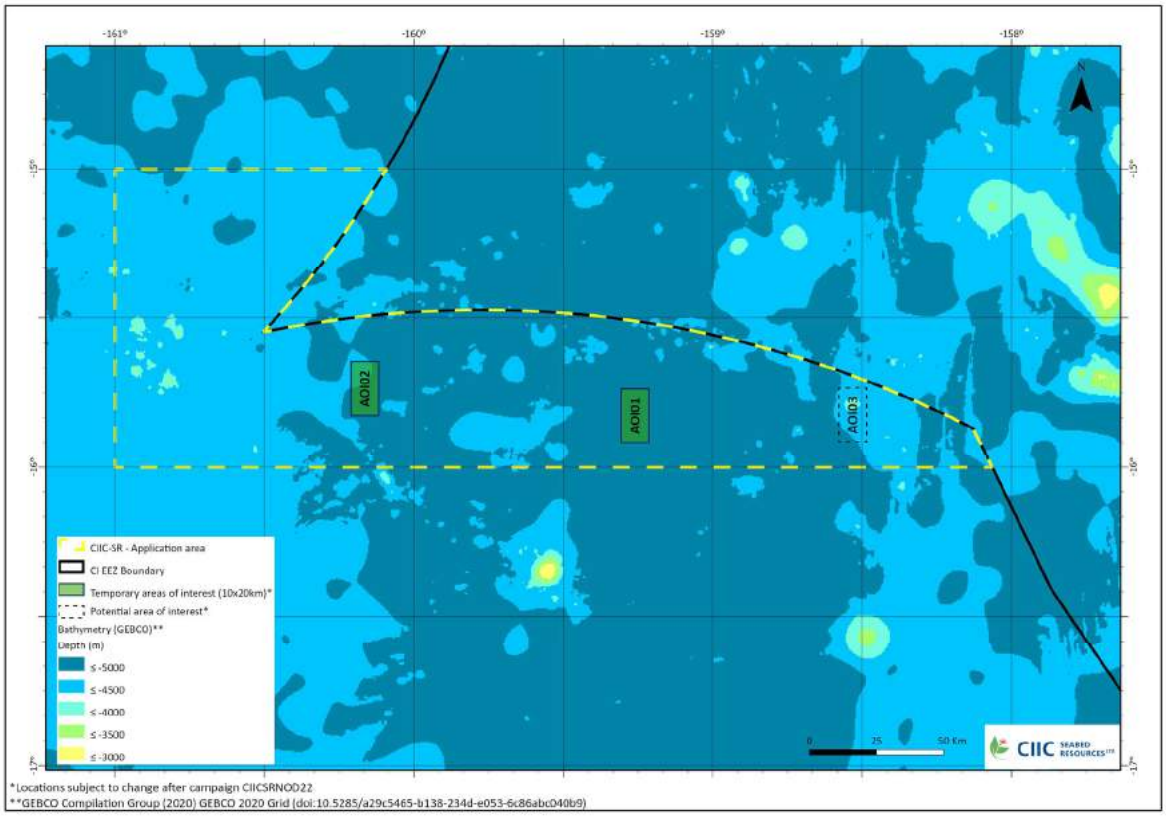


Figure II- 8: Preliminary location of potential Areas Of Interest (AOI's)

One or part of an AOI or additional area(s) outside the AOIs will be studied within the license area with the aim of monitoring natural variability and the preservation of representative habitats and biota away from the impacts of mining.

A similar scientific scope will be replicated for each AOI, combining a multi-disciplinary scope of scientific survey and activities spread over the environmental baseline campaigns (CIICNOD24 Legs 1 & 2 – CIICNOD26 Leg 1):

- The AUV survey will be performed at different altitudes above the seabed, to collect different types of geophysical data, as explained in the section 3.4 of the CIIC-SR Application.
- Physical samples (box-corer) will allow the determination of the burial ratio of PMN for a specific area and validate the nodule abundances (kg/m²) deduced from the imagery analysis. They will also be used for biological study purposes, and specifically for the study of the sessile fauna (fixed on nodules) and biota present in the sediment. Box-corer samples will also be used for the determination of the geotechnical properties of the upper sediment, by determining the shear strength (vane test), the particle-size distribution, the

Atterberg limits, density and water content. Carbonate content, pore water analysis and other geochemical laboratory analysis will also be performed.

- The multi-corer samples will also be collected to study meiofauna and microbes at different depths from the seabed (Section 3.7 of the CIIC-SR application).
- The CTD water sampling rosette will bring water sampled from different depths, as the Niskin bottles installed on the CTD frame can be programmed accordingly. Once recovered and secured on deck, the water is filtered and preserved appropriately for later analyses in a laboratory. This is further described in Section 3.8 of the CIIC-SR application.
- The GraviProbe, described in the Section "Equipment" of the Application (section 3.14), will allow the collection of geotechnical information from the top (4 m) sediment layers. The dynamic cone has been designed to make continuous measurements through the 4 m of sediment.
- Collecting 2 to 4 wet tons of PMN with a type of epi-benthic sledge used as a dredge constituted by 2 frame-units.
- Three short environmental moorings and one long mooring will be deployed during CIICSRNOD23 to respond very quickly to the need for scientists to have data on deep sea currents, but also all along the water column.

Overview Planning

The CIIC-SR offshore expedition CIICSRNOD23 is expected to take place during the year 2023 (target period: Q2 2023). The estimate ship-time has been evaluated from the start of the mobilization in Rarotonga to the end of the demobilization in Rarotonga (Figure II-9). If the mobilization is relocated to another country, or split into 2, the schedule below will have to be adapted accordingly.

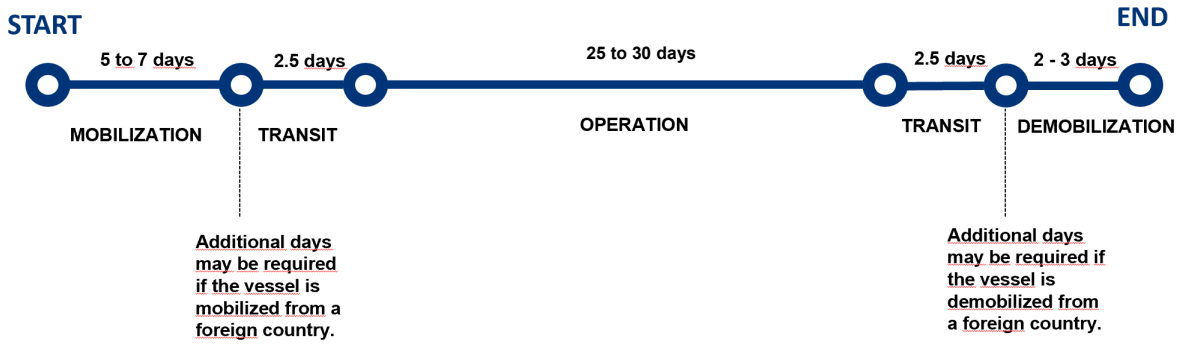


Figure II- 9: Overview of the CIICNOD23 Planning.

As required by the Authority, a more detailed breakdown table of the offshore activities has been included below (Table II-3) to clarify:

1) the offshore operational activities constituting CIICSRNOD23,
2) expected milestones that CIIC-SR would like to achieve,
3) dedicated ship time per offshore operational activity,
4) total ship time required for this campaign (including contingency).

The estimates given in this table are preliminary and cannot be considered as definitive.

Table II- 3: Dedicated ship time per offshore activity and estimate of the total number of days spent in operation – CIICSRNOD23.

CIIC-SR OFFSHORE CAMPAIGN [CIICSRNOD23]					
Activity	**Preferred Equipment**	**Expected Quantity (TBC)**	**Estimated ship time per deployment**	**total [hrs]**	**Comment**
Bathymetry/backscatter survey	Hull-mounted multibeam type EM120 or EM122	3283	234.5	234.5	Survey speed: 7-8 kts (14km/hr = 336 km/day) - Distance surveyed (incl turns): 3283 km
Short mooring deployment	Acoustic release/ADCPs/turbidity meter	3	5	15	Physical and chemical oceanography studies (near and above seafloor)
Long mooring deployment	Acoustic release/ADCPs/turbidity meter/sediment traps/CTDs, etc.	1	12	12	Physical and chemical oceanography studies (full water column)
Physical sampling	Box-corer	50	4	200	7km between samples - mostly located in the "intermediate to dense" area (15 - 35kg/m²) - resource, sediment and biota studies
Physical sampling	Multi-corer (MUC)	9	4	36	3 MUC samples per AOI - sediment and biota studies
Geotechnical profiling	GSR Graviprobe	3	12	36	Shear strength profiling of the upper 4m-sediment layer
HR Geophysical survey	AUV Remus 6000 or AUV Hugin 6000	6	8	48	Multibeam / Side-scan sonar / seismic reflection - 15m altitude
HR Seabed Imagery	AUV Remus 6000 or AUV Hugin 6000	6	8	48	2 dives per AOI (2 x 75km) / AUV camera (type CathX camera) - 5m altitude
Nodule dredging	GSR dredge	3	12	36	Expected quantities: 2 to 4 tons of polymetallic nodules
Physical profiling WC	CTD Rosette/Niskin bottles	6	5	30	Water column profiling and sampling for chemical oceanography studies
			Contingency (5%)	**34.775**	**hrs**
			Total [hrs]	**730.275**	**hrs**
			Total [days]	**30.43**	**days**

Most of the ship-time for this first campaign will be dedicated the bathymetric survey carried out from the vessel using a hull-mounted MBES equipment from the research vessel. Technical specifications of the MBES device of the equipment can slightly change from one brand to another one, but the expected performance is as follows:

1) Survey speed: 7 to 8 knots
2) MBES swath: 15km (3x water depth)
3) Line spacing: 10 km
4) Foreseen overlap between lines: 75%
5) Daily production: 336 km
6) Nb of longitudinal lines: 32
7) Number of crossed lines: 2
8) Total distance to be surveyed: 3,284 km
9) Estimated ship time required: 9.8 days

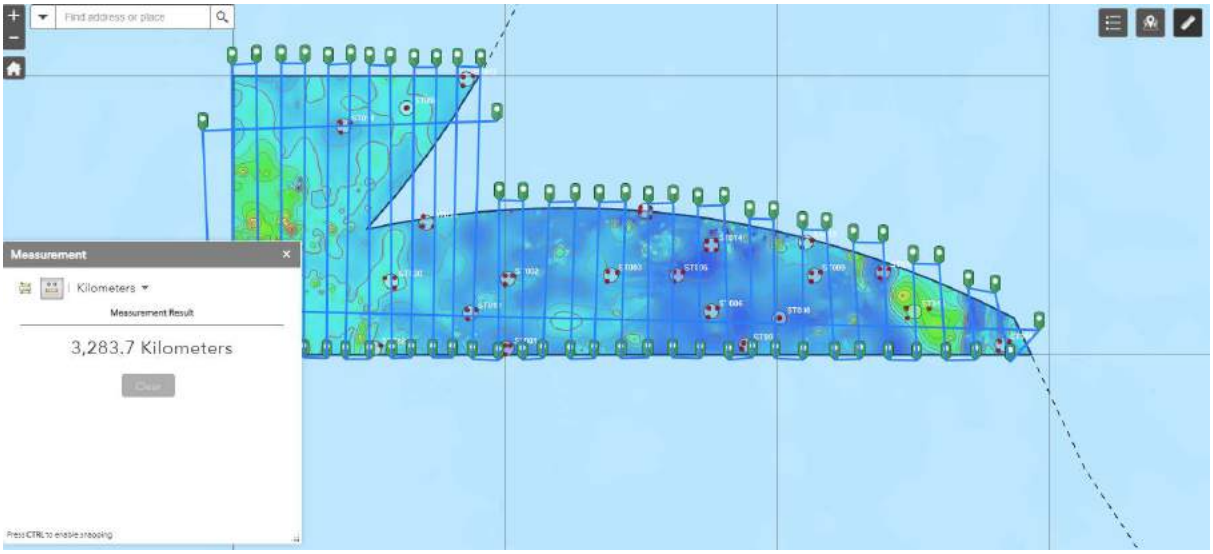


Figure II- 10: Preliminary track lines of the MBES bathymetric survey – CIICSRNOD23

In order to feed and validate the RD model, a significant amount of BC samples will be taken during this first campaign to validate the abundances ranges defined with the MBES backscatter data and the seabed imagery. BC samples will also be used for the biological research and biota identification, as the multi-core operation.

For ship-time optimization, CIIC-SR will use the best available AUV technology (e.g. Hugin 6000 or equivalent), able to conduct multi-purposed surveys in a large time period (60 to 90 hours).

Mooring deployment and GraviProbe operation will complete the scope of work constituting the first offshore campaign.

5.2 2024 Offshore Expedition [CIICSRNOD24]

Proposed Scope & Milestones

The objectives of the second campaign of this plan of work is dedicated to environmental baseline studies.

Annex 3 “Approved Environmental Management Program” outlines the key activities needed to develop a strong baseline characterization, known to be key for a future Environmental Impact Assessment (EIA), culminating in an Environmental Impact Statement (EIS). These requirements have been listed and inspired by the International Seabed Authority (ISA) (EIS Template: Annex 4 of the draft version of the Draft Regulations, ISBA/25/C/WP.1) and the *Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area* (ISA, 2020). The Cook Islands Seabed Minerals Authority and the National Environmental Service also provides details of the expectations for environmental baseline data acquisition.

The proposed milestones have been summarized in Annex 3 “Approved Environmental Management Program”.

Overview Planning

Due to the abundance of tests and operations to be carried out, as described in the program above, the planning of this expedition must be divided into two parts, named 'legs'. The sequence of activities is not yet defined in detail, and will depend on the initial scientific results of the 2023 offshore campaign.

The table below (Table II-4) gives a general idea of the required ship time in the scenario that the mobilization and demobilization take place in another country than Cook Islands. CIIC-SR already considers having 2 offshore legs during CIICSRNOD24, with very distinct activities identified and estimated in Table II-5. This preliminary scope and dedicated quantities/ship time will have to be further discussed with the scientific community to define the most logical sequence, the exact location and required quantities.

Table II- 4: Overview planning of the 2024 CIIC-SR Offshore expedition.

Planning	**Duration [Days]**
Mob (NZ)	3
Transit 1 (from NZ)	9
Mob 2 (Rarotonga)	5
Transit 2 (to site)	2.5
Operation (Leg 1)	20 to 25
Stand-by	3
Transit 3 (from site)	2.5
Demob/remob (Rarotonga)	3
Transit 4 (to site)	2.5
Operation (Leg 2)	20 to 25
Stand-by	3
Transit 5 (from site)	2.5
Demob (Rarotonga)	2
Transit 6 (to NZ)	9
Demob (NZ)	2
Total Charter period	+/- 90

CIIC-SR proposes to conduct a preliminary environmental study in 2023 (deployment moorings, determination of 3 AOIs and collection of physical samples) and 3 legs of intensive offshore activities in a period of 2 years (2024 - 2026).

Table II- 5: Preliminary scope and dedicated quantities and ship time for legs 1 and 2 of the 2024 CIIC-SR Offshore expedition.

CIIC-SR OFFSHORE CAMPAIGN [CIICSRNOD24 - Leg 1 & Leg 2]					
Activity	**Preferred Equipment**	**Expected Quantity (TBC)**	**Estimated ship time per deployment**	**total [hrs]**	**Comment**
HR Geophysical survey	AUV Remus 6000 or AUV Hugin 6000	20	8	160	Bathymetry & backscatter data physical habitat classification Megafauna observation
HR Geophysical survey	AUV Remus 6000 or AUV Hugin 6000	20	0	0	Acoustic nekton and plankton survey focused on the benthic boundary layer
Physical sampling	Box-corer	30	4	120	Xenophyophore/ other epifauna Nodule for epifauna and encrusting protists Metabarcoding, eDNA Macrofauna (barcoding for genetic connectivity studies) Trace-element analysis & metal of sediment. Geological properties, particle size distribution (PSD), density, specific gravity & settling velocity distribution
Physical sampling	Box-corer	80	4	320	7km between samples - mostly located in the "intermediate to dense" area (15 - 35kg/m²) -for resource, sediment and biota studies
Physical sampling	Multi-corer	50	4	200	metazoan meiofauna community and metabarcoding, foraminifera (morphology + DNA barcoding and metabarcoding) sediment eDNA (top layer), microbial community, isotope analyze of meiofauna - Pigment, pore water nutrient, organic matter in sediment /nutrient - metal porewater concentration. - Bioturbation - lead (Pb210) profile
Physical sampling	Epibenthic sledge	10	8	80	taxonomic biodiversity and genetic connectivity fine sediment fraction of sediment Macrofauna - Taxonomy + Tissue extract for genetic barcoding population genomic, stable-isotope analysis and trace-element analysis for ecotoxicity studies
Physical sampling	Benthic Lander Biogeochemistry (chamber)	5	3	15	Biogeochemical and nutrient flux studies of sediment/overlying water
Physical sampling	Benthic Lander Respiration	3	7	21	Pore-water oxygen profile, redox condition and respiration rate
HR Imagery	Benthic Lander with Demeral scavenger trap and baited camera	3	6	18	Photographs of demersal predators & benthic scavengers genetic barcoding and population genomic analysis Metal in tissue and ecotoxicology
Physical sampling	ROV	4	14	56	Megafauna sampling
Physical sampling	ROV	0	4	0	Gelatinous plankton
Physical sampling	CTD Rosette/Niskin bottles (clean)	10	4	12	pH, alkalinity, nutrient, dissolved organic and inorganic carbon, pigment, dissolved oxygen, Phytoplankton + eDNA
Physical sampling	CTD cast	10	4	40	Water column profiling for physical parameters
Physical sampling	Multinet - fine	4	5	20	Zooplankton
Physical sampling	Multinet - coarse	4	10	40	Larger nekton species and biome / abundance
Short mooring recovery and re-deployment	Acoustic release/ADCPs/turbidity meter	6	5	30	Physical and chemical oceanography studies (near and above seafloor)
Long mooring recovery and re-deployment	Acoustic release/ADCPs/turbidity meter/sediment traps	2	12	24	Physical and chemical oceanography studies (full water column)
			Contingency (5%)	**57.8**	**hrs**
			Total [hrs]	**1213.8**	**hrs**
			Total [days]	**50.58**	**days**

5.3 2026 Offshore Expedition [CIICSRNOD26]

Proposed Scope & Milestones

The 2026 CIIC-SR offshore campaign will be comprised of 2 legs:
The **first leg** will continue the baseline studies. The scope of CIICSRNOD26 [Leg 1] will depend on the gaps that remain, but it will also mostly be dedicated to the biological study involving temporal variability of the habitats, already investigated during the 2024 offshore expedition CIICSRNOD24.

The **second leg** will focus on the technical trials of PPV Patania II in the CIIC-SR License area, within the plan of work and environmental monitoring strategy developed in the EIS and approved by the CI Seabed Minerals Authority and involved stakeholders.

The scope will consist of the In-situ validation and optimization of the technology and working principles. Additionally, purpose-build measurement equipment will be installed on PATANIA II that will provide insight in the functioning of the collection system:

(1) Nodule collection system,
(2) trafficability with increased ground pressure,
(3) dedicated sensor suite (multibeam, density meter etc.)

The second important scope will involve environmental monitoring and an assessment of the environmental effects of the Patania II trial. CIIC-SR has the objective to team up with international scientists focusing on environmental effects of scaled seabed exploitation activities. It is envisaged that state-of-the-art monitoring and research equipment such as an AUV, ROV and several types of lander systems could be mobilized for the study of the far- and near-field sediment plume dispersion.

Planning

For this offshore expedition and due to the complexity of the installation of Patania II equipment onboard of the chartered vessel, CIIC-SR may consider conducting the mobilization and a demobilization of the PATII related equipment in a larger port, possibly located outside Cook Islands. After mobilization, the vessel will be repositioned in Cook Islands where further “small” equipment and personnel (staff + part of the crew) will come onboard the vessel.

In total, about 97 days should be required from the start of the mobilization to the completion of the demobilization. This period should also correspond to the charter period for the vessel and part of the equipment.

Table II- 6: Overview planning of the offshore expedition CIICSRNOD26.

Planning	Duration [Days]
Mob (NZ)	10
Transit 1 (from NZ)	9
Mob 2 (Rarotonga)	3
Transit 2 (to site)	2.5
Operation (Leg 1)	25 to 30
Stand-by	3
Transit 3 (from site)	2.5
Demob/remob (Rarotonga)	3
Transit 4 (to site)	2.5
Operation (Leg 2)	15 to 20

Stand-by	3
Transit 5 (from site)	2.5
Demob (Rarotonga)	2
Transit 6 (to NZ)	9
Demob (NZ)	5
Total Charter period	**+/- 97 days**

As the activities planned during the first part of the expedition have a very different purpose compared to the second part (environmental baseline study vs mining trial and environmental monitoring), it is logical to divide the campaign into two legs: the first one dedicated to the scientific research and the second one dedicated to the technical validation test of the mining technology and the associated monitoring of the environmental effects.

The tables (Table II-7 & Table II-8) below give additional details on activities expected to be carried out during CIICSRNOD26 – Leg1 and Leg 2, estimated quantities, objectives, and dedicated ship time. Similar to CIICNOD24, the first leg will be mostly dedicated to the environmental baseline studies. The main objective is to visit the same AOIs to better identify the different habitat types, including biota, and help to better understand temporal variations by collecting the same kind of samples.

The campaign will also dedicate ship time for the collection of box-core samples that will be used for the resource validation and the biological study.

The Environmental Impact Statement (EIS) for the mining trial (CIICSRNOD26) is expected to be delivered during the second half of 2025, 12 months prior to the period of the trial. The 2026 offshore campaign will combine technology (with the deployment of the GSR pre-prototype vehicle PATANIA II) and the monitoring of environmental effects.

Table II- 7: Preliminary scope and dedicated quantities and ship time for leg 1 of the 2026 CIIC-SR Offshore expedition.

CIIC-SR OFFSHORE CAMPAIGN [CIICSRNOD26 - Leg 1]					
Activity	**Preferred Equipment**	**Expected Quantity (TBC)**	**Estimated ship time per deployment**	**total [hrs]**	**Comment**
HR Geophysical survey	AUV Remus 6000 or AUV Hugin 6000	10	8	80	Bathymetry & backscatter data physical habitat classification Megafauna observation
HR Geophysical survey	AUV Remus 6000 or AUV Hugin 6000	10	0	0	Acoustic nekton and plankton survey focused on the benthic boundary layer
Physical sampling	Box-corer	15	4	60	Xenophyophore/ other epifauna Nodule for epifauna and encrusting protists Metabarcoding, eDNA Macrofauna (barcoding for genetic connectivity studies) Trace-element analysis & metal of sediment. Geological properties, particle size distribution (PSD), density, specific gravity & settling velocity distribution
Physical sampling	Box-corer	40	4	160	7km between samples - mostly located in the "intermediate to dense" area (15 - 35kg/m²)
Physical sampling	Multi-corer	25	4	100	metazoan meiofauna community and metabarcoding, foraminifera (morphology + DNA barcoding and metabarcoding) sediment eDNA (top layer), microbial community, isotope analyze of meiofauna - Pigment, pore water nutrient, organic matter in sediment /nutrient - metal porewater concentration. - Bioturbation - lead (Pb210) profile
Physical sampling	Epibenthic sledge	5	8	40	taxonomic biodiversity and genetic connectivity fine sediment fraction of sediment Macrofauna - Taxonomy + Tissue extract for genetic barcoding population genomic, table-isotope analysis and trace-element analysis for ecotoxicity studies
Physical sampling	Benthic Lander Biogeochemistry (chamber)	3	3	9	pulse chase experiment with isotopically enriched substrates Biogeochemical and nutrient fluxes sediment-overlying water
Physical sampling	Benthic Lander Respiration	2	7	14	Pore-water oxygen profile, redox condition and respiration rate
HR Imagery	Benthic Lander with Demeral scavenger trap and baited camera	2	6	12	Photographs of demersal predators & benthic scavengers genetic barcoding and population genomic analysis Metal in tissue and ecotoxicology
Physical sampling	ROV	2	14	28	Megafauna sampling
Physical sampling	ROV	2	0	0	gelatinous plankton
Physical sampling	CTD Rosette/Niskin bottles (clean)	5	4	12	pH, alkalinity, nutrient, dissolved organic and inorganic carbon, pigment, dissolved oxygen, Phytoplankton + eDNA
Physical sampling	CTD cast	5	4	20	Water column profiling for physical parameters
Physical sampling	Multinet - fine	2	5	10	Zooplankton studies
Physical sampling	Multinet - coarse	2	10	20	Larger nekton species and biome / abundance
Short mooring recovery and re-deployment	Acoustic release/ADCPs/turbidity meter	6	5	30	Physical and chemical oceanography studies (near and above seafloor)
Long mooring recovery and re-deployment	Acoustic release/ADCPs/turbidity	2	12	24	Physical and chemical oceanography studies (full water column)
			Contingency (5%)	**30.95**	**hrs**
			Total [hrs]	**649.95**	**hrs**
			Total [days]	**27.08**	**days**

Table II- 8: Preliminary scope and dedicated quantities and ship time for leg 2 of the 2026 CIIC-SR Offshore expedition.

CIIC-SR OFFSHORE CAMPAIGN [CIICSRNOD26 - Leg 2]					
Activity	**Preferred Equipment**	**Expected Quantity (TBC)**	**Estimated ship time**		**Comment**
			per deployment	**total [hrs]**	
HR Geophysical survey	AUV Remus 6000 or AUV Hugin 6000	4	6	24	in- and out- survey to collect bathymetry, SSS, imagery of the seabed before and after the Patania II trial.
HR Geophysical survey	AUV Remus 6000 or AUV Hugin 6000	6	6	36	Turbidity moniotoring of the Technical validation test
Monitoring	Box-corer	6	4	24	Xenophyophore/ other epifauna Nodule for epifauna and encrusting protists Metabarcoding, eDNA Macrofauna (barcoding for genetic connectivity studies) Trace-element analysis & metal of sediment. Geological properties, particle size distribution (PSD), density, specific gravity & settling velocity distribution
Monitoring	Multi-corer	6	4	24	metazoan meiofauna community and metabarcoding, foraminifera (morphology + DNA barcoding and metabarcoding) sediment eDNA (top layer), microbial community, isotope analyze of meiofauna - Pigment, pore water nutrient, organic matter in sediment /nutrient - metal porewater concentration. - Bioturbation - lead (Pb210) profile
Collector technical trial	Patania II	1	72	72	taxonomic biodiversity and genetic connectivity fine sediment fraction of sediment Macrofauna - Taxonomy + Tissue extract for genetic barcoding population genomic, table-isotope analysis and trace-element analysis for ecotoxicity studies
Collector Technical Validation	Patania II	6	20	120	Biogeochemical and nutrient fluxes sediment-overlying water
Monitoring	Patania II sensors	6	0	0	Turbidity meters and ADCPs mounted on the 'selfie-sticks' of Patania II
Monitoring	Landers / ADCP's / turbidity	2	7	14	Pore-water oxygen profile, redox condition and respiration rate
Monitoring	ROV	2	14	28	Megafauna sampling before and after trial test with Patania II
Monitoring	CTD Rosette/Niskin bottles	5	4	12	pH, alkalinity, nutrient, dissolved organic and inorganic carbon, pigment, dissolved oxygen, Phytoplankton + eDNA
Monitoring	CTD Cast	5	4	20	Water column profiling for physical parameters
Short mooring recovery and re-deployment	Acoustic release/ADCPs/turbidity meter	8	5	40	Physical and chemical oceanography studies (near and above seafloor)
			Contingency (5%)	**20.7**	**hrs**
			Total [hrs]	**434.7**	**hrs**
			Total [days]	**18.11**	**days**

6. Resource definition

To achieve an accurate and reliable estimation of the PMN resource available in the area under application, CIIC-SR has developed an exploration program based on the acquisition of:

1) Low Resolution (LR) Bathymetry and backscatter data (100% coverage of the license area)
2) High Resolution (HR) seabed imagery (AUV) inside the AOIs
3) HR Side-scan sonar imagery (AUV) inside the AOIs
4) HR bathymetry and backscatter data inside the AOIs
5) Collection of box-core samples at constant distance (7km and 15 km-spacing)

By combining the above activities, CIIC-SR should be able to assess the PMN resources to a high level of confidence.

Based on the necessary spacing required to reach the "indicated" level of PMN resource, CIIC-SR has made an estimate of the number of BC samples necessary to reach this level of confidence where the RSC report has mapped the area with the greater abundance of nodules (> 15kg/m²).

In total, about 271 samples are required to reach an indicated/measured level of the PMN resource in the area greater than 15 kg/m² and an inferred level for the abundances below 15 kg/m².

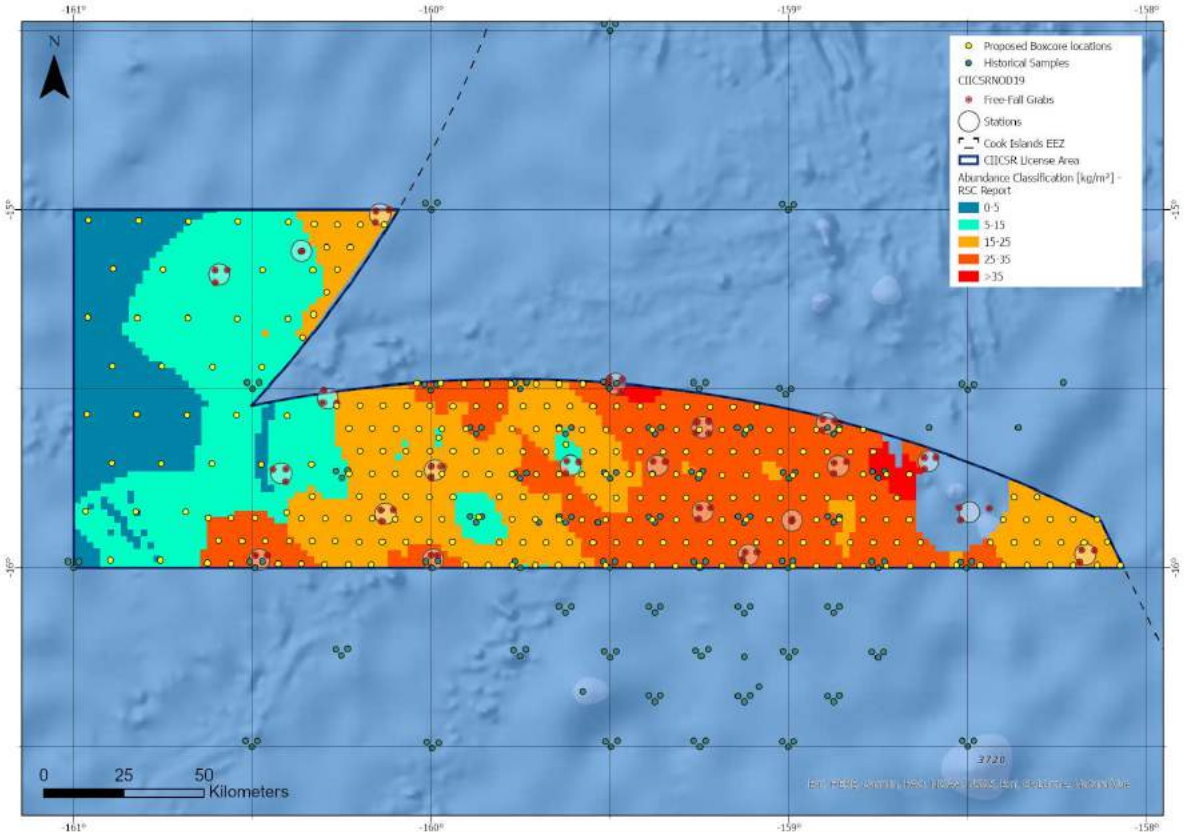


Figure II- 11: Preliminary design of the BC sampling grid, superimposed with the preliminary resource model developed by the company RSC (based on historical data), required to achieve the "indicative" level of PMN resource. The position of the Areas of Interest (AOIs) will be re-located in a later stage, after the entire acquisition of the bathymetrical and backscatter data. Inside the AOIs, CIIC-SR expects to reach the "measured" level of PMN resource.

As the quantity of box-cores is very significant, only a part of the total quantity is expected to be performed over the three exploration campaigns, also considering the ship-time dedicated for the other activities (bathymetric survey, dredge, sampling, mooring operation…). Based on operational ship-time, CIIC-SR expects to complete 170 BC samples during the three campaigns, which represent 62% of the total quantities.

By spreading this quantity of BC samples in the entire license area, but most specifically in the area where the nodule abundance has been evaluated in the RSC report as higher than 15 kg/m², CIIC-SR should be able to secure 148M wet tons of nodules at the "indicated" level and 12M wet tons at the highest level of confidence (measured level) at the end of the 5-years exploration contract (Table II-9).

Table II- 9: Estimation of the BC samples to be collected for the resource assessment and the estimate of the level of confidence that CIIC-SR would like to reach after completion of the three offshore campaigns included in the Plan of Work.

CIIC-SR Resource definition - Box-corer sampling Plan									
Nodule Abundance	Spacing between samples	Area	Estimate Nb of BC's	Offshore campaigns			Completed	Completed	Left
[kg/m²]	[km]	[km²]	[unit]	CIICSRNOD23	CIICSRNOD24	CIICSRNOD26	[unit]	[%]	[%]
0 - 5	15	3,327	13	N/A	4	3	7	54	46
5 - 15	15	5,062	24	N/A	5	5	10	42	58
15 - 25	7	5,280	115	20	25	7	52	45	55
25 - 35	7	5,574	115	30	42	25	97	84	16
> 35	7	223	4	N/A	4	N/A	4	100	0
Total		**19,466**	**271**	**50**	**80**	**40**	**170**	**63**	**37**

level of confidence	Area [km²]	Percent [%]	Average Nodule Abundance [kg/m²]	PMN Resource [10^6t - wet]
Measured	600	3.08	20	12.00
Indicated	6,712	34.48	22	147.66
Inferred	12,154	62.44	4	48.62
	19,466			**208.28**

7. Economics and value of exploration/mining

7.1 Economical benefit to the Cook Islands

CIIC-SR is not yet able to evaluate, at this stage of the project, the indirect financial benefit to the Cook Islands local industry by the support to the preparation and execution of the offshore campaigns. However, and as already demonstrated during our first offshore expedition in 2019, CIIC-SR is devoted to involving and support the local companies, especially the ones related to construction, naval support (bunkering), catering, lodging, etc. It is estimated that approximatively 5 to 10% of the budget dedicated to the offshore expedition would be contributed to the CI economy.

7.2 Mining revenue

Revenue from mining (e.g. through taxes and royalties) will not be realised until mining operations have commenced. Nevertheless, CIIC-SR has made some estimates of what could be expected as metal resource in the area under application.

The below table outlines the estimated potential resources that the area under application could contain. The estimated numbers made in the Cook Islands EEZ reserved area (initial area) are based on historical information, with an ("inferred") low level of confidence, not including the results of the 2019 CIIC-SR offshore campaign.

Table II- 10: Estimation of the available resource in the area under application and estimated quantities (in wet and dry tons)

General specifications of the area under application (based on historical data)		Unit
Area	19,170	Km²
% Mineable	50%	
Mineable area	9,585	Km²
Abundance	27	kg/m²
Estimated quantity of PMN (wet)	204,000,000	Tonne (wet)
Water content	30%	
Estimated quantity of PMN (dry)	147,000,000	Tonne (dry)

Table II- 11: Quantity estimates of the minerals who could pretend to be extracted from the polymetallic nodules (in dry tons)

	%	Unit (Tonne - dry)
Manganese	15.00%	22,050,000
Nickel	0.30%	441,000
Copper	0.10%	147,000
Cobalt	0.50%	735,000
Rare Earth Elements	0.19%	279,300

Given the demand for cobalt is on the rise, it is anticipated that the price of cobalt will also rise. CIIC-SR's initial estimates are that the overall economic viability will be positive for both CIIC-SR and the Cook Islands.

7.3 Risk Management Plan

It is understood that risks need to be identified, assessed, and mitigated using precautionary measures. These measures (single or combined) must be able to eliminate or minimize the risk to as low as reasonably practicable and to an acceptable level.

Risk Management Processes

CIIC-SR's Risk Management Process (RMP) is a structured and repeatable process designed to facilitate the identification, analysis, evaluation, treatment, and monitoring of risks significant to the organisation's business, key project, or transaction level objectives.

Developing a deep and broad understanding of risks and critical controls in the organisation improves decision making and resource management. Ultimately the process can serve to develop

a culture where risk information is rich and transparent and is used to inform where resources (financial and non-financial) are best allocated for control enhancement, control optimisation and risk reduction.

Figure II- 12: CIIC-SR's Risk Management Process. Adapted from Essential Tools for Management Accountants – Governance and Risk Management, Chartered Group Management Accountants (2013).

More details on Risk Management can be found in Annexes 3 and 4.

7.4 Pre-feasibility study

A pre-feasibility study, also including potential responses to the risks described above, will be investigated during the first year of the exploration contract. The draft version will require additional input mostly coming from the collector test scheduled for 2026.

7.5 Planned closure, decommissioning and, where applicable, rehabilitation work

CIIC-SR is committed to follow and apply, in total transparency, all environmental rules and principles, including decommissioning and where applicable rehabilitation work, elaborated and detailed in the Cook Islands key-legislations and acts including:

1) Environment (Seabed Minerals Activities) Regulations (2020)
2) Marae Moana Act (2017)
3) Cook Islands Environmental Act (2003)
4) Prevention of Marine Pollution Act (1998)
5) Pollution Act (1998)

No specific closure, decommissioning or rehabilitation works are envisaged to be needed following the exploration phase.

8. Financing Plan

Schedule of indicative expenditures

The financial table (Table II-12) outlines the anticipated yearly expenditure for the five-year program of activities. This is an estimate based on experience in offshore operations. CIIC-SR will aim to optimize this expenditure. Optimization includes shared working with other contractors operating in the Cook Islands EEZ, where this may be mutually beneficial.

Table II- 12: General financial schedule - per year - of indicative expenditures estimated by CIIC-SR.

Exploration and Environmental work programs		
Year 1:	*Preparation of the offshore campaigns and scientific studies.*	$ 372,900
Year 2:	*1st offshore expedition CIICSRNOD23 (Resource and baseline study) + post-study*	$ 14,964,058
Year 3:	*2nd offshore expedition CIICSRNOD24 (Env. baseline study) + post-study*	$ 15,804,919
Year 4:	*Desktop and laboratory studies*	$ 3,865,363
Year 5:	*3rd offshore testing of pre-prototype collector vehicle PATANIA II and equipment + environmental monitoring*	$ 20,512,166
	Total (NZD millions):	**$ 55,519,407**

CIIC-SR wishes to emphasize that it considers the plan of work for this five-year exploration period and the projected concomitant investment to be contingent on:

- the satisfactory progress of the regulations on exploitation.
- the PMN resource availability and quality.
- the COVID19 restrictions in place.
- The sufficient technology advancements
- the strategic partnership of CIIC-SR and its affiliates.
- the metals market within the next coming years.

Financing Capability & Audit

CIIC-SR can count on the solid financial basis of the DEME-Group, mother company of CIIC-SR's partner Global Sea Mineral Resources and leader in the highly specialized fields of dredging and land reclamation, solutions for the offshore energy market, environmental and infra marine works, with a turnover of 2.195 billion EUR in 2019 (EBITDA: 369.5 million EUR).
Financial_Report_DEME_2020.pdf (deme-group.com)

The total contribution to the GSR project has been estimated to more than 120 Million EUR over the last 9 years (CIIC-SR expenditure still excluded).

Yearly financial audits are also performed by the audit entity Deloitte to assess the good financial stability of the company within the DEME-Group structure. The official annual accounts of GSR are also filed by the National Bank.

CIIC-SR is also under an auditing system for all expenses done within the Joint Venture. The auditor KPMG is performing annual audit on all expenditures.

9. Summary

In total, CIIC-SR is looking to perform:

- 30 operational days dedicated to resource assessment,
- 80 operational days of environmental baseline study and
- 20 days of technical performances and associated environmental monitoring.

The program will be completed by intensive desk study, laboratory analyses, trainings and preparation of offshore exploration campaigns.

Each year, CIIC-SR will provide the CI Seabed Minerals Authority with an annual report summarizing all achieved work performed during the preceding contractual year, including all technical, environmental and resource milestones, according to the template developed by the ISA in ISBA/21/LTC/15 or a template provided by the Cook Islands Seabed Minerals Authority.

Meanwhile, CIIC-SR will support all scientists involved in the exploration project to produce peer-reviewed scientific papers, to be published in international journals, in sake of total transparency regarding environmental-related topics.

Item	Study area	Equipment	Impact on seabed?	Covered Topics	CIICSRNOD23	CIICSRNOD24 - Leg 1	CIICSRNOD24 - Leg 2	CIICSRNOD26 - Leg 1	CIICSRNOD26 - Leg 2
1	Low-resolution Bathymetry / backscatter	Hull-mounted multibeam	N	RD/ENV/TECH	■	■			
2	PMN nodule abundance & geochemical analysis for RD	Box-corer	Y (limited)	RD	■	■	■	■	
3	Geotechnical characterization of the upper sediment	Box-corer	Y (limited)	GEO/TECH	■	■	■	■	
4	Large nodule collection	Dredger / PATANIA II	Y	RD/METAL	■				■
5	Geotechnical characterization of the upper sediment	Graviprobe	Y	GEO/TECH	■				
6	High Resolution Bathymetry	AUV Remus 6000 or Hugin 600	N	RD/ENV/TECH	■	■		■	
7	Side-scan sonar mosaic (AUV)	AUV Remus 6000 or Hugin 600	N	RD	■	■		■	
8	Photo imagery (AUV)	AUV Remus 6000 or Hugin 600	N	RD/ENV	■	■		■	
9	Sediment Properties	Box-corer	Y (limited)	GEO/ENV	■	■	■	■	
10	Bioturbation	Multi-corer	Y (limited)	ENV	■	■	■	■	■
11	Biological Communities - Macrofauna [250 micron], Nodule Fauna	Box-corer	Y (limited)	ENV	■	■	■	■	■
12	Physical Oceanography (Long-term Studies)	Long Environmental Moorings	N	ENV	■	■	■	■	■
13	Physical Oceanography (Opportunistic Current Profiles)	Environmental Moorings / ADCP	N	ENV	■	■	■	■	■
14	Marine Animal Observations	Binocular	N	ENV	■	■	■	■	■
15	Chemical Oceanography (Water Column Chemistry)	CTD rosette (+ dissolved oxygen / chlorophyll)	N	ENV	■	■	■	■	■
16	Seafloor and Near-Bottom Megafauna observation	AUV/ ROV / PATANIA II	N/Y	ENV	■	■	■	■	■
17	Noise study with hydrophones	Hydrophones on Environmental Moorings	N	ENV	■	■	■	■	■
18	Fluxes to the sediment	Sediment traps on Environmental Moorings	N	ENV		■	■	■	■
19	Biological communities (Connectivity)	BC/MC/ROV	Y (limited)	ENV		■	■	■	■
20	Heavy Metals and Trace Elements	Box-corer / Multi-corer	Y (limited)	GEO/ENV		■	■	■	
21	Biological Communities - Meiofauna [32-250 micron], Microfauna [<32 micron]	Multi-corer	Y (limited)	ENV		■	■	■	
22	Chemical Oceanography (Sediment Pore Water)	Multi-corer	Y (limited)	ENV		■	■	■	
23	Biological communities (Oxygen Consumption Experiments)	Landers	N	ENV		■	■	■	
24	Biological communities (Pelagic Communities)	Plankton net / Fish traps	N	ENV		■	■	■	
25	Biological communities (Demersal Scavengers)	Moored Time Lapse Camera	N	ENV			■	■	
26	Biological Communities – Fauna Sampling	ROV	N	ENV			■	■	
27	Sediment sampling	ROV	Y (limited)	ENV			■	■	
28	Oxygen profiles	ROV	Y (limited)	ENV			■	■	
29	Technical test of the GSR technology	PATANIA II	Y	TECH/ENV					■
30	Near-field monitoring of the sediment Plume	PATANIA II	Y	ENV					■
31	Far-field monitoring of the sediment Plume	Environmental Moorings / ADCP	N	ENV					■
32	Plume monitoring	ROV / AUV Remus 6000 or Hugin 600	N	ENV					■

RD: Resource Definition
GEO: Geology / Geotechnical
ENV: Environment (incl. biology, plume modelling...)
TECH: Technology
METAL: Metallurgy

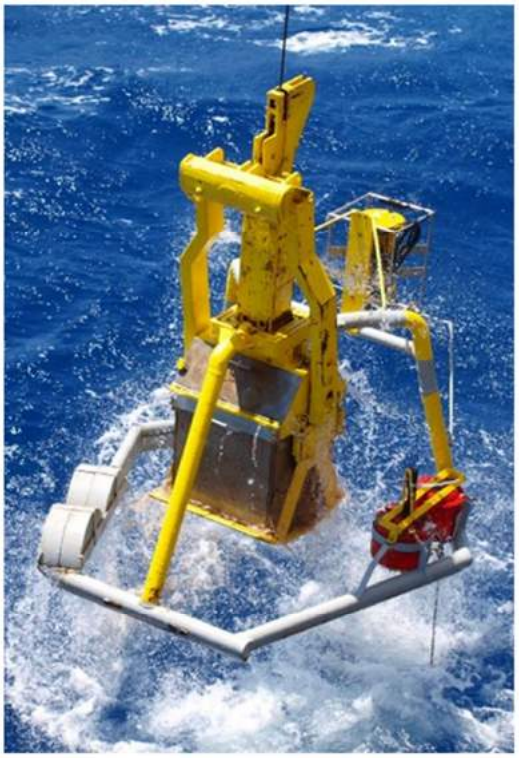
Figure II- 13: Indicative plan of the environmental, geological and technical study that CIIC-SR will attempt to cover during the 5-years exploration period, per offshore campaign.

CIIC SEABED RESOURCES LTD

Annexes of the CIIC-SR License for Exploration Activities

Annex 03

The approved Environmental Management Program



Title:	Annex 03 of the License for Exploration Activities
Author:	François Charlet – GSR Exploration Manager
Checked by:	Eusenio Fatialofa – CIIC-SR General Manager
	Samantha Smith–Head of Sustainability & External Relations
Date:	24/01/2022
Reference:	P03-CIICSR-EV-RPT-00001_Annex 03
Version:	3

Signed: ..... On Behalf of: CIIC-SR

Name: Eusenio Fatialofa .....Date: 24 January 2022

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Abbreviations

CCZ	Clarion Clipperton Zone
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMMP	Environmental Management and Monitoring Plan
GSR	Global Sea Mineral Resources NV
ISA	International Seabed Authority
MP	Monitoring Plan
MSR	Marine Scientific Research
NGO	Non-Governmental Organisation

1. Introduction

As detailed in Schedule 3 of the Seabed Minerals (Exploration) Regulations 2020, the environmental management programme:

a) establishes a proposed programme of work for environmental baseline studies, environmental assessment, and the management of potential environmental effects of exploration activities on the marine environment; and
b) is subject to the requirements of the Environment Act 2003, associated regulations and applicable guidelines; and
c) is considered by the National Environment Service and the National Environment Council in connection with the application for environmental approval

Environmental considerations are currently covered by the Environment Act 2003, with further regulations planned to include seabed mineral activity.

2. Environmental Objectives

CIIC-SR's overarching environmental objective is to ensure the effective protection of the marine environment during exploration activities.

The key overall objectives of CIIC-SR's environmental program include:

- Establishing an environmental baseline to characterise surface, water column and seafloor environments;
- Providing an understanding of the characteristics of the environmental and socioeconomic receptors that could be exposed to effects from the potential future mining;
- Gaining an understanding of how receptors might respond to effects from mining;
- Modelling the impacts and effects of seafloor polymetallic nodule mining and how these may be prevented or mitigated;
- Conducting mining system component trials and monitoring them to validate impact and effect predictions;
- Conducting an environmental impact assessment (EIA) which will define the expected environmental effects from a full-scale nodule extraction operation including evaluating and developing ways to prevent or otherwise minimize impacts as far as possible to the environment from full-scale operations. The EIA will culminate in an Environmental Impact Statement (EIS);
- Developing a robust Environmental Management Plan (EMP) and Monitoring Plan (MP) for full-scale operations, including the delineation of protected areas and/or representative areas of habitat and biodiversity of the type that will be potentially affected by seabed minerals extraction operations;
- Conducting ongoing environmental monitoring to ensure that no serious harm is caused to the marine environmental from exploration activities.

3. Legislation Framework / Marae Moana Act 2017 & CIIC-SR Commitments

CIIC-SR is committed to following and applying, in total transparency, all environmental rules and principles elaborated and detailed in the key-legislations and acts in place by the Cook Islands Authority.

Legislation framework

The main act to preserve and conserve the marine environment is the Marae Moana Act 2017, but many other legislations must be considered, such as:

1) Seabed Mineral Bill (2019)
2) Seabed Minerals Amendment Act (2020)
3) Seabed Minerals (Exploration) Regulations (2020)
4) Environment (Seabed Minerals Activities) Regulations (2020)
5) Marae Moana Act (2017)
6) Cook Islands Environmental Act (2003)
7) Prevention of Marine Pollution Act (1998)
8) Maritime Transport Act (2008)
9) Pollution Act (1998)
10) Traditional Knowledge Act (2013)
11) Maritime Zones Act (2018)
12) Marine Resources Act (2005)
13) CI Heritage Trust Act (1999)
14) Maritime Zones Act (2018)
15) Maritime Transport Act (2008)

It is noted that Schedule 1 Tier 2 and Schedule 2 Tier 3 seabed mineral activities of the draft Environmental (Seabed Minerals Activities) Regulations 2020 will require a consent or project permit from the Cook Islands National Environment Service prior to the commencement of the associated Tier 2 or Tier 3 activity. CIIC-SR commits to obtaining such a consent prior to conducting any Tier 2 or Tier 3 activities in the Cook Islands Exclusive Economic Zone (EEZ).

Marae Moana Act & CIIC-SR Commitments

The main Marae Moana Act requires that the CI EEZ area be managed for the primary purpose of protecting and conserving the ecological, biodiversity and heritage values of the Cook Islands marine environment. The Marae Moana Council, chaired by the CI Prime Minister, administrates the Marae Moana Act, and includes: (1) Opposition leaders, (2) religious leader, (3) representative of the finance ministry and (4) community leaders.

For the purposes of this Act, the principles of ecologically sustainable use are:

1) **Principle of protection, conservation, and restoration**
   (a) the principle of protection, conservation, and restoration is that the areas within the marae moana should be:
      i. protected, and their biodiversity conserved, for their cultural and natural heritage value; and
      ii. shared by all Cook Islanders:

➔ *CIIC-SR fully supports this Principle. All CIIC-SR exploration activities would be well outside the Marae Moana exclusion zones. Environmental impacts and effects from marine scientific research-like exploration activities are minimal and will have no measurable impact on the exclusion zones. For any activity that requires an environmental impact assessment / environmental impact statement, the extent of environmental effects will be studied, presented prior to the activity taking place, and monitored to ensure these are acceptable and do not reach the Marae Moana exclusion zones. Importantly, the knowledge gained from exploration activities will enable a greater understanding and enhanced environmental management of the Cook Islands' EEZ/Marae Moana.*

2) **Principle of sustainable use to maximise benefits**
(b) the principle of sustainable use to maximise benefits is that the marine resources should be used to maximise benefits, while meeting key environmental objectives to benefit current and future generations of Cook Islanders.

➔ *CIIC-SR fully supports this Principle.*

3) **Precautionary principle**
(c) the precautionary principle is that the precautionary principle of the Rio Declaration should be applied where there are threats of serious or irreversible damage, and that a lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation in accordance with the Cook Islands' capabilities in the implementation of the marae moana.

➔ *CIIC-SR fully supports this Principle and is committed to taking a step-by-step precautionary approach to project development.*

4) **Principle of community participation**
(d) the principle of community participation is that all stakeholders should participate in the planning and implementation processes, which means that information exchange, consultation, respect for differing points of view, recognition of culture and traditions, equitable access to opportunities for present and future generations, easily understood and openly justified processes, and the shared ownership of responsibility should be promoted and encouraged in the decision-making processes of the marae moana:

➔ *CIIC-SR fully supports this Principle and looks forward to engaging with representatives from various governmental departments, local communities including churches, schools, local businesses and other stakeholders to ensure we understand their concerns and ideas about the project and we would welcome the opportunity to work together to ensure CIIC-SR is meeting this principle and contributing positively to the Cook Islands.*

5) **Principle of transparency and accountability**
(e) the principle of transparency and accountability is that the processes for assessing, planning, allocating, managing, and evaluating management of ocean resources should provide transparent and clear lines of accountability:

➔ *CIIC-SR fully supports this Principle. As an example, CIIC-SR's partner, GSR, has a track record of operating transparently, including inviting independent teams of scientists to monitor its activities and publish their findings.*

6) **Principle of integrated management**
(f) the principle of integrated management is that the integration of decision making across all relevant stakeholders (Government, non-government, and external partners) should be pursued in decisions affecting the operation of this Act:

➔ *CIIC-SR fully supports this Principle.*

7) **Principle of investigation and research**
(g) the principle of investigation and research is that a culture of investigation and research as a basis of discussion and decision-making should be fostered, and that ocean planning and management decisions should be based on the best available scientific and other information, recognising that current information regarding ocean resources may be limited.

➔ *CIIC-SR fully supports this Principle and is a strong proponent of evidenced-based decision making. CIIC-SR will partner with the scientific research community to conduct environmental baseline studies and environmental impact assessments. This is to ensure planning, including environmental management, and decisions are made based on the best science possible.*

8) **Principle of ecosystem-based management**
(h) the principle of ecosystem-based management is that there should be an ecosystem-based approach to the management of natural resources that aims to sustain the health, resilience, and diversity of ecosystems of species, while allowing for sustainable use by humans of the goods and services they provide.

➔ *CIIC-SR fully supports this Principle. A key goal of CIIC-SR's is to work to ensure the effective protection of the marine environment, including maintaining overall marine biodiversity and ecosystem health and function.*

9) **Principle of sustainable financing**
(i) the principle of sustainable financing is that adequate funding for activities implemented for the marae moana should be pursued to achieve desired outcomes.

➔ *CIIC-SR fully supports this Principle.*

4. Description of the Marine Environment

4.1 Physico-chemical environment

4.1.1 Climatology

Seasonal temperatures differ between the northern and southern Cook Islands. The Northern Cook Islands' (Northern Group) position, which is close to the equator, results in fairly constant temperatures throughout the year, while in the Southern Cook Islands (Southern Group) temperatures cool off during the dry season (May to October). Changes in temperatures are strongly tied to changes in the surrounding ocean temperature. The annual average temperature at Penrhyn in the Northern Group is 28°C and at Rarotonga in the Southern Group is 24.5°C. The Cook Islands' climate varies considerably from year to year due to the El Niño-Southern Oscillation.

Tropical cyclones affect the Cook Islands between November and April. In the 41-year period between 1969 and 2010, 47 tropical cyclones passed within 400 km of Rarotonga, an average of just over one cyclone per season. The number of cyclones varies from year to year, with none in some seasons but up to six in others. Over the period 1969 to 2010, cyclones occurred more frequently in El Niño years (Cook Islands Meteorological Service et al., 2011).

4.1.2 Bathymetry

The deep-seabed bathymetry associated with the CI EEZ is complex and includes deep ocean ridges, a trench, seamounts, thermal vents, extinct and active underwater volcanoes and remote submerged reefs.

The Cook Islands lies to the east of the Tongan trench, which averages over 5,000 m deep, while the remainder of the deep-seabed surrounding the Cook Islands includes an undulating benthic substrate that averages a depth of 3,000 m below the water surface. The Cook Islands are the result of volcanic activity and coral growth with Rarotonga and Aitutaki consisting of emergent peaks of extinct volcanoes.

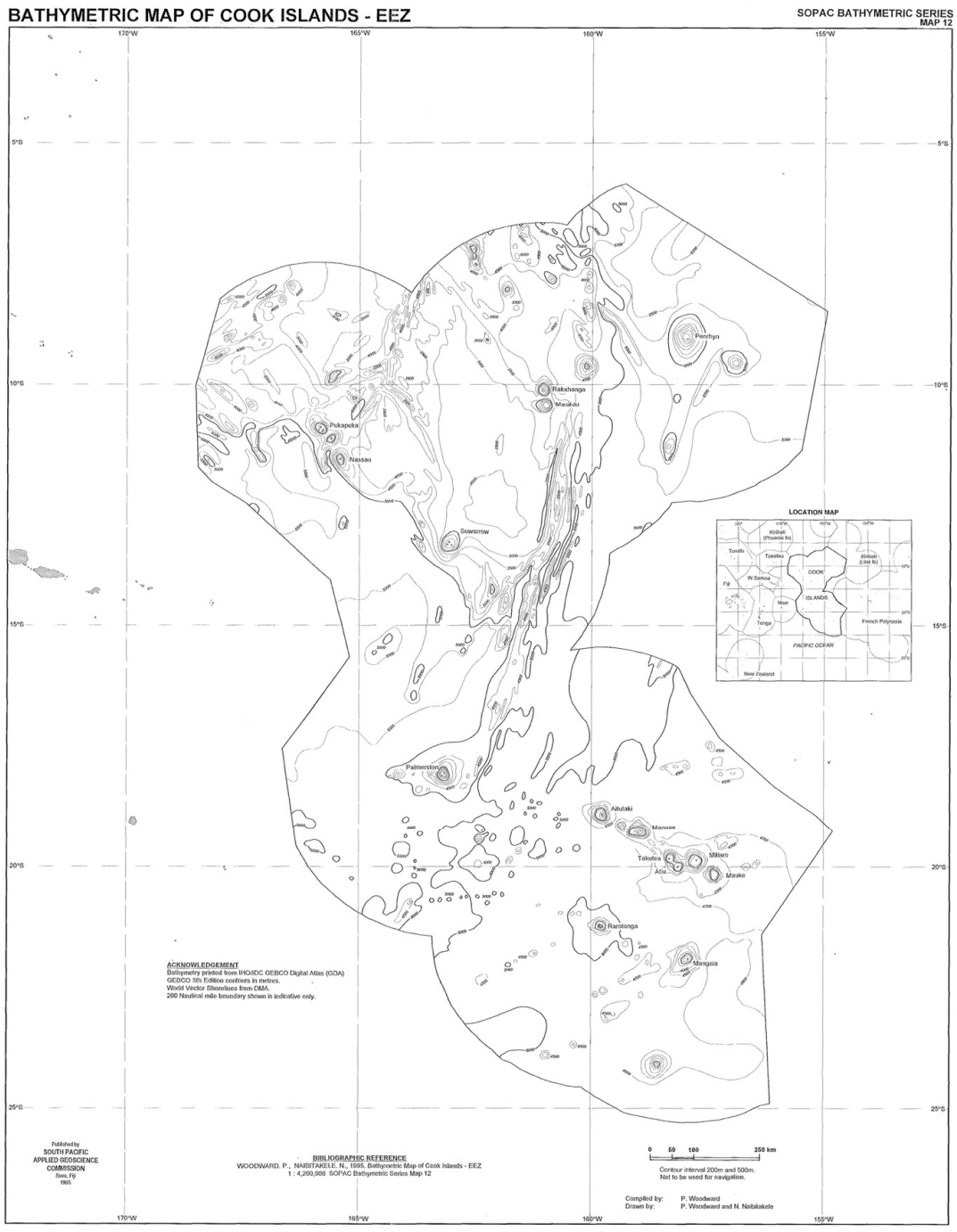

Figure III- 1: Bathymetric map of Cook Islands EEZ compiled by P. Woodward ; drawn by P. Woodward and N. Naibitakele.(National Library of New Zealand)(Red box: license area (approximately))

The southern group of islands, including the Eclipse Seamount between Aitutaki and Manuae and except for Rarotonga and Mangaia, form a linear volcanic chain with a west-northwest trend. This chain, a continuation of the Austral island chain is a result of a significant fracture in the earth's crust. Rarotonga and Mangaia are on the crest of a separate arch surrounding the Mauke-Aitutaki chain.

4.1.2.1 North and South Penrhyn Basins

The North Penrhyn Basin (NPB) is bounded to the west by the Manihiki Plateau, to the east by the Southern Line Islands, and to the south by the South Penrhyn Basin (SPB). Water depths range from about 5,000- 5,900 m. The South Penrhyn Basin is bounded to the south by the Aitutaki Passage and SW Pacific Basin, to the southwest by the Samoan Basin and to the northwest by the southern part of the Manihiki Plateau. Water depths generally exceed 5000 m. The NPB is separated from the SPB in the vicinity of Penrhyn Island.

4.1.2.2 Samoan Basin

The Samoan Basin is bounded to the south by the SW Pacific Basin, to the north by the Tokelau Islands and the Manihiki Plateau and to the west by the Tonga Kermadec Trench. Water depths are between 5000-5600 m.

4.1.2.3 Southwest Pacific Basin.

The SW Pacific Basin (SWPB) lies south and west of the southern Cook Islands and extends far south of the CIEEZ. Within the area considered in the present report (the CIEEZ only) the southern boundary of the SWPB is taken as the 25th parallel. Its maximum depth is near 6000 m.

4.1.2.4 Manihiki Plateau

The Manihiki Plateau is centred on about 10ºS and 164ºW and covers an area of about 800,000 square kilometres.

4.1.2.5 Aitutaki Passage

The Aitutaki Passage trends north-northeast from about 20ºS to about 17ºS at about 160ºW. It connects the SWPB to the SPB and is up to about 180 km wide and 4900-5500m deep. It is an important pathway for the movement from south to north through the region of cold, deep Antarctic Bottom Water (AABW) which originates off Antarctica.

4.1.2.6 Other bathymetric features

Seamounts are old submerged volcanic peaks eroded over time and support ecosystems that have high biodiversity and endemism. The main cause of this increased diversity is up welling currents and oceanographic phenomena that drive primary productivity and creates additional ecosystem niches that support more species. They are important aggregation sites for pelagic and demersal fish as well as invertebrates and have been reported to act as important navigational “waypoints” for oceanic migratory species (Rodgers, 2012). On average, 15% of benthic species found associated with seamounts in the Pacific are endemic, either to that specific seamount or to a cluster of seamounts (Alder and Woods, 2004).

The location of seamounts within the Cooks Islands EEZ are documented. The largest seamount “Eclipse” is located roughly 50 km to the southeast of the Aitutaki while there are several smaller deeper seamounts located south of Rarotonga and which are utilized by the local fishers. Benthic organisms associated with the deep water of Cook Islands are not of current national economic importance and are not harvested commercially.

There are some seamounts around the allocated area, in the western area.

4.1.3 Currents

In the northern part of the Cook Islands region, the westward flowing equatorial current system is an important oceanographic feature. A divergence along the equator leads to upwelling of nutrient rich waters stimulating high biological productivity. The equatorial current system is the northern

limb of an anticlockwise circulating gyre within which the Cook Island's EEZ sits. Biological productivity in the southern part of the Cook Island's EEZ is low.

A second major current in the Cook Island's EEZ is the northwards flow of the Antarctic Bottom Water current (ABW) between the sea floor and about 3,500m. This has been identified in the Aitutaki Passage. It also flows along the ridge just south of the Nova-Canton Trough and around the northeastern margin of the Manihiki Plateau to enter the North Penrhyn Basin.

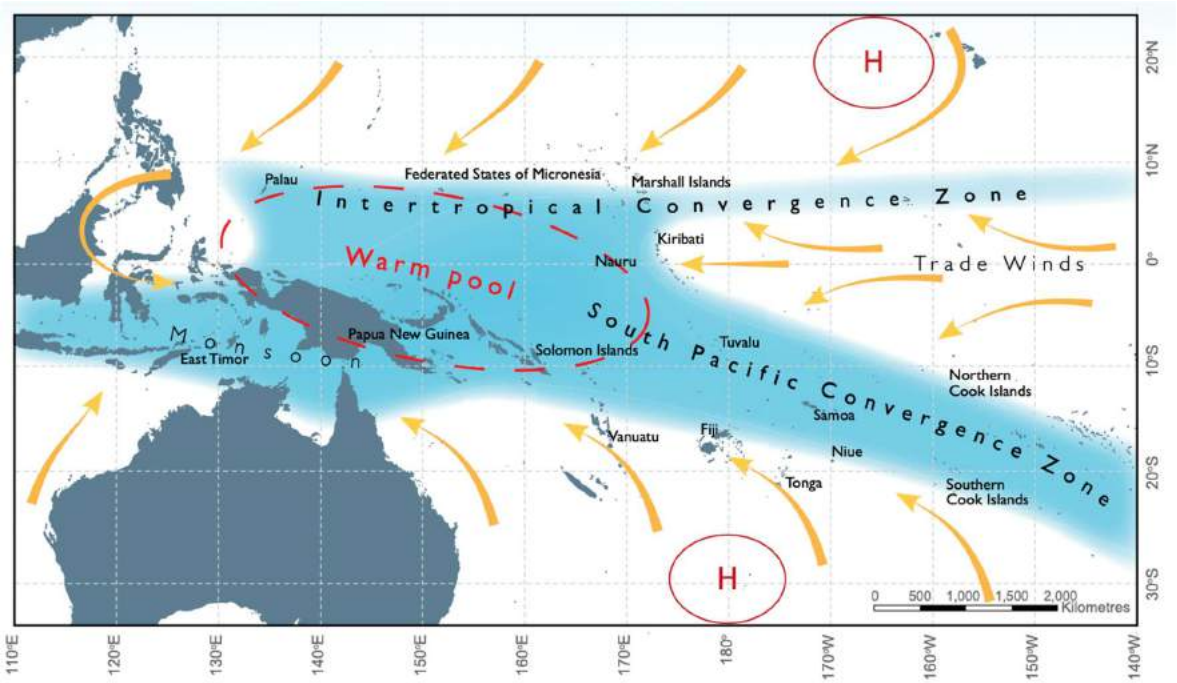

Figure III- 2:The average positions of the major climate features in November to April. The arrows show near surface winds, the blue shading represents the bands of rainfall convergence zones, the dashed oval shows the West Pacific Warm Pool and H represents typical positions of moving high pressure systems. (Source: Pacific Climate Change Science Program)

4.1.3.1 Chemical oceanographic setting

The quantity of organic material reaching the sea floor diminishes as the sea floor deepens because it decays en route through the water column. The remains of shells and skeletons composed of calcium carbonate (calcite) accumulate on the sea floor above the calcium carbonate compensation depth (CCD) where the rate of supply of carbonate from the overlying surface water equals the rate of dissolution. Below the CCD, no calcite is found in the sediments, unless displaced by slumping.

4.1.3.2 Seabed substrate characteristic

The Cook Island's EEZ is located on the Pacific Plate which is thought to be moving overall towards the west-northwest at about 8-10 cm per year into the equatorial zone of high biological productivity. Northern Cook Islands EEZ sediments are mainly derived from biological productivity in surface waters. Overall sedimentation rates can be as low as 1 mm/1000 years but are more usually about 1-5 mm/1000 years, except under the equatorial high productivity zone where they are higher. Local increases in sedimentation can be associated with islands and atolls (Cronan, 2013) and local seismicity can also trigger mass sediment movement.

Depending on water depth and proximity to the equatorial high productivity area, the sediment types found on the ocean floor of the Cook Island EEZ are predominantly calcareous or siliceous

oozes, or aluminosilicate clays. Of the former, siliceous oozes are mainly found within the equatorial high productivity area where water depths are greater than about 5200 m. Above this depth in the equatorial zone of the CIEEZ calcareous oozes accumulate. With increasing distance from the equatorial high productivity zone in the CIEEZ, calcareous oozes give way to aluminosilicate pelagic clays in deeper waters but remain on elevated features) (Cronan, 2013).

4.1.4 Biological environment

4.1.4.1 Surface: Seabirds

The Pacific is important for seabirds, and seabirds are important for the Pacific. For millennia seabirds have provided benefits to people such as food, feathers and nutrients for farming (seabird guano). Seafarers use seabirds for navigating and locating fish schools.

There are 62 seabird species that regularly use the tropical Pacific. Some are abundant and breed in enormous colonies on remote atolls, others are poorly known, rare and/or highly threatened. All seabirds require the protection and effective management of important sites that they rely on, both on land for breeding and at sea for feeding (BirdLife International, 2012).

Large pelagic birds such as Albatrosses, shearwaters, petrels, boobies and gannets could be present offshore of the Cook Islands near the intended exploration site (Carter and Carter, 2000).

4.1.4.2 Surface: Marine mammals

The EEZ of Cook Islands has resident, as well as transient or migratory, populations of cetaceans and since 2001 has been a dedicated whale sanctuary (Figure III-3). There has been considerable effort within the southern waters of the Cook Islands to study and identify the nation's marine mammal diversity and information on the presence and population status of cetacean within the nation and seasonal migrations of all species is being documented. The Cook Island have become a center for marine mammal research, especially for surveys and tracking programs based in Avarua (Garrigue et al., 2010; Olavarría et al., 2007).

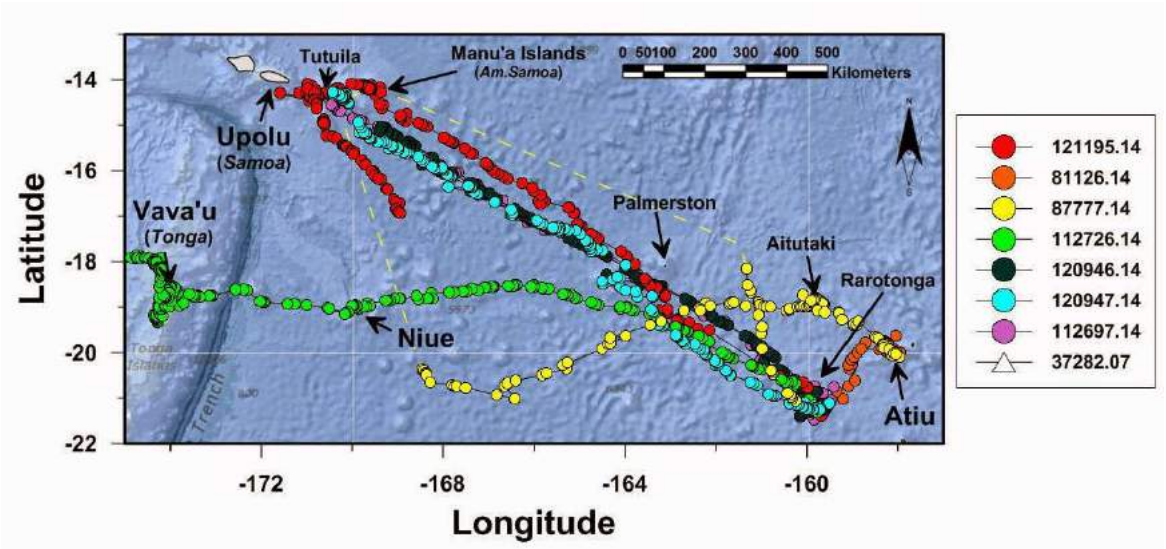

Figure III- 3:Tagged Humpback Whale migration behaviour. Tagged in the Cook Islands in September 2014 (Source: Cook Islands Whale Research / Center for Cetacean Research and Conservation, 2015)

Peak periods of humpback whale migration entering the Cook Islands EEZ waters occur between the months of July through to November. Frequent travel routes between the Cook Islands and

Samoa have been recorded (Figure III-3). Cetacean species are commonly seen in southern and northern Cook Islands waters and, because of the bathymetry associated with the Islands, are found very close to shore. This easy access has stimulated a commercial whale watching industry based primarily on the seasonal migration of the humpback whales. There are 20 species confirmed in the Cook Island EEZ in these waters (Table III-1) (Hauser and Clapham, 1995; Olavarría et al., 2007).

Table III- 1: Cetaceans confirmed in the Cook Island EEZ. (DD: data deficient; LC: least concern; NT: near threatened; VU: vulnerable; EN: endangered) (Source: IUCN Redlist, 2020

Common Name	Scientific name	IUCN Category
Dwarf Minke-Whale	*Balaenoptera bonaerensis*	NT
Blue Whale	***Balaenoptera musculus***	**EN**
Humpback Whale	*Megaptera novaeangliae*	LC
Common Dolphin	*Delphinus delphis*	LC
Short-finned pilot Whale	*Globicephala macrorhynchus*	LC
Fraser's Dolphin	*Lagenodiphis hosei*	LC
Ocra	*Orcinus orca*	DD
Melon-Headed Whale	*Peponocephala electra*	LC
Pantropical spotted Dolphin	*Stenella attenuata*	LC
Spinner Dolphin	*Stenella longirostris*	LC
Sperm Whale	***Physeter macrocephalus***	**VU**
Blainville's beaked Whale	*Mesoplodon densirostris*	DD
Cuvier's beaked Whale	***Ziphius cavirostris***	**VU**
Bryde's Whale	*Balaenoptera edeni*	LC
Sei Whale	***Balaenoptera borealis***	**EN**
Risso's Dolphin	*Grampus griseus*	LC
Peale's Dolphin	*Lagenorhynchus australis*	LC
False Killer Whale	*Pseudorca crassidens*	NT
Striped Dolphin	*Stenella coeruleoalba*	LC
Bottlenose Dolphin	*Tursiops truncatus*	LC

It is important to underline the behavioral characteristics on beaked whales and sperm whales, especially regarding feeding habits. These species of marine mammals are known to perform deep dives to forage for food. The deepest recorded dive was performed by a Cuvier's beaked whale, reaching depths of 2992 m (Schorr et al., 2014). It is noted that the seafloor (and mineral deposits) occur about 2 km below this depth. Nevertheless, whale studies will form an important part of the environmental baseline and impact assessment work of CIIC-SR.

Marine turtles

Three species of sea turtles are known to live within Cook Island waters and are on the IUCN red list, including: the hawksbill (*Eretmochelys imbricata*) which is Critically Endangered; and the endangered green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) turtles. All species of turtles are protected under Cook Islands Law. Pelagic species, such as the leatherback sea turtles

(*Dermochelys coriacea*) are also present in the region (Western and central Pacific fisheries commission, 2019).

4.1.4.3 Water column/midwater

A number of pelagic shark and fish species are present in the CI EEZ and are present on the IUCN red list. Of the 11 pelagic shark species (Table III-2), 3 are considered endangered (whale, pelagic thresher and shortfin mako shark) and 2 species are critically endangered globally (Oceanic whitetip and Scalloped Hammerhead shark).

Table III- 2: Threatened and/or protected pelagic shark and fish species in the Cook Island CCZ (DD: data deficient; LC: least concern; NT: near threatened; VU: vulnerable; EN: endangered; CR: Critically endangered) (Source: IUCN Redlist, 2020)

Common Name	Scientific name	IUCN Category
Whale Shark	***Rhincodon typus***	**EN**
Silky Shark	*Carcharhinus falciformis*	VU
Galapagos Shark	*Carcharhinus galapagensis*	LC
Oceanic Whitetip Shark	***Carcharhinus longimanus***	**CR**
Tiger Shark	*Galeocerdo cuvier*	NT
Blue Shark	*Prionace glauca*	NT
Scalloped Hammerhead Shark	***Sphyrna lewini***	**CR**
Pelagic Thresher Shark	***Alopias pelagicus***	**EN**
Shortfin Mako Shark	***Isurus oxyrinchus***	**EN**
Cookiecutter Shark	*Isistius brasiliensis*	LC
Prickly Shark	*Echinorhinus cookei*	DD
Big eye Tuna	*Thunnus obesus*	VU

4.1.4.4 Benthic communities

To date, no area specific benthic biological studies have been conducted in the area. But we can assume that the benthic community associated with polymetallic nodules fields is similar to the communities around the Pacific, such as those found in the Clarion Clipperton Zone (CCZ). This assumption can be made due to the relatively similar and stable environment associated with polymetallic nodule fields found in the abyss. This assumption will be tested and further explored during the exploration phase of the project.

Bacterial biomass associated with polymetallic nodules ecosystems

The identity and distributions of bacterial populations in deep-sea sediments and associated polymetallic nodules have to date received relatively little attention. The few studies have shown, a decline in bacteria density as the depth of sediment increases. Similar profiles have been observed to other deep-sea ecosystems, not limited to the nodule fields (Lindh et al., 2017; Sweetman et al., 2019).

Macrofauna associated with polymetallic nodules ecosystems

In general, macrofaunal abundance, diversity, and community composition were similar between studied sites within the CCZ, implying that the macrofaunal community associated with polymetallic nodule areas is, at least at scales of 10 to 100 s of km, somewhat homogeneous (De Smet et al., 2017). The macrofaunal taxon composition is dominated by Nematoda (32-60 % of total abundance), and Copepoda (8-23 %), although these are not considered as macrofaunal taxa by most macrofaunal studies in the Pacific nodule area. Polychaetes are reported in the literature to be the most abundant taxon of macrofauna and accounted for 8-20 % in sampled stations of the CCZ in 2015. Tanaidacea were also spotted (5-20 %), along with Amphipoda, Bivalvia, Isopoda, Ophiuroidea and Ostracoda (20% all together) and Acari, Brachiopoda, Decapoda, Chaetognatha, Cumacea, Gastropoda, Mysida, Nemertea, Oligochaeta, Other Crustacea, Pycnogonida, Scaphopoda and Sipuncula (4.45 ± 1.95 % all together)(De Smet et al., 2016; GSR Global Sea Mineral Resources, 2018).

Megafauna associated with polymetallic nodules ecosystems

While generalisations can be made, it is problematic to assume that the megafaunal assemblage in the Cook Islands is similar to the assemblages associated with other polymetallic nodule fields of the Pacific. Differences in megafaunal community ecology were found between all landscape types within the CCZ. However, density and biodiversity trends can be deduced. Seafloor geomorphology was important in the structuring of abyssal megafauna. Lower megafauna density & diversity in a bathymetric valley than flat and ridge areas (Schoening et al., 2020; Simon-Lledó et al., 2019). The following figure (Figure III-4) demonstrates general megafauna diversity associated with the CCZ nodule fields.

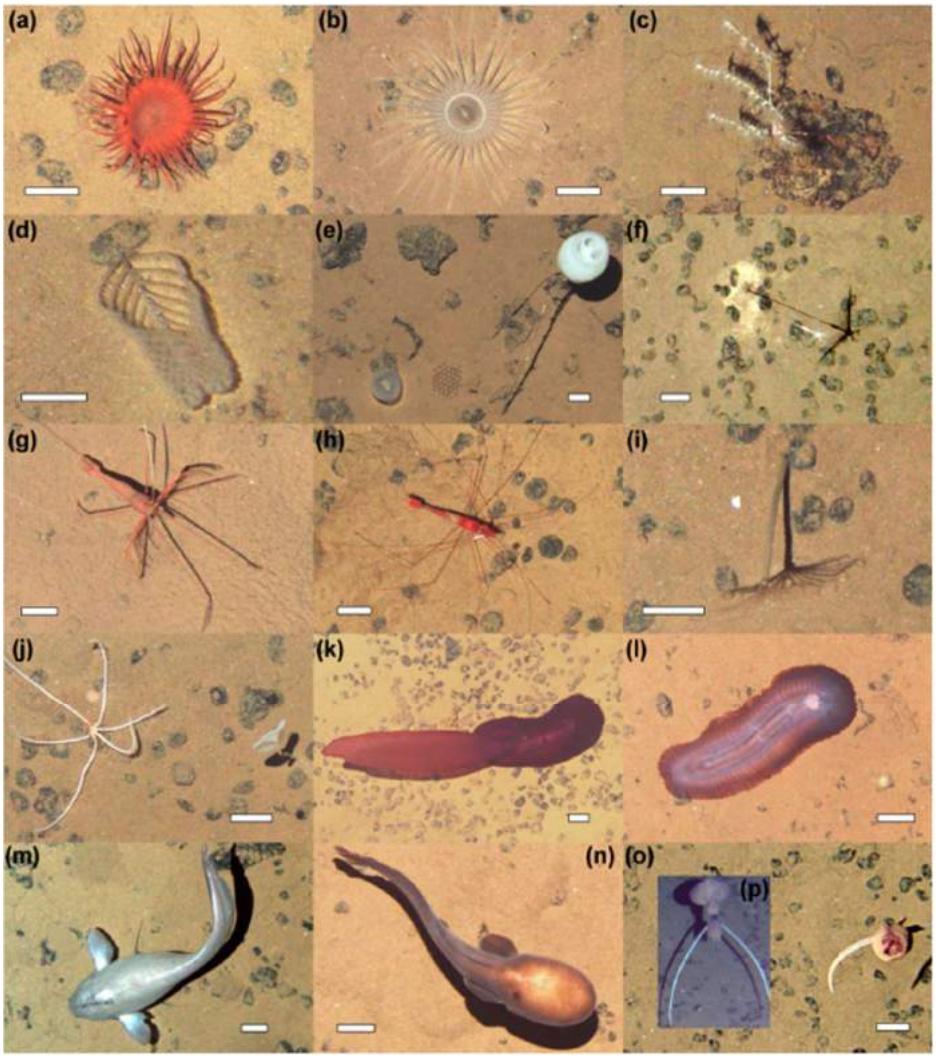

Figure III- 4: Examples of metazoan megafauna photographed at the APEI6 seafloor during AUV survey. Scale bars representing 50 mm. (a) Actiniaria msp-6. (b) Actiniaria msp-13. (c) Bathygorgia cf. profunda. (d) Abyssopathes cf. lyra. (e) Left: Chonelasma sp.; right: Hyalonema sp. (f) Cladorhiza cf. kensmithi. (g) Bathystylodactylus cf. echinus. (h) Nematocarcinus sp. (i) Sabellida msp-1 (polychaete). (j) Left: Freyastera sp.; right: Caulophacus sp. (k) Psychropotes cf. long- icauda. (l) Benthodytes cf. typica. (m) Coryphaenoides sp. (n) Typhlonus nasus.o and p: probable new Mastigoteuthis sp.(Source: Simon-Lledò et al., 2019)

5. Description of Social, Historical and Cultural Aspects

The Cook Islands became a British protectorate in 1888. By 1900 administrative control was transferred to New Zealand. In 1965 the Cook Islands chose self-government, in free association with New Zealand.

The Cook Islands consists of 15 small islands scattered over 2 million square kilometers of the Pacific Ocean. They lie in the centre of the Polynesian Triangle, flanked by Fiji 2,300 km to the west, Tahiti 1,140 km to the east, Hawaii 4,730 km north, and New Zealand 3,010 km southwest. The climate of the Cook Islands is sub-tropical and tropical oceanic moderated by trade winds.

The Cook Islands with a very small land area of 240 km^2 but an immense ocean marine area of nearly 1.96 million km^2 of the ocean within the Cook Islands Exclusive Economic Zone.

In June 2020, the Ministry of Finance and Economic Management Statistics office estimated a total population for the Cook Islands dropped by 19.9 percent (3,900 people) to reach 17,900 and the Resident population increased by 4.8 percent (800 people) over December 2019. The biggest factor affecting this estimate was due to overseas border travel restrictions to fight the spread of the COVID-19 globally. COVID-19 is still impacting many overseas countries.

The Cook Islands and all people from the South Pacific have a strong spiritual and cultural connection to the Ocean. In Cook Islands Maori the South Pacific Ocean is respectfully named “Moana Nui O Kiva”. The idea is that Cook Islanders, on their different islands, are not separated, but connected by the ocean and that everything in the sea is for the wise use of the people of the Cook Islands, in communion with nature and the ocean.

From the environmental viewpoint ra’ui, is a traditional conversation practice in the Cook Islands which is a form of resource management. The Marae Moana Act was founded on the traditional principles of ra’ui. In general, traditional culture dictates that anything done by a person or clan must be done in harmony with nature.

6 Risk Assessment & Management of potential environmental impacts of exploration activities on the marine environment

6.1 Impacts due to baseline characterization operations

The main focus of exploration is to gather data, with as little impact as possible on the seafloor and in the water column. Much of the exploration and baseline study technologies and methodologies are the same as those used by the marine scientific research community and are low impact activities.

Nevertheless, CIIC-SR has investigated the potential environmental impacts for each of the foreseen offshore activities (MBES / AUV surveys, sampler deployment, dredge operation…) and as defined some mitigations where applicable (Table III-3). Further, more detailed, risk assessments will be performed prior to each offshore campaign, in due course (see Annex 04 for further details).

Table III- 3: Expected environmental impacts and proposed mitigation.

Category	Equipment	Topic	Environmental Impact	Pre-mitigation Owner	Pre-mitigation Likehood	Pre-mitigation Expected impact	Pre-mitigation average risk value	Mitigation	Post-mitigation Likehood	Post-mitigation Expected impact	Post-mitigation average risk value
ENV	Exploration vessel	Light	Light can be an attractant to birds, fish, sharks, cephalopods and marine mammals.	Contractor	4	3	12	This impact will be more important at night, in response the crew will lower deck lights as much as possible to still allow safe operations.	2	3	6
ENV	Exploration vessel	Noise - vibrations	The acoustic impact of vessels can affect the behaviour of animals.	Contractor	4	3	12	The short-term nature of the exploration campaigns will limit the impact. Noisy activities will stop when mammals are observed.	3	1	3
ENV	Exploration vessel & hydraulic equipment	hydraulic fluids and hydrocarbon spills	Potential impacts at the surface can be due to accidental discharge (hydraulic fluids and hydrocarbon spills) and waste from surface vessel	Contractor	4	4	16	Strictly follow IMO obligations and standards regarding safety and environmental practice at sea (e.g. MARPOL). The crew will be trained in marine pollution emergency response plan (Cronan, 2013) and offshore emergency drills will be carried out frequently.	2	4	8
ENV	Exploration vessel	Multibeam eco sounder	Low environmental impact	Contractor	3	3	9	Optimize the survey plan to avoid focusing on the same area too long. "Soft" start to "inform" potential mammals around the vessel.	2	2	4
ENV	Dredge & epibenthic sledge	Sediment resuspended	Low environmental impact if remains under 10,000 m²	Contractor	5	3	15	Optimize dredging operation with stable equipment which helps to reduce the time/distance disturbed on the seabed	4	2	8
ENV	Multi- and box-corer	Sediment resuspended	Very low environmental impact	Contractor	4	1	4	Not much can be optimized here, footprint of sampling devices is small.	4	1	4
ENV	AUV	Noise and vibration	Acoustic impact	Contractor	3	3	9	Limit the time spent on site / in one area.	1	3	3
ENV	Mooring	Mooring deployment	Low environmental impact as most of the equipment can be recovered.	Contractor	1	2	2	Not much can be optimized here. Footprint on the seafloor is limited to the anchor dimensions.	1	2	2
ENV	Landers	Moored Time Lapse Camera or Lander	Low impact, confined to where lander/camera have contact with seafloor, no more than 2 m x 2 m + usually gently deployed by ROV	Contractor	2	1	2	Not much can be optimized here, impact is limited to footprint of instrumentation.	2	1	2
ENV	CTD sampler	Water sampling and profiling (Niskin bottles, CTD)	Negligible, no impact to seafloor, short-term presence of wire and instrumentation in the water column	Contractor	1	1	1	Not much can be optimized here.	1	1	1
ENV	ROV	Biota and other sampling	Very low, confined to limited removal of individual animals. Main issue: oil spillage in the water + landing on the seabed /disturbance with propellers	Contractor	3	3	9	Standard procedures in place for equipment recovery, use of biodegradable hydraulic fluid, standard procedures for umbilical management, standard ROV procedures and operations	3	2	6
ENV	Pankton Nets/Fishing Gear	Biota sampling in the water column	Negigible, no impact with seafloor, short term presence of sampling devices in the water column	Contractor	1	2	2	Efforts will be made to work with local fisher people for this work and to ensure no interference with legal fishing practices.	1	2	2

6.2 Impacts due to the use of the PPV Patania II for exploration (CIICSRNOD26)

Comparing the similarities between Cook Islands and CCZ nodules fields (soft sediment, low deep-sea currents, deep-waters…), we can assume that the environmental effects and mitigation strategies will be similar for both locations. The Patania II trials in both the CCZ and Cook Islands EEZ offer an important opportunity to validate and where needed improve predictions and assess the environmental effects that may result from potential future nodule mining operations on the seabed.

The types of physico-chemical environmental effects of nodule removal from the seafloor, that potentially might occur during the CIICSR exploration, are:

- habitat/nodule removal;
- sediment disturbance and plume formation;
- biogeochemical alteration of the sediment (i.e., change of habitat integrity) ;

Picking up the nodules and removing the associated fine-grained muds locally disturbs the benthic habitat in the mining area, leading to alteration of seabed habitat, and entails the generation of sediment plumes near the seafloor. Several disturbance experiments have been undertaken in nodule provinces over the past 40 years. When the time series of biological effects of disturbance experiments are considered, there is evidence of minor recovery of density in some groups in some experiments. In some cases, the mobile fauna and very small-sized fauna experienced fewer negative effects over the longer term, almost all studies show some recovery in faunal density and diversity for meiofauna and mobile megafauna, often within one year. On the other hand, some faunal groups (such as those reliant on the hard substrate provided by the nodules) showed no evidence of recovery. It can be concluded that the recovery process of meiofauna after anthropogenic impact would take at least several decades in the area of impact/effect. There may be remediation efforts (such as the deployment of artificial hard substrates) that may assist with speeding up recovery. Such options can be further explored in due course.

Biogeochemical impacts are specific to the nature and intensity of the physical impact, with strongest effects observed in regions where the surface reactive layer of sediment with labile organic matter is lost and deeper sediment layers are exposed at the surface.

The removal of topmost sediments in the direct trial area and the re-deposition of these sediments after discharge and dispersion to more remote areas might furthermore lead to the smothering of organisms, the clogging of respiratory or filter-feeding organs of particular organisms and/or the release of metals (to be assessed) or oxygen-consuming substances. Processes of nutrient cycling and organic matter remineralisation might also be affected.

In order to assess these effects, a 3D hydrodynamic and sediment transport model will be developed to understand & restrict the impact of the resuspension of the sediment. furthermore, an in-depth environmental monitoring program will be developed. The details of the model and monitoring, as well as a complete list of environmental effects expected from the sediment plume on the physico-chemical environment and the biological communities, will be described in the Environmental Impact Statement (EIS) to be submitted before the technical trials.

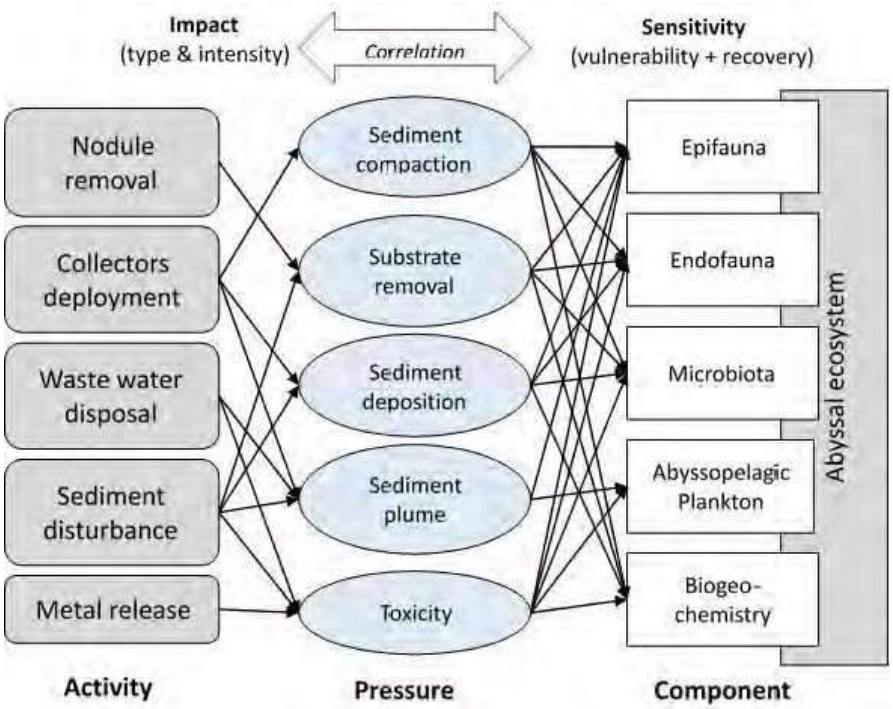

Figure III- 5: Generic outline for cumulative effect assessment of potential future mining-related activities that may generate pressures on different ecosystem components. The conceptual scheme visualizes potential relationships between impact intensity and sensitivity that need to be assessed (GSR, 2018).

6.2 Impacts on other Marine Users

The exploration activities being planned by CIIC-SR will be considerate of the activities of other marine users and CIIC-SR will work to ensure there are no conflicts. The offshore activities will occur at a minimum of 290 km from the nearest coast, with most of the work being conducting 340 km offshore. The exploration phase will allow the geological and environmental study of the polymetallic nodule fields present in the license area. The study will not be limited to the benthic ecosystem but the study of water column and surface ecosystem above the nodule field(s) of interest. All data collected will be available for the benefit of all, including marine users.

CIIC-SR wishes to take an open, transparent and inclusive approach to stakeholder engagement and welcomes engagement with governmental departments, local communities including churches, schools, local businesses and other stakeholders to better understand the concerns and ideas they have regarding how we might work cooperatively during the exploration phase of the project.

CIIC-SR will collaborate with the Cook Islands Seabed Minerals Authority (SBMA) to identify key sea user stakeholders to ensure appropriate engagement and communication occurs.

Examples of organizations and stakeholders that will be engaged include, but are not limited to:

- Te Vaka Moana: South Pacific Fisheries Cooperation
- Pacific Islands Forum Fisheries Agency
- The Secretariat of the Pacific Community
- Pacific Islands Tuna Industry Association
- Morae Moana

- Te Ipukarea Society
- Pacific Islands Conservation Initiative
- Secretariat of the Pacific Regional Environment Program
- Cook Islands Fisheries Field Office
- Western & Central Pacific Fisheries Commission
- Non-Governmental Organisation
- Shipping companies
- Tourism industry
- Cable companies
- Oil and gas companies
- Other mineral contractors

6.2.1 Fisheries

Exploration activities are not expected to have any measurable impact on any of the Cook Islands fisheries. CIIC-SR's tenement application area does not overlap with known productive areas of fishing.

According to the Fisheries and Aquaculture Department of the Food and Agriculture Organization of the United Nations (FAO), the deepest longline and purse seine operations occur at a maximum of 300 m below sea level. It is envisaged the longest oceanographic mooring will extend from the seafloor to ~500 m water depth, which should provide a 'buffer zone' of 200 m between the deepest predicted fishing operations and the top of the longest subsea mooring.

CIIC-SR is open to suggestions and promotes communication between the parties to ensure no interference.

6.2.2 Tourism

Tourism is a key economic sector for many small and developing island countries. In Oceania in particular, some countries heavily depend on tourism activities to generate income and employment. And this is the case of the Cook Islands, over 50% of the GDP comes from the tourism and service sector (WHO, 2015).

Between 1990 and 2008, the Cook Islands have seen an increase of 177% of visitors. Marine-based eco-tourism is becoming increasingly popular in the region and plays an important role in providing alternative livelihood options particularly for coastal communities. Whale and dolphin watching-based ecotourism has become a popular tourist attraction in the region, especially due to the fact that the Cook Islands is a breeding ground for humpback whales (Seidel and Lal, 2010).

CIIC-SR acknowledges the importance of the tourism industry for the Cook Islands, which includes but is not limited to activities such as:

- Boating/Cruising
- Fishing
- Whale watching
- Paddle boarding
- SCUBA Diving
- Snorkeling
- Surfing
- Lagoon Cruises

It is assumed that the deep-sea exploration activities of the nodule fields are far away from tourist interest and that the low impact nature of exploration activities will have negligible to zero impact on the tourism industry. CIIC-SR makes a commitment to ensure that these activities will not be negatively affected, along with the commitment to work in collaboration with the tourism industry to ensure the project develops with the input of the tourism industry.

6.2.3 Navigation

CIIC-SR exploration vessels, equipment and activities will not impede or disrupt national and international shipping lanes or the navigation of other sea vessels. CIIC-SR will follow the Cook Islands' National Maritime Transport Policy to ensure that all activity and navigation will pose no threat to the marine environment, the economy and the sustainability of transport by sea within the Cook Islands EEZ (Cook Islands Maritime Authority, 2014).

CIIC-SR will communicate its plans for offshore campaigns and onshore logistics with the Cook Islands Ports Authority as well as the Cook Islands Ministry of Transport to help ensure potential conflicts are avoided.

6.2.4 Submarine Cabling

No interactions with submarine cabling are anticipated. As of July 2020, the Cook Island are connected to the global network through the Manatua One Polynesia Fibre Cable. This 3600 km underwater cable connects Rarotonga and Aitutaki to French Polynesia as an extension to the Honotua cable linking Tahiti to Hawaii. This allows the residents of the Cook Islands to gain access to high speed, capacity and durable internet and other communication services.

6.2.5 Other Marine Minerals Exploration Contractors

CIIC-SR is aware of other potential mineral exploration contractors and will work collaboratively with them to ensure there are interferences are avoided. CIIC-SR will also commit to work with these other contractors to limit the impact the mineral exploration activities. As an example, CIIC-SR can work with other contractors to stagger port calls and diversify campaign support activities. CIIC-SR will, of course, engage with the Cook Islands government and local authorities to help ensure the exploration activities as beneficial as possible to the people and local economy.

6.2.6 Oil and Gas

There are no offshore oil and gas activities in the Cook Islands EEZ.

6.2.7 Marine Scientific Research

From a desktop review, it does not appear that a great deal of Marine Scientific Research (MSR) currently occurs in the Cook Islands EEZ, with the most recent research campaigns fulfilled by two companies engaged in mineral exploration (CIIC-SR and Ocean Minerals LLC [OML]).

CIIC-SR plans to partner with local, regional and international members of the scientific community to carry out the research required for environmental baseline studies and environmental impact assessment. These partnerships will result in significant amounts marine scientific data, which CIIC-SR will share with the Cook Islands.

CIIC-SR also aims to collaborate with other contractors that have successfully secured an exploration license, to optimise and produce data that will advance marine scientific knowledge, particularly relevant for regional environmental management.

6.2.8 Conservation

6.2.8.1 Marae Moana

Marae Moana is a multiple-use marine park which extends over the entire Exclusive Economic Zone of the Cook Islands, covering an area of 1.9 million square kilometres. It is currently the largest commitment by a single country for integrated management and conservation from ridge to reef and from reef to ocean. Marae Moana was legally designated on 12 July 2017 by the Marae Moana Act 2017 which has the primary purpose of protecting and conserving the ”ecological, biodiversity and heritage values of the Cook Islands marine environment” (FAO, 2017b).

CIIC-SR is committed to work outside the exclusion zones stated by the Marae Moana Act 2017 and will respect the conservation practices and biodiversity protection of the Marae Moana multiple-use marine park.

6.2.8.2 Species conservation

CIIC-SR recognises the EEZ of Cook Islands has resident, as well as transient or migratory, populations of cetaceans and since 2001 has been a dedicated whale sanctuary. CIIC-SR recognises that the EEZ is also home to a wide range of endangered species that are protected by Cook Island Law, such as sea turtles and sharks.

CIIC-SR will investigate all marine species (cetaceans, marine turtles and others) further as part of its EIA.

6.2.9 Ports & Maritime access

Port of Avatiu is the principal port of the Cook Islands. Arutanga Port is the only mainstream operation port that serves Aitutaki internationally.

The area under application is approximately 500-700 km north of Rarotonga, Cook Islands. The closest land is Aitutaki Island, 200 km south of the area under application. The area under application is also well outside the 50-mile exclusion radius of the Marae Moana Marine Park. It is only accessible via ship. Exploration operations are conducted by ocean-going vessels and there are no restrictions of access to the site. The site is outside major shipping lanes; however, public notices to mariners would have to be filed for any deployment of equipment, moorings, or operations that could affect shipping. The area is approximately 3,400 km from Auckland, New Zealand; 7,000 km from Los Angeles, USA; 5,000 km from Brisbane, Australia and 9,500 km from Shanghai, China.

Before any offshore activities, CIIC-SR will consider and make sure to be aligned with all QHSE-S Legislation developed in the Cook Islands, with a specific intention on:

- Maritime Rules Offences Regulations 2014
- Maritime Transport Act 2008
- IMDG Code or International Maritime Dangerous Goods Code
- Prevention of the Marine Pollution Act 1998
- Marae Moana Act 2017
- Environment Act 2003

6.2.10 Proposed Mitigation for Exploration

In order to minimize the effects and disruption linked to CIIC-SR's exploration activities, we will commit to working with the Cook Islands government to avoid all conflict with the current marine users. The data gathered at both the seafloor and within the water column will be shared and will hopefully be of benefit to the community. CIIC-SR will also respect and adhere to the Cook Islands' government laws regarding the conservation exclusion zones and guidelines regarding transit to and from port areas. CIIC-SR is open and proactive concerning communication between all involved parties mentioned previously.

7 Methodology used for environmental baseline studies and impact assessment

At this stage of the project, CIICSR is not in a position to detail the exact scope of work of the environmental baseline studies as this requires further initial environmental study in the Cook Islands EEZ and identification of Areas of Interest (assuming some can be found) and the establishment of representative set-aside areas. However, the plan of work will certainly follow the national and international recommendations and regulations.

Appendix A of Annex 3 outlines key activities exploration will entail and the environmental impacts associated with each. All of these are low impact. Where the impacts are higher (e.g. Patania II trial) and an EIA is required, one will be developed then which will outline how the environmental impacts will be managed. We reiterate that the majority of exploration activities are very low impact activities (see Appendix A of Annex 3).

7.1 Environmental baseline studies

Environmental baseline studies (including oceanographic studies) will be conducted according to the regulations and recommendations and/or guidelines in place. At the time of writing, the Seabed Minerals Authority has not defined specific recommendations in that regard. As such, CIIC-SR will for the time being refer to the *Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area (ISBA/25/LTC/6/Rev.1 and /Corr.1)* developed by the International Seabed Authority (ISA, 2020). This guidance has been developed over several years and through the involvement of multiple stakeholders. ISBA/25/LTC/6/Rev.1 provides details of the expectations of the ISA and its stakeholders for environmental baseline data acquisition. The studies are summarised in Table III-4 grouped by major study area, which serves to describe the magnitude and level of detail required to support the EIS. The proposed programme of work (e.g. offshore campaign timings) for environmental baseline studies is included within the overall plan of work, provided in Annex 02.

Table III- 4: Summary of ISA-recommended Environmental Baseline Studies.*

Study area	Study summaries	ISBA/25/LTC/6
Physical Oceanography	**Parameters** Pressure, currents, conductivity / salinity, oxygen, turbidity & other optical properties, particulate matter and turbulence intensity. Satellite-based observations of SST & productivity over multiple years at synoptic scale. **Expected effort** Water column profiles, spacing ~ bearing in mind topography differences. Oceanographic moorings. Currents: 0 - 200m above seafloor ~ topography Amplitude tidal & seasonal variability currents (ref. annex I paragraph 13). Monitoring for "several years" required (ref; annex I paragraph 21). Sediment traps @ 10m, 500m and 2000m above the seafloor.	Paragraph 15 (a) Annex I paragraph 9-13 and 15, 21
Chemical Oceanography	**Parameters** Metals and other elements that may be released during mining in both particulate and dissolved form, oxygen concentration, pH, carbonate system (CO_2, alkalinity), nutrients such as phosphate, nitrate, nitrite, silicate, organic matter (dissolved & particulate). **Expected effort** Samples at the same locations of physical oceanographical sampling. Specific focus on the depth range of the oxygen minimum zone and discharge depths. Temporal variation on tidal, seasonal and interannual scales	Paragraph 15 (b) Annex I paragraph 16 - 19
Biological communities (water column)	**Parameters** Taxonomy, diversity, abundance, biomass & community structure, primary productivity, bacterial productivity, vertical migration, DNA analysis of some of the taxonomic groups **Taxonomic groups** Zooplankton, phytoplankton, nekton (fish), megafauna, seabed scavengers, … with focus on planned return water discharges depths **Expected duration** Temporal variation on seasonal and inter-annual scales; Paragraph 46 indicates sampling is required "for one test-mining & one PRZ with a minimum annual sampling over at least 3 years"	paragraph 15(d) Annex I paragraph 41, 44 and 51.

Study area	Study summaries	ISBA/25/LTC/6
Biological communities (seabed)	**Parameters** Taxonomy, diversity, abundance, biomass & community structure, DNA analysis of all taxonomic groups. *faunal succession following tests** **Taxonomic Groups** Megafauna, seabed scavengers, macrofauna, metazoan meiofauna, foraminifera, nodule biota, microbiology **Expected duration** Temporal variation on at least inter-annual scales. Minimum 1 year of time-lapse camera deployment to cover resuspension events & megafauna Paragraph 46 however indicates sampling is required "for one test-mining & one PRZ with a minimum annual sampling over at least 3 years"	paragraph 15(d) annex I paragraph 42, 49.
Ecosystem functioning	**Parameters** Oxygen consumption. Food-web linkages & fluxes in and between pelagic & benthic habitats. Sediment bioturbation.	paragraph 15 e, f, g, h annex I paragraph 52, 53
Plume modelling	**Parameters** Dispersal of particles & dissolved substances. Al water depths where discharge and accidental spills could occur.	annex I paragraph 14, 20, 21 and 23
Ecotoxicity assessments	**Parameters** Trace metals in muscle and target organs of demersal fish & invertebrate species. Whole organism concentrations of trace metals sampled at gradients from disturbance experiments. Bioassays of algal fluorescence and experiments to determine toxicity at multiple trophic levels **Expected duration** Sampled over time to determine natural variability, and thereafter at least annually once mining operations begin.	annex I paragraph 45
Underwater noise	**Parameters** Natural background soundscape across depth profile and especially in the SOFAR channel **Expected duration** 1 year of data from continuous recordings	annex I paragraph 43
Geological Properties	**Parameters** High-resolution bathymetry. Granulometry & basic properties seabed sediments, heavy metal & trace metals in sediments, nodules and porewater. Porewater profiles down to 20cm. Nutrients, specific gravity, density, dissolved and particulate organic & inorganic carbon, sediment redox system. Characteristics of sediments resettled after disturbance	paragraph 15 (c) annex I paragraph 24, 25, 26, 27, 28

*Note this list is a summary and is not exhaustive

Where possible, CIIC-SR will connect and collaborate with other sea users who may be interested in forming local partnerships to conduct environmental studies, and in particular seasonal and/or regional studies.

Appendix A of this annex presents a list and some details about the methodologies that are envisaged to be used to conduct the above-mentioned studies. The baseline data for the environmental impact assessment will be established using the best available technology and sampling methodology.

7.2 Impact assessment

Another key objective of the environmental program of the exploration phase is to develop an Environmental Impact Assessment (EIA), culminating in an Environmental Impact Statement (EIS) and Environmental Management and Monitoring Plan (EMMP) for future mining operations. During exploration, the baseline environmental conditions will need to be understood, as described in Section 3.1, and an environmental impact assessment will need to be completed to assess the likely impacts and effects a mining operation will have on the environment. To reach the best deliverables, CIIC-SR is also planning to set-up a stakeholder consultation approach, including several workshops to share ideas and gather feedback.

CIIC-SR has gathered important data about the potential effects of polymetallic nodules collection including through field trials. It is also planned to deploy the PATANIA II – GSR's pre-prototype seafloor nodule collector - in the Cook Islands' EEZ in or around 2026 (estimated). An environmental impact assessment and monitoring plan will be developed and submitted to the Seabed Minerals Authority prior to the activity taking place (as per requirement of the Part 5 of the Environment Act 2003), to understand and monitor the potential effects of this trial operation. Patania II has been developed as part of GSR's polymetallic nodule project in the CCZ and was first deployed in the GSR and BGR CCZ contract areas in April/May 2021. From a scientific point of view, the Patania II trial offers an important opportunity to assess *in situ* environmental effects that may arise from a potential future nodule mining operation on the seafloor. For the CCZ trial, Patania II cleared nodules from a small area of seafloor (approximately 0.1 km²) at a water depth of ~4,400 m during a 2-day period in the GSR license area and 1-day period in the BGR area. This was the minimum time and space required to achieve the technology and monitoring objectives. The results from the trial, which at the time of writing are still being processed, will inform the engineering design of the full-scale system and should reduce unknowns about environmental effects of full-scale polymetallic nodule mining. In the spirit of transparency, GSR agreed that a consortium of independent scientists[1] would monitor the Patania II harvesting trials, with a key aim of reducing existing knowledge gaps and uncertainties surrounding environmental effects. In parallel, GSR developed and executed its own environmental monitoring programme. The findings are still being processed and will be shared in due course.

The Patania II trial in the Cook Islands' EEZ will benefit from the learnings gained during the CCZ trial. CIIC-SR will ensure that any effects that might be specific to the Cook Islands marine ecosystems will be taken into consideration and addressed in the prior-EIA/EIS and monitored.

Lessons learned from the pre-prototype Patania II trial will be dedicated to improving the final design of the prototype Patania III, the prototype commercial-scale seafloor nodule collector, including enhancing environmental performance. The commercial scale collector is expected to operate very similarly to Patania II, incorporating progressive adjustments and improvements, whilst operating according to the same design-principles.

[1] GSR is collaborating with the European research project 'MiningImpact2'. Scientists from 28 European institutes will join efforts with BGR (German CCZ Contractor), to independently monitor the trials planned for 2021 to help understand the environmental effects of collecting mineral resources from the seafloor. MiningImpact2 is a project of the Joint Programming Initiative Healthy and Productive Seas and Oceans (JPIO).

7.3 Why methodology is appropriate

For the past 40 years, a considerable amount of research has been undertaken, focusing on the environmental effects of polymetallic nodule mining on the deep seafloor. A summary of important studies can be found in **Appendix B.** To date, the main geographical focus has been in the CCZ area of the Pacific Ocean and a few studies have been conducted in the Peru Basin.

The common trend highlighted is the complexity with conducting research at abyssal depths.
The ISA has hosted workshops for Contractors and experts with the aim of standardizing methodologies (see, for example, ISA workshop proceedings documents [ISA 1999, 2002] and technical studies [ISA 2011, 2014]) and has developed *Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration of marine minerals in the Area* (ISBA/25/LTC/6/Rev.1). The methodology described above and in **Appendix A** aligns with these recommendations which have been developed through a transparent process and multi-stakeholder approach, including scientific experts, regulators, Member States, Sponsoring States, Contractors, NGOs, among others.

7.4 How proposed work relates to recovery operations and understanding of the ecological setting and how it is going to advance the knowledge and lead to ultimate sustainable recovery operations

The exploration phase is crucial to develop a socially and environmentally acceptable mineral recovery operation that aligns with and supports the Marae Moana principles. As explained earlier, understanding the receiving environment is necessary to (1) understand the impacts & effects due to the extracting activity, (2) reduce the remaining uncertainties related to polymetallic nodule mining, and (3) develop tailored environmental management plans for future seafloor polymetallic nodule mining to minimise and mitigate environmental effects to the extent possible.

Indeed, the achievement of high environmental standards is integral to the CIIC-SR approach.
Detailed baseline studies will be conducted at the proposed mineral extraction site (once it has been identified through exploration work) and at other sites in order to establish a reference area, or areas as needed, away from the impact of mining. The purpose of this reference area is two-fold:

1. To study natural variability away from mining
2. To ensure the protection of habitats and biota representative of what will be lost or impacted as a result of mining.

CIIC-SR intends to take a transparent, inclusive and multi-stakeholder approach to project planning. CIIC-SR will specifically partner with the scientific community to review and develop environmental plans, conduct the baseline studies, progress the environmental impact assessment (EIA) culminating in an environmental impact statement (EIS), including developing ways to mitigate and minimize impacts. Collaborating scientists will be free to publish their findings, ensuring CIIC-SR is transparent and contributes to the global marine scientific knowledge. Partnering with scientific experts helps to ensure the science is done well and that any project or regulatory decisions are made based on the best available scientific evidence.

Members of CIIC-SR have a history of collaboration with world-leading scientific institutes and projects, such as:

- **Marine Biology Research Group (MBRG) of Ghent University** have been involved with GSR's CCZ project since the inception of its exploration program, to ensure that internationally renowned expertise is directly available to assist with the development and

implementation of the biological oceanography baseline program. Since the 1970s, MBRG has researched the marine environment and has specialized mainly in the ecology of the seafloor, a field also known as marine benthic ecology. MBRG has already shown its interest in conducting scientific research in the EEZ of the Cook Islands (see Letter of Intent attached in the section 10 of the present Exploration Application).

- **The oceanographer Jon Wood, from Ocean Data Technologies Inc. (ODT) (Hyannis, MA, USA**) in involved the GSR CCZ Project's oceanographic data acquisition and brings much knowledge and extensive expertise and experience.
- **Professor Thomas Peacock, a physical oceanographer and environmental fluid dynamics expert from the independent Massachusetts Institute of Technology (MIT), Cambridge, MA, USA,** is leading the characterization of the sediment plume generated by deep sea nodule harvesting. MIT has already shown its interest in conducting scientific research in the EEZ of the Cook Islands (see Letter of Intent attached in the section 10 of the present Exploration Application).
- As mentioned above, GSR agreed that a consortium of independent scientists[2] would monitor the 2021 Patania II trial, with the goal of transparency and with a key aim of reducing existing knowledge gaps and uncertainties surrounding environmental effects. Knowledge gained will be incorporated into the next phase of engineering design and environmental planning.
- GSR is partnering with the scientific community to develop environmental baseline study plans and an EIA Scoping Report for its seafloor polymetallic nodule project in the CCZ. This draft 400+ page document provides the results of the scoping process undertaken. It presents an outline description of GSR's CCZ project, the environmental and social setting for the project, presents the proposed key issues for the EIA (based on Environmental Risk Assessment), and describes the proposed approach to environmental baseline studies and the EIA, including further data collection, assessment methods and assessment criteria. To date, over 40 relevant international scientific experts have provided input to the Scoping Report, which is due for completion in 2022. A list of scientists involved to date is provided below in Table III-5.

Table III- 5: Scientific expertise consulted in the development of GSR's baseline study plans and EIA Scoping Report.

Name	Organisation	Country
Pedro Martinez[a,c]	Private consultancy INES. Senckenberg Research Institute German Centre for Marine Biodiversity Research (DZMB)	Germany
Andrew Sweetman[a,b,c]	Heriot Watt University	UK
Daniel Jones[a,b,c]	NOC - National Oceanographic Centre (Southampton)	UK
Jennifer Durden[a]	NOC - National Oceanographic Centre (Southampton)	UK
Adrian Glover[a,b,c]	The Natural History Museum (London)	UK

[2] GSR is collaborating with the European research project 'MiningImpact2'. Scientists from 28 European institutes will join efforts with BGR (German CCZ Contractor), to independently monitor the trials planned for 2021 to help understand the environmental effects of collecting mineral resources from the seafloor. MiningImpact2 is a project of the Joint Programming Initiative Healthy and Productive Seas and Oceans (JPIO).

Name	Organisation	Country
Thomas Dahlgren[a,b,c]	University of Gothenburg	Sweden
Fabrizio Frontalini[a,c]	University of Urbino	Italy
Andrew Gooday[a,b,c]	NOC - National Oceanographic Centre (Southampton)	UK
Miguel Caetano[a]	CIIMAR - Centro Interdisciplinar de Investigacao Marinha e Ambiental	Portugal
Joana Raimondo[a,b]	CIIMAR - Centro Interdisciplinar de Investigacao Marinha e Ambiental	Portugal
Miguel Santos[a]	CIIMAR - Centro Interdisciplinar de Investigacao Marinha e Ambiental	Portugal
Jan Pawlowski[a,b,c]	(University of Geneva), Private consultancy ID-Gene Ecodiagnostics SàRL	Switzerland
Tasmin Patel[a,b,c]	RBINS - Royal Belgian Institute for Natural Sciences	Belgium
Isabelle Schon[a,b,c]	RBINS - Royal Belgian Institute for Natural Sciences	Belgium
Steven Degraer[a,b,c]	RBINS - Royal Belgian Institute for Natural Sciences	Belgium
Maarten Van Steenberg[a,b,c]	RBINS - Royal Belgian Institute for Natural Sciences	Belgium
Dries Van den Eynde[c]	RBINS - Royal Belgian Institute for Natural Sciences	Belgium
Alex Poulton[a,b,c]	Heriot Watt University	UK
Timothy Crone[a,b,c]	Lamont-Doherty Earth Observatory, Columbia University, Private consultancy Real-Time Oceanographic	USA
DelWayne Bohnenstiehl[a,b]	Real-Time Oceanographic	USA
Nadia Pieretti[a]	Università Politecnica delle Marche, Ancona, Italy	Italy
Ann Vanreusel[a,b]	Ghent University - MARBIOL group	Belgium
Ellen Pape[a,c]	Ghent University - MARBIOL group	Belgium
Franscesca Pasotti[a,b,c]	Ghent University - MARBIOL group	Belgium
Tãnia Campinas Bezerra[b]	Ghent University - MARBIOL group	Belgium
Willy Baeyens[a,b,c]	VUB - Free University of Brussels	Belgium
Yue Gao[a,c]	VUB - Free University of Brussels	Belgium
Martine Leermakers[a]	VUB - Free University of Brussels	Belgium
Torben Rhiel[a,b,c]	Senckenberg	Germany
Magdalena Blazewicz[a]	University of Lodz	Poland
Inmaculada Frutos[a,b]	University of Lodz	Poland
Annemiek Vink[a,b]	BGR – Federal Institute for Geosciences and Natural Resources of Germany	Germany
Thomas Peacock[a,b,c]	MIT – Massachusetts Institute of Technology	USA

Name	Organisation	Country
Boudewijn de Crop[a,b]	IMDC – International Marine and Dredging Consultants	Belgium
Alexander Breugem[a]	IMDC – International Marine and Dredging Consultants	Belgium
Cindy Van Dover[a,b,c]	Duke University	USA
Steven Vandenborre[a,b]	Federal Agency for Environment & Health	Belgium
Patrick Schotte[a,b]	Federal Agency for Economy	Belgium
Sophie Mirgauxb	Federal Agency for Environment & Health	Belgium
Thanos Gritzkalis[a]	VLIZ (Flemish Marine Institute)	Belgium
Klaas Deneudt[a]	VLIZ (Flemish Marine Institute)	Belgium
Wieter Boone[a]	VLIZ (Flemish Marine Institute)	Belgium
Luciana De Melo Santos Genio[b]	International Seabed Authority	Jamaica
Philomene Verlaan[b]	University of Hawaii	UK
Tracey Sutton[b,c]	Nova Southeastern University	USA
Ashley Marranzino[b]	Nova Southeastern University	USA
Rosanna Boyle[b,c]	Nova Southeastern University	USA
Kevin Boswell[b,c]	Florida International University	USA

(Note: [a]attended January 2020 Workshop, [b]attended December 2020 Workshop (virtual). [c]provided comments on the draft Scoping Report)

CIIC-SR is eager to follow a similar approach to its partner, GSR and is keen to include scientists from the Cook Islands and the Pacific Islands. CIIC-SR is indeed interested in exploring with the Cook Islands ways to maximize the involvement of Cook Islanders in environmental work, including training and capacity building initiatives in the field of marine science and/or other relevant areas of interest.

8 Environmental Management

Most of the CIIC-SR Project Management Plan will be inspired by the DEME-Group document, as DEME is a leader in offshore operation, ISO certified and experienced with challenging engineering projects. The document will be adapted to the CIIC-SR scope of work, involved vessel and equipment.

Some of the personnel involved onboard will also be DEME personnel, such as the QHSE officeron board. CIIC-SR as a company is not ISO certified. DEME is certified in accordance with ISO 45001, ISO 9001, and ISO 14001 standards as per the DEME Group Multisite Certification Scheme. The DEME-Group holds several QHSE certificates (ISO 14001 – Environmental Management Systems – Requirements, ISM – International Safety Management Code, ISO 45001 – Occupational Health & Safety Management System, ISO 9001 Quality Management Systems

requirements: SCC – Safety, Health and Environment checklist contractors & CO2-ladderv3-0 Niv 5 – CO2 awareness certificate level).

8.1 Environmental Management System

It is not the CIICSR intention to be ISO certified during such period of time, and for the planned offshore activities. This is something to be considered for a potential exploitation phase. CIIC-SR Environmental Management System will be developed to align with ISO 14001:2015.

8.2 Roles and Responsibilities

The effective implementation of the environmental program will be dependent on established and clear roles, responsibilities and reporting lines within CIIC-SR and its contractors. An overview of the key personnel with environmental delivery roles in a typical DEME project include the following.

- Project Manager (PM). Overall accountability and ensuring suitable resources are available.
- Environmental Coordinator (EC). Empowered to direct and control works so that they are managed in accordance with the agreed environmental requirements.
- Superintendents. Responsible for day-to-day supervision of works; environmental aspects will be overseen by the EC. Given the overall size of the project and complexity of environmental aspects related to it, it is anticipated that the organisational structure may include a number of dedicated Environmental Superintendents, assisting and reporting to the EC.
- Site Staff. Responsible for environmental impacts and resolving incidents quickly in the correct manner.
- Subcontractors. All subcontractors appointed by the DEME Group will be required to have an environmental representative responsible for ensuring environmental considerations are included in risk assessments, carrying out audits and inspections, and attending site inspections undertaken by DEME Group.

A similar approach will be applied by CIIC-SR.

8.3 Environmental Awareness Plan

CIIC-SR will ensure that all its personnel have the necessary experience, training and qualifications to be able to perform their duties. An occupational health, safety and environmental awareness plan will be put in place to inform all personnel engaged in exploitation activities as to the occupational and environmental risks resulting from their work.

DEME's centralised systems keep track of employee certificates and training and help identify future training needs proactively. Competences are evaluated companywide following a standardised process on an annual basis and training includes environmental awareness training. The human resources department will assist the PM in ensuring adequately trained personnel are assigned to the Project.

9 Public Outreach, awareness, education

CIIC-SR has developed a Communication & Engagement Strategy with the goal being to enhance the project's implementation success by communicating effectively with those who are interested in or who may be affected by the project and/or its outcomes.

The main objectives are:

1. Ensure known communication events are captured and referenced in forward planning.
    - Build and develop an events calendar from the baseline activities and project milestones.
2. To promote the 5-year exploration project and manage public perceptions
    - Build awareness of the project and increase support and reduce misconceptions and false expectations.
3. To foster the commitment and support of the Cook Islands Government
    - Assure effective and responsible project implementation; enhance partnership with CI Government; build CIICSR reputation and capacity for successful project delivery; ensure contractual and policy objectives are achieved.
4. To engage and build support of key regulatory authorities
    - Regulatory requirements are met and in a timely manner, and the necessary consents/approval of the authorities are obtained.
5. To effectively document the project for future developments and referencing
    - Fully documented processes, progress and lessons learned will improve future project delivery and provide referencing material for future generations.

The strategy establishes baseline activities for communicating and engaging with various stakeholder groups and contains several key messages to be shared throughout the life of the project.

CIIC-SR plans to progress the training opportunities to further develop the capacity in the Cook Islands with a Cook Islands National Capacity Building Programme which is currently in the developmental stages. The program will aim to provide education and skill development for Cook Island Nationals in all areas relating to seabed minerals including exploration, marine science, mining, technical expertise, management, and financial and legal expertise. It is hoped that upon successful granting of the exploration license, CIIC-SR will be recruiting potential candidates within the Cook Island to participate in their next offshore campaign anticipated in 2023.

10 Statement of Costs

The financial table included in Annex 2 of the License for Exploration Activities (Table III-6) outlines the anticipated yearly expenditure for the five-year program of activities.

Table III- 6: General financial schedule - per year - of indicative expenditures estimated by CIIC-SR.

Exploration and Environmental work programs		
Year 1:	*Preparation of the offshore campaigns and scientific studies.*	$ 372,900
Year 2:	*1st offshore expedition CIICSRNOD23 (Resource and baseline study) + post-study*	$ 14,964,058
Year 3:	*2nd offshore expedition CIICSRNOD24 (Env. baseline study) + post-study*	$ 15,804,919
Year 4:	*Desktop and laboratory studies*	$ 3,865,363
Year 5:	*3rd offshore testing of pre-prototype collector vehicle PATANIA II and equipment + environmental monitoring*	$ 20,512,166
	Total (NZD millions):	**$ 55,519,407**

This is an estimate based on:

1) Experience in offshore equipment, tools, and vessel:
2) Experience with scientific partners for personnel, consumables, and equipment:
3) Preliminary feedback from potential sub-contractor

For these specific reasons the estimate which require further discussion with potential sub-contractors and other contractors also operating in the Cook Islands EEZ (for synergy with equipment and vessel), CIICSR is not in a position yet to provide more breakdowns in the estimated costs.

CIIC-SR will aim to optimize this expenditure. Optimization includes shared working with other contractors operating in the Cook Islands EEZ, where this may be mutually beneficial.

CIIC-SR wishes to emphasize that it considers the plan of work for this five-year exploration period and the projected concomitant investment to be contingent on:

- the satisfactory progress of the regulations on exploitation.
- the PMN resource availability and quality.
- the COVID19 restrictions in place.
- The sufficient technology advancements
- the strategic partnership of CIIC-SR and its affiliates.
- the metals market within the next coming years.

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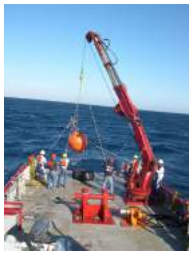
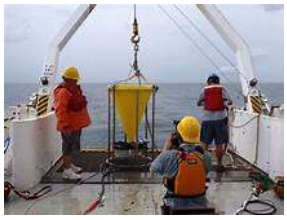
Appendix A: List of environmental baseline studies and possible approaches to complete them. *(Images: Google Images)*

Study Area: Physical Oceanography (Long-term Studies)	
  	
Platform	**Multiple moorings installed on the seafloor**
Study Objective	To understand the currents around the extraction site over a 12 to 36 month period (depending on the mooring). Study enables modelling the extent and duration of sediment plumes that may be formed during full-scale operations.
Technique Description	Moorings will be anchored to the seafloor and will include instrumentation such as single point current meters, acoustic doppler current profilers (ADCPs), sediment traps, CTDs, transmissometers, and other instruments, along with buoyancy devices. Moorings will be of multiple lengths, and most will focus on bottom-water currents, with at least one envisaged to cover almost the entire water column. Moorings will be retrieved on a ~12 monthly basis for data download, equipment maintenance and mooring reinstallation. Following data acquisition, hydrodynamic modelling of sediment plume extent and duration will be performed.
Project Stage	EIA
General Comments	Moorings are usually anchored using scrap metal or cement blocks. The moorings will be affixed to the anchor with dual acoustic releases, which are triggered from the ship using a “Deck Box” when equipment retrieval is necessary.
Area Disturbed	Small, corresponds to size of the anchor which is typically less than 2 m x 2 m.
Environmental impact[3]	Very low. Note that the depth of the shallowest instrument will need to be determined in consultation with the Cook Islands government and local fisheries to ensure there is no chance of entanglement by fishing nets or lines.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by marine scientific research (MSR) groups and environmental agencies.

[3] Environmental impact beyond standard vessel operations.

Study Area: Physical Oceanography (Opportunistic Current Profiles)	
 	
Platform	**L-ADCP (Lowered Acoustic Doppler Current Profiler)**
Study Objective	To understand the currents within the license area at a single point in time – will help to 'calibrate' the long-term moorings over a larger area of study. Study enables an estimate of the extent and duration of sediment plumes that may be formed during full-scale operations.
Technique Description	A Lowered-Acoustic Doppler Current Profiler (ADCP) is tethered to the ship by a long cable and is used to obtain water column current (speed and direction) profiles in a simple vertical down and up cast.
Project Stage	EIA
General Comments	Data needs to be carefully processed following collection to remove interferences from ship movements and deployment method (i.e. the movement associated with the instrumentation traveling through the water column).
Area Disturbed	Nil. No physical contact made with the seafloor.
Environmental impact[4]	None. No physical contact made with the seafloor.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

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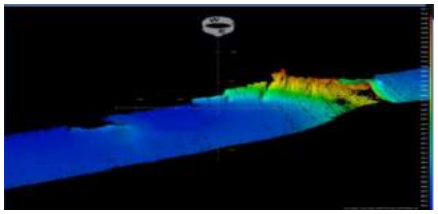
[4] Environmental impact beyond standard vessel operations.

Study Area: Geology (High Resolution Bathymetry)	
 	
Platform	**Deep Tow / AUV**
Study Objective	To produce Geographic Information System regional maps with high resolution bathymetry showing major geological and geomorphological features to assess the heterogeneity of the environment. These maps will be produced at a scale appropriate to habitat variability. This information will also assist with the placement of study locations and mooring installations.
Technique Description	The Deep Tow method employs an underwater sled that is tethered to the ship by a long (fibre-optic) cable. The sled is towed several meters above the seafloor and can be up to 5000 m behind the vessel. A typical deep-tow method uses two side-mounted sonars to map the seafloor on each side of the instrument. The sonars emit low power[5] sound waves, which are reflected off the seafloor and recorded by receivers on the side scan instrument.
Project Stage	Early Exploration
General Comments	Deep Tow: sled can remain in the water for up to 2 days at a time. A typical survey area may take several weeks to complete.
Area Disturbed	Nil. No physical contact made with the seafloor.
Environmental impact[6]	Negligible. No physical contact made with the seafloor. Sound levels not high enough to cause physical damage to marine animals.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

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[5] Power and frequency levels dependent on specific technique used.

[6] Environmental impact beyond standard vessel operations.

Study Area: Geology (Heavy Metals and Trace Elements)	
  	
Platform	**Multiple Corers or Mega Corers**
Study Objective	To collect information on the potential for heavy metal and trace element release during full-scale mineral extraction operations, and their concentrations.
Technique Description	A multi corer is a bottom sampling tool used for sampling in chemical, geo-chemical and biological applications. The coring head is hydraulically damped to ensure undisturbed samples. It is deployed from a research vessel with a deep-sea wire. The design of the system allows for multiple cores to be retrieved from a single deployment/retrieval cycle, increasing the chances of successful core retrieval in areas of difficult seabed terrain (i.e. hard bottom, seamounts, and undulating bathymetry). Cores are brought up to surface, sectioned and preserved following best practice technique.
Project Stage	EIA
General Comments	Multi corers generally have between four and twelve individual corers that will separately penetrate the seafloor once contact is made. Multi corers can be outfitted with additional instrumentation such as altimeters, CTDs, and penetrometers. Casts are usually completed within several hours.
Area Disturbed	Varies depending on how many corers, but the diameter of the base of a mega corer (twelve core tubes) is ~ 2.8 m.
Environmental impact[7]	Very small, restricted to area where sample is taken.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

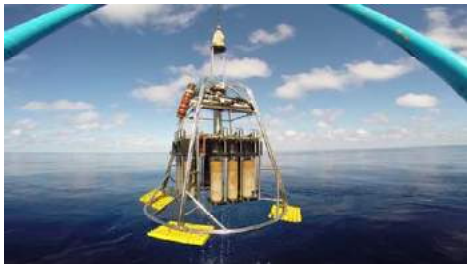
[7] Environmental impact beyond standard vessel operations.

Study Area: Geology (Heavy Metals and Trace Elements)	
   	
Platform	**Box Corers**
Study Objective	To collect information on the potential for heavy metal and trace element release during full-scale mineral extraction operations, and their concentrations.
Technique Description	Bottom sampling tool designed for minimum disturbance of sediment and overlying features. It is deployed from a research vessel with a deep-sea wire. Upon contact with seafloor, the outer shovel is released, and the sample taken.
Project Stage	Early Exploration, EIA
General Comments	Box corers typically have an area of approximately 2500 cm^2. Retrieval and deployment time depends on winch capabilities and water depth, however, total time generally does not take more than several hours at depths of ~5000 m. Box corers can be outfitted with additional instrumentation such as altimeters, CTDs, and penetrometers.
Area Disturbed	Maximum area of 0.75 m x 0.75 m with 0.65 m depth penetration per sample if largest known box corer is utilized.
Environmental impact[8]	Very Low.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

[8] Environmental impact beyond standard vessel operations.

Study Area: Chemical Oceanography (Water Column Chemistry)	
  	
Platform	**Water Sampling Carousel / Rosette, CTD**
Study Objective	To understand baseline water quality conditions in the water column overlying the site targeted for nodule extraction, capturing at least two summer/winter seasons (seasonal studies).
Technique Description	Water sampling bottles (or "Niskin" bottles) are arranged in a rosette formation around other sensors (e.g. CTD). The instrument package is tethered to the ship by a long cable and is used to obtain water column samples and profiles in a simple vertical down and up cast. Each bottle can be triggered individually to enable sampling from various locations. A CTD, which is commonly attached to the water sampling carousel, provides profiles of chemical and physical parameters through the entire water column by detecting its conductivity and temperature (which in turn relates to concentration of salt and other inorganic compounds in seawater). By analysing these parameters, scientists can make inferences about the occurrence of certain biological processes.
Project Stage	EIA
General Comments	Casts are usually completed within several hours.
Area Disturbed	None. No physical contact made with the seafloor.
Environmental impact[9]	Negligible. No physical contact made with the seafloor.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups to characterize water chemistry of the deep sea.

[9] Environmental impact beyond standard vessel operations.

Study Area: Chemical Oceanography (Sediment Pore Water)	
  	
Platform	**Multiple Corers or Mega Corers**
Study Objective	To understand baseline water chemistry conditions in sediment pore waters. To collect information on metal and other elements that may be released during the nodule extraction process.
Technique Description	A multi corer is a bottom sampling tool used for sampling in chemical, geo-chemical and biological applications. The coring head is hydraulically damped to ensure undisturbed samples. It is deployed from a research vessel with a deep-sea wire. The design of the system allows for multiple cores to be retrieved from a single deployment/retrieval cycle, increasing the chances of successful core retrieval in areas of difficult seabed terrain (i.e. hard bottom, seamounts, and undulating bathymetry). Cores are brought up to surface, sectioned and preserved following best practice technique.
Project Stage	EIA
General Comments	Multi corers generally have between four and twelve individual corers that will separately penetrate the seafloor once contact is made. Multi corers can be outfitted with additional instrumentation such as altimeters, CTDs, and penetrometers. Casts are usually completed within several hours.
Area Disturbed	Varies depending on how many corers, but the diameter of the base of a mega corer (twelve core tubes) is ~ 2.8 m.
Environmental impact[10]	Very small, restricted to area where sample is taken.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

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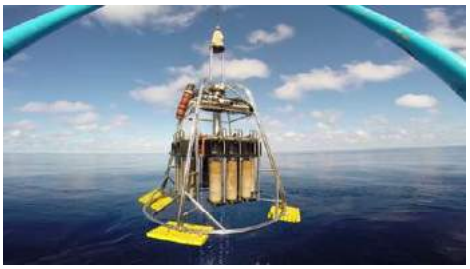
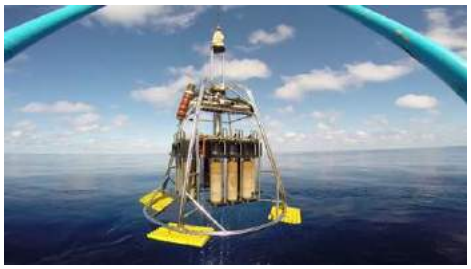
[10] Environmental impact beyond standard vessel operations.

Study Area: Sediment Properties	
   	
Platform	**Box Corers, Multiple Corers**
Study Objective	To study baseline sediment conditions and predict the behaviour of mineral extraction on sediment composition. To determine the basic properties of the sediment, including measurements of soil mechanics and composition to adequately characterize the surficial sediment deposits which are the potential source of deep-water plume.
Technique Description	See *Heavy Metals and Trace Elements* study for Box coring techniques. See *Heavy Metals and Trace Elements* and *Sediment Pore Water* studies for Multiple corer techniques. Sediment to be sampled taking into account the variability of the seabed.
Project Stage	EIA
General Comments	See Box corer methods. See Multi corer methods.
Area Disturbed	Small, area equivalent to the size of the box corer (typically 0.25 to 0.56 m^2 per deployment) or multi corer (base diameter ~2.8m).
Environmental impact[11]	Very small, restricted to area where sample is taken.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

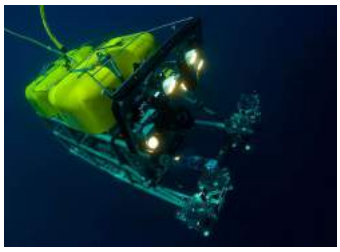
[11] Environmental impact beyond standard vessel operations.

Study Area: Biological Communities - Meiofauna [32-250 micron], Microfauna [<32 micron]	
  	
Platform	**Multiple Corer**
Study Objective	To understand baseline biological conditions within the seafloor sediments and predict the impact of mineral extraction on biological communities. Samples of fauna to be representative of variability of habitats, bottom topography, depth, seabed and sediment characteristics, abundance and mineral resource being targeted.
Technique Description	See *Sediment Pore Water* study for a description of the sampling technique. Meiofauna: One complete core to be dedicated to metazoan meiofauna (sieved through a 32 micron mesh), a second core for molecular meiofauna analysis with the top 0-5 cm processed. A separate core should be provided for foraminiferal meiofauna, sliced into 1-cm thick layers down to 5 cm depth. Microfauna: Microbial metabolic activity should be determined using adenosine triphosphate or other standard assay. In soft sediment, vertical profiles should be obtained with suggested intervals for sampling as follows: 0-0.5, 0.5-1.0, 1-2, 2-3, 3-4, 4-5 cm. Samples should then be preserved as appropriate.
Project Stage	EIA
General Comments	Multi corers generally have between four and twelve individual corers that will separately penetrate the seafloor once contact is made. Multi corers can be outfitted with additional instrumentation such as altimeters, CTDs, and penetrometers. Casts are usually completed within several hours.
Area Disturbed	Varies depending on how many corers, but the diameter of the base of a mega corer (twelve core tubes) is ~ 2.8 m
Environmental impact[12]	Very small, restricted to area where sample is taken.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

[12] Environmental impact beyond standard vessel operations.

Study Area: Biological Communities - Macrofauna [250 micron], Nodule Fauna	
  	
Platform	**Box Corer**
Study Objective	To understand baseline biological conditions within the seafloor sediments an on hard substrates and predict the impact of mineral extraction on biological communities. Samples of fauna to be representative of variability of habitats, bottom topography, depth, seabed and sediment characteristics, abundance and mineral resource being targeted.
Technique Description	See *Heavy Metals and Trace Elements* study for a description of the sampling technique. Macrofauna: information obtained on abundance, species structure, biomass and diversity. Vertical profiles with a suitable depth distribution (i.e. 0-1, 1-5, 5-10 cm) should be obtained. Where possible, whole box core samples should be used and should not be sub-cored or divided. Nodule Fauna: information obtained on abundance, biomass and species structure should be determined from nodules taken from the top of the box corers.
Project Stage	EIA
General Comments	Box corers typically have an area of approximately 0.25 m^2. Retrieval and deployment time depends on winch capabilities and water depth, however, total time generally does not take more than several hours at depths of ~5000 m. Box corers can be outfitted with additional instrumentation such as altimeters, CTDs, and penetrometers.
Area Disturbed	Maximum area of 0.75 m x 0.75 m with 0.65 m depth penetration per sample if largest known box corer is utilized. Note: it is recommended that a 0.25 m^2 box core be used to allow comparisons with CCZ macrofauna work.
Environmental impact[13]	Very Low.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

[13] Environmental impact beyond standard vessel operations.

Study Area: Biological Communities – Fauna Sampling by ROV (Megafauna [>2 cm]) [Draft]	
  	
Platform	**Remotely Operated Vehicle (ROV)**
Study Objective	To understand baseline biological conditions of visible fauna (megafauna - 2 cm and bigger) at the seafloor and predict the impact of mineral extraction on biological communities. Samples of fauna to be representative of variability of habitats, bottom topography, depth, seabed and sediment characteristics, abundance and mineral resource being targeted.
Technique Description	Select target species, combined taxonomy and genetic studies (study to be confirmed – possibly not practical due to low numbers of animals expected in nodule provinces).
Project Stage	EIA
General Comments	The ROV is lowered to the seafloor and surveys are completed and discrete samples can be taken. The ROV is powered by electricity and is hydraulically controlled from the support ship using an umbilical. ROV is typically underwater for 6 to 12 hours at a time, depending on whether or not samples need to be recovered to surface.
Area Disturbed	None – very little contact with seafloor, if any
Environmental impact[14]	Very low, confined to limited removal of individual animals.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

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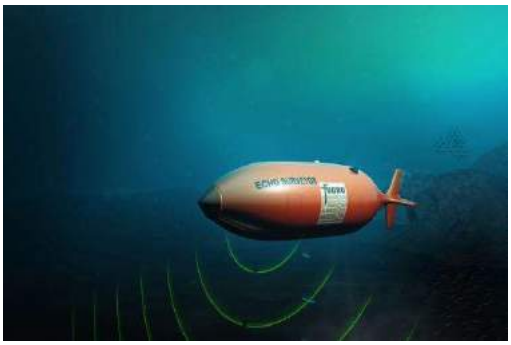
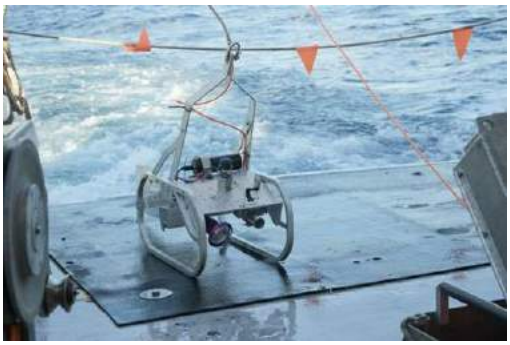
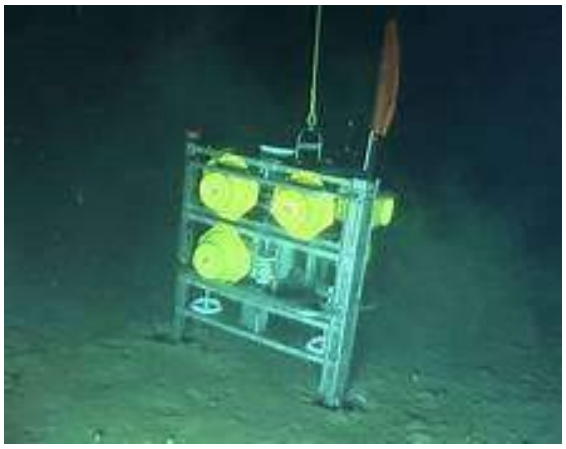
[14] Environmental impact beyond standard vessel operations.

Study Area: Biological Communities – Photo/video Transects (Seafloor and Near-Bottom Megafauna)	
	
Platform	**ROV/AUV/Towed Camera System (TBC)**
Study Objective	To understand baseline biological conditions at and immediately above the seafloor and predict the impact of mineral extraction on biological communities.
Technique Description	Follow pre-established transect lines and record observed biota. Assess density and biodiversity of megafauna (animals >2 cm).
Project Stage	EIA
General Comments	See ROV, AUV, and Towed methods
Area Disturbed	None – no contact with seafloor
Environmental impact[15]	None – no contact with seafloor (see ROV)
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

[15] Environmental impact beyond standard vessel operations.

Study Area: Biological Communities (Demersal Scavengers)	
	
Platform	**Moored Time Lapse Camera(s), Baited Time Lapse Cameras**
Study Objective	To understand baseline biological conditions at and immediately above the seafloor and predict the impact of mineral extraction on biological communities.
Technique Description	Recording device is set up within suitable distance of time lapse camera (TLC) anchored bait to observe behaviour of demersal scavengers.
Project Stage	EIA
General Comments	Likely to be deployed during ROV operations
Area Disturbed	Minimal, confined to area where TLC anchor has contact with seafloor, estimated to be less than 2 m x 2 m.
Environmental impact[16]	Negligible.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

[16] Environmental impact beyond standard vessel operations.

Study Area: Biological Communities (Pelagic Communities)	
  	
Platform	**Plankton nets, fishing gear, etc.**
Study Objective	To assess the pelagic communities in the water column and near-bottom (in the benthic boundary layer) that may be impacted by operations (e.g. the operational and discharge plumes) and to assess their baseline metal concentrations.
Technique Description	Pelagic monitoring moorings will comprise of a buoyed camera unit to monitor a separate baited/weighted line suspended in the water column
Project Stage	EIA
General Comments	Pelagic monitoring rigs will be deployed opportunistically See Plankton net methods
Area Disturbed	Nil if suspended in water column.
Environmental impact[17]	Negligible.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

[17] Environmental impact beyond standard vessel operations.

Study Area: Biological Communities – Marine Animal Observations	
	
Platform	Ship
Study Objective	To record sightings of marine mammals, other near-surface large animals (such as turtles and fish schools) and bird aggregations, identifying the relevant species and behaviours where possible. Details to be recorded in transit to and from areas of exploration and on passage between stations. Temporal variability should be assessed.
Technique Description	Marine Animal Observation Log filled out on the bridge of the ship.
Project Stage	EIA
General Comments	All crew of research vessel will be instructed to notify onboard environmental contractor of all sightings of marine animals while at sea. Sightings will properly be recorded by qualified personnel.
Area Disturbed	None.
Environmental impact[18]	None.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

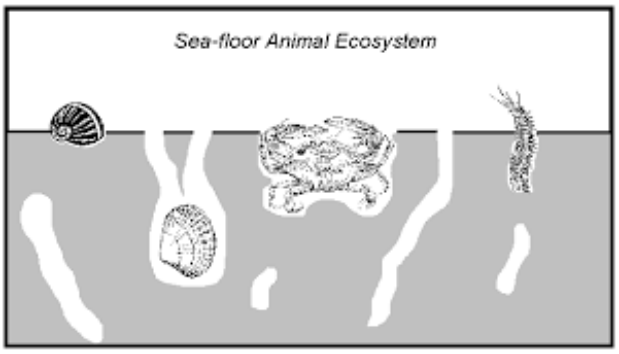
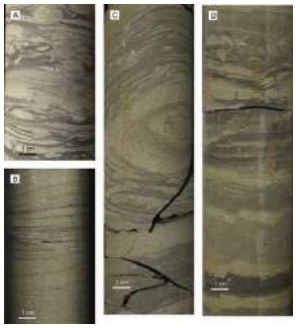
[18] Environmental impact beyond standard vessel operations.

Study Area: Biological Communities (Connectivity)	
  	
Platform	Ship.
Study Objective	To assess the regional distribution of species and genetic connectivity of key species.
Technique Description	Samples taken as per methods described above (e.g. ROV, box corer, multiple corer) and specimens are processed, preserved and analysed appropriately.
Project Stage	EIA
General Comments	See above for the relevant technique.
Area Disturbed	See above for the relevant technique.
Environmental impact[19]	See above for the relevant technique.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

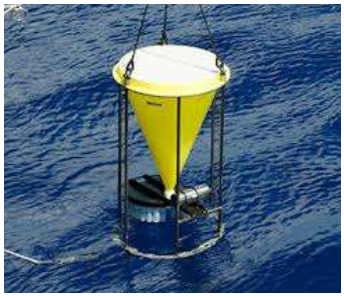
[19] Environmental impact beyond standard vessel operations.

Study Area: Biological Communities (Oxygen Consumption Experiments)	
  	
Platform	**Lander**
Study Objective	To understand baseline biological activity within the seafloor sediments and predict the impact of mineral extraction on biological communities.
Technique Description	Landers are used to measure the sediment-water exchange of nutrients by placing a chamber over the sediment and taking water samples with syringes from the chambers at fixed moments in time. The oxygen concentrations in the chambers are also measured. This gives us an idea of the uptake of oxygen by the sediment. We can compare this measured oxygen uptake to that calculated from profiles of oxygen measured in sediment cores.
Project Stage	EIA
General Comments	N/A
Area Disturbed	Small – equivalent to size of lander (~2 m x 2 m)
Environmental impact[20]	Negligible.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

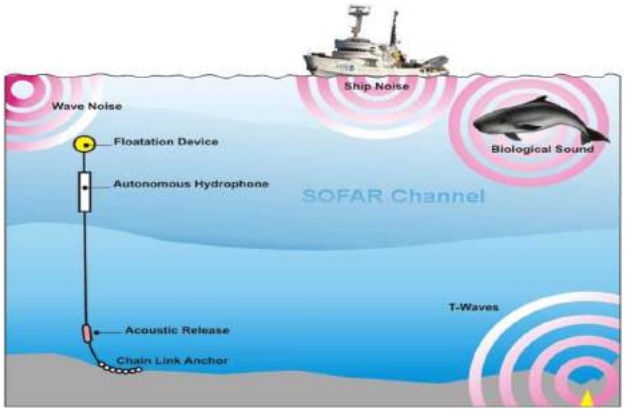
[20] Environmental impact beyond standard vessel operations.

Study Area: Bioturbation	
 	
Platform	**Multiple Corer**
Study Objective	To gather data on the mixing of sediments by organisms and to predict the impact of extractive activities on biological communities.
Technique Description	See multiple corer methods. Rates of bioturbation (i.e. the mixing of sediments by organisms) must be measured to analyse the importance of biological activity prior to a mining disturbance and can be evaluated from profiles of excess Pb-210 activity in the cores. Excess Pb-210 activity should be evaluated on at least five levels per core (suggested depths are 0-0.5, 0.5-1.0, 1-1.5, 1.5-2.5 and 2.5-5 cm).
Project Stage	EIA
General Comments	
Area Disturbed	None – no contact with seafloor.
Environmental impact[21]	Negligible.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

[21] Environmental impact beyond standard vessel operations.

Study Area: Fluxes to the Sediment (Sedimentation)	
 	
Platform	**Moored Time Lapse Sediment Traps**
Study Objective	To gather time series data on the flux and composition of materials from the upper water column to the deep sea. To understand baseline sedimentation rates and to evaluate the effects of mineral extraction activities (especially plumes) on these rates.
Technique Description	It is currently envisaged that time lapse sediment traps will be incorporated into the moorings used for physical oceanography studies (see above), or as stand-alone moorings. Measurements will be focused near the seafloor. Traps will be in place for a minimum of 12 months and one sample collected per month to obtain seasonal data. Besides weight/volume, the material collected in the traps will also be analysed to determine nutrient and trace element transport to deep sea environments.
Project Stage	EIA
General Comments	In addition to providing sedimentation data, analyzation of trace elements can help with understanding local upwelling phenomena.
Area Disturbed	None – no contact with seafloor.
Environmental impact[22]	Negligible.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR groups.

[22] Environmental impact beyond standard vessel operations.

Study Area: Noise	
	
Platform	**Moored Hydrophones**
Study Objective	To determine the baseline noise levels, for example from marine mammals and shipping, and estimate impact of mineral extraction activities.
Technique Description	It is currently envisaged that hydrophones will be incorporated into the moorings used for physical oceanography studies (see above), or as stand-alone moorings.
Project Stage	EIA
General Comments	Hydrophones for this application are not off the shelf. Some design development will likely be needed and may represent a collaboration opportunity.
Area Disturbed	Very little. Possibly the area of an anchor to keep it in place on seafloor (0.5-1 m^2)
Environmental impact[23]	Negligible.
Technique used in Marine Scientific Research (MSR)	Yes. These are standard techniques used by MSR and environmental agencies in shallower waters.

[23] Environmental impact beyond standard vessel operations.

Appendix B: Key Environmental Impact Assessment Work for Nodule Provinces in the Deep Sea

Study Name (location, year)	Entity	Key Focus Areas	Objectives/Findings
DOMES (CCZ, 1970s)	USA	Baseline studies, impact prediction	DOMES identified three key future EIA study areas: • benthic community impacts due to nodule removal • near-surface biota impacts due to plumes from discharge water (assumes surface discharge) • benthic community impacts due to deposition of suspended sediments. The study suggested test harvesting was needed to confirm predictions made.
ECHO-1 (CCZ, 1983)	USA	Revisited DOMES Site C post test mining in 1978	Objective was to examine benthic recolonization using box core samples following small-scale test mining by OMA some five years earlier. No significant differences were found between macrofauna and meiofauna from mining tracks and a nearby control area. Dick and Foell (1985) [cited in Morgan et al. 1999] determined that the tests were inconclusive due in part to the techniques used, which had low positional accuracy.
Acute Mortality Experiment (CCZ, late 1980s?)	USA	Studied impacts of sedimentation on fauna	Known amounts of sediment were added to corers positioned on the seabed with the expectation to learn the amount of sedimentation required to smother or entomb benthic animals. This project experienced technical difficulties with core recovery from the sea floor. General conclusions were that there was little evidence of serious disturbance to macrofauna when subjected to burial <1 cm of sediment, while burial under 4 cm of sediment appeared to cause entombment of 25% to 50% of the macrofauna in six days.
Quagmire II Expedition (CCZ, 1990)	USA	Revisited DOMES Site C post test mining in 1978	Examined benthic recolonization using precision sampling techniques (RUM-III vehicle) following small-scale test mining by OMA in 1978. Carried out a critical-dose experiment to determine the sensitivity of benthic fauna to sedimentation levels. The major cruise objectives were not achieved.
DISCOL (Peru Basin, 1989 to 2015)	Germany	Large-scale disturbance-recolonization experiment (Peru Basin)	The work involved baseline data gathering, ploughing ~11 km^2 of the sea floor using a "plough-harrow" down to 10 to 15 cm depth. ~20% of the area was affected by the plough harrow, ~70% was covered by various thicknesses of sediment, and ~10% remained

			unaffected. Following the disturbance, studies were conducted immediately after the impact, after six months, then at three and seven years to determine the rate of recolonization of the impacted areas. Due to the impact, the abundances of all fauna decreased significantly, then three years after the impact, densities of major faunal groups significantly exceeded what had been found during baseline studies, although diversity was lower. After seven years, the tracks remained clearly visible. The undisturbed areas remained more or less constant. For the megafauna, animals that depend on hard substrates (nodules) remained absent while more mobile animals dominated. A further offshore study at the DISCOL site was conducted in 2015, some 26 years post disturbance (as part of MIDAS and JPIO; jpio-miningimpact.geomar.de). The researchers noted that while the faunal densities of most taxa recovered rather quickly and were almost back to pre-disturbance conditions after seven years, the diversity and community composition had not recovered 26 years after the impact. The study highlighted that to minimise large-scale impacts, there is a need for marine spatial planning, including the establishment of set-aside areas. It should be noted that no impact minimisation, mitigation, or restoration activities were trialled as part of the original disturbance experiment.
Benthic Impact Experiment; BIE (CCZ, 1993)	Collaboration between Russia, USA, and Japan	Studied the effects of sediment redeposition on benthic fauna	Work included baseline studies (including current meters, box cores and sediment traps), then blanketing an area with sediment by towing through an area 150 × 3,000 m in a NE–SW direction, resulting in the suspension of ~4,000 m^3 of sediment. Bulk of sediment travelled north and settled quickly as a sediment-laden fluid flow. Of the 71 macrofaunal families analysed, only two appeared to be impacted by sediment redeposition. Overall species diversity remained unaffected by sediment redeposition. However, the resultant sediment thickness was not attainable due to wide dispersion causing no measurable significant accumulation outside the disturbance area. Therefore, no relationship between faunal succession and sediment was accomplished.
Japan Deep-Sea Impact Experiment;	Japan	Studied the effects of	Used the same device as BIE in a western CCZ location. Samples before and after

JET (CCZ, 1993)		sediment redeposition on benthic fauna	disturbance were collected and then collected again after 1 year. Abundances and vertical distributions of meio- and microfauna were studied. Again, there was no quantification of the resedimentation thickness. The extended effects of disturbance on the abundances of each faunal component were different. Changes in abundance in total fauna were greatest in the upper layers of sediment.
Interocean-metal Joint Organization Benthic Impact Experiment; IOM-BIE (CCZ,1995, 1997, 2000)	IOM, COMRA (China)	Studied the effects of sediment redeposition on benthic fauna	IOM-BIE monitored ecosystem changes following a sediment disturbance. Immediately following the disturbance, intense feeding activity by megabenthos was observed, presumably due to additional availability of food sources. Meiobenthos abundance decreased, and their vertical distribution was altered. During the 2000 campaign, the results collected indicated the abyssal meiobenthos in the control area had been affected by (assumed) natural processes. By 2000, abundances at the 10M site had reverted to control area levels.
Indian Deepsea Experiment; INDEX (CIOB, 1997 to 2007)	India	Studied the effects of sediment redeposition on benthic fauna (Central Indian Ocean Basin; CIOB)	INDEX utilized the Deep Sea Sediment Resuspension System (Brockett and Richards 1994) to resuspend >6,000 m^3 of sediment over a nine-day period. Monitoring over a decade showed that the CIOB has highly heterogeneous environmental conditions in terms of spatial variation. India reported at an ISA workshop held in 2010 that the monitoring of environmental conditions after the benthic disturbance experiment indicated the benthic conditions were steadily moving towards restoration and the effects of disturbance are waning with time.
Kaplan Study (CCZ, 2002 to 2007)	International; USA, UK, Japan, France (JM Kaplan Fund and ISA funded)	Baseline Studies (biological)	The Kaplan study was designed to study biodiversity, species ranges, and gene flow in the abyssal Pacific nodule province, with specific reference to predicting and managing the impacts of deep seabed mining. The Kaplan study aimed to i) estimate, using, molecular methods and rigorous statistical techniques, the number of polychaete, nematode and foraminiferal species at three stations spaced at 1,500 km intervals across the Pacific nodule province; ii) evaluate species overlap and rates of gene flow; iii) communicate findings and make specific recommendations on minimizing the risks to biodiversity resulting from mining. Based on the data collection and analysis, the researchers recommended that the ISA

			establish a network of MPAs across the CCZ to safeguard biodiversity that could be affected by mining activities. This eventually led to the establishment of APEIs within the CCZ.
EqPac (JGOFS EqPac) (CCZ, 1992)	USA	Equatorial Pacific Process Study; Baseline studies	The EqPac process study was conducted along 140°W. Four process cruises took place, with a fifth benthic cruise and sediment trap legs adding to the overall study. The scientific objectives of this study were to determine the fluxes of carbon and related elements, and the processes controlling these fluxes between the Equatorial Pacific euphotic zone and the atmosphere and deep ocean.
NIXO/NIXO 47 (CCZ, 2004)	France	Studied long-term effects of physical disturbance made by a dredge (OMCO) in 1978	This study compared surface sediments in and outside a dredge track. 26 years after the dredging event, the track was still visible. The physical and chemical properties of the disturbed sediment sampled in the track had not changed significantly over time and had not shown any recovery since the disturbance. On the other hand, the biological activity measured in the track with a respirometer did not differ from the unperturbed site, which suggests that the benthic fauna have completely recovered, as have nutrient fluxes at the water–sediment interface (Khripounoff et al. 2006).
NaVaBa Program (CCZ, 1996 to present)	China	Natural variability baseline studies	10 cruises were conducted from 1998 to 2010, focusing on environmental baseline work for the COMRA contract area. Initial studies examined spatial variability/heterogeneity and functional relationships between fauna.

MiningImpact 1 (CCZ, 2015-2017)	Europe	Assess the long-term impacts of polymetallic nodule mining on the deep-sea environment	**This campaign determined that:** • **Nodule ecosystems support a highly diverse fauna of sessile and mobile species.** • **Faunal communities & environmental parameters show a high variability even on a very local spatial scale.** • **Benthic fauna communities differ significantly between seamounts and nodule habitats.** • **Loss of seafloor integrity by nodule and sediment removal generally reduces population densities and ecosystem functions. Biogeochemical remineralization processes (see next page) and the productivity of the benthic community are both impacted by nodule removal.**

			• **Disturbance impacts on nodule ecosystems last for many decades, affect numerous ecosystem compartments and functions**
Joint Programming Initiative Healthy and Productive Seas and Oceans (JPI Oceans) MiningImpact 2 (CCZ, 2018 to 2022)	Europe	Environmental monitoring of the PATANIA II pre-prototype seafloor nodule collector trial	This programme will examine various environmental effects of seafloor nodule collection. A significant part of the programme will be devoted to a comprehensive monitoring programme around the industrial-like test of the PATANIA II pre-prototype vehicle system. The test will involve harvesting nodules from an area between 0.022 km² and 0.1 km² (depending on actual nodule abundance and in-situ nodule pickup and discharge efficiency) of the seabed in the GSR and the Federal Institute for Geosciences and Natural Resources (BGR, Germany) Contract Areas of the CCZ. MiningImpact 2 will collect independent scientific information on the environmental impacts of the test operation

CCZ = Clarion-Clipperton Zone; DOMES = Deep Ocean Mining Environmental Study; EIA = Environmental Impact Assessment; OMA = Ocean Mining Associates ; BIE = Benthic Impact Experiment; IOM = Interoceanmetal Joint Organization; MPA = Marine Protected Area; COMRA = China Ocean Mineral Resources Research and Development Association; CIOB = Central Indian Ocean Basin; OMCO = Ocean Minerals Company.

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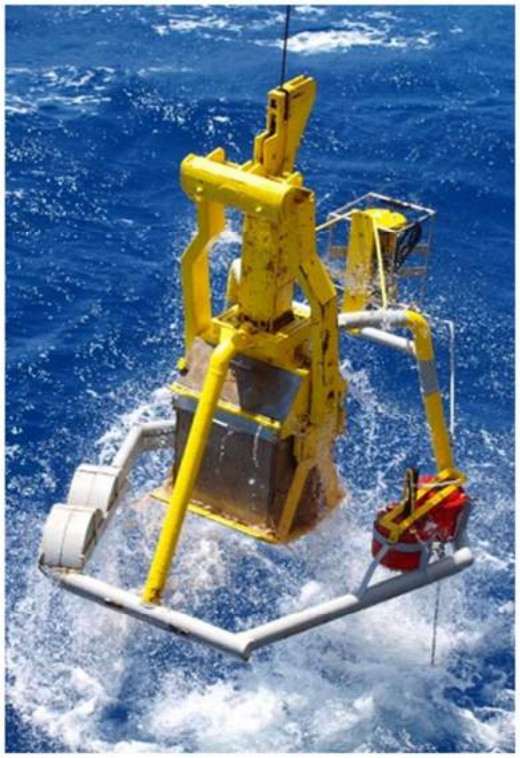
Annexes of the CIIC-SR License for Exploration Activities

Annex 04

The approved Incident Response and Risk Management Plan



Title:	Annex 04 of the License for Exploration Activities
Author:	François Charlet – GSR Exploration Manager
Checked by:	Eusenio Fatialofa – CIIC-SR General Manager
	Samantha Smith–Head of Sustainability & External Relations
Date:	24/01/2022
Reference:	P03-CIICSR-EV-RPT-00001_Annex 04
Version:	3

Signed: ..... On Behalf of: CIIC-SR

Name: Eusenio Fatialofa.....Date: 24 January 2022

CONTENT

Abbreviations

ALARP	As Low As Reasonably Practicable
BOSIET	Basic Offshore Safety Induction and Emergency Training
CCFZ	Clarion Clipperton Fracture Zone
CI	Cook Islands
COSHH	Control of Substances Hazardous to Health
CPE	Collective Protective Equipment
DEME	Dredging, Environmental and Marine Engineering
DPA	Designated Person Ashore
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
ERP	Emergency Response Plan
GSR	Global Sea Mineral Resources
HIRA	Hazard Identification and Risk Assessment
HR	Human Resources
HSE	Health, Safety, and Environment(al)
HUET	Helicopter Underwater Escape Training
IMCA	International Marine Contractors Association
IMO	International Maritime Organisation
ISA	International Seabed Authority
ISM	International Safety Management
ISPS	International Ship and Port Facility Security
JSEA	Job Safety and Environmental Assessment
KPI	Key Performance Indicator
MARPOL	International convention for the Prevention of Marine Pollution from Ships
MRCC	Marine Rescue Coordination Centre
NOK	Next Of Kin
PMN	Polymetallic Nodules

PMS	Project Management System
PPE	Personal Protective Equipment
PPV	Pre-Prototype Vehicle
PTW	Permit To Work
QHSE-S	Quality, Health, Safety, and Environment(al) and Security
RAMS	Risk Assessment and Method Statement
SAR	Search And Rescue
SHOC	Safety Hazard Observation Card
SSP	Ship Security Plan
STCW	Standard for Training, Certification and Watch keeping
SWP	Safe Work Procedure(s)

DEFINITIONS

Emergency	Uncontrolled dangerous event that requires prompt action to protect Health, Safety and Environment.
Environment	The natural, ecological, and social context affecting and/or affected by the Project activities.
Health	The condition for sound and vigorous operations of the human body and mind.
Marine Coordinator	Assigned contact person by the Employer for coordination of Emergency response situations.
Office(s)	Any permanent or temporary facilities supporting the Project management and activities.
Project Name	CIIC-SR 5-years Exploration
Safety	The condition free from risks that may cause damage to people’s safety or property
Security	The protection from individuals or systems who may deliberately impact the safety level

Introduction

PROJECT OBJECTIVES

In its application submitted to the SBMA, CIIC-SR has planned a series of offshore exploration campaigns in the area under application located in Cook Islands Exclusive Economic Zone (CI EEZ).

The purpose of these campaigns is many but can be summarized in three main objectives:

1) The evaluation and quantification of PMN resources in the area under application.
2) The assessment of the environmental, oceanographic, and meteorological conditions.
3) The development, test, and validation of the mining technology in the CI EEZ, with in parallel the study of the environmental impact of such harvesting operation.

PURPOSE

The purpose of this Project Emergency Response Plan (PERP) is to define relevant Emergency situations and a set out guidelines for response that are associated with the scope of work. All Emergency procedures and documentation are aimed to safeguard life, the Environment, Site facilities and Vessels. Not related to Covid-19 Infections which is defined into the Covid-19 Mitigation Plan.

SCOPE

This plan explains which situations are foreseen as, and which people have relevant roles in such circumstances. General procedures are defined for Emergency related to Vessels' operations, fire, first aid, environmental impact, adverse weather conditions, rescue plans and security.

This plan was made specifically for the project when emergencies occurred during offshore operation in the CI EEZ. This plan is specific to the Project and the guidelines incorporate Emergency plan and the QHSE Management System (Section IX of the CIIC-SR Application).

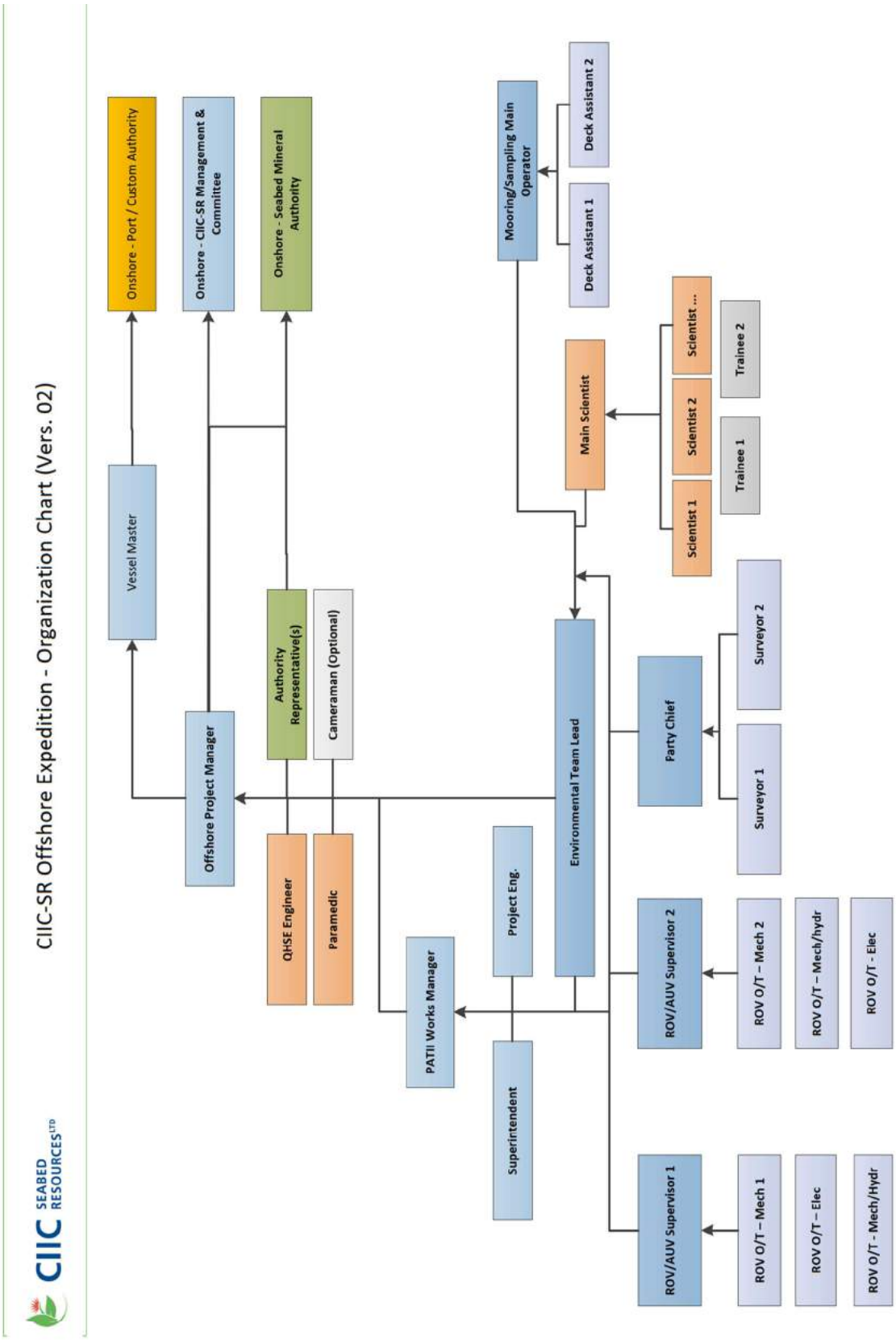
EMERGENCY RESPONSE OBJECTIVES

CIIC's main objective is in to prevent any dangerous situation to become uncontrolled. This is achieved by proactively training the Project personnel and communicating regularly on the existing hazards and their potential for impact on HSE. Shall an Emergency situation occur, the main objective is to respond effectively and as specified in the Emergency procedures to mitigate any impacts. In any Emergency situation, every employee shall look after his/her own Safety and, only when deemed reasonably safe, assist fellow employees.

Organigram & Responsibilities

Expedition organisation chart

The preliminary organization chart is detailed below, with the description of the role and responsibilities for personnel accountable for the implementation, management, and reviews of the risk management plan.


CIIC-SR Offshore Expedition - Organization Chart (Vers. 02)
CIIC SEABED RESOURCES LTD
Onshore - Port / Custom Authority
Onshore - CIIC-SR Management & Committee
Onshore - Seabed Mineral Authority
Vessel Master
Offshore Project Manager
Authority Representative(s)
Cameraman (Optional)
QHSE Engineer
Paramedic
PATII Works Manager
Superintendent
Project Eng.
Environmental Team Lead
Party Chief
Surveyor 2
Surveyor 1
Main Scientist
Scientist 1
Scientist 2
Scientist ...
Trainee 1
Trainee 2
Mooring/Sampling Main Operator
Deck Assistant 1
Deck Assistant 2
ROV/AUV Supervisor 2
ROV O/T – Mech 2
ROV O/T – Mech/hydr
ROV O/T - Elec
ROV/AUV Supervisor 1
ROV O/T – Mech 1
ROV O/T – Elec
ROV O/T - Mech/Hydr

CIIC-SR Project & Exploration manager

The Project Manager is responsible for:

- Approving this plan and other relevant documents and will ensure their implementation.
- Ensuring that all employees on site are familiar with this document through safety inductions, regular HSE meetings, HSE Toolbox talks, training, and safety drills, etc.
- Reviewing accident and incident reports.
- Daily coordination with the Vessel master on operational, emergency issues.
- Daily coordination with the CIIC-SR Management

As Exploration Manager, the PM is responsible for:

- He/she is acting as Liaison Officer between CIIC-SR, scientists, and CI Authority representatives
- Daily coordination between All Parties on the Research Vessel.
- In charge of the planning of activities

Vessel Master

The Vessel Master is responsible for:

- The safe and efficient day-to-day operation of the vessel
- Complying with the laws of navigation and the entire body of statutes that regulate ships and seagoing matters
- Maintaining the seaworthiness of the vessel and protecting the interests of the Institution
- 1st point of contact with shore in case of emergency
- In charge of the safety of all people present onboard of the vessel

CIIC-SR Works manager

The Works Manager is responsible for:

- Daily coordination with the project manager on research activities and operation on board, emergency issues.
- Daily coordination with the different contractors, emergency issues.
- Daily coordination with his/her shift supervisors on operational, emergency issues.

Environmental Team Lead

The Environmental Team Lead is responsible for:

- Daily coordination with the project manager on mooring and sampling operational, emergency issues.
- Daily coordination with the different contractors on board on mooring and sampling operational, emergency issues.

- Daily coordination with his/her shift supervisors on mooring and sampling operational, emergency issues.

CIIC-SR Project QHSE manager

The Project QHSE Manager is responsible for:

- Developing Emergency Response plans and Emergency response communication flowchart.
- Ensuring the updating, distribution, promotion and implementation of this Emergency Response Plan and related documents, including the Project HSE Management Plan.
- Regularly reviewing the procedures as required.
- Reporting to and advising the project manager on emergency issues.
- Daily coordination with the bridge on planned/conducted drills.

Corporate assistance persons

In case of major emergencies with regards to project related emergencies, the following employees are responsible for providing assistance at corporate level:

- **CIIC-SR Prevention Advisor** – in case of an occupational Emergency with regards to project personnel related emergencies in cooperation with the Vessel Owner Prevention Advisor.
- **CIIC-SR Environmental coordinator** – in case of an Environmental emergency with regards to project related emergencies in cooperation with Vessel Owner Environmental coordinator and Environmental Authority.
- **CIIC-SR Single Point of Contact (SPOC)** – in case of an Emergency with project personnel on the Vessel
- **Vessel Designated Person Ashore (DPA)** – in case of an Emergency on the Vessel.
- **Vessel Corporate Security Officer (CSO)** – in case of breach of Security on the Vessel.

Emergency situations

It has been noted that in case of any emergency, the bridge/ paramedic needs to be contacted for assistance. The emergency response procedure of the Vessel is leading during this campaign and need to be followed by all project personnel.

Minor emergency

A minor Emergency is one that can be dealt with completely by the Project and/or Vessel crew on site.
The Vessel Master or Project Manager coordinates the Emergency.
The Vessel Master may call on other Vessels for support.

Major emergency

A major Emergency requires direct assistance and support from shore, from the nearest port (Rarotonga), from Emergency services and/or local agencies. The Vessel Master or Project Manager will coordinate the Emergency and contact the necessary external assistance entities.

If there is any doubt whether an emergency is minor or major, the worst case shall be assumed and followed up. The request for external Emergency response services may be cancelled when it becomes clear that the situation does not longer require assistance.

Known potential emergency situations

This Project Emergency Response Plan covers a wide range of Emergency situations. These may be described as accidents, emergency situations with the potential for accidents or situations that result from accidents. The list below includes known possible Emergency situations and shall be update if different Emergency situations are identified:

Fire or explosion	Fuel or oil spills
Black out on the Vessel	Man overboard (MOB)
Vessel collision, sinking or capsizing	Personnel or object falling from height
Accidents with hydraulic, hot, and cutting working equipment	Electrical accident
Adverse weather	Any severe personal injury or illness

These situations may lead to following scenarios decided by the captain of the Vessel, which in themselves are also regarded as emergency situations:

- Ship abandonment.
- Personnel evacuation.

Preliminary Emergency Response Procedures (to be updated with accurate contact details)

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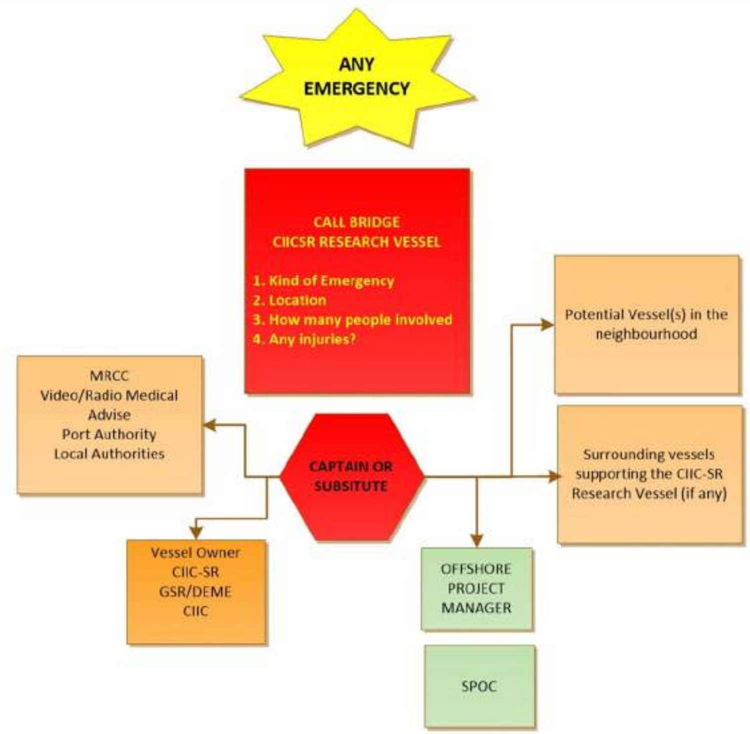
CIIC-SR EMERGENCY RESPONSE PROCEDURE



Project Related Vessels			
Name	Contact Details		Email
Vessel Name	VSAT:		
	Mobile1:	+XX XXXXXXX	bridge@xxxxxx.com
	Mobile2:	+XX XXXXXXX	master@xxxxxx.com
Vessel Name	VSAT:		
	Mobile1:	+XX XXXXXXX	bridge@xxxxxx.com
	Mobile2:	+XX XXXXXXX	master@xxxxxx.com

EMERGENCY CONTACT DETAILS

First Line of Communication

EMERGENCY Contacts

Vessel [NAME]				Onshore Services
BRIDGE	900	PARAMEDIC	TBA	
Offshore Project Representatives: [Project Manager Name] Mobile: +XX XXXXXX Onboard: XXX [Work Manager Name] Mobile: +XX XXXXXX Onboard: XXX [QHSE Officer Name] Mobile: +XX XXXXXX Onboard: XXX				Port Authority1 Name contact Radio Service: XXX Phone number1: +XX XXXXXX Phone Number +XX XXXXXX Port Authority2 Name contact Radio Service: XXX Phone number1: +XX XXXXXX Phone Number +XX XXXXXX
Onshore point of contact CIIC-SR: [General Manager Name] Office Number: +XX XXXXXX Mobile: +XX XXXXXX Email: Name@xxxx.com **DPA / CSO Vessel Owner:** Name Owner Representative Office Number: +XX XXXXXX Mobile: +XX XXXXXX Email: Name@xxxx.com				Port Authority3 Name contact Radio Service: XXX Phone number1: +XX XXXXXX Phone Number +XX XXXXXX

Second Line of Communication

Name		Contact details	Email
Environmental Coordinator	Phone: Mobile:	+XX XXXXXX +XX XXXXXX	Name@xxxx.com
Prevention Advisor CIIC-SR	Phone: Mobile:	+XX XXXXXX +XX XXXXXX	Name@xxxx.com
HR Support CIIC-SR	Phone: Mobile:	+XX XXXXXX +XX XXXXXX	Name@xxxx.com

IMPORTANT CONTACTS

Name		Contact details	Email
CIIC-SR Emergency Contact	Phone: Mobile:	+XX XXXXXX +XX XXXXXX	Name@xxxx.com
Administrator	Phone: Mobile:	+XX XXXXXX +XX XXXXXX	Name@xxxx.com
Vessel Manager	Phone: Mobile:	+XX XXXXXX +XX XXXXXX	Name@xxxx.com
Vessel Owner - Emergency number	Phone: Mobile:	+XX XXXXXX +XX XXXXXX	Name@xxxx.com

General Emergency Response Procedure

The following paragraphs describe the responsibilities of all CIIC-SR campaign personnel who encounter an emergency situation related to the campaign. The Vessel will be in charge of all emergency response activities, but CIIC-SR will assist the vessel wherever possible, but only on request of the Vessel Master or representative.

Timely response to an emergency situation is not only an important element to reduce the harmful impact but also a decisive factor for effectively starting the required assistance. The following steps provide a sound basis for everyone handling any emergency:

1. Always place your own safety first
2. Remain calm and evaluate the situation
3. Sound the alarm
4. Ensure the Vessel master or his replacement is contacted
5. Provide help and assistance
6. Keep the situation stable and keep monitoring
7. Follow instructions of Vessel master/ master's substitute.

As soon as possible write down your personal witness statement of the situation to establish untainted information for incident investigation.

The Emergency Notification Flowchart shows the different lines of communication for the CIIC-SR Offshore Expedition (to be updated) with important phone numbers.

Offshore emergency response procedures

Medical evacuation of an injured person to shore

Emergency situations on that occur on board of Vessels may require the evacuation of personnel. In case of a major Emergency, the Vessel master or his substitute has the overall responsibility to contact all persons who can be of any assistance to the situation. The Vessel master or his substitute is the person who decides whether a person needs to be evacuated to shore.

Fire

In case a fire is discovered, the following actions shall be taken:

- Remain calm
- Sound the alarm by activating a manual call point or alerting the bridge.
- Give clear information (location and size of fire)
- Without endangering yourself, one attempt may be taken to extinguish the fire using a fire extinguisher.
- Leave the area and go to the Muster Point.
- Follow instructions of person in charge at Muster point.

First aid and medical emergencies

In case of a medical emergency offshore, the following actions shall be taken:

- Alert the vessels Master and the Paramedic, contact the bridge, and raise the alarm.
- Monitor the condition of the victim until paramedic arrives.
- Paramedic to assess the type of trauma or illness and provide the necessary basic life support or first aid treatment and attempt to stabilise the victim on the spot.

The Vessel master or his substitute decides if onshore medical assistance is needed.

Environmental incidents

In case of a spill on deck, the following actions shall be taken:

- Raise the alarm, alert the bridge.
- Take action to stop of minimise the spill
- Organise clean-up equipment, position sorbent material/clean-up equipment to prevent the substance from spreading, commence clean-up
- Assess spillage and damage and report

In case of a spill in the ocean, the following actions shall be taken:

- Contact the bridge, they will be in charge of the emergency response.

Project specific rescue plans

Reference is made to the emergency recovery procedure of any equipment lying on the seabed. This document will be available once the specifications of the equipment used offshore will be known, as the technical specifications of critical devices helping for the recovery (as Remotely Operating Vehicle).

Performance monitoring

HSE Objectives/ KPI

The following Key Performance Indicators (KPI) and specific targets are thus considered:

- **Reporting of observations,** as the number of Safety Hazard Observation Cards (SHOC) submitted * 100.000 working hours / total working hours.
- **Toolbox participation,** as the number of people that attended toolboxes * 100.000 working hours/ total working hours
- **Timely reporting of incidents with damage,** as the number incidents with damage reported within 24 hours of occurrence.
- **Timely closeout of QHSE actions,** as the number of QHSE actions closed as planned + pending actions not overdue.
- **Major Environmental incidents,** as the number of environmental incidents with restitution costs.

HSE Inspections

The purpose of these inspections is to establish a dialogue between supervisors' personnel and operating personnel and therefore ensure that everyone understands and applies HSE procedures.

Identified issues that cannot be remedied in a reasonable short time shall be added to the HSE action list. Any output from inspections that needs actions is registered in the action list for solution and follow up.

SHOC Cards

All personnel working on the Project site or on board of a Vessel can fill in and submit a Safety Hazard Observation Card (SHOC) to inform the management team about an HSE situation that requires an improvement or to propose a new idea for improvement. This can be done on paper version. The QHSE Manager on site is responsible for retrieving and recording the SHOCs and assist in the planning of actions. The Project Manager can upgrade a SHOC to an incident if it is assessed to be of that level.

Incident reporting and investigation

The general guidelines for internal reporting, investigating and following up incidents in the Project are explained in the procedure for Incident Management**.**

The procedure consists of the following steps:

Issue draft report of the incident;

- Review and acceptance of draft report by the responsible manager;
- Detailed report of the incident and assignment of ownership and responsibilities;
- Review and acceptance by the QHSE responsible;
- Completion of detailed report;
- Completion of consequences;
- Incident investigation;
- Allocation of follow up actions;
- Review, approval and closing of the incident;
- Statistical follow up.

Action List

The HSE inspections, SHOC cards, incidents, HSE meetings and/or toolbox talks, may identify issues that need corrective action and proper follow up. The actions, deadlines and responsibilities are formulated, controlled and followed up in a register, action list or DPR

HSE Performance reporting and statistics

The DPR reports shall include relevant HSE information from all parties and personnel involved in the Project.

This includes, but not limited to:

- Incidents, injuries and near misses statistics during the reporting period.
- Man-hours worked by the Project personnel during the report period.
- Lost time Incidents.
- Permits to Work issued.
- Toolboxes.
- SHOC cards.

Audit and review process

In order to mitigate all risks before the execution of each offshore project, a" Readiness Review" (RR) will be organized to evaluate the preparation work and equipment/vessel involved for the

offshore operation. An internal committee of experts (5 to 6 persons) will evaluate the readiness of the offshore expedition and deliver key messages, observations, and recommendations. A "close-out" report will be delivered by the committee with all its comments and feedback of the interview and discussion the committee had with the project key personnel. The CIIC-SR project team will have the obligation to act prior to vessel departure.

After the campaign, a "End-of-work" report will summarize the offshore activities, timeline and will list the improvements made during the campaign to reduce risks onboard. The lessons-learnt will also be included with the perspective to improve the preparation and execution of the next offshore campaigns.

A post-event analysis of incidents, accidents and successes will help gain insight to the overall performance of the IRMP and allow for continuous improvement to the plan.
The internal audit questions can assist in the audit and review process:

- How well did we identify and analyse the risks involved?
- Did we identify actual causes?
- Were risks rated and assessed correctly?
- Did the controls operate as intended?
- Were treatment plans effective?
- Were monitoring & review process effective?
- How can risk management by improved?
- Who needs to know about these learnings?
- What needs doing so failure events are not repeated?

Security

Security on vessels

The main purpose of the ISPS Code is to establish an international framework involving co-operation between operators, authorities, and the shipping / port industries to detect security threats and take preventive measures against security incidents affecting ships or port facilities.

Vessels shall have a valid International Ship Security Certificate. The Ship Security Plan (SSP) contains confidential information and is protected from unauthorized access. This plan is only accessible by the Vessel Master and appointed persons. The Project management will not impose further security measures on Vessels.

CIIC-SR Personnel training

The need for training is based on applicable recognised training standards, Risk assessments, high risk tasks, and Contractual requirements. Access to Project sites will not be permitted to individuals who have not done the required trainings, whose certificates have expired or who cannot deliver the certificates.

All CIIC-SR personnel shall be able to understand and communicate in the English language to perform his/her job function. The subcontracted personnel's supervisors shall be able to understand and communicate in the English language.

The minimum training and identification requirements for working on the project are:

- Vessels safety induction.

- Project Safety induction.
- BOSIET (OPITO Approved)
- Helicopter Underwater Escape Training (HUET), including CA-EBS
- Appropriate offshore medical certificate (OGUK Medical Certificate)
- Valid passport, including US Visa approval.

Specific trainings will also be required when necessary for crew and staff as:

- 1st aid rescue;
- Working at height;
- Contact with hazardous Substance;
- Welding, electricity;
- …

Emergency training and communications

Training, drills, and inductions

The Vessel specific Emergency response information will be covered in a Vessel induction. This induction covers the Vessel layout, with reference to the available Emergency and first aid equipment, escape routes and Muster Point, as well as indication of what to do in case of emergency and who to go to for support.

If a CIIC-SR risk assessment identifies a potentially dangerous situation that has a high potential for occurrence, the Works Manager in collaboration with the Vessel Master or his substitute and Project QHSE Manager, will organize a drill to assess the response to the potential situation. At the start of a Project the Emergency contact numbers will be checked.

Communication priority

Depending on the nature and severity of the emergency, the following lines of communication shall be used:

- **First line of communication** – In case of a major emergency the Vessel has the coordinating role of the situation. The master or his substitute will contact the CIIC-SR Project Manager. The Project manager contacts the DPA/SPOC of CIIC-SR and is in charge of the CIIC-SR Campaign second line of communication.
- **Second line of communication** –The project manager contacts the CIIC-SR Management onshore and depending on the type of emergency, the prevention advisor or environmental coordinator.

The different lines of communication will be mentioned on the Emergency Notification Flowchart (to be updated) with all relevant contact details. This flowchart will be distributed to the Vessel, so that all people involved have the correct contact details.

Emergency Incident Reporting

All emergency situations and related impacts must be reported in accordance with the Project HSE Management Plan. The report will be automatically distributed to the CIIC-SR Project Manager.

Next of kin (nok)

The DPA or his deputy is the single point of contact when it becomes to NOK of involved crew, once contacted by the Vessel, he/she will contact the crewing manager who will than initiate the NOK process.

Risk Management Plan

The exploration activities will involve many risks which need to be identify, assess, and mitigate by precautionary measures. These measures (single or combined) must be able to eliminate or minimize the risk to as low as reasonably practicable.

Risk Management Processes

CIIC-SR's Risk Management Process (RMP) is a structured and repeatable process designed to facilitate the identification, analysis, evaluation, treatment, and monitoring of risks significant to the organisation's business, key project, or transaction level objectives.

Developing a deep and broad understanding of risks and critical controls in the organisation improves decision making and resource management. Ultimately the process can serve to develop a culture where risk information is rich and transparent and is used to inform where resources (financial and non-financial) are best allocated for control enhancement, control optimisation and risk reduction.

Figure: Adapted from Essential Tools for Management Accountants - Governance and Risk Management, Chartered Group Management Accountants (2013).

Quality, Health, Safety, Environment and Security Risk Assessment Process

The following flowchart shows different stages to CIIC-SR QHSES Risk Assessment process. After the generic Risk Assessment Method Statement (RAMS) is completed, a Hazard Identification Risk Assessment (HIRA) will be performed to identify specific risks which should be taken into account in CIIC-SR's RAMS. After the specific RAMS control measures are put into place to mitigate the risks. If the control measures show there is a need for a specific procedure for a

specific task, part of the RAMS may be detailed into more lower-level documents like Safe Work Procedures (SWP) to allow better understanding of the tasks including risks and control measures.

The HIRA will be done with the HIRA technique that allows the early identification and classification of hazards in the various project disciplines and scopes of Works, and the HIRA technique that allows the understanding of abnormalities in processes or operations, what are their causes and consequences. These techniques shall co er the applicable scope of design, production of materials and execution Works and include the following general steps: Identification of hazards, Identification of consequences/impacts, Evaluation of Risk level, Identification of controls.

Figure: CIIC-SR's QHSES Risk Assessment Process

Risk & Control Assessment – Risk map and guides

Risk Map (Likelihood rating X Consequence rating)

Likelihood (Probability)							
Very Likely 5	>90% - <100%	5	10	15	20	25
Likely 4	>50 - 90%	4	8	12	16	20
Possible 3	>25% - 50%	3	6	9	12	15
Unlikely 2	>10% - 25%	2	4	6	8	10
Very Unlikely 1	1% - 10%	1	2	3	4	5
		Minor 1	Slight 2	Moderate 3	High 4	Very High 5

Consequence

Likelihood Rating Guide

Rating	Percentage	Probability Description
Very Likely 5	>90% - <100%	Very likely chance of a hazard to result in a scenario
Likely 4	>50 - 90%	Not certain to happen but an additional factor may result in an incident
Possible 3	>25% - 50%	The scenario could occur when several factors are present, but is otherwise unlikely to happen
Unlikely 2	>10% - 25%	A rare combination of factors would result in this scenario
Very Unlikely 1	1% - 10%	An almost unthinkable combination of factors would cause this scenario

Consequence Rating Guide

Rating	Personal Illness/Injury *Including injury and illnesses or health issues*	Reputation *Including potential reputation loss from legal offences or low product qualtiy*	Environment & Community *Including environmental incidents and the impact of environmental aspects*	Assets *Including damage to equipment, potential financial penalties with reference to contract, fines and the cost of environmental aspects*	Quality *Including production and efficiency loss, insufficient product quality to contract specifications, loss of client satisfaction ...)*
Very High 5	Major accident; event leading to multiple deaths Occupational diseases (e.g. lung diseases) or permanent disability	International impact / negative exposure	Major environmental accident (e.g. Major pollution with long-term implications and very high restitution costs, protected species - more than 10 killed, habitat destroyed / heritage site destroyed) Major local or important global impact	Massive damages Substantial loss of payment, loss of contract Severe penalties or environmental damage Catastrophic equipment failure; full redesign of equipment and/or project required More than €10 000 000	More than 10 days loss of full production, no delivery of product (deadline) Project going far beyond budget Product failure to speifications rendering the product unusable for clients' end use; client will no longer work with our company in the future
High 4	Very serious accident; event leading to a single death or severe injury Poisoning or dangerous infection	Extensive national impact / negative exposure	Severe environmental accident (e.g. Severe pollution with short-term implications and significant restitution costs, protected species - one to ten killed, irrepairable damange to heritage site) Important local or significant global impact	Serious damage to equipment resulting in production shutdown & significant production loss Significant loss of payment Very important environmental aspect cost Equipment breakdown is not repairable; partial redesign and rebuild required €1 000 000 - €10 000 000	2-9 equivalent days loss of full production, late delivery of product (deadline) Project exceeding budget Product missing significant specification aspects, limiting end use for client; client will avoid working with our company in the future
Moderate 3	Event leading to loss time incident (sprains, broken bones, 3rd grade burns) Persistent illness such as dermititis, acne or asthma	Limited national impact / negative exposure	Moderate pollution (e.g. Repeated minor breaches of emission standards or moderate spill with damage on site, protected species - one killed/important repairable damage to heritage site) Significant local or limited global impact	Localised damage to equipment requiring extensive repair, significant loss of function/production Significant loss of payment Important evironment aspect cost Excessive wear and tear; maintenance has major impact on the project; redesign recommended €100 000 - €1 000 000	Less than 2 equivalent days loss of full production, untimely delivery of product (deadline) Cost increase with influence on budget options Major product defeciencies, not fully rectifiable but within acceptable limits for clients' end use
Slight 2	Minor injury requiring medical treatment (stiches, open wounds, 1st or 2nd grade burns) Headache, nausea, dizziness, mil rashes	Local impact / negative exposure	Mior impact to the environment (e.g. minor breach of emission standards or minor spill with limited damage on site, protected species hurt but not killed/minor repairable damage to heritage sites) Limited local impact (minor short-term impact but no lasting damage to the environment)	Damage to equipment requiring minor remedial repair, loss of production Contractual payment open to major discussion Limited environmental aspect cost Increased wear and tear; significant increase in maintenance €10 000 - €100 000	Less than 1 equivalent day loss of full proudction Large cost increase within budget Major rectifiable product deficiencies
Minor 1	Negligable injury requiring first aid treatment (scratches, bruises) Negligible health implication; no absense from work	No impact	No or Negligable impact to the environment (e.g. No protected species hurt or killed / minor impact on hertiage or community) None or negligable impact (e.g. limited emission)	Negligable loss of function / production with no damage to equipment Contractual payment open to minor discussion None or low enivronmental aspect cost Minor wear and tear; normal maintenance Less than €10 000	Less than 1 hour loss of full production Negligable cost increase within budget Minor rectifiable product spec deficiencies

Risk Score

Consequence	Likelihood	Risk Score	Risk Rating	Risk Rating Response
Very High	Very Likely	25	High	Mitigation Strategy identified and approved for implementation Weekly Status reporting to CIIC Board of Director Weekly Monitoring of Risk Triggers
Very High	Likely	20		
Very High	Possible	15		
High	Very Likely	20		
High	Likely	16		
Moderate	Very Likely	15		
Very High	Unlikely	10	Medium	Mitigation Strategy identified Weekly monitoring of Risk Triggers
High	Possible	12		
High	Unlikely	8		
Moderate	Likely	10		
Moderate	Possible	12		
Slight	Very Likely	10		
Slight	Likely	8		
Very High	Very Unlikely	5	Low	Acceptable
High	Very Unlikely	4		
Moderate	Unlikely	6		
Moderate	Very Unlikely	3		
Slight	Possible	6		
Slight	Unlikely	4		
Slight	Very Unlikely	2		
Minor	Very Likely	5		
Minor	Likely	4		
Minor	Possible	3		
Minor	Unlikely	2		
Minor	Very Unlikely	1		

Control Effectiveness Rating

Design \ Operation	Effective	Partially Effective	Ineffective
Effective	**Effective** The control is designed to substantially or completely mitigate the risk. The control is operational as per design objectives the majority of the time.	**Partially Effective** The control is designed to substantially or completely mitigate the risk. The control is normally operational, but on occasions is not applied when it should be, or not as per design objectives	**Ineffective** The control is designed to substantially or completely mitigate the risk. The control is not applied or applied incorrectly
Partially Effective	**Effective** The control is designed to mitigate most aspects of the risk, but some residual risk remains. The control is operational as per design objectives the majority of the time.	**Partially Effective** The control is designed to mitigate most aspects of the risk, but some residual risk remains The control is normally operational, but on occasions is not applied when it should be, or not as per design objectives	**Ineffective** The control is designed to mitigate most aspects of the risk, but some residual risk remains. The control is not applied or applied incorrectly
Ineffective	**Ineffective** The control is limited in nature or poorly designed. When used correctly it provides only limited protection. The control is operational as per design objectives the majority of the time.	**Ineffective** The control is limited in nature or poorly designed. When used correctly it provides only limited protection. The control is normally operational, but on occasions is not applied when it should be, or not as per design objectives	**Ineffective** The control is limited in nature or poorly designed. When used correctly it provides only limited protection. The control is not applied or applied incorrectly

Design

Operation

Risk and Control Assessment – Register

RISK DETAILS								MITIGANTS / CONTROLS						RISK ASSESSMENT		
ID	Risk Description	Date	Assessment Level (Org)	Risk Owner	Risk Category	Cause(s)	Impact(s)	QHSE Assessment options	Mitigants/Controls	Control Type	Owner	Status	Effectiveness Rating	Risk Likelihood	Risk Consequence	Risk Rating/Score
Unique Identifier for this Risk	Give a brief summary of the risk.	The date the risk was identified	At what entity or program level has this risk been identified?	Responsible executive accountable for the risk	Categorisation of risk according to risk library examples	What are the various potential causes related to this risk event?	What will happen if the risk is not mitigated or eliminated?	What are the related QHSE assessments to be undertaken to identify specific QHSE risks to a process or scheduled activity?	If the risk can be eliminated or mitigated by existing processes, list them here.	Is the control or mitigant, Preventative, Detective or Corrective in nature?		The status of the mitigation strategy or control actions	Effectiveness rating for the individual mitigation / control	Rate 1 (Very Unlikely) to 5 (Very Likely)	Rate 1 (Minor) 5 (Very High)	(IMPACT x LIKELIHOOD) Address the highest first.
R-1	**Hazardous Materials** Unplanned accidental release of hazardous materials into the environment.	dec/20	Project	Project Manager	Health, Safety, Environment & Security	* Fire on exploration vessel * Mismangement of hazardous materials * Inadequate or unsafe storage of hazardous materials * Handling of materials incorrectly to procedures advised by manufacture or regulators	* Contimination of water or soil * Realease of toxic vapours * injuries or fatalities amongst staff * injuries of fatalities to marine and terrestrials fauna and flora * Damonge to assetes and critical equipment * Regulatory fines and licence conditions	HAZOP Workshop Job Safety & Environment Analysis Take 5 (risk assessment) Tool box talk	Safe Working Procedures - to align with recommendations provided by manufacturer and/or regulators	Preventative	Project/Process Owner	In Plan	[Select]	2	4	8
									Workplace Health & Safety Training and certification (for permits required)	Preventative	Project/Process Owner	In Plan	[Select]			
									Use of Personal Protective Equipment (PPE) for process owners and operations staff	Corrective	Project/Process Owner	In Plan	[Select]			
									Safety Data Sheet for all hazardous substances shall be made available in the Project Offices (Project specific hazardous substances).	Preventative	Project/Process Owner	In Plan	[Select]			
									Establishment of bounded areas according to the respective Safety Data Sheets and SWP to prevent releases or contact with the other components in the working environment.	Preventative	Project/Process Owner	In Plan	[Select]			
									Storage and disposal of hazardous substances shall occur in designated packages in a segregated manner to prevent reaction between different substances and releases to the Environment.	Preventative	Project/Process Owner	In Plan	[Select]			
									All hazardous substances present on or transported to Project sites or Vessels are required to be labelled according to the GHS regulation and registered.	Preventative	Project/Process Owner	In Plan	[Select]			
R-2	**Spillage** Uncontrolled and/or unintended release of hydrocarbons and other chemicals to the Environment (spillage)	dec/20	Project	Project Manager	Health, Safety, Environment & Security	* Machine or mechanical malfunction * Accidental mishandling of materials * Inadequate or unsafe storage of hazardous liquid substances	* Contimination of water or soil * realease of toxic vapours or liquids * injuries amongst staff * injuries of fatalities to marine and terrestrials fauna and flora * Regulatory fines and licence conditions	HAZOP Workshop Job Safety & Environment Analysis Take 5 (risk assessment) Tool box talk	Safe Working Procedures - to align with recommendations provided by manufacturer and/or regulators	Preventative	Project/Process Owner	In Plan	[Select]	2	4	8
									Workplace Health & Safety Training and certification (for permits required)	Preventative	Project/Process Owner	In Plan	[Select]			
									Use of Personal Protective Equipment (PPE) for process owners and operations staff	Corrective	Project/Process Owner	In Plan	[Select]			
									Storage of hazardous liquid substances, such as fuels, oils and lubricants (all oils to be biodegradable), shall be stored on dripping trays in designated and segregated areas	Preventative	Project/Process Owner	In Plan	[Select]			
									All hydraulic and fuel transfer equipment and related systems shall be inspected and maintained regularly to ensure the condition of hoses and containers and their connection points.	Preventative	Project/Process Owner	In Plan	[Select]			
									Spill Kit installation and Standard Operating Procedures	Corrective	Project/Process Owner	In Plan	[Select]			
R-3	**Crane operation failures** Structural failures during crane operation, collisions between crane loads and people, plant or structures or injuries due to falling objects from crane(s).	dec/20	Project	Project Manager	Health, Safety, Environment & Security	* Unsecured and/or unbalanced machinery * Unskilled or un-certified operator(s) * Machine malfunction * Mis-timed or accidental dropped loads * Rigging failures	* injuries or fatalities amongst staff * Damonge to assets and/or critical equipment * Reputational impacts to the broader campaign * Regulatory fines and licence conditions	HAZOP Workshop Job Safety & Environment Analysis Take 5 (risk assessment) Tool box talk	Lifting operations developed in accordance with GSR's lifting plan template and the manual of standard lifts.	Preventative	Project/Process Owner	In Plan	[Select]	2	4	8
									Certification of cranes and lifting equipment.	Preventative	Project/Process Owner	In Plan	[Select]			
									Maintenance of crain and lifting equipment in accordance with legislative requirements	Preventative	Project/Process Owner	In Plan	[Select]			
									The area of lifting operations shall be signed and cordoned to prevent unauthorised persons from entering the area.	Preventative	Project/Process Owner	In Plan	[Select]			
R-4	**Working at heights** Staff injury or death due to fall during working at heights procedure/activity	dec/20	Project	Project Manager	Health, Safety, Environment & Security	* Loss of balance during operations/procedure * Unsafe heights allowed for operational procedures * Unstable or unsecure platform for operations * Operator medical episode	* injuries or fatalities amongst staff * Damage to assets and/or critical equipment * injuries of fatalities to marine and terrestrials fauna and flora * Reputational impacts to the broader campaign * Regulatory fines and imposed licences conditions	HAZOP Workshop Job Safety & Environment Analysis Take 5 (risk assessment) Tool box talk	GSR protection hierarchy (eg. Collective Protective Equipment before Personal Protective Equipment) for the selection and management of equipment.	Corrective	Project/Process Owner	In Plan	[Select]	3	5	15
									Provision and/or installation of of platforms, scaffolds and guardrails	Preventative	Project/Process Owner	In Plan	[Select]			
									Mandatory use of fall arrest equipment	Preventative	Project/Process Owner	In Plan	[Select]			
									Workplace Health & Safety Training and certification (for permits required)	Preventative	Project/Process Owner	In Plan	[Select]			
R-5	**Nodule Handling** Injury or harm to staff due to unsafe handling of sample nodules	dec/20	Project	Project Manager	Health, Safety, Environment & Security	* Inappropriate or unsafe manual handling of sample nodules * Inappropriate use of storage or handling equipment * Failure of equipment or storage containers	* injury or significant harm (long and short term) to staff * Plant or vessel fire * Alteration of seabed habitat * Contaminated assets and/or critical equipment * Reputational impacts to the broader campaign * Regulatory fines and imposed licences conditions	HAZOP Workshop Job Safety & Environment Analysis Take 5 (risk assessment) Tool box talk	Safe Working Procedures - to align with recommendations provided by geological experts and/or regulators	Preventative	Project/Process Owner	In Plan	[Select]	2	2	4
									Use of Personal Protective Equipment (PPE) for process owners and operations staff	Corrective	Project/Process Owner	In Plan	[Select]			
									Mandatory transport and storage of nodules in designated packages in a segregated manner	Preventative	Project/Process Owner	In Plan	[Select]			

RISK DETAILS								MITIGANTS / CONTROLS						RISK ASSESSMENT		
ID	Risk Description	Date	Assessment Level (Org)	Risk Owner	Risk Category	Cause(s)	Impact(s)	QHSE Assessment options	Mitigants/Controls	Control Type	Owner	Status	Effectiveness Rating	Risk Likelihood	Risk Consequence	Risk Rating/Score
Unique identifier for this Risk	Give a brief summary of the risk.	The date the risk was identified	At what entity or program level has this risk been identified?	Responsible executive accountable for the risk	Categorisation of risk according to risk library examples	What are the various potential causes related to this risk event?	What will happen if the risk is not mitigated or eliminated?	What are the related QHSE assessments to be undertaken to identify specific QHSE risks to a process or scheduled activity?	If the risk can be eliminated or mitigated by existing processes, list them here.	Is the control or mitigant, Preventative, Detective or Corrective in nature?		The status of the mitigation strategy or control actions	Effectiveness rating for the individual mitigation / control	Rate 1 (Very Unlikely) to 5 (Very Likely)	Rate 1 (Minor) 5 (Very High)	(IMPACT x LIKELIHOOD) Address the highest first.
R-6	**Maintenance** Workplace incidents related to the unsafe use and/or maintenance of hydraulic tools under pressure, manual tools, industrial hoses, engines and pressure valves.	dec/20	Project	Project Manager	Health, Safety, Environment & Security	* Inadequate or overdue maintenance of mechanical equipment and tools * Malfunction in equipment and/or tools * Unsafe operation of equipment and/or tools * Operation of tools by untrained/uncertified employees * Operation of tools and equipment under fatigue	* Injury or significant harm (long and short term) to staff * Damage to plant, assets or equipment * Reputational impacts to the broader campaign * Regulatory fines and imposed licences conditions	HAZOP Workshop Job Safety & Environment Analysis Take 5 (risk assessment) Tool box talk	Permits to work for specific tools and equipment to be mandated and reviewed on a scheduled basis	Preventative	Project/Process Owner	Existing	(Select)	3	4	12
									"Lock out tag out" procedures developed for tools/equipment and promoted to all relevant operational staff.	Preventative	Project/Process Owner	Existing	(Select)			
									Verification of the calibration of tools and pressure levels before beginning operations - to be incoporated in SOPs or SWPs	Preventative	Project/Process Owner	Existing	(Select)			
									Working environment conditions, (e.g. illumination, produced noise, safe guards from moving parts and fumes from fuels when working on fuel tanks) to be specified in SWPs and checked by manager/supervisor before commencement of any maintenance or operational activity	Preventative	Project/Process Owner	Existing	(Select)			
									Safe Working Procedures - to align with recommendations provided by manufacturer, experts and/or regulators	Preventative	Project/Process Owner	Existing	(Select)			
									Machine guarding and barriers where possible	Preventative	Project/Process Owner	Existing	(Select)			
									Use of Personal Protective Equipment (PPE) for operational and maintenance staff	Corrective	Project/Process Owner	Existing	(Select)			
R-7	**Use of Power Tools** Workplace incidents related to the unsafe use and/or maintenance of power tools	dec/20	Project	Project Manager	Health, Safety, Environment & Security	* Poor selection of tools for designated jobs across plant or vessels * Malfunction in equipment and/or tools * Unsafe operation of equipment and/or tools * Operation of tools by untrained/uncertified employees * Operation of tools and equipment under fatigue	* Injury or significant harm (long and short term) to staff * Damage to plant, assets or equipment * Reputational impacts to the broader campaign * Regulatory fines and imposed licences conditions	HAZOP Workshop Job Safety & Environment Analysis Take 5 (risk assessment) Tool box talk	Permits to work for specific tools and equipment to be mandated and reviewed on a scheduled basis	Preventative	Project/Process Owner	Existing	(Select)	2	3	6
									Safe Working Procedures - to align with recommendations provided by manufacturer, experts and/or regulators	Preventative	Project/Process Owner	Existing	(Select)			
									Voltage limits specified in SWPs for formal procedures and Safety Data Sheets	Preventative	Project/Process Owner	Existing	(Select)			
									Power tool access control via PWT system	Preventative	Project/Process Owner	Existing	(Select)			
									Machine guarding and barriers where possible	Preventative	Project/Process Owner	Existing	(Select)			
									Use of Personal Protective Equipment (PPE) for operational and maintenance staff	Corrective	Project/Process Owner	Existing	(Select)			
R-8	**COVID-19** The risk of a COVID outbreak on the exploration vessel resulting in single or multiple client representative and/or crew infections	mrf/21	Project	Project Manager	Health, Safety, Environment & Security	* Lack of awareness regarding spread of the infection * Unsafe work practices - lack of social distancing * Lack of hygenic practices (e.g. hand washing, sneezing into arms/tissues) * Sub-par cleaning practices	* Severe acute respiratory syndrome * Injuries or fatalities amongst staff * Impacted schedule and/or project budget	HAZOP Workshop Job Safety & Environment Analysis Take 5 (risk assessment) Tool box talk	A COVID-19 Crew Change Reporting Tool - data captured will be used to monitor the health and whereabouts of the personnel quickly and efficiently during this COVID-19 pandemic	Preventative	Project/Process Owner	Existing	Effective	3	4	12
									Daily evaluation and temperature measurements for the quarantined persons.	Detective	Project/Process Owner	Existing	Effective			
									Mandatory PCR COVID-19 Testing	Detective	Project/Process Owner	Existing	Effective			
									Development and promotion of COVID safety instructions	Preventative	Project/Process Owner	Existing	Effective			
									Home quarantine 2 days before O/S travel or 8 days before joining the vessel	Preventative	Project/Process Owner	Existing	Effective			
									Hotel quarantine to start at the time of the arrival at the hotel of the day zero.	Preventative	Project/Process Owner	Existing	Effective			
									Cleanning of contaminated areas	Preventative	Project/Process Owner	Existing	Effective			
									Controlled evacuation of infected client representative or crew member(s)	Corrective	Project/Process Owner	Existing	Effective			

CIIC-SR O&R Register: Version 1

Current active version: 1- Last Modified: 29-12-2021

		Identification of O&R							Mitigations			Post-Mitigation Assessment		
Version	Register ID	Category *	Discipline	Topic	Description "Due to [origin/cause], an uncertainty in ... [impact/cause]." *	Pre-mitigation Likelihood	Pre-mitigation Expected impact	Pre-mitigation Average Risk value	Mitigation Strategy / Actions	Responsible	Comments / Feedback / Outcome	Post-mitigation Likelihood	Post-mitigation Impact	Post-mitigation Average Risk Value
1	SC_001	Site Constraints	Laws and Regulations	Permits /licences / approvals their may be ane xtra permit required for the 25 tons of nodule recovery	No Nodules available for pilot processing plant, delay of pilot testing by > 1year and cost for extra campaign	4	4		Check if current permit suffices or maybe a addendum is required?	EFA	max area to collection below 10000m2 no permit required	1	-1	
1	SC_002	Site Constraints	Laws and Regulations	Regulations/Permit timing:access to EEZ	No full testing prior to Pacific Ocean expedition or delays	2	2		Check legal framework	EFA	Test can be done without landing at seabed / drivability test at BE EEZ	1	-1	
1	SC_003	Site Constraints	Site Contraints Logistic	Regulations/Permit timing: AUV needs to be installed onboard JPIOMI2 vessel	AUV not installed on board missing Seabed image 3rd party	2	2		Back-up AUV will be installated on Normand Energy	FCH	Under discussion to take OI AUV on board of own vessel, awaiting on Board approval	1	2	
1	SC_004	Site Constraints	Weather	Delays and damages due to weather	delay /damage during	4	1		Contingency plans, call of extension option on vessel charter	FCH / EFA	take workable weather window in account during Charter negotiations	1	1	
1	SC_005	Site Constraints	Other	Facilities Power Supply and other utilities	Unexpected Cost	3	3		Details cost estimate based on previous mobilisations	EFA / FCH	Detailed estimate made on program and previously invoices	1	-1	
1	SC_006	Site Constraints	Interfaces with Stakeholders	Coordination responsibility	Delays /poor productivity due to poor project mgmt / control	2	2		District discipline to robust plan, assure good communication, instructions etc.,	FCH / EFA	Weekly meeting and project status done, update on satelite availability on OP	1	1	
1	SC_007	Site Constraints	Geographical	Subsurface unknowns	Potential damage due to unknown seabed conditions	3	3		Extensive survey done before landing at seabed	FCH	examine all available survey data	1	-1	
1	SC_008	Site Constraints	Laws and Regulations	Administrative restrictions imposed on equipment/personnel	Approvals & Bureaucracy	2	1		Buy-in strategy /policy /	EFA	cooperation with local agencies & Custom brokers	1	1	
1	SC_009	Site Constraints	Interfaces with Stakeholders	Damage / Failure of mechanical components PAT II or LARS	Failure of expedition	2	3		Framework agreement with mechanical workshop in San Diego	EFA	No frame agreement in place, support of 2 mechanical shop available, vendor list in	1	-1	
1	SC_010	Site Constraints	Laws and Regulations	Access to Rarotonga in case of emergency	No access to nearest port in case of emergency, detour to San Diego required, Delays	2	1		to see how our US entity can be used	FCH/EFA	place contact made and support US branch available, refresher to be send to Jan in accordance with present planning	1	0	0
1	SC_011	Site Constraints	SC: Failing Interfaces & Communication & Information	Critical operations failure	Failure of expedition	1	4		Do readiness review - checklists and meetings, adaptation EoW GSRNOD19-bis	ALL	regulary meetings and checklist to be held to avoid loss ends	1	0	
1	SC_012	Site Constraints	Site Contraints	Mobilization Personnel	Boarding of personnel delays due to COVID19	3	4		Detailed planning	FCH	Travel restrictions to be checked with local authorities	2	3	
1	SC_013	Site Constraints	Health and Safety	Methodology	Preparation of Project specific plans and MST	2	2		Plans, MST & Task plans	ALL	create doc's to minimise risk	1	1	
1	SC_014	Site Constraints	SC: Failing Interfaces & Communication & Information	External communication plan inadequate	Comminication with JPIOMI2 vessel, when not in close view	2	2		Clear communication plan,	FPE / FCH / HEDB	commication setup	1	1	
1	Com_001	Commercial	Project Schedule	Work Schedule / LDs & extension of time	Project Planning / Priority tasks	2	2		Detailed planning, contractual agreements	ALL	planning to agree over all team and define simops	1	1	
1	Com_002	Commercial	Project Schedule	Work Schedule / LDs & extension of time		2	2		High Level planning	FPE / FCH	LD's negosiation with Vessel Owner	1	2	
1	Fin_001	Finance	Project Finance	Work budget	Detailed cost estimate, offers	3	4		Details cost estimate based on previous mobilisations	FCH	Detailed estimate made on program and previously invoices and planning	1	2	
1	Fin_002	Finance	Project Finance	Work budget	Cost control	2	3		Cost control against estimates, early notification in case of overruns	FCH	cost control within estimate.	1	2	
1	Fin_003	Finance	Project Finance	Environmental / Mooring cost	No data or minimal 1year delay	2	3		Submit additional budget request to Board (possible as part of the environmental strategy document)	FCH	Pending			
1	HR_001	HR	Staff Requirements	Lack of training and/or education.	Qualified / skilled personnel trained for dedicated operations	3	1		Clear job description and training	FCH/EFA	HR register to be kept KRB	2	-1	
1	HR_002	HR	Other	Marine Crew qualification.	Marine Crew	2	3		carefully review of qualification key personnel, as part of charter agreement	FCH	Minimum Marine qualification, capability to replace in case breach	1	2	

1	Leg_001	Legal & Insurances	Other	Flag state requirements / Issues	any restriction / requirements causing delays	2	3		Counter check on requirements with Vessel Owner	FCH	No restrictions within the scope of Special Service Vessel	1	-1	
1	Leg_002	Legal & Insurances & Securities	Other	Work permit system no in place for onshore works	Liability in case of incident / accident	4	3		adapt DEME work permit system	FCH	All works to be covered by Work Permit System	2	-1	
1	Leg_003	Legal & Insurances	Insurances	LOH, HMI	H&M equioment failure, Loss of equipment	3	5		Project Insurance	FCH	Project presentation, update value register, statement of underwritters	1	2	
1	Leg_004	Legal & Insurances Securities	Contract Terms and Conditions	Intellectual property	No data or to late for EIA	2	2		Cooperation agreement with BGR, including early access to data	FCH	early access to data via	1	1	
1	Prod_001	Production and	Equipment Efficiency	Condition and capacity, sampling equipment not meeting expectations	Expedition failed and impact on Business Case	3	5		Functional FMEA	FCH	/ FLS / TOSH	1	2	
1	Prod_002	Production and Execution	Handover	Hand over specifications/criteria	Hand over meeting before and after each shift change	2	3		Shift hand over meetings and toolbox meetings	ALL		1	-1	
1	Prod_003	Production and Execution	Equipment Efficiency	Condition and capacity	Vessel condition, materials and delay	1	3		As-builts, testing, inspection, etc..	FCH		1	1	
1	Prod_004	Production and Execution	Equipment Efficiency	Condition and capacity	Sampling device condition, materials and delays	1	3		As-builts, testing, inspection, FMEA, etc	FCH	FMEA, Onshore testing	1	1	
1	Prod_005	Production and Execution	Other	Loose equipment on Seabed	Loose equipment on seabed	2	5		Emergency recovery procedure Check on availability of ROV on own vessel	FCH	use of main deck crane own vessel and assistance of ROV	2	3	
2	Prod_006	Production and Execution	Methodology	Moorings / landers / Patania II during placement of instruments	loss of data, no data for EIA & hydrodynamoc modelling, damage to third party equipment & sensors (JPIO/MI2 / independant researchers)	2	3		Agree on safe distances between vessels, instrumentation placement (map in advance), communications between JPIO/MI2 &	FCH	Item Positions known in relation with communication protocol	1	1	
1	Prod_007	Production and Execution	Equipment Efficiency	Workability vessel	Weather limit for ROV deployment	2	2		to be checked and comfirmed	FCH				
2	Equip_001	Equipment	Status of Equipment	Spare parts management	Critical spare parts not on board causing delay / Failure	3	2		Assign dedicated store keeper	FCH		1	-1	
1	Equip_002	Equipment	Status of Equipment	AUV sensor functionality	Partly expedition failure due to missing coverage	3	2			FCH		2	2	
2	Equip_003	Equipment	Status of Equipment	Access to Rarotonga in case of emergency inability to recover moorings	Delay / No data or minimal 1 year delay for hydrodynamic modelling, extra cost new moorings	3	4		Emergency recovery by ROV	FCH	Cutting tool available on ROV JPIO/MI2 vessel	2	3	
2	Equip_004	Equipment	Status of Equipment	Mooring equipment failure (identified during maintenance onboard)	NO Data for EIA	2	2		Spare equipment on board	FCH		1	3	
1	Equip_005	Equipment	Condition & Capacity	Inadequate instruments Patania II	questionable or unusable data, no data for EIA and hydrodynamic modelling	1	2		Ensure range different instrumentatino & measurement principles for the same paramater. For example turbidity = optical, conductivity & acoustic instruments, combined with water samplers.	FCH	implemented, slpit MIT plume assessment to evaluate	1	1	
2	Equip_006	Equipment	Status of Equipment	Invalid calibrations	questionable or unusable data, no data for EIA and hydrodynamic modelling	1	2		Ensure valid calibrations of all instruments (spare turbidity sensors all freshly calibrated), instrument inspection &	FCH	All equipment external calibrated	1	1	
2	Equip_007	Equipment	Status of Equipment	Invalid calibrations mooring sensors	questionable or unusable data, no data for EIA and hydrodynamic modelling	1	2		test plan Ensure valid calibrations of all instruments (spare turbidity sensors all freshly calibrated), instrument inspection &	FCH	Procedure to calibrate available	1	-1	
2	Equip_008	Equipment	Condition & Capacity	Loss of ENV sensors on Patania II due to water ingress / technical failure	loss of data, no data for EIA & hydrodynamoc modelling	3	4		test plan Insurance, instrument inspection & test plan	FCH	Test plan in place and spare equipment available	1	2	
2	Equip_009	Equipment	Other	Surprise / aggressive response of large megafauna during decent & on seabed, as a consequence of noise, electromagnetics or lights	damage to equipment, loss of Marine Crew establish true cause afterwards	1	2		Monitor with camera, emergency swicth off of lights and main power ? If feasible ?		EM switch installed	1	1	

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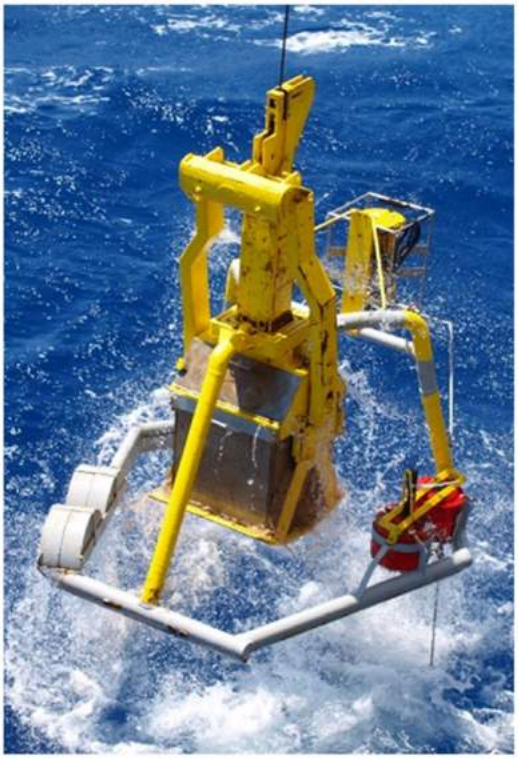
Annexes of the CIIC-SR License for Exploration Activities

Annex 05

The approved Occupational Health and Safety Plan



Title:	Annex 05 of the License for Exploration Activities
Author:	François Charlet – GSR Exploration Manager
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	Samantha Smith–Head of Sustainability & External Relations
Date:	24/01/2022
Reference:	P03-CIICSR-EV-RPT-00001_Annex 05
Version:	2

Signed: ..... On Behalf of: CIIC-SR

Name: Eusenio Fatialofa..... Date: 24 January 2022

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Abbreviations

ALARP	As Low As Reasonably Practicable
CCFZ	Clarion Clipperton Fracture Zone
COSHH	Control of Substances Hazardous to Health
CPE	Collective Protective Equipment
DEME	Dredging, Environmental and Marine Engineering
EIS	Environmental Impact Statement
ERP	Emergency Response Plan
GSR	Global Sea Mineral Resources
HIRA	Hazard Identification and Risk Assessment
HSE	Health, Safety, and Environment(al)
HUET	Helicopter Underwater Escape Training
IMCA	International Marine Contractors Association
IMO	International Maritime Organisation
ISA	International Seabed Authority
ISM	International Safety Management
ISPS	International Ship and Port Facility Security
JSEA	Job Safety and Environmental Assessment
KPI	Key Performance Indicator
MARPOL	International convention for the Prevention of Marine Pollution from Ships
PMS	Project Management System
PPE	Personal Protective Equipment
PPV	Pre-Prototype Vehicle
PTW	Permit To Work
QHSE-S	Quality, Health, Safety, and Environment(al) and Security
RAMS	Risk Assessment and Method Statement
SHOC	Safety Hazard Observation Card
SWP	Safe Work Procedure(s)

1. Introduction

Due to the nature of our activities, CIIC-SR offshore expeditions may take place under challenging working environments. Workplace health, wellbeing, and safety - for our own people, as well as subcontractors, suppliers, partners and other stakeholders - is our highest priority.

As young company, CIIC-SR will have to look at parent companies, experiences, and knowledge. For this reason, CIIC-SR will base his safety policy and QHSE Management System on the GSR/DEME system, which has been developed from the rich experiences accumulated in the past. The DEME-Group has a robust Quality, Health, Safety and Environment management system in place, describing policies, practices, and procedures. The management system reflects the diversity of activities and industries. The effectiveness of its management system is continually improved in order to ensure that the highest standards are maintained.

The DEME-Group process owners set up and maintain process descriptions, generic risk assessments, work instructions and procedures, and other useful documentation and tools. They also keep track of actions and help identify KPIs and targets. They also strongly encourage knowledge sharing within the organisation. As specialists in their domain, they can give advice to all levels within the organisation.

2. Health and Safety and Environment Policy

2.1 Mission, Vision & Core Values

This applied CIIC-SR policy is based on DEME/GSR's STRIVE statement. In this statement we describe what we want to be, what we want to achieve and what we believe in. This QHSE policy states how CIIC-SR will manage QHSE aspects with regard to all offshore activities who will be executed during the 5-year exploration contract.

2.2 Objectives

We constantly strive for an even higher execution level in the field of QHSE, based on the standards that apply in the industry and branches. The principle behind the slogan 'Zero accidents and zero environmental incidents' is the target of our organization. All possible must be done and all necessary resources provided in order to achieve this target. Our priority is and remains the well-being of our employees and subcontractors by creating a high-quality, healthy, safe, and eco-friendly work environment. Each employee is timely informed, instructed and trained as needed in order to execute his/her tasks. All subcontractors' activities are professionally coordinated, and the employees are fully integrated in the project organization. Our innovative attitude results in the deployment of state-of-the-art equipment, the use of prototypes and the development and application of new methods. This depicts the way CIIC-SR meets every new challenge with adequate solutions. CIIC-SR is constantly adopting additional measures in function of specific risks or opportunities. CIIC-SR also respects its customers' and suppliers' specific requirements or

individualities. The quality of the internal processes and of our management system is systematically evaluated and mapped, and continuously reviewed in order to improve.

2.3 Standards

CIIC-SR's offshore activities will be executed following the industry standards by IMCA (International Marine Contractors Association), Renewable UK, FPAL and the Offshore Oil & Gas Industry. All applicable guidelines and standards recommended by IMO Class and Flag state, are considered.

FPAL as an organization does not publish any standards regarding QHSE performance. However, upon registration within the FPAL platform, Suppliers are given the opportunity to enroll in the "FPAL Verify" scheme. As part of this scheme the FPAL organization performs an external audit on the Supplier to review QHSE performance against compliance with industry standards such as OGP and NORSOK. Therefore "FPAL compliance" needs to be defined as "Supplier's operations are verified regarding compliance with industry standards (OGP and NORSOK) by the FPAL organization".

Oil & Gas standards are intrinsically interwoven into the QHSE management system set-up of CIIC. Examples of such standards are i.e. OPITO trainings (lifting, BOSIET, …), OPITO/NOGEPA medical examinations, IOGP Offshore Helicopter Recommended Practices, ... As a full list of Oil and Gas standards is perhaps too extensive to detail (the applicable standards are integrated into each individual process), however general reference can be made to OPITO, NOGEPA and IOGP as Oil & Gas organizations publishing standards to which CIIC adheres to where applicable to this industry and working environment.

Renewables UK is a non-profit organization providing support and insight into the renewable energy sector. In addition to sector analysis they provide several Health and Safety Publications giving guidance regarding sector performance. On the link below, an overview can be found regarding the Renewable UK Health and Safety Publications.
https://www.renewableuk.com/page/HealthSafety

Most of the CIIC-SR Project Management Plan will be inspired by the DEME-Group document, as DEME is a leader in offshore operation, ISO certified and experienced with difficult engineering projects. Document will be adapted to the CIICSR's scope of work, involved vessel and equipment. Some of the personnel involved onboard will also be DEME personnel, as the QHSE officer on board.
CIIC-SR as a company is not ISO certified. DEME is certified in accordance with the ISO 45001, ISO 9001, and ISO 14001 standards as per the DEME Group Multisite Certification Scheme. The DEME-Group holds several QHSE certificates (ISO 14001 – Environmental Management Systems – Requirements, ISM – International Safety Management Code, ISO 45001 – Occupational Health & Safety Management System, ISO 9001 Quality Management Systems – requirements: SCC – Safety, Health and Environment checklist contractors & CO2-ladderv3-0 Niv 5 – CO2 awareness certificate level). It is not the CIICSR intention to be ISO certified during such period of time, and for the planned offshore activities. This is something to be considered for a potential exploitation phase. CIIC-SR will make sure that the Management Plan follows the highest safety and operational standards.

2.4 Strategy

Each employee has the right and the obligation to stop any activity that he/she estimates involves unacceptable risks. We believe that consultation between employers, employees and their representatives is crucial for the organization of the work. CIIC-SR makes an inventory of all possible relevant risks and opportunities on corporate level and takes into account the applicable internal and external context. In-depth assessments of possible risks and opportunities take place during the preparation phase of the projects. Control measures are determined and monitored. In practice this means:

- Conclude clear agreements with the client(s) / Authority
- Meet the clients'/Authority' requirements
- Continuously optimize and adjust business processes
- Strive for improvement using measurable targets
- Follow up on products and services rendered by third parties
- In all respects strive for customers', employees' and all other stakeholders' satisfaction
- Our employees are given the opportunity to give their input on QHSE level when it concerns them, they are consulted via the (legal) consultative bodies about those adjustments that have a relevant influence on QHSE
- Ensure open communication involving local partners
- Assure ourselves of a profitable and competitive position on the market
- Where necessary, timely involve subcontractors in the project and strive for common goals or partnerships

The DEME QHSE-S department has the assignment and gets the resources to verify the application and effectiveness of the global QHSE management system by checking and auditing vessels, projects and legal entities, including CIIC-SR. QHSE is always on the agenda of the CIIC-SR management team meeting and board of directors.

2.5 Scorecards

CIIC-SR will use various KPIs (SHOC, industrial accidents, incidents, green initiatives etc.) that are subject to a periodic follow-up and adjusted when necessary.

2.6 Plan & Actions

On each level within the organization (e.g. on board of vessels, at project management team level and process owner level) action lists are used, of which action items can be transferred. The action items are closely monitored. The use of action lists enables us to continuously adjust our processes and our organization. During the yearly Management Reviews the foundation is laid for the Year Action Plans (YAP) in line with the internal and external context and the most relevant risks and opportunities. The plans are implemented through actions, which are executed on various levels within the organization, bearing in mind the priorities. The present policy statement forms the basis for more detailed policies, tailored to local circumstances, which might be necessary at the level of Activity Lines, business units, projects and vessels. These statements are communicated during Activity Line, project and vessel inductions, and reassessed yearly during the management reviews.

2.7 Security Charter

DEME/GSR are world-class players that operates at the forefront of technology across the planet and will accompany CIIC-SR in that direction. High-tech knowhow, competitive markets and sometimes aggressive operational environments can unfortunately also expose our People, Premises, Equipment & Vessels, Goods, Business Information, Reputation, etc. to malicious intent such as vandalism, sabotage, theft, piracy, kidnapping, aggressive information gathering, cyber-attacks, image damaging, etc. CIIC-SR will commit to the protection of all assets and information. As such, the Security Charter shall be adopted by all Business Units.

To address these issues in a global and comprehensive way, CIIC-SR will benefit of the DEME's Enterprise Security Office:

- Provides General Management with periodic updates on the Security Threats and Incidents
- Suggests Security Policies & Procedures to General Management which, once accepted, become mandatory for the Organization and must be implemented and enforced by Line Management
- At the explicit request of Line Management, provides advice in order to help Line Management to achieve compliance with the Security Policies & Procedures
- In exceptional cases, can be requested by General Management to coordinate security related issues or emergencies
- Will check compliance with the Security Policies & Procedure and report its findings to both General
- Management and the Line Managers involved. Within the scope of its assignment, the Enterprise Security Office has access to all company sites, vessels and information.

The DEME Enterprise Security Office provides guidance and support, but it is the individual responsibility of each employee to apply the Security Policies & Procedures and to act in a security-conscious way. We expect our staff to make sure that external parties (visitors, contractors, consultants, temporary staff, etc.) present on our remises or handling our information act accordingly. We also expect all CIIC-SR staff to immediately report all security related incidents or concerns to the DEME's Enterprise Security Office.

3. Safety and environmental management system

Deep sea exploration of polymetallic nodules at water depths exceeding 4000m requires various challenging operations. From scanning the seabed mapping the nodule abundance to dredge the seabed. But for every activity, safety will also prime and several actions will always be executed before departure, to make sure all potential safety concerns have been detected, assessed and controlled.

The purpose of a Project HSE Management Plan is to set out how Health, Safety, Security and Environment are managed throughout the duration of the CIIC-SR offshore campaigns. The plan must show how Risks associated with Project activities are properly assessed and reduced to a level as low as reasonably practicable (ALARP).
This plan provides further guidelines on the required training, competences and communications to control the Risks. Procedures are set for inductions, meetings, toolbox talks and other communication initiatives to raise HSE awareness. All guidelines regarding the management of working equipment, training and communications apply equally to the Subcontractors under the responsibility of CIIC-SR.

In addition to Safety aspects, this plan addresses welfare and hygiene on site, Environmental topics and Safety on site to ensure the overall assessment, monitoring and control of impacts. HSE monitoring involves inspections of work, incident reporting, action lists and documenting of HSE related information.

3.2 Management strategies and policies

The CIIC & GSR management team will organise a yearly Management Review to assess the HSE strategy and the achievement of objectives, and accordingly identify the necessary arrangements. This is based on the following policies of DEME:

QHSE policy – defines the key values for Quality, Health, Safety and Environment, aiming at zero accidents and environmental incidents**.**

Stop Work Authority policy – Every employee has the right and the duty to halt any activity whenever he/she believes that the execution thereof involves unacceptable risks.

Drugs and alcohol policy – forbid the use, distribution and possession of any kind of alcohol and drugs on board of Offshore Vessels, Project sites and supporting Offices. All employees under the responsibility of CIIC-SR, including Subcontractors and Suppliers' personnel, in any worldwide location are entitled to a drug and alcohol-free working environment.

Smoking at Work policy – forbids smoking inside buildings, vehicles, construction trailers or any Project related facilities unless designated as smoking area. Smoking areas shall be clearly signalized with a smoker pictogram, open air and always equipped with a durable ashtray.

3.3 Responsibilities

The line of responsibilities within the Project is illustrated in the Project Organisation Chart. The key responsibilities within the Project are usually led by the Exploration Project Manager, who is supported by the work manager (for operation) and the QHSE project engineer (for safety) and by the technical and environmental engineering team.

These persons will certainly be employees of CIIC-SR, GSR/DEME and CIIC and will have also the role to support sub-contractors (AUV/ROV operators), scientists and experts invited to perform the required activities and research.

Every person on board has his/her own responsibilities. For instance, the project manager will be in charge of:

- Clear leadership, setting objectives and overall management of the Project team.
- Ensuring the Project is executed according to HSE standards and applicable legislation.
- Delegating or reallocating tasks or duties as he/she deems necessary.
- Liaising with the Project QHSE Manager and with Works Managers in respect of all operations.
- Assigning responsibilities in the action list and following up the action status.
- Evaluate the incident investigations.

However, in term of QHSE-S topics, every employee and crew member is responsible for:

- Carrying out his duties in accordance to HSE requirements.
- Using equipment, machines, vehicles and tools for the intended purpose.
- Stopping any Work with unacceptable Risk and communicating to his supervisor.
- Reporting incidents, near misses and hazardous observations in a timely and efficient manner.

3.4 HSE Objectives / KPI

The following Key Performance Indicators (KPI) and specific targets are thus considered:

- **Reporting of observations,** as the number of Safety Hazard Observation Cards (SHOC) submitted * 100.000 working hours / total working hours.

- **Toolbox participation,** as the number of people that attended toolboxes * 100.000 working hours/ total working hours
- **Timely reporting of incidents with damage,** as the number incidents with damage reported within 24 hours of occurrence.
- **Timely closeout of QHSE actions,** as the number of QHSE actions closed as planned + pending actions not overdue.
- **Major Environmental incidents,** as the number of environmental incidents with restitution costs.

3.5 Emergency Response Plan

3.5.1 General Procedure

The procedure to manage emergencies in the Project is explained in the **Annex 04 "Incident Response & Risk Management Plan"**. This includes the necessary HSE actions to be taken in uncontrolled situations or accidents, and the personnel or entities to be contacted for assistance.

The speed of response in an emergency situation can significantly determine the level of HSE related impact. The PERP provides the following general guidelines on how to handle an emergency situation:

- Always place your own safety first
- Remain calm and evaluate the situation
- Sound the alarm
- Ensure the Vessel master or his replacement is contacted
- Provide help and assistance
- Keep the situation stable and keep monitoring
- Follow instructions of Vessel master/ masters replacement.

CIIC SEABED RESOURCES LTD — CIIC-SR EMERGENCY RESPONSE PROCEDURE

Project Related Vessels			
Name	Contact Details		Email
Vessel Name	VSAT:		
	Mobile1:	+XX XXXXXXX	bridge@xxxxxx.com
	Mobile2:	+XX XXXXXXX	master@xxxxxx.com
Vessel Name	VSAT:		
	Mobile1:	+XX XXXXXXX	bridge@xxxxxx.com
	Mobile2:	+XX XXXXXXX	master@xxxxxx.com

EMERGENCY CONTACT DETAILS				
First Line of Communication				
EMERGENCY Contacts				
Vessel [NAME]				Onshore Services
BRIDGE	900	PARAMEDIC	TBA	
Offshore Project Representatives:				Port Authority1
[Project Manager Name]				Name contact
Mobile: +XX XXXXXX				Radio Service: XXX
Onboard: XXX				Phone number1: +XX XXXXXX
[Work Manager Name]				Phone Number +XX XXXXXX
Mobile: +XX XXXXXX				
Onboard: XXX				Port Authority2
[QHSE Officer Name]				Name contact
Mobile: +XX XXXXXX				Radio Service: XXX
Onboard: XXX				Phone number1: +XX XXXXXX
Onshore point of contact CIIC-SR:				Phone Number +XX XXXXXX
[General Manager Name]				
Office Number: +XX XXXXXX				
Mobile: +XX XXXXXX				Port Authority3
Email: Name@xxxx.com				Name contact
DPA / CSO Vessel Owner:				Radio Service: XXX
Name Owner Representative				Phone number1: +XX XXXXXX
Office Number: +XX XXXXXX				Phone Number +XX XXXXXX
Mobile: +XX XXXXXX				
Email: Name@xxxx.com				
Second Line of Communication				
Name		Contact details		Email
Environmental Coordinator	Phone:	+XX XXXXXX		Name@xxxx.com
	Mobile:	+XX XXXXXX		
Prevention Advisor CIIC-SR	Phone:	+XX XXXXXX		Name@xxxx.com
	Mobile:	+XX XXXXXX		
HR Support CIIC-SR	Phone:	+XX XXXXXX		Name@xxxx.com
	Mobile:	+XX XXXXXX		
IMPORTANT CONTACTS				
Name		Contact details		Email
CIIC-SR Emergency Contact	Phone:	+XX XXXXXX		Name@xxxx.com
	Mobile:	+XX XXXXXX		
Administrator	Phone:	+XX XXXXXX		Name@xxxx.com
	Mobile:	+XX XXXXXX		
Vessel Manager	Phone:	+XX XXXXXX		Name@xxxx.com
	Mobile:	+XX XXXXXX		
Vessel Owner - Emergency number	Phone:	+XX XXXXXX		Name@xxxx.com
	Mobile:	+XX XXXXXX		

3.5.2 Emergency Scenarios

The following scenarios shall be considered as emergencies and may lead to the evacuation of personnel or abandonment of the Vessel:

- Fire or explosion.
- Fuel or oil spills.
- Black-out on the Vessel.
- Man overboard.
- Vessel collision, sinking, capsizing or grounding at sea.
- Personnel or object fall from height.
- Accidents with hydraulic, hot and cutting working equipment.
- Electrical accident.
- Adverse weather.
- Any severe personal injury or illness.

In case of any emergency the vessel is leading in the emergency response and CIIC-SR should adhere to the instructions given by the vessel master or his replacement(s).

A preliminary Risk and Control Assessment has been drafted in Annex 4 “Incident Response & Risk Management Plan”. The register will be further completed once the exact scope, vessel and equipment will be better identified. The exercise will also require the expertise of several professionals and scientists to be as much as possible complete and accurate.

3.6 Environmental topics

3.6.1 Hazardous substances

Hazardous substances may result in contamination of water or soils, fire, release of toxic vapors, injuries or fatalities to marine and terrestrials fauna and flora, and damage to property. The categories of hazardous substances, or dangerous goods, are defined by the International Maritime Organisation (IMO) as explosives, gases, flammable liquids, flammable solids, oxidizing substances, toxic and infections substances, radioactive material, corrosives and other miscellaneous types. It is therefore important to ensure these substances are handled according to the applicable regulations and the manufacturer recommendations.

The use of hazardous substances shall occur in bounded areas and according to the respective Safety Data Sheets and SWP to prevent releases or contact with the other components in the working environment. The storage and disposal of hazardous substances shall occur in designated packages or containers in a segregated manner to prevent reaction between different substances and releases to the Environment. All hazardous substances present on or transported to Project sites or Vessels are required to be labelled according to the GHS regulation and registered.

3.6.2 Spill prevention

Spill prevention and response measures are set to control the release of hydrocarbons and other chemicals to the Environment and minimise the Environmental impact in the event releases occur. These hazardous liquid substances, such as fuels, oils and lubricants (all oils to be biodegradable), shall be stored on dripping trays in designated and segregated areas. All hydraulic and fuel transfer equipment and related systems shall be inspected and maintained regularly to ensure the condition of hoses and containers and their connection points.

In the event of a spill, the discharging source must be stopped immediately, and spill must be cleaned with the designated spill kit available on board. All spills into waters shall be immediately notified to the vessel.

3.6.3 Waste Management

Waste may result from activities performed on Project sites or on board of Vessels. Considering the nature and scope of Works performed by GSR, a greater effort is placed on the management of waste on board of the vessel. The vessel segregates their waste in a proper manner and CIIC-SR should hold themselves to the vessel segregation system.

The production of waste will be minimized (e.g. just in time deliveries, by use of compactors), and wherever possible shall be re-used on the site where it was produced (e.g. re-use of wooden boxes). Where waste cannot be re-used on site, every endeavor will be made to use it in an environmentally beneficial manner, for example by recycling (e.g. recycling of scrap metal by specialized companies).

3.7 Performance Monitoring

3.7.1 HSE Inspections

The purpose of these inspections is to establish a dialogue between supervisors' personnel and operating personnel and therefore ensure that everyone understands and applies HSE procedures.

Identified issues that cannot be remedied in a reasonable short time shall be added to the HSE action list. Any output from inspections that needs actions is registered in the action list for solution and follow up.

3.7.2 SHOC Cards

All personnel working on the Project site or on board of a Vessel can fill in and submit a Safety Hazard Observation Card (SHOC) to inform the management team about an HSE situation that requires an improvement or to propose a new idea for improvement. This can be done on paper version. The QHSE Manager on site is responsible for retrieving and recording the SHOCs and assist in the planning of actions. The Project Manager can upgrade a SHOC to an incident if it is assessed to be of that level.

3.7.3 Incident reporting and investigation

The general guidelines for internal reporting, investigating and following up incidents in the Project are explained in the procedure for Incident Management**.**

The procedure consists of the following steps:

Issue draft report of the incident;

- Review and acceptance of draft report by the responsible manager;
- Detailed report of the incident and assignment of ownership and responsibilities;
- Review and acceptance by the QHSE responsible;
- Completion of detailed report;
- Completion of consequences;
- Incident investigation;
- Allocation of follow up actions;
- Review, approval and closing of the incident;
- Statistical follow up.

3.7.4 Action List

The HSE inspections, SHOC cards, incidents, HSE meetings and/or toolbox talks, may identify issues that need corrective action and proper follow up. The actions, deadlines and responsibilities are formulated, controlled and followed up in a register, action list or DPR.

3.7.5 HSE Performance reporting and statistics

The DPR reports shall include relevant HSE information from all parties and personnel involved in the Project.

This includes, but not limited to:

- Incidents, injuries and near misses statistics during the reporting period.
- Man-hours worked by the Project personnel during the report period.
- Lost time Incidents.
- Permits to Work issued.
- Toolboxes.
- SHOC.
- (…)

3.7.6 Energy Consumption Reporting

All consumption over the Project shall be reported on at least a monthly base, using the inhouse reporting tool (APPRISE).

3.7.7 Lesson learnt

A list of lessons learned will be kept up to date during the project and discussed in the End-of - Works meeting. Any proposed actions during the meeting will be added to an action list and followed up by the GSR team for future operations.

3.8 Equipment Management

3.8.1 Suitability of Equipment

Equipment management starts in first place with the selection of suitable equipment for the activity. The types of equipment included are machinery, equipment, lifting gear, PPE and various consumables. To ensure the Safety of machinery and equipment on the Project site.

The following aspects shall be considered:

- Suitability for the intended use
- Compliance with the required rules and regulations.
- Properly marked.
- Well maintained.
- Suitable inspection scheme.

3.8.2 Personal Protective Equipment

All personnel are required to use specific PPE according to the characteristics of their activities on site and the conditions of their workplaces, Safe Work Procedures, codes of good practice and site or Vessel specific requirements. Additional PPE may be specified in HIRA, Method Statements and/or the applicable legislation.

GSR shall provide its employees with the required PPE. It is the responsibility of each Subcontractor or Supplier to also provide its employees with the required PPE. Visitors and third parties must comply with these procedures and practices.

The following PPE is the minimum requirement for all personnel involved in the project:

Minimum	Additional
Safety Helmet (EN 397)	*Harness (EN 361) and Fall Arrest equipment*
Hi-visibility jacket, vest or shirt	*Hearing protection (EN 352) (task specific)*
Fixed safety footwear (EN ISO 20345)	*Lifejacket 275N (EN ISO 12402 or SOLAS) approved**
Eye protection (EN 166)	*Safety Gloves (task specific)*
	Suitable work clothes (task specific)

3.9 Health and welfare

The management of Health and welfare on Project site and Vessels involves the following aspects:

3.9.1 Work Environment

- Chemical, carcinogenic, mutagenic and biological agents.
- Noise and vibrations.
- Natural and artificial lighting.
- Heating and ventilation.
- Ionizing and non-ionizing radiation.

3.9.2 Visual display unit

- Ergonomics of computer and accessories.

3.9.3 Hygiene

- Absorption of toxic substances.
- Fresh water supply.
- Waste management.

3.9.4 Fitness at work

- Medical assessment and health monitoring.
- Drugs and alcohol.
- Stress and fatigue.
- Psychological burdening.

3.9.5 Manual Handling

- Procedures and assistance equipment.

3.9.6 Provision of welfare facilities

- Sanitary and washing facilities.
- Accommodation and rest facilities.
- Food preparation and drinking water supply.
- Clothing storage and treatment.

3.9.7 Violence

- Physical and mental harassment.
- Investigation of suspected violence in the workplace.
- Disciplinary policy for violence in the workplace.

4 CIIC-SR offshore COSHH Procedure

For specific reasons related to the scientific and engineer research, CIIC-SR will have to use chemical substances who can be harmful for the environment and people. In order to protect them, an offshore COSHH Procedure must be applied. This procedure defines the rules of purchase, storage, application and disposal of substances on board of the vessels to protect the health of the employees (COSHH!) and the environment.

A summary of the COSHH Procedure is given in Annex A.

5 The past record of compliance with health, safety and environmental legislation.

The goal of this part is to clarify how CIIC-SR manages compliance with HSE requirements throughout its organization and the tools available for this purpose.

HSE legal compliance is required for:

1) Permanent locations (consist out of all the entities, offices, site, warehouses…that are managed by CIIC-SR and where CIIC-SR has a presence that is not project specific.
2) Projects: those locations that fall under CIIC-SR management systems and where CIIC-SR is present but only on a temporary basis as part of a project specific scope.
3) Maritime assets: those vessels which are owned / operated under the DEME management system.

5.1 Responsibilities

Accountable for compliance: the accountability for legal compliance lies with the applicable most senior line manager, as identified in the applicable organization chart (for project: Project Manager / Director).

Responsible for execution:
The most senior line manager can execute HSE legal compliance or assign an HSE Legal Compliance Responsible (applicable for CIIC-SR). For a project, the responsible for execution is the project QHSE-S Manager/engineer.

These responsibilities carry out identification, compliance verification, communication and follow-up in the HSE legal compliance process.

One specific CIIC-SR QHSE-S manager will be appointed for each offshore campaign. He/she will oversee all QHSE-S matters on board of the vessel.

5.2 Identification:

Before any offshore activities, CIIC-SR will consider and make sure to be aligned with all QHSE-S Legislation developed in the Cook Islands, with a specific intention on:

- Maritime Rules Offences Regulations 2014
- Maritime Transport Act 2008
- Prevention of the Marine Pollution Act 1998
- Marae Moana Act 2017
- Environment Act 2003

5.3 Compliance verification:

It is the role of CIIC-SR to verify whether the specific requirements, as stated within the applicable legislations, are compliant with:

1) The available management systems and procedure;
2) And the project HSE management plan

5.4 Communication

Any changes coming from these actions need to be communicated to the relevant stakeholders. The HSE Legal Compliance Responsible will identify the relevant stakeholders and communicate accordingly.

Compliance evaluation results must be documented by using legal compliance register, audit report and action list.

CIIC & GSR will proceed with internal audits on Project by means of kick-off meeting and Readiness Review (management review) workshop before the start of each offshore campaign. If required, the items will escalate to the highest GSR/CIIC level.

5.5 Review & follow-up

The QHSE-S Manager will require to follow-up all changes in legislation or upcoming new legislation. After changes or new legislation has been identified, the HSE officer will verify whether they are applicable within the framework of the CIIC-SR exploration project.

6 Safety issues related to weather conditions

Cook Islands lie within the extensive and persistent trade wind zone of the South Pacific. It has a tropical, mild maritime climate with a pronounced hot, wet season during the months of November to April, when two-thirds of the annual rain falls, and a cool, dry season from May to October. The hot, wet season coincides with the cyclone season for the South Pacific region. The climate is dominated by easterly trade winds and the country has an annual rainfall of 2000 mm. The average temperature ranges from 21°C to 28°C throughout the year. The climate is often strongly influenced by large inter-annual variation and the El Niño Southern Oscillation phenomenon.

The tropical cyclone season usually starts in November and ends in April. During this period cyclones tend to form to the far west of the northern Cook Islands and migrate towards the south,

reaching latitude 15°S. During El Niño years, the southern Cook Islands experience a reduction of rainfall, sometimes by up to 60% of the annual rainfall, while in the northern Cook Islands rainfall increases in excess of 2,300 mm annually (i.e. over 200% change). The situation reverses during the La Niña phase.

A climate risk study for the Cook Islands by Asian Development Bank (2005) showed potential for extreme wave and wind events primarily driven from tropical cyclones. Annually, the Cook Islands have between 0 and 3 cyclones. During El Niño conditions cyclone frequency increases.

For the CIICSRNOD19 offshore campaign, a weather forecast from BMT Argoss (example in the annexes of Section 2 “CIICSRNOD19 Fieldwork Report” of the CIIC-SR Application) was received every 12 hours, with a 7 days prediction of the wind speed and direction, as the wave height (sig. wave height, swell wave height…) and direction. The weather was also communicated daily by radio VHF to the vessel by the Rarotonga radio service.

There was no delay due to weather conditions during the entire period of operation. The sampling system, personnel, vessel and applied method using the deck crane allowed to operate safely, under all climatic conditions encountered during the mission.

7 Communication

7.1 Project inductions

All personnel entering the Project site offshore for the first time shall receive a general project safety induction before being granted access. These inductions enable the familiarization with respect specific hazards and procedures.

The following topics shall be included as a minimum.

- General HSE rules.
- PPE requirements.
- Key HSE hazards and practices.
- Restricted areas.
- Emergency instructions.
- Individual responsibilities.

Every new employee will receive a further induction from his/her supervisor covering the specific HSE aspects in his/her tasks.

7.2 Meetings and consultations

Meetings shall be held with the different parties involved in the CIIC-SR offshore expeditions to enhance the awareness on HSE related matters.

7.2.1 Toolbox talks

All personnel shall receive a detailed briefing prior to the start of an activity regarding the method of work to be followed. This includes the explanation of HSE preventive measures stated in the RAMS. Furthermore, a toolbox talk can be organized prior to any non-routine activity, as part of a

PTW or following an incident to brief on respective topics. Toolbox talks shall be documented and filed in the Apprise reporting system as part of the QHSE reporting.

7.2.2 QHSE Alerts

CIIC-SR must prepare QHSE alerts at project level based on issues registered on Project. The purpose is to provide information or remind the personnel about relevant incidents but also on the correct work procedures. These will also be discussed during toolbox talks.

7.2.3 Notice Boards

CIIC-SR Project site shall be provided with notice boards with all relevant documents and messages for the operating personnel. This may include HSE statistics, details on the Project Emergency Response Plan (PERP), list of first aiders, QHSE policy, incident reporting information, QHSE alerts, etc.

7.2.4 External Communication

All external communication shall be approved by the Project Manager and, where applicable, GSR/DEME corporate communications department shall be involved.

7.2.5 RECORDS

The record filling, storage and archiving of HSE related information shall be done in the QHSE folder. CIIC-SR will ensure all documents are properly identified and managed to facilitate their traceability throughout the Project.

In order to always keep communication with the shore in case of emergency, Iridium or VSAT satellite lines will be available on board of the vessel. Since the preliminary research campaign in 2019, CIIC-SR is aware of workable equipment, such as the Marlink Iridium hardware and subscription (Marlink - 10Gb), mostly used for internet communication.

The mains purposes of the internet communication is:

- to provide the daily progress report to the CIIC-SR Management,
- to have access to the Garmin platform allowing the visualization of the GPS trackers fixed on each FFG device,
- to give access to internet for the staff and crew. In order to control the bandwidth, only one laptop with internet access was available on board of the vessel.

The Iridium hardware (Sailor 4300 router/Antenna/phone) is an easy equipment to install on board of each vessel, with a small antenna directly plugged to the router.

Daily progress reports will be sent every day to the CIIC-SR Management. The report includes all daily performances, activities, planning for the next 24hrs, weather conditions and QHSE update table (LTI, toolboxes…).

8 Risk Assessment Flowchart

CIIC-SR carries out integrated risk assessments: in the risk assessment process hazards related to people, assets, environment, quality, and reputation are considered. When it comes to environmental aspects and impacts, CIIC-SR takes into account the Life Cycle Approach. When determining control measures, CIIC-SR applies the prevention hierarchy.

8.1 Hazard Identification and risk assessment

There are several Risk Management Tools available. Depending on the purpose and scope of the Risk Assessment, another tool is used.

The process for Risk Assessment is described below:

The flowchart above shows the different stages of the RA process. After the generic RAMS and HIRA will be performed to identify project specific risks which should be taken into account in CIIC-SR's RAMS. After this specific RAMS control measures are put into place to mitigate the risks. If the control measures show there is a need for a specific procedure for a specific task, part of the RAMS may be detailed into more lower level documents like Safe Work Procedures (SWP) to allow better understanding of the tasks including risks and control measures.

The Hazard Identification and Risk Assessment will be done with the HIRA technique that allows the early identification and classification of hazards in the various project disciplines and scopes of Work, and the HIRA technique that allows the understanding of abnormalities in processes or operations, what are their causes and consequences. These techniques shall cover the applicable scopes of design, production of materials and execution Works and include the following general steps:

Identification of hazards – These include chemical substances, working tools or unstable environments, but also incompatible operations or inconsistencies in the planning and design of activities. On shared Sites, the hazards presented by adjacent and simultaneous operations shall be considered. The different parties shall meet to brainstorm and review any preliminary Risk assessment based on applicable legislation, manufacturers recommendation, previous incident data or knowledge of employees.

Identification of consequences/impact – These include personnel, assets, environment, production quality and reputation. The identification of target personnel is based on the roles and responsibilities of the employees within the Project organisation performing the specific tasks, but also additional people that may be affected by such tasks. Assets, production quality and environment may be impacted by the specific conditions, materials, tools and location of the task. The reputation of the Project and the business can be considered a secondary impact depending on a major loss.

Evaluation of Risk level – The Risk level is determined as the combination between the probability of a hazardous event occurring and the amount of impact that event may have on personnel, assets, environment, production quality or reputation. The evaluation is based on previous incident data and the experience/knowledge of the multidisciplinary team participating in the assessment workshop.

Identification of controls – Preventive and protective measures are determined based on the hierarchical order. Sufficient measures shall be taken to minimise the probability or impact of Risks. These measures will be integrated into the Risk Assessments and SWP and communicated to the personnel during inductions, daily operation meetings, toolbox talks and Permit To Works (PTW). No employee may start working before attending an explanation of the respective Method Statement and accordingly signing the attendance list as proof of understanding.

The hierarchical order of controls to be considered in the Risk Assessments is:

- ✓ Elimination of hazards and selection of another method of work.

- ✓ Substitution of the hazard with a least impactful one.
- ✓ Engineering controls that physically change/adapt the working tools and conditions.
- ✓ Administrative controls related to SWPs and signalisation.
- ✓ Personal Protective Equipment (PPE) that enables a closer contact with the hazards.
- ✓ Emergency controls that address uncontrolled or uncontrollable hazardous events.

At the level of the Activity Lines, several activities & techniques and high-risk tasks have been selected which are relevant to our scope of work. Each of these activities and high-risk tasks have a process owner who is responsible for setting up and maintaining a generic risk assessment. Besides a formal yearly review, the risk assessments are (re-)evaluated as a result of incidents, inspections, audits, project feedback… These generic risk assessments form the base for operation specific risk assessments. Where necessary, the risk assessments are further detailed using JS(E)A. On the work floor these method statements are further detailed and implemented via JS(E)A, permits to work, last minute risk assessments (Take 5), toolboxes and others.

8.2 QHSES Risk Matrix

8.2.1 Incident management: Potential risk score of an incident

The potential risk score of an incident is determined by combining the probability and the potential severity. The potential severity must be determined for the PAQER-categories: People, Assets, Quality, Environment, Reputation. For the potential severity you need to determine a realistic worst case outcome, or most severe probable outcome.

Take into account different plausible circumstances that can influence the severity, such as different weather conditions, different area/location, different ongoing operations, different timing... It is important not to incorporate too many “what-ifs” (changed circumstances) in order to arrive at a worse but less credible outcome. If two or more “what-ifs” are required to reach a particular consequence, then the credibility of that scenario should be challenged.

The potential risk score of an incident will determine if an investigation is required:

Green	No investigation required. Actions to be defined and recorded.

Amber	Investigation required Actions to be defined and recorded.
Red	

Probability

The following list helps to determine the **probability**. There are five categories of **probability**:

(1) VERY UNLIKELY	(2) UNLIKELY	(3) POSSIBLE	(4) LIKELY	(5) VERY LIKELY
An almost unthinkable combination of factors would cause this scenario. Very limited exposure: <1x per year	A rare combination of factors would result in this scenario. Limited exposure: 1x per month	The scenario could occur when several factors are present, but is otherwise unlikely to happen. Occasional exposure: 1x per week	Not certain to happen but an additional factor may result in an incident. Frequent exposure: 1x per day	Very likely chance of a hazard to result in a scenario. Constant exposure: More than once per day

Note: Environmental aspects occur continuously, not with the chance of an incident. Assume a probability of 3 for continuous environmental aspects e.g. use of fuel, emission of CO2, waste generation …). The severity is determined by both the quantity and how damaging the aspect is for the environment

8.2.2 Severity

The following table helps to determine the **severity** in general.
There are five **severity** scores:

1. Minor
2. Slight
3. Moderate
4. High
5. Very High

The table below gives more detailed definitions for each of the PAQER categories. These definitions will help you to decide what the possible effect or consequence of the hazard or the impact of the environmental aspect is that you are discussing.

	(1) MINOR	(2) SLIGHT	(3) MODERATE	(4) HIGH	(5) VERY HIGH
(P) PERSONAL ILLNESS/INJURY *(Including injuries and illnesses or health issues)*	Negligible injury requiring first-aid treatment (scratches, bruises) Negligible health implications; no absence from work	Minor injury requiring medical treatment (stiches, open wounds, 1st or 2nd grade burns) Headache, nausea, dizziness, mild rashes	Event leading to a lost time incident (sprains, broken bones, 3rd grade burns) Persistent illness such as dermatitis, acne or asthma	Very serious accident; event leading to a single death or severe injury Poisoning or dangerous infection	Major accident; event leading to multiple deaths Occupational diseases (e.g. lung diseases) or permanent disability

	(1) MINOR	(2) SLIGHT	(3) MODERATE	(4) HIGH	(5) VERY HIGH
(A) ASSETS *(Including damage to equipment, potential financial penalties with reference to contract, fines, and the cost of environmental aspects)*	Negligible loss of function/production with no damage to equipment	Damage to equipment requiring minor remedial repair, loss of production	Localized damage to equipment requiring extensive repair, significant loss of function/production.	Serious damage to equipment resulting in production shutdown & significant production loss	Massive damages
	Contractual payment open to minor discussion	Contractual payment open to major discussion.	Limited loss of payment	Significant loss of payment	Substantial loss of payment, loss of contract
	None or low Env. aspect cost	Limited Env. aspect cost	Important Env. aspect cost	Very important Env. aspect cost	Severe penalties or Env. damage
	Minor wear and tear; normal maintenance	Increased wear and tear; significant increase in maintenance	Excessive wear and tear; maintenance has major impact on the project; redesign recommended	Equipment breakdown is not repairable; partial redesign and rebuild required	Catastrophic equipment failure; full redesign of equipment and/or project required
	Less than € 10 000	€ 10 000 to € 100 000	€ 100 000 to € 1 000 000	€ 1 000 000 to € 10 000 000	More than € 10 000 000
(Q) QUALITY *(Including production and efficiency loss, insufficient product quality to contract spec, loss of client satisfaction, …)*	Less than 1 hour loss of full production	Less than 1 equivalent days loss of full production	Less than 2 equivalent days loss of full production, untimely delivery of product (deadline)	2-9 equivalent days loss of full production, late delivery of product (deadline)	More than 10 days loss of full production, no delivery of product (deadline)
	Negligible cost increase within budget	Large cost increase within budget	Cost increase with influence on budget options	Project exceeding budget	Project going far beyond budget
	Minor rectifiable product spec deficiencies	Major rectifiable product deficiencies	Major product deficiencies, not fully rectifiable but within acceptable limits for clients' end use	Product missing in significant spec aspects, limiting end use for client; client will avoid working with our company in the future	Product failure to spec rendering product unusable for clients' end use; client will no longer work with our company in the future

	(1) MINOR	(2) SLIGHT	(3) MODERATE	(4) HIGH	(5) VERY HIGH
(E) ENVIRONMENT *(Including environmental incidents and the impact of environmental aspects)*	No or negligible damage to environment (e.g. No protected species hurt or killed/minor impact on heritage or community)	Minor impact to the environment (e.g. Minor breach of emission standards or minor spill with limited damage on site, protected species hurt but not killed/minor repairable damage to heritage sites)	Moderate pollution (e.g. Repeated minor breaches of emission standards or moderate spill with damage on site, protected species – one killed/important repairable damage to heritage sites)	Severe environmental accident (e.g. Severe pollution with short term local implications and significant restitution costs, protected species – one to ten killed/irreparable damage to heritage sites)	Major environmental accident (e.g. Major pollution with long-term implication and very high restitution costs, protected species – more than ten killed, habitat destroyed/heritage site destroyed)
	None or negligible impact (e.g. limited emission)	Limited local impact (minor short-term impact but no lasting damage to the environment)	Significant local or limited global impact	Important local or significant global impact	Major local or important global impact
(R) REPUTATION *(Including potential reputation loss from legal offences or low product quality)*	No impact	Local impact/negative exposure	Limited national impact/negative exposure	Extensive national impact/negative exposure	International impact/negative exposure

Risk Assessment matrix

SEVERITY / PROBABILITY	(1) MINOR	(2) SLIGHT	(3) MODER-ATE	(4) HIGH	(5) VERY HIGH
(1) VERY UNLIKELY	1	2	3	4	5
(2) UNLIKELY	2	4	6	8	10
(3) POSSIBLE	3	6	9	12	15
(4) LIKELY	4	8	12	16	20
(5) VERY LIKELY	5	10	15	20	25

LOW RISK	MEDIUM RISK	HIGH RISK

Note: The risk is acceptable when it is As Low As Reasonably Practicable (ALARP). This means that the risk has been reduced to a level that is tolerated by the organization having regard to its legal obligations and its own (Template available **Annex B**)

8.2.3 High risk tasks

LIFTING OPERATIONS: Lifting operations are prepared and executed according to GSR's lifting plan template and the manual of standard lifts. These procedures describe the responsibilities of the lifting team and how to safely plan and execute a lift. It also includes references to Risk assessments for crane lifting operations, working with mobile cranes, rigging of loads, man ridding operations and use of manual hoisting material. GSR shall ensure that cranes and lifting equipment is certified, maintained and operated in accordance with legislative requirements. The area of lifting operations shall be signed and cordoned to prevent unauthorised persons from entering the area. The person in charge of the lift shall ensure that no personnel are standing under any lift or slew operation. The following aspects shall also be considered for the safe performance of lifting activities:

- Development and implementation of a documented lift plan.
- Suitable and adequate assessment of the risks associated with the lifting operation.
- Correct selection and use of appropriate equipment.
- Use of equipment which is well maintained and in good condition.
- Clarification of roles and responsibilities for the lifting operation.
- Involvement of trained and experienced personnel who have been assessed as competent.

WORKING AT HEIGHT: Working at height involve all activities and conditions in which the operator is elevated from the ground level and faces the risk of falling. GSR applies the fall protection hierarchy (eq. CPE before PPE) for the selection and management of equipment. This means that in first place GSR will assess the possibility of carrying the works as close as possible to ground level to avoid falls, when not possible platforms, scaffolds and guardrails will be provided to the operators works, and additionally fall arrest equipment shall be provided to minimise the impact of falls. All Works related to working with scaffolding, fall arrest, ladders, man-riding basket or mobile elevating work platforms shall be Risk assessed, regardless of the height involved. The following aspects shall be taken into account for Works at height:

- Access and egress from workplace
- The working conditions, nature, and duration of Works.
- The distance of potential fall.
- The need and conditions for easy evacuation in case of emergency.
- Additional Risks related to the specific equipment being used at height.

WORKING WITH HAZARDOUS SUBSTANCES: Hazardous substances include, but not limited to, oil, grease and degreasing agents, fuels, asbestos, painting, and rust/paint removal. Whenever an activity required the use of such substances proper controls shall be in place to protect the health of the employees and the environment. The following aspects shall be considered when working with hazardous substances:

- Hazardous substances shall be properly packed and labelled according to the Globally Harmonised System of Classification and Labelling of Chemical (GHS).
- A Safety Data Sheet for all hazardous substances shall be made available in the Project Offices (Project specific hazardous substances).
- Hazards products shall be stored, transported and disposed as specified in the Safety Data Sheet file, the MARPOL 76/78 convention, the European legislation REACH and local regulations.
- Personnel that may be exposed to hazardous substances shall be informed and trained about the Risks and Safe Work Procedures.

NODULE HANDLING (Annex C): During handling of Nodules after collection from the seabed. The following measures should be taken:

- Avoid any contact with skin, face, nose and mouth
- Use of gloves fit for the purpose.
- Washing of working clothes after every shift.

MAINTENANCE: the hazards in maintenance and mechanical operations involve the handling of hydraulic tools under pressure and manual tools, working with hoses and working on engines and pressure valves. The following aspects shall be taken into account when performing maintenance works:

Ensure the vehicle is earthed to the main vessel before approaching.

- Apply the “lock out tag out” procedure for electrical tools.
- Ensure the correct Permits To Work are in place.
- Verify the calibration of tools and pressure levels before beginning operations.
- Ensure suitable working conditions, illumination, produced noise, safe guards from moving parts and fumes from fuels when working on fuel tanks.
- Leakages and disposal of fuels shall follow the guidelines for working with hazards substances and spill prevention.

USE OF POWER TOOLS: Power and hand tools shall be used in accordance with the manufacturer’s instructions. Tools must be operated only by competent workers who are knowledgeable in the safe use, limitations and maintenance of that tool. Tools will operate at the lowest voltage necessary for the task. Power tools include, but not limited to, electrical hand tools, high pressure cleaning tools, gas and electrical welding and cutting tools, pneumatic tools and hydraulic tools. The use of power tools may also occur during maintenance works related to repairs of the vehicle or related infrastructures to facilitate the assembly and disassembly of flanges, mechanical works and electrical installation works.

Only authorised and qualified personnel may undertake these kind of Works. This will be controlled by the vessels PTW system. The following aspects shall be taken into account when using power tools:

- Working on or near live exposed equipment shall be avoided whenever practicable.

- All electrical equipment shall be considered live unless proven de-energised.
- Personal protective equipment shall be used and emergency plan shall be in place.
- All power tools shall be used only for the intendent purpose as specified by the manufacturer.

9 Training

The need for training is based on applicable recognised training standards, Risk assessments, high risk tasks, and Contractual requirements. Access to Project sites will not be permitted to individuals who have not done the required trainings, whose certificates have expired or who cannot deliver the certificates.

All CIIC-SR personnel shall be able to understand and communicate in the English language to perform his/her job function. The subcontracted personnel's supervisors shall be able to understand and communicate in the English language.

The minimum training and identification requirements for working on the project are:

- Vessels safety induction.
- Project Safety induction.
- BOSIET (OPITO Approved)
- Helicopter Underwater Escape Training (HUET), including CA-EBS
- Appropriate offshore medical certificate
- Valid passport, including US Visa approval.

Specific trainings will also be required when necessary for crew and staff as:

- 1st aid rescue;
- Working at height;
- Contact with hazardous Substance;
- Welding, electricity;
- …

10 Database Management

10.1 The necessity of a GIS

Since the 1970s, several offshore campaigns were conducted in the CI EEZ for seabed mineral exploration. During these campaigns, a significant amount of data was gathered and is very interesting for CIIC-SR resource assessment. They also conducted their own campaign (CIICSRNOD19) in September 2019.
In order to make every information easily accessible, managed and used by all involved people, the development of a geographic information system (GIS) has proved very valuable and useful.

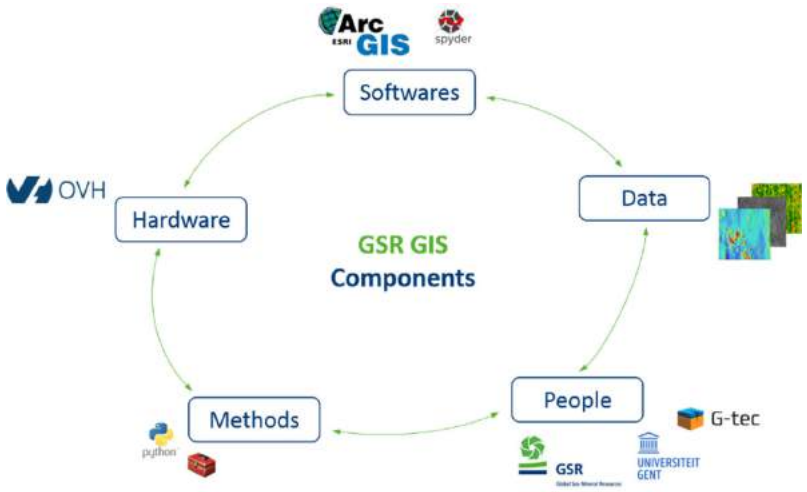
A GIS captures, stores, analyzes, manages, and presents data that is linked to location. It provides a framework for gathering and organizing spatial data and related information so that it can be displayed and analyzed (source: wiki.gis.com).

A GIS is composed of 5 main parts:

- People
- Data

- Hardware
- Software
- Methods

For CIIC-SR project, the GIS support is performed by G-tec SA.



The five components in GIS for GSR project.

10.2 Hardware and software environment: accessibility and safekeeping

This section details the IT & GIS infrastructure chosen by G-tec. From an end-user point of view this section can be seen as a description of cloud's components.

10.2.1 Hardware

G-tec is used to work with dedicated external server. The advantages of external servers are:

- **Security**: datacenter is located in a secured building (protected against fire, overheating, electrical breakdown, intrusion…). In addition, the server is not shared and G-tec has the full control on it.
- **Stability**: servers are planned to work continuously and in case of damage on some components, replacing can be done without shutting down of the machine.
- **Performance**: all components (processor, memory, GPU…) of the server are evaluated to ensure the best performance for GIS purposes. Datacenters offer high bandwidth rate which is a guarantee of best accessibility even during peak of load due to large number of users.

G-tec has been working with OVH's server for several years (2013 to now) and had never encounter major issue related to security, accessibility, or performance trouble.

Currently the datacenter in which G-tec owns a dedicated server is in Roubaix (France). This location ensures a good connectivity for end-users from Europe.

More information available on: https://www.ovh.co.uk/dedicated_servers/

10.2.2 Software

ESRI Technologies

ESRI is the market leader for delivering GIS and geospatial analytics solutions for more than 40 years (Curran R., 2016). This company offers the most extensive capabilities to capture, analyze and deliver spatial data. To take advantage of new technologies evolution and being able to propose the most powerful GIS application to explore geophysical, geotechnical and operational information to their customers G-tec is used to work with ESRI technologies and ArcGIS environment. ArcGIS platform contains all software solutions to deploy a modern GIS:

ArcGIS Desktop & ArcGIS Pro: ArcGIS Desktop and ArcGIS Pro are major software's to compute and visualize data. Those software are dedicated to GIS specialists in order to design models of the world across geographic data and processes.

ArcGIS Enterprise: ArcGIS Enterprise is made of ArcGIS Server and Portal which work together to provide a robust web-GIS environment. In ArcGIS Enterprise, GIS – Administrators are able to manage users, database, geographic information shared on the web and to monitor server performance. This server-side software is at the core of GIS solution for GSR.

Number of apps: in order to provide proper representation and tools required by customers, ESRI has developed numbers of dedicated applications. Those applications must be configured and/or extended to be used in specific situation. ESRI also provides solutions to create in WYSIWYG (What You See Is What You Get) mode web application.

Development environment: numerous SDK (Software Development Kit) and API (Application Programming Interface) are provided for specific platform (Web, Windows, Android, IOs…).

More information is available on:
https://developers.arcgis.com/documentation/core-concepts/what-is-arcgis/ .

In the case of CIIC-SR project, the desktop solutions of ArcGIS are used to implement and managed file geodatabases containing most gathered and produced data. These can be geographic features, geolocated images (raster's) or non-geographic data such as tables and reports.

The CIIC-SR file geodatabases are stored on the dedicated server presented in the previous chapter. From there, maps are produced and shared as services using ArcGIS Server.
Finally, a web application has been developed through ArcGIS Portal where the different services are consumed. This application can be considered as a dynamic view of CIIC-SR databases. It is very useful for quick data visualization but also to access other linked documents such as reports or pictures.

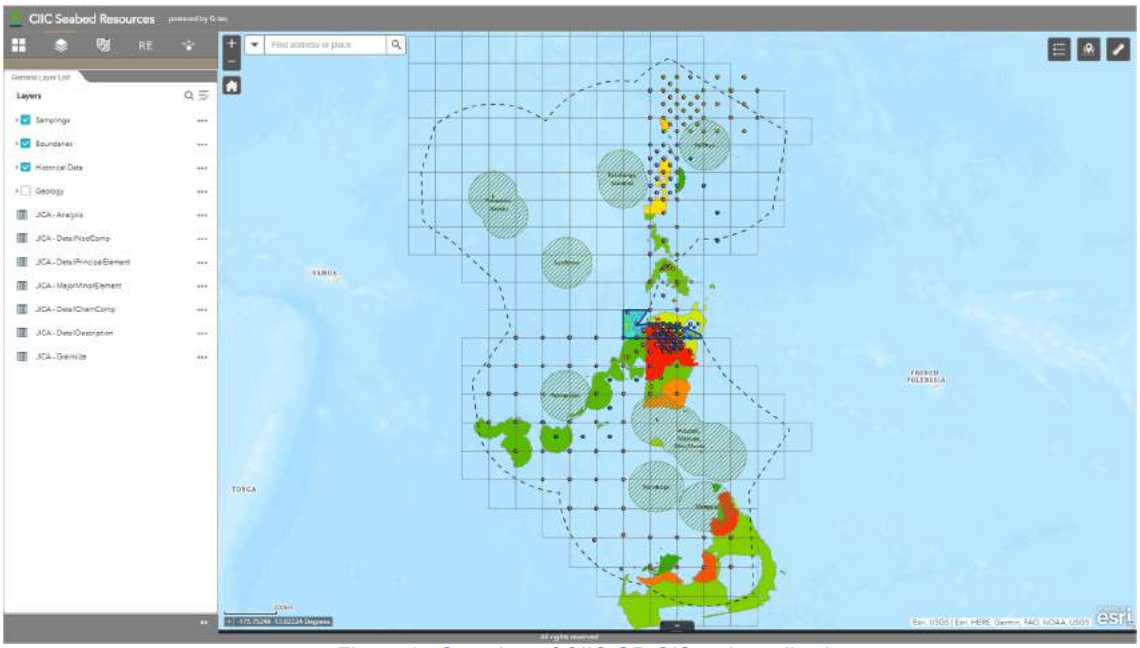


Figure 1 : Overview of CIIC-SR GIS web application.

Data mining & administration using Python

Data have little interest by themselves. To bring knowledge and ability to take better decision they need to be transformed into information. To achieve this goal GIS software's sometimes need to be extended with external modules or across processes. G-tec has acquired a strong experience in using Python language to bring more power inside GIS like live tracking, big data analysis, machine learning and administration.

For example, because no standard software was available, a Python algorithm has been developed to process more than 50,000 AUV pictures in order to identify and quantify the presence of nodules on the seabed. This algorithm combines existing libraries and customized function.

10.2.3 Security

As already mentioned, CIIC-SR data are stored on an external server which ensure good security. Weekly backups are made on an external hard disk and GIS manager's personal computer. Both are encrypted.

Regarding the web application, only authorized users can access it using personal login and password.

10.2.4 CIIC-SR Database structure and data integration

As explained in the previous chapter, it was chosen to store the data gathered during historical and future campaigns creating file geodatabases in ArcGIS desktop shows the general tree of implemented data structure.

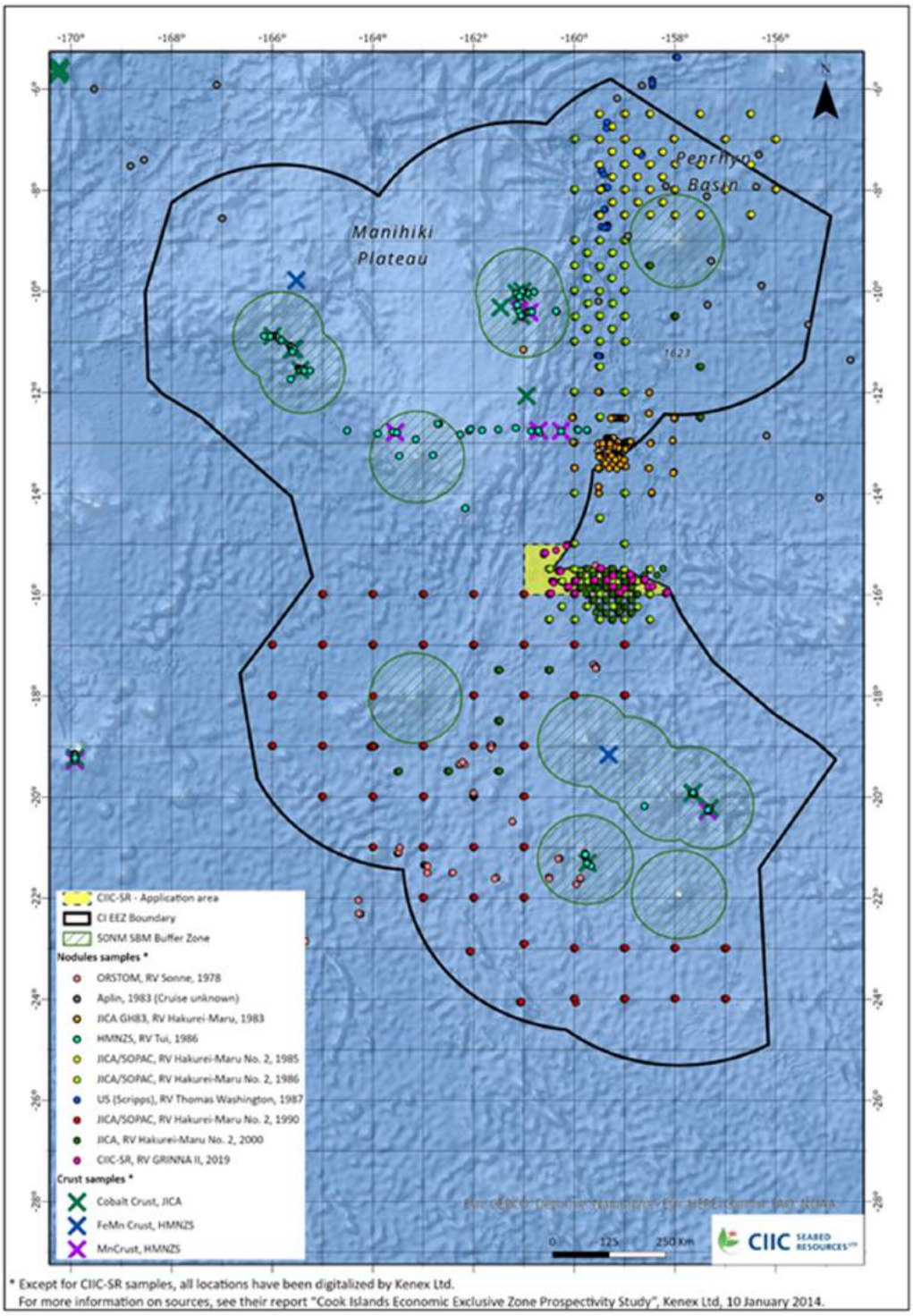
The main directory is divided in four file geodatabases depending on the type of data.
The two main databases named "Project Features" and "Imagery" are used to store survey data from CIIC-SR missions but also recent data from other sources.

“Project Features” contains vector data (points, lines, and polygons) such as sampling locations or boundaries and attached tables (for example samplings description attached to samplings locations).
For the moment, no imagery data were acquired by CIIC-SR. Therefore, “Imagery” contains general raster information such as GECBO bathymetry (https://www.gebco.net). In the future, imagery survey data from CIIC-SR campaigns will be integrated in this database: multibeam, backscatter, side scan sonar, etc. These data can be surveyed directly from the vessel or with an AUV (Autonomous Underwater Vehicle).

Given the large amount of historical data available in the CI EEZ area, a dedicated database has been created to store all this information. The Table below lists all offshore campaigns conducted in the CI EEZ area since the 1970s.
In 2013, the Cook Islands Seabed Minerals Authority mandated Kenex Ltd. (http://www.kenex.com.au/) to digitalize and create a GIS database from historic cruise data. Based on these data, they were able to conduct a resource estimation study on the overall area (Kenex Ltd., January 2014) (Kenex Ltd., December 2014).
This information were integrated in the CIIC-SR database and consist mainly of samples location, analysis tables and seabed pictures. Referring to the table below, integrated data were gathered during cruises RV Sonne (1978), RV Hakurei Maru (1983), RV Hakurei Maru 2 (1985, 1986, 1990, 2000), HMNZS Tui (1986), RV Thomas Washington (1987).

Research Vessel & Year of Survey	Survey Area	Surveyed Commodity
RV Tangaroa (1974)	Rarotonga, Cook Islands	Manganese Nodules
MV Ravakai (1976)	Area between Rarotonga and Penrhyn	Manganese Nodules, Metalliferous Sediment and Phosphate
RV Acheron (1977)	Southern Group, Cook Islands	Precious Coral, Manganese Nodules
RV Coriolis (1977)	Selected areas within the EEZ of the Cook Islands	Manganese Nodules
RV Machias (1978)	Penrhyn and Samoa Basins, Nearshore waters of the Cook Islands	Manganese Nodules and Precious Coral
RV Sonne (1978)	West of Rarotonga and Aitutaki Passage	Manganese Nodules
RV Machias (1980)	Northern Cook Islands	Manganese Nodules, Phosphate, Precious Coral
RV Machias (1980)	East of Penrhyn Island, Penrhyn Basin, Penrhyn, Manihiki, Nassau Islands	Manganese Nodules, Precious Coral, Phosphate
RV Sonne (1980)	Aitutaki Passage	Manganese Nodules
RV Hakurei Maru (1980)	South Penrhyn Basin	Manganese Nodules
MV Ravakai (1983)	Slopes of Rakahaga and Manihiki Atoll	Precious Coral
RV Hakurei Maru (1983)	South Penrhyn Basin	Manganese Nodules
RV Hakurei Maru 2 (1985)	Western Penhryn Basin, eastern margin of the Manihiki plateau and the North of Penrhyn Island.	Manganese Nodules
HMNZS Tui (1986)	Manihiki Plateau and adjacent Southwest sea areas	Cobalt-rich Crust, Manganese Nodules
RV Hakurei Maru 2 (1986)	Western edge of the southern Penhryn Basin (to the east of the Manihiki plateau)	Manganese Nodules
RV Moana Wave (1987)	Cook Islands: Suwarrow trough, eastern Manihiki Plateau, Rakahaga-Manihiki island area	Cobalt-rich Crust and Metalliferous sediments
RV Thomas Washington (1987)	Northern Cook Islands and adj acent High Seas	Manganese Nodules, Cobalt-rich Crust, Deep Sea Sediment
RV Sonne (1990)	North-east edge of Manihiki Plateau	Complex of Volcanic Cones and mineral resources
RV Hakurei Maru 2 (1990)	Southern Cook Islands	Manganese Nodules
RV Hakurei Maru 2 (2000)	Central Cook Islands (i.e. Southern Penrhyn Basin)	Manganese Nodules
RV Sonne (2007)	Manihiki Plateau	Petrological and geological plateau development, Manganese Nodules

Summary of previous offshore research and minerals exploration in the Cook Islands (Applied Geoscience and Technology Division (SOPAC))

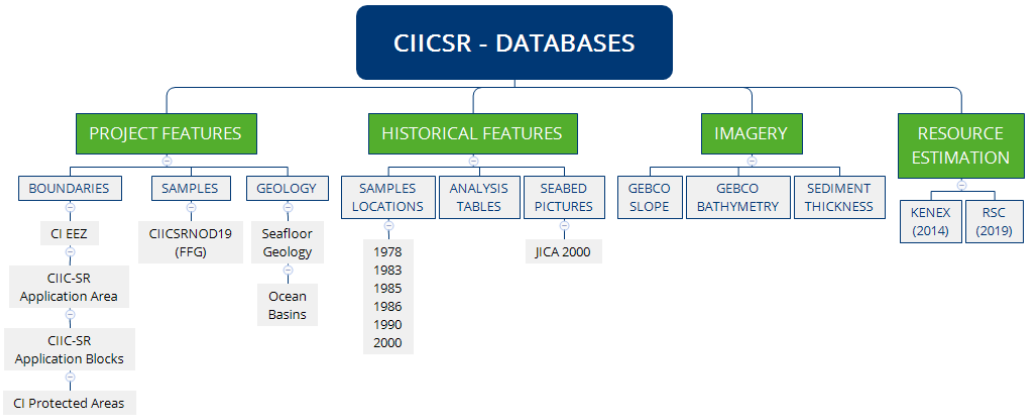


Map of all historical samples integrated in the CIIC-SR database and free-fall grabs sampled during CIICSRNOD19.

Finally, a fourth database has been created to store all results obtained through resource estimation studies. Results obtained by Kenex study mentioned above were integrated. In 2019, RSC Consulting Ltd conducted their own resource estimation study specifically on CIIC-SR

application area, following GSR request. These results were integrated too (see “Cook Islands Polymetallic Nodule Project:
Technical Report and Mineral Resource Estimate of the CIICSR Exploration Area, Sean Aldrich, MSc MAusIMM, 15 February 2019).

It is important to notice that the spatial references for all CIIC-SR geodatabases are GCS WGS 1984 as geographic coordinate system and WGS 1984 UTM Zone 4S as projected coordinate system.



Tree structure of databases for CIIC-SR project.

10.3 Data content and description

10.3.1 Project Features

Boundaries	
Type(s)	Polygons
Description	Boundaries of specific areas in the Cook Islands EEZ
Content	CI EEZ, CIIC-SR application area, CIIC-SR application blocks, CI protected areas
Attachment(s)	None

Samples	
Type(s)	Points, Lines
Description	All samples acquired by CIIC-SR during offshore campaigns. Each feature has an attribute table with specific information.
Content	Free-fall grabs acquired during CIICSRNOD19.
Attachment(s)	Description sheets (PDF), nodules description sheets (PDF), pictures (JPG)

Geology	
Type(s)	Polygons

Description	General geology information taken from Kenex Ltd. GIS data package
Content	Seafloor geology, ocean basins
Attachment(s)	None

10.3.2 Historical Features

Historical Samples	
Type(s)	Points
Description	Samples acquired during historical cruises in 1978, 1983, 1985, 1986, 1987, 1990 and 2000
Source	SHP files from Kenex Ltd. data package
Content	Samples location and attribute table containing specific information
Attachment(s)	None

Historical Analysis	
Type(s)	Tables
Description	Sample analysis tables associated to historical samples points feature.
Source	SHP files from Kenex Ltd. data package
Content	General analysis, detailed chemical composition, detailed nodules composition, grainsize, principal element, major/minor element, general description
Attachment(s)	None

JICA Pictures	
Type(s)	Points
Description	Seabed pictures acquired by JICA/SPOCA during 2000 offshore campaign.
Source	SHP files from Kenex Ltd. data package
Content	Pictures location in CIIC-SR application area
Attachment(s)	Pictures (JPG)

10.3.3 Imagery

GEBCO bathymetry	
Type(s)	Raster
Description	Global terrain model for ocean and land at 15 arc-second intervals, +/- 450x450m resolution.
Source	GEBCO Compilation Group (2020) GEBCO 2020 Grid (doi:10.5285/a29c5465-b138-234d-e053-6c86abc040b9)

GEBCO slope	
Type(s)	Raster
Description	Slope raster in percent derived from GEBCO bathymetry model (same resolution).
Source	GEBCO Compilation Group (2020) GEBCO 2020 Grid (doi:10.5285/a29c5465-b138-234d-e053-6c86abc040b9)
Sediment Thickness	
Type(s)	Raster
Description	Sediment thickness in centimeters over the CI EEZ. Resolution is about 10km cellsize.
Source	Kenex Ltd. data package from their prospectivity study

10.3.4 Resource Estimation

KENEX - Prospectivity	
Type(s)	Polygons
Description	Prospectivity study results obtained by Kenex Ltd. In 2014
Source	Cook Islands Economic Exclusive Zone Prospectivity Study, Kenex Ltd, 10 January 2014
Content	Potential classification, Prospectivity Classification, Final targets
Attachment(s)	None

KENEX - Probabilistic	
Type(s)	Raster (resolution +/- 5km)
Description	Probabilistic study results obtained by Kenex Ltd. In 2014
Source	Probabilistic Valuation of Cook Islands EEZ Seabed Minerals Acreage, Kenex Ltd, December 2014
Content	Estimated abundance in kg/m²
Attachment(s)	None

RSC	
Type(s)	Grid (2x2km)
Description	Abundance classification obtained by RSC Consulting Ltd. In 2019
Source	“Cook Islands Polymetallic Nodule Project: Technical Report and Mineral Resource Estimate of the CIICSR Exploration Area, Sean Aldrich, MSc MAusIMM, 15 February 2019
Content	Abundance range classes (in kg/m²) over CIIC-SR application area
Attachment(s)	None

Annex A: Handling hazardous substances

Purpose and Scope

This procedure defines the rules of purchase, storage, application and disposal of substances in the office, on board of the vessels and at the project sites to protect the health of the employees (COSHH!) and the environment.

Product Information

Labels on the Packing and Hazard Identification

The new labels on packages are according to the new European legislation on chemical "Registration, Evaluation, Authorization and Restriction of Chemicals" (REACH).
REACH further is a based on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) of the United Nations Conference on Environment and Development (UNCED). The GHS which contains harmonized criteria for classification and labelling of chemicals has been developed for facilitating worldwide trade while protecting human health and the environment.

GHS Pictogram ð

Figure XX: Example of a Label according to REACH

Warning Symbols for Hazardous Substances

The warning symbol is always accompanied by a Hazard Statement Code or H-code, e.g. H300, H332. (For the denotation, see Table below). It will be checked on a regular basis whether all substances are properly labelled with the composition of every product and warning symbols.

Table XX: Example of Hazard Statements for Hazardous Products

Toxic

Acute toxicity (oral, dermal, inhalation).

H300:Fatal if swallowed

H300:Fatal if swallowed

H301:Toxic if swallowed

H310:Fatal in contact with skin

H310:Fatal in contact with skin

H311: Toxic in contact with skin

H330:Fatal if inhaled

H330: Fatal if inhaled

H331: Toxic if inhaled

Comparison between old and new Sign

	Toxic	Harmful	Irritant	Hazardous for the environment	Corrosive	Explosive
Old signs						
New signs						

Safety Data Sheet

- The Safety Data Sheet (SDS) enables the employer to determine the hazards of chemical agents present in the workplace and to assess any risk to the health and safety of workers arising from their use.
- The SDS gives guidelines for spill management and environmental precautions.
- The SDS gives information about a product with the intention to be able to use, store and transport the product without harm for health and environment.
- The safety data sheet consists of several numbered headings according to art.31 of 1907/2006/EC. (see example of SDS's available at the project site or vessel)
- The Hazard Statements and precautionary statement are also included in the SDS.

Product Data Sheet

The Product Data Sheet (PDS) ([1]) gives information how to use a product with the intention to be able to use the product effectively and without harm for health and environment.

Work Procedure for the Safe Use of the Product

A work instruction of the specific application of the product, also called COSHH Assessment, has to be available on the project site or vessel if the risk assessment indicates as such. The basis for the work instruction is the MSDS from the supplier. Following points need to be covered :

- What are the dangers, and to whom
- What is the task involved
- Which control measures could prevent harm
- Make sure these control measures are in place and check that they work

([1]) Manufactures use also other names as "technical data sheet".

Register of Chemical Products

- A register which contains all hazardous products used has to be available on board or at the project site.
- In the register following data are registered.

  - Name of the product.
  - Name of the producer (additionally).
  - Impact classification (product category).
  - Activity: the way how the product is supposed to be used.
  - Indication on health, safety and environmental hazard (based on the R-phrases)
  - Link to the SDS file of the product
  - For hazardous products within the danger categories D or E, the PPE that have to be worn have to be identified by using e.g. the PPE matrix (see **Ref. 2**).

Introduction of new Products

General Principles for Prevention when introducing new Products

The first consideration is to prevent exposure by removing a substance or by replacing it with a less harmful one.
If removing or replacing the product is not possible, control of exposure may be achieved by any combination of the following:

- Total or partial enclosure of the process and handling systems.
- Use of plant, processes and systems of work which minimise the generation of, or suppress and contain, spill, leaks, dust fumes and vapours of hazardous substances.
- The limitation of the quantities of a substance at the place of work.
- Keeping the number of persons who might be exposed to a substance to a minimum, and reducing the period of exposure.
- Prohibiting eating, drinking and smoking in areas that may be contaminated by the substance.
- Hygiene measures, including providing adequate washing and laundering facilities and regular cleaning of walls/bulkheads and other surfaces.
- The designation of those areas which may be contaminated and the use of suitable and sufficient warning signs.
- The safe storage, handling and disposal of hazardous substances and use of closed and clearly labelled containers.
- Control the preventive measure by a permit to work.
- Have means available to clean spills and to handle possible emergency situations.

Procedure for new Chemical Substances

All people responsible for introducing new products ([2]) should carefully read the Safety Data Sheet (SDS) and if possible the Product Data Sheet (PDS) before they introduce or use any hazardous substance for the first time. The SDS can help them to reduce the risks (but not the underlying hazard) associated with the materials on board of the vessels or at the project sites.

([2]) chemical that is not in the list of approved chemicals on board of a vessel or at the project site.

The purchaser is responsible for the delivery of the SDS to assure that **the product is not used before** the assessment by the QHSE department/ QHSE Engineer has been done**.**
Hazardous products belong to categories B or C according to the categorizing of products.

Category A: Products without direct demonstrable hazards

Category B: Products with demonstrable hazards that were ordered previously and comply with the QHSE standards of DEME Offshore.
Hazards of hazardous substances **Ref.1**

Category C: Products with demonstrable hazards, for which no appropriate specifications are available. For products of this category the QHSE department must be consulted.
Hazards of hazardous substances **Ref.1**.

If a subcontractor uses hazardous products on a project site ([3]) he has to deliver the SDS, PDS and a risk assessment and/or work procedure if necessary to the project management.

Product without Warning Symbol

If the SDS or the label on the package doesn't have a warning symbol for a hazardous substance the fabricator and/or supplier will be contacted for requesting the hazards resulting out of the nature of the substance. The substance will be added to the register of chemicals on board of the vessel or at the project sites.

Product with Warning Symbol

Important!
If the SDS or the label on the packing contains a hazard sign and a danger or warning statement (see §0) for a hazardous substance, the QHSES department has to assess the risks for the health of the employees and the environment before the first purchase of the substance. The product may not be used before the assessment of the QHSES department.

The purchaser is responsible for the delivery of the SDS to assure that the product is not used before the assessment by the QHSE department has been done.
When assessing the risks the QHSES department will consider the items of §0 above. (See also UK chemical substances regulation 2002 "CHIP")
If acceptable for use on site and if required by the risk assessment "Handling Hazardous Substances" (**Ref.1)**, a safe work instruction will be drawn up and the product will be added to the approved list on board of the vessel or on the project site with indication of the required protective measures and the way of discharge.
The first order of a new hazardous substance has to be signed by an authorized QHSE-officer.
The SDS will be added in the company file with hazardous products and a copy will filed on board of a vessel or a project site where the product is used.
The package of this of the Hazardous Products has to be labelled according to §0 above.

Control of Exposure of Products Hazardous for Health and Environment

General Rules to be applied for all Substances

- Wear safety gloves during any prolonged contact.
- Do not eat, drink or smoke during use.

([3]) docking is also considered as a project site. The project manager is a technical superintendent responsible for the docking.

- Wear protective clothing. (overall)
- Wear a mask EN149:2001 FFP3 if there is any risk of inhalation when applications involving pressure sprays are used.
- Availability of safe means for removal of spills in an environmentally correct way.

Transport of dangerous goods by water

IMDG Code or International Maritime Dangerous Goods Code is accepted as an international guideline to the safe transportation or shipment of dangerous goods or hazardous materials by water on vessel. IMDG Code is intended to protect crew members and to prevent marine pollution in the safe transportation of hazardous materials by vessel.

It is essential that dangerous goods are packed and marked fully in accordance with regulations. The IMDG Code defines methods of packaging and advices on terminology, packaging, labeling, placarding, markings, stowage, segregation, handling, and emergency response. Transports should always be accompanied by a duly completed IMO Dangerous Goods Declaration form and the corresponding SDS sheets.

Rules to be applied for Hazardous Substances in use

- Following documents have to be available on board of a vessel or on a project site:
  1) In the master's files or the project manager's files:
     - For all chemical substances: A copy of the SDS.
     - For all hazardous substances: A copy of a datasheet how to apply the product safely.
     - The product register similar to "**Ref.1**" on board of the barges or on the project site.
  2) In the document holders in each store with hazardous substances:
     - A copy of the SDS of the hazardous substances.
     - A copy of a datasheet how to apply the hazardous product safely.
     - The products register similar to "**Ref.1**" on board of the barges or on the project site.
- Apply the safety measure according to the SDS or the specific safety procedure for the product.
- Apply the guidelines according to the SDS with regard to spill management, environmental precautions and storage.
- If you have any questions or doubts, consult the available documents or ask a supervisor for further information.

Specific Products with Environmental Requirements

Bunkered Fuel for Ships

Requirements for bunker fuel are among others:

- Sulphur content
- Delivery note to comply with appendix V of Annex VI of MARPOL 73/78.

Waste products

Hazardous waste products are collected separately and removed by a certified waste processing company. A paper proof confirmation of collection of the waste has to be obtained.

The compatibility of the waste types mutually and the material of the recipient or the container in which the waste is collected, should also be taken into account.

The recipients and containers have to be such that:

- Storage is environmental-friendly: no leak(age), protection against rain;
- All receptacles and containers are marked with their determination, i.e. the description of the garbage category or the type of the appropriate waste.
- Warnings are shown for specific dangers e.g. poisonous material, material dangerous to health, fire)
- Storage causes no bad smell.

Storage of Hazardous Products

General

Hazardous products may only be stored in a dedicated room, taking into consideration the risks mentioned in the SDS.
All flammable products (e.g. paints, aerosols,…) must be stored inside a fireproof locker. Flammable products will to be kept away from oxidizing products. Products that are hazardous for the environment (e.g. hydraulic oil) and irritating products will be stored on top of drip trays. These drip trays will have a collecting volume of the biggest barrel and at least 10% of the total volume of the barrels. Corrosive products (e.g. acids) will be stored on top of corrosive resistant drip trays with a collecting volume of the biggest barrel and at least 10% of the total volume of the products stored on the drip tray. Hazardous waste will be collected and stored separately and transported according to the hazardous nature of the product.
For hazardous products a SDS has to be available in the storage room. So it can be consulted by the user of the hazardous product.

Rules for Products inconsistent to Each other for Storage

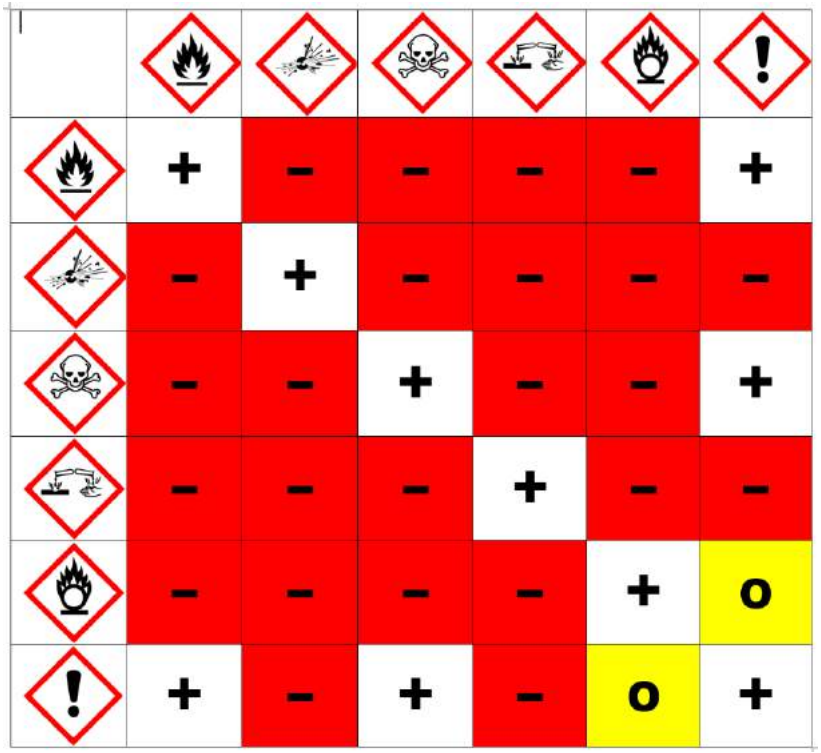
Some products are inconsistent with each other for storage.
Information to determine inconsistence = SDS:

- Chapter 3: identification of the hazard;
- Chapter 7: management of the storage.

The most typical example: caustic and acid products may not be stored together.

Table 1: Inconsistency for Storage between generic Groups

+	Can be stored together.
-	Can **NOT** be stored together.
O	Can only be stored together if **specific measures** has been taken.



Disposal

On Board of Vessels

Apply the garbage management plan on board of the vessels. (See ISM-system of the vessel and ref. 5)

At a Project Site

Apply the project garbage management plan referred to in the HSE-plan.

Training

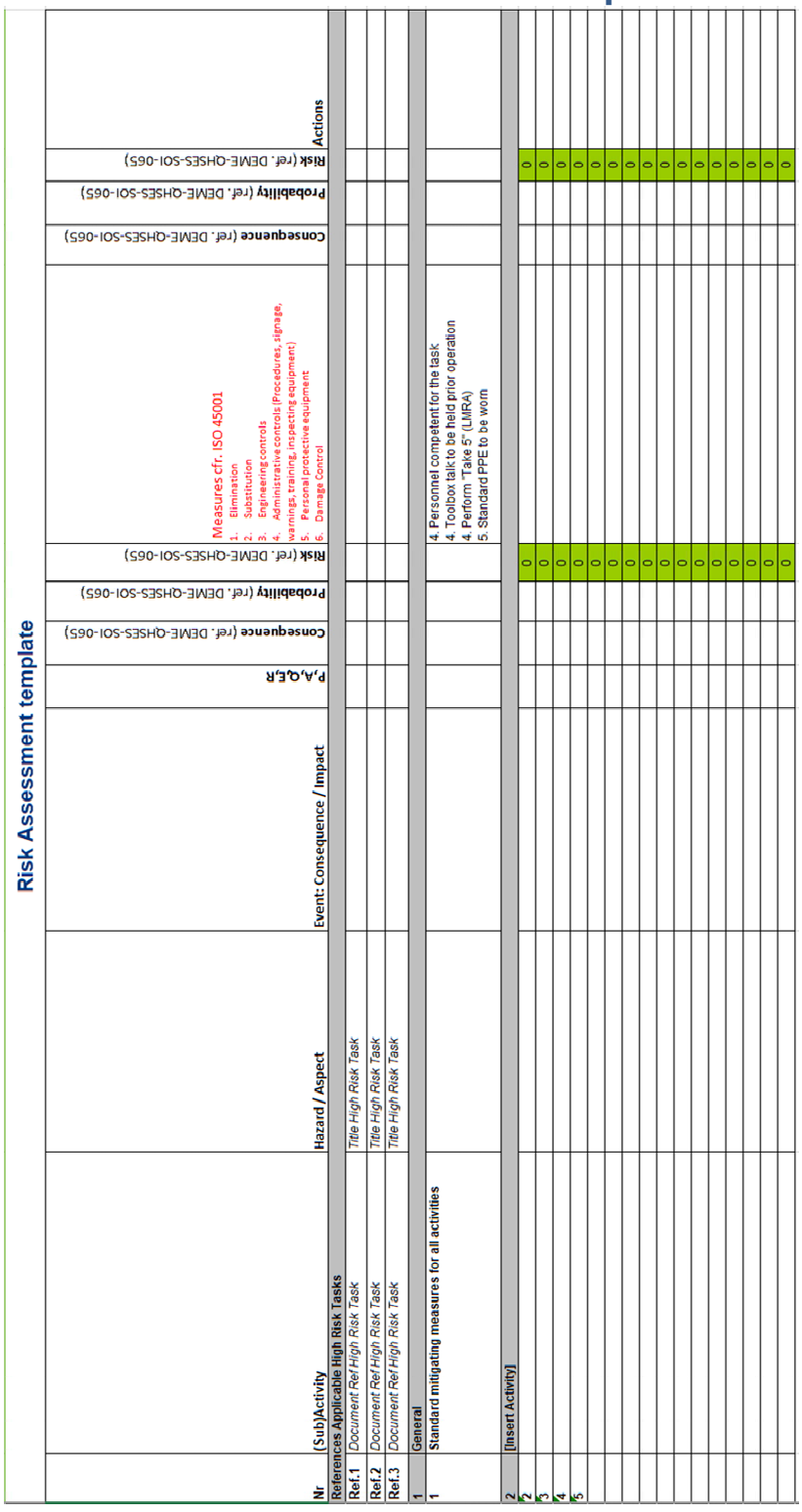
All personnel that have to come in contact with a hazardous Substance are to have sufficient and adequate training to be able to work safely with the substance and to ensure that third parties and the environment are also kept safe whilst they are working. For this purpose safety information and if applicable 0 above) must be available and good job preparation is required.

Emergencies

In case of accidental contact with eyes, ingestion or inhalation consult the SDS and call for a doctor or emergency services. ([4])
In case of fire or spills consult the SDS of the substance and call the emergency services if necessary as per vessel or project emergency plan.
Before starting the job, evaluate which emergency response material must be at hand e.g. fire extinguisher, spill kit, eye wash.

([4]) The required safety information (Safety Data Sheet (SDS) and COSHH or Product Data Sheet (PDS)) is available in the document holder in the place where the product is stored and in the Project Office or Master's office.

Annex B: Risk Assessment Template



Risk Assessment template

Nr	(Sub)Activity	Hazard / Aspect	Event: Consequence / Impact	P,A,Q,E,R	Consequence (ref. DEME-QHSES-SOI-065)	Probability (ref. DEME-QHSES-SOI-065)	Risk (ref. DEME-QHSES-SOI-065)	Measures cfr. ISO 45001 1. Elimination 2. Substitution 3. Engineering controls 4. Administrative controls (Procedures, signage, warnings, training, inspecting equipment) 5. Personal protective equipment 6. Damage Control	Consequence (ref. DEME-QHSES-SOI-065)	Probability (ref. DEME-QHSES-SOI-065)	Risk (ref. DEME-QHSES-SOI-065)	Actions
References Applicable High Risk Tasks												
Ref.1	*Document Ref High Risk Task*	*Title High Risk Task*										
Ref.2	*Document Ref High Risk Task*	*Title High Risk Task*										
Ref.3	*Document Ref High Risk Task*	*Title High Risk Task*										
1	**General**											
1	**Standard mitigating measures for all activities**							4. Personnel competent for the task; 4. Toolbox talk to be held prior operation 4. Perform "Take 5" (LMRA) 5. Standard PPE to be worn				
2	**[Insert Activity]**						0				0	
2							0				0	
3							0				0	
4							0				0	
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Annex C: Handling PMN nodules

GSR
Global Sea Mineral Resources

P03-GSR-HS-SWP-00001

SAFE HANDLING OF POLYMETALLIC NODULES

Rev.2020-07-23 Uncontrolled if printed. Most recent version is available on Aconex. page 1 of 1

This document has been generated based on Vendor data and the content of it is not reviewed by Chemwatch, so some parts of this document may be incomplete.

Chemwatch: 45-7805

Chemwatch Hazard Alert Code: 4

GHS MINI

Manganese Ore

INGREDIENTS	CAS NO	%	8HR OEL
manganese dioxide	1313-13-9	80	0,2; 0,05 mg/m3
iron	7439-89-6	<3	-
graded sand	14808-60-7.	<2	0,1 mg/m3

GHS

DG

UN No: **Not Applicable**
DG Class: **Not Applicable**
Subsidiary Risk: **Not Applicable**
Packing Group: **Not Applicable**

HEALTH HAZARD INFORMATION

Signal word: Danger

Hazard statement(s):

H372	Causes damage to organs through prolonged or repeated exposure.
H350	May cause cancer.

Precautionary statements(s): General

Not Applicable

Precautionary statements(s): Prevention

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.

Wash hands thoroughly after handling.

Do not eat, drink or smoke when using this product.

Wear eye protection, dust mask, protective gloves and clothing.

Precautionary statements(s): Response

If exposed or concerned: Get medical attention.

Precautionary statements(s): Storage

Store locked up.

Precautionary statements(s): Disposal

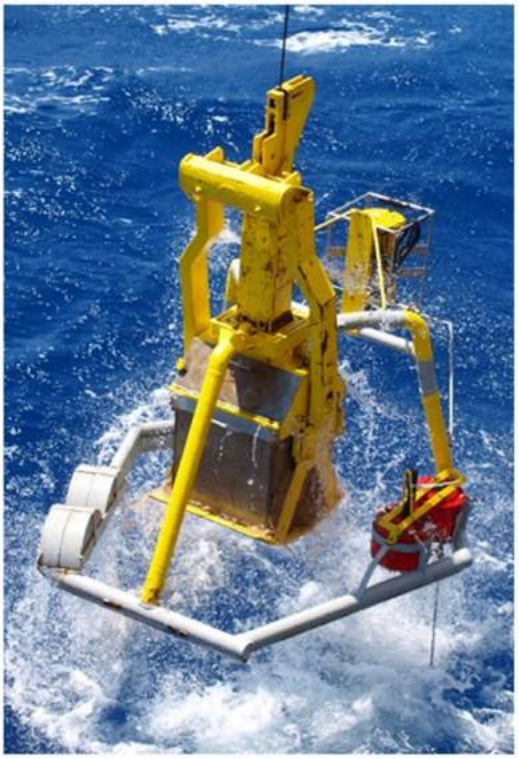
Dispose of contents and container in accordance with local regulations.

CIIC SEABED RESOURCES LTD

Annexes of the CIIC-SR License for Exploration Activities

Annex 06

The approved Local Engagement, Training and Business Development Plan.



Title:	Annex 06 of the License for Exploration Activities
Author:	François Charlet – GSR Exploration Manager
Checked by:	Eusenio Fatialofa – CIIC-SR General Manager
	Samantha Smith–Head of Sustainability & External Relations
Date:	24/01/2022
Reference:	P03-CIICSR-EV-RPT-00001_Annex 06
Version:	2

Signed: ..... On Behalf of: CIIC-SR

Name: Eusenio Fatialofa ..... Date: 24 January 2022

Table of Contents

Abbreviations

AUV	Autonomous Underwater Vehicle
CCZ	Clarion Clipperton Zone
CI	Cook Islands
CI Gov	Cook Islands Government
CIIC	Cook Islands Investment Corporation
CIIC-SR	Cook Island Investment Corporation Seabed Resources
DEME	Dredging, Environmental and Marine Engineering
EEZ	Exclusive Economic Zone
ISA	International Seabed Authority
JVC	Joint venture Company
PMN	Polymetallic Nodules
ROV	Remotely Operated Vehicle
SBMA	Seabed Minerals Authority
SNC	Seafloor Nodule Collector
SOV	Surface Operation Vessel

1. Introduction

The business partnership between Global Sea Mineral Resources–Cook Islands (GSR-CI) and Cook Islands Investment Corporation (CIIC) – to form the joint venture company (JVC) CIIC-SR - is predicated on all parties contributing their respective resources and expertise, focused on activities associated with the responsible exploration and exploitation of polymetallic nodules (PMN). The relationship is based on mutual benefit, to be a leader of the sector within the Cook Islands, to develop best practice deep-sea technology, to develop sustainable ways of accessing and harvesting the resource and to participate across the deep-sea mineral value chain, from technical feasibility to commercial benefits. The relationship is values-based, including providing development opportunities for the Cook Islands nation in the broader sense, preserving the environment where the JVC operates and developing career and providing training opportunities for Cook Islanders.

To achieve the vision, a number of mission statements for CIIC-SR have been developed, to guide the organization from a strategic perspective.

Acting in the best interests of the Cook Islands: the organization is committed to acting in the best interests of the Cook Islands, the environment, and people, by acting in a responsible and ethical manner.

Acting in an environmentally and socially responsible way: in collaboration with well-known universities and international experts, GSR has to date organized seven deep-sea expeditions (including one in the CI EEZ) that have gathered geotechnical data relevant for the design of a prototype nodule collector, as well as environmental data on ecology, biodiversity, in addition to oceanographic, geological, and mineral resource information.

Use of innovative technologies: GSR has a long-term goal of developing a semi-autonomous and adaptive mining system for future seabed polymetallic nodule mining operations. The future system will determine the most operationally efficient and environmentally responsible mining path, while guaranteeing safe execution, integrating forecasted hydrodynamic and sediment transport data, optimal manoeuvrability, and production efficiency of a Seafloor Nodule Collector (SNC), in relation to the dynamic response of a Surface Operation Vessel (SOV) connected through a ~5 km riser, allowing for environmental and resource adaptive management. AUV/ROV equipment and environmental moorings will monitor the environmental impact, before, during and after the deep-sea operations in a specific mining field and adapt the mining production accordingly.

Investing, training, and developing Cook Island staff: CIIC-SR is committed in the development of Cook Islanders (students, young workers…) across the deep-sea minerals sector, through training, internships, scholarships and mentoring.

Long term sustainable returns: the organization is focused on generating a long term returns for the involved trainees in their future professional life, and for the development of the Cook Islands.

These mission statements have been inspired by Schedule 5 of the Regulations, which sets out the headline content for the local engagement, training, and business development plan.

2. Employment, training, and capacity building of the Cook Islands' community

2.1 Employment

In January 2020, CIIC advertised a vacancy for CIIC Seabed Resources Limited (CIIC-SR), General Manager. The vacancy received over one hundred applications and after a robust evaluation of the potential candidates, the inaugural CIIC-SR General Manager, Mr. Eusenio Fatialofa was appointed in May 2020. Eusenio Fatialofa is a Cook Islander and currently CIIC-SR's only resident employee. Eusenio has participated in three seabed mineral expeditions with GSR in both the Cook Islands EEZ and to the Clarion Clipperton Zone in international waters.

CIIC-SR plans to build on the successful September 2019 research campaign in the Cook Islands waters, which entailed a two-week expedition. The research campaign was a first in over two decades within the Cook Islands EEZ and was executed under the supervision of the Cook Islands Seabed Minerals Authority. During the preparation phase and execution of the campaign, CIIC-SR employed several local companies such as Raro Welding, who manufactured the "free fall grab" seafloor sampling equipment based on existing designs and they were used for the collection of nearly half a ton of polymetallic nodules at 5,100m-deep. The campaign also chartered local vessel MV GRINNA II from Cook Islands-based Taio Shipping, along with locally employed crew and technical officers. In addition to the involvement of Mr. Eusenio Fatialofa (engineer from Cook Islands Investment Corporation CIIC), other Cook Islanders took part in the offshore campaign, including Rima Browne, geographical information systems officer from the Seabed Minerals Authority. Rima and Eusenio both have experience on previous deep-sea offshore expeditions. They were also joined by fellow Cook Islanders Junior Tapoki from the National Environment Service's monitoring and compliance Division, and Chloe Wragg, fisheries officer, and data analyst with Ministry of Marine Resources. The at-sea experience during this campaign was valuable training and capacity development for all Cook Islanders on board.

On completion of the campaign, Rima Browne of the Cook Islands SBMA shared information with the general public in a presentation held at the University of the South Pacific (USP) Cook Islands campus on 26 November 2020. The members of the local research team joined her to share their own experiences in the first deep-sea research in the Cook Islands EEZ in over a decade. On display were the PMN samples collected as well as samples of prehistoric Megalodon Shark teeth which were also collected from the seabed floor during the research campaign.

It is anticipated that as the project progresses through exploration to mining, there will be a progressive increase in employment, training, and capacity building opportunities. Due to the technical nature of many of the offshore campaigns and specific vessel and specialised equipment requirements (e.g. remotely operated vehicles), offshore vessels and specialised equipment will largely be sourced outside the Cook Islands. Vessels are typically hired with a dedicated crew and so vessel crew employment will be limited. However, offshore campaigns will need support from local facilities (ports, storage, bunkering, logistics, food, etc.) and this could result in income for local people and businesses.

2.2 Capacity building

The primary objective of CIIC-SR will be to determine, through consultation with Cook Islanders, scientists, NGOs and other stakeholders, technical/environmental and societal priorities and needs for capacity building and development. By recognizing these capacity gaps, the proposed plan of action can be further developed to address the national priorities.

CIIC-SR plans to take the following steps to develop its capacity building program within the Cook Islands:

- Identify, confirm, or review priority issues for action within the CIIC-SR exploration program;

- Explore related capacity needs which are not covered in Section 5 (Plan of Work);
- The Strategy and Action Plan described in Section 5 outline priority issues, capacity constraints and opportunities for capacity building and development as identified in the SBMA tender package provided online. We hope that, through this report, CIIC-SR will meet the expectations set out in these documents;
- The Action Plan will be used to mobilize support from stakeholders to implement the strategies and actions needed to optimize the CIIC-SR scope for the coming 5 years of exploration in the CI EEZ.

2.3 Training Opportunity

CIIC-SR plans to progress the training opportunities to further develop the capacity in the Cook Islands with a Cook Islands National Capacity Building Programme which is currently in the developmental stages. The program will aim to provide education and skill development for Cook Island Nationals in all areas relating to seabed minerals including exploration, marine science, mining, technical expertise, management, and financial and legal expertise. It is hoped that upon successful granting of the exploration license, CIIC-SR will be recruiting potential candidates within the Cook Island to participate in their next offshore campaign anticipated in 2023.

CIIC-SR has committed to provide a training program for young professionals and students from Cook Islands. The program will be elaborated in cooperation with the Cook Islands authorities, selected universities, and industrial partners. The training process aims at transferring knowledge and information to Cook Islanders. The objective is for them to develop their own role in future sustainable economic operations in the deep seas and to build up the relevant capacities and skills in this field of work. This is in line with the principles set forth in principle 9 of the Rio Declaration on Environment and Development.

The training program will consist of three main aspects:

- Undergraduate and master's courses with Universities in New Zealand
- Fellowship in cooperation with Universities in Belgium;
- Internship and traineeship within the contractor and partner companies, including participation in the campaigns at sea;
- Specific professional trainings at sea.

Undergraduate and Master of Science Courses in cooperation with universities in New Zealand (examples)

Bachelor of Engineering (Honors) – Maritime Engineering Majors program is a joint venture organized between Auckland University of Technology (AUT) and the Australian Maritime College (AMC) at the University of Tasmania (UTAS) enables New Zealand students to study maritime engineering. Students spend the first two years in New Zealand and the final two years at AMC in Launceston, Tasmania. You can choose from three majors: Marine and Offshore Engineering, Naval Architecture and Ocean Engineering.

More info: https://www.aut.ac.nz/courses/bachelor-of-engineering-honours/maritime-majors

The 'Master of Science (MSc) by course work and thesis in Marine Biology' program is organized by the faculty of Science. A Master of Science (MSc) will develop technical, laboratory and academic writing skills to prepare for a career in science in the subject of Marine Biology. The MSc will take applicants between two and two and half years of full-time study. In the first year of

the MSc, the participant will take several courses related to the specialist subject area. Next follows in-depth supervised research for 12-15 months and the writing of a thesis.
More info: https://www.wgtn.ac.nz/explore/postgraduate-programmes/master-of-science-by-coursework-and-thesis/overview?subject=marine-biology-msc

Fellowships in cooperation with universities in Belgium (examples)

The "*Master of Marine and Lacustrine Science and Management*" program is organized by the Faculty of Science of the Free University of Brussels, Antwerp University and Ghent University. The Program adopts a multidisciplinary approach integrating physical, chemical, geological, ecological, and societal aspects and including nature conservation and sustainable development. The master program is recognized as part of the European Higher Education Area, under the Budapest-Vienna Declaration of March 2010.
More info: Marine and Lacustrine Science and Management | Vrije Universiteit Brussel (vub.be)

EMerald is a two-year master's programme organised by four European Universities in Belgium. The programme is designed to focus on the following major aspects of Resources Engineering, Characterisation, Processing, Modelling and Management. The programme is organised into four semesters. The first semester will take place in Liège, the second semester in Nancy, the third semester in Luleå and the fourth semester is in one of the four partner Universities. The EMerald Master Programme has been designed to find the right balance between knowledge of resources (geology, landfills, urban mines, reserve characterization and modelling) and process engineering techniques (comminution, sorting, preconcentration, extractive metallurgy and waste disposal).
More info: EMerald - Master in Resources Engineering (uliege.be)

CIIC-SR is interested in exploring other partnerships with local educational institutes and universities, as well as those from neighbouring countries, such as New Zealand, that would be of benefit Cook Islanders.

Internship within the contractor and partner companies

CIIC-SR also would like to offer offshore internship opportunities. The 4–6-week offshore internship is organized and supervised by GSR and will take place during the offshore expeditions (dates to be confirmed), in the CIIC-SR area under application.

As it is required for any offshore safe work, a recognized offshore safety training, the BOSIET, will also be part of the training (also supported by CIIC-SR).

The internship will give trainees a serious introduction to deep-sea technologies, up to the latest high-tech state-of-the-art equipment. It will mostly focus on field works on board of research vessel.

Specific professional trainings

Seminar on Dredging Technologies: The two-week course is organized by the Antwerp Port Training Centre (APEC) in Antwerp, Belgium, and covers all essential theoretical and practical aspects with regard to dredging such as navigating in muddy areas, strategies for the dumping of dredged sediments, the various types of dredgers, dredger simulators, maintenance dredging, large scale projects, spoil recycling, maintenance of dredgers, construction of dredgers, technical aspects and new developments, technical renovation including dredging

technologies for international maritime experts. The APEC course gives the nominee a serious introduction to the latest high-tech state-of-the-art dredging technologies and equipment. The dredging technologies and corresponding environmental management techniques from the dredging industry are indispensable knowledge leading towards sustainable deep-sea harvesting practices.

More info: Home - APEC Port Training

For each training, CIIC-SR will cover the travel, accommodation, and tuition costs for selected trainee during the complete period of the course/internship.

Professional training at DEME / GSR. CIIC-SR, GSR and DEME are also proposing internship trainings (desk study), for a period to be determined with the candidate, to work on specific topics related with marine engineering, marine science, or deep-sea exploration.

The table below summarises an example training program that could be offered by CIIC-SR.

	Year 1 - 2022	Year 2 - 2023	Year 3 - 2024	Year 4 - 2025	Year 5 - 2026
CIIC-SR Training program for Cook Islanders	- 2x Master training for the 'Master of Science (MSc) by course work and thesis in Marine Biology'	- 4 x professional training on board of CIIC-SR vessels during the 2023 offshore campaign. - 2x Undergraduate training for Maritime Engineering (Majors Marine and Offshore Engineering, Naval Architecture, Ocean Engineering)	- 2 x professional training for Seminar on dredging technologies at the Antwerp Port Training Center (APEC) - 4 x professional training on board of CIIC-SR vessels during the 2024 offshore campaign.	- 1 x fellowship training for master's degrees (Ocean & Lakes – BE) - 1 x fellowship training for master's degree (Emerald – BE) - 2 x professional training at the GSR/DEME Head Office in Belgium	4 x professional training on board of CIIC-SR vessels during the 2026 offshore campaign

The training program proposed by CIIC-SR is very ambitious because it involves the supervision of 20 training sessions within the allotted contractual period. The trainings are of a very high quality, and already tested in the past through the program of GSR and CIIC in their respective contract with the ISA.

CIIC-SR is also open to all proposals coming from the Authority regarding the integration of more timely and/or more local training. Some discussions are also underway with scientific institutes in the region, such as NIWA (New Zealand) which could provide opportunities in the education of Cook Islanders, in the field of marine science.

3. Public engagement, collaboration, and information

CIIC-SR recognises the importance of communicating with stakeholders and the need to be proactive and transparent in developing a communication strategy. Understanding stakeholders, affected parties, and communicating with them in a planned, direct, and open manner is a key element of any project. A well thought-out and managed communication programme will contribute significantly to the overall success of CIIC-SR and will assist in managing road-blocks and identifying opportunities such as capacity building.

CIIC-SR will develop a Communication Strategy / Engagement Plan and would welcome the opportunity to consult with the Cook Islands government to ensure that the proposed strategy is one that is considered effective, respectful, and culturally appropriate.

The CIIC-SR Communication Strategy / Engagement Plan will be a working document which will be regularly updated or refined as the CIIC-SR project progresses and as new information and/or issues come to light.

The strategy and/or plan will aim to cover the communication aspects of the future exploration campaigns within the Cook Islands EEZ, to ensure that stakeholders are well informed of CIIC-SR's activities. The objectives are to:

- Inform the public about CIIC-SR exploration activities within the CI EEZ;
- Provide updates and share information about what is being learned as a result of the offshore campaigns;
- Provide opportunities for the public to provide comments, and ask questions and, where relevant and desired, become involved with the project.

CIIC-SR plans to take the following steps to develop its Communication Strategy / Engagement Plan and engagement:

- Establish an in-country CIIC-SR representative to ensure local presence for local interaction about the project (note that this step has been completed).
- Stakeholder mapping (i.e. the identification and analysis of stakeholders) will be needed, in consultation with the Cook Islands government. This will need to be updated on a regular basis.
- A list of expertise and service requirements required for the project will be developed.
- A review and gap analysis will be conducted of the existing relevant local expertise – this will include fisheries experts, marine scientists, sample analysis capabilities, etc.
- Review of local service providers– this will include local businesses that may be able to provide supplies (such as food, fuel) for the exploration campaigns, etc.
- A review of the local (and preferred) communication techniques and technologies – i.e. television (e.g. CITV), radio, print (e.g. CI News, CI Herald), digital media (e.g. websites, newsletters, social media, etc.).
- A review of the local meeting / conference / workshop facilities in which face-to-face meetings, workshops, etc., could be held.
- A schedule (including locations) of consultations will be developed, in consultation with the Cook Islands government.
- Development of educational / informational material for distribution, developed in consultation with the Cook Islands government

CIIC-SR would also be pleased to offer berths on its exploration vessels to appropriately trained Cook Islands government representatives.

4. Preservation and protection of environment

A key goal of the Environmental Impact Assessment (EIA), Environmental Impact Statement (EIS), Environmental Management Plan (EMP) and Monitoring Plan (EP) is to demonstrate that both commercial and environmental objectives can be met, and that the benefits of eventual mining

outweigh the environmental cost. If this cannot be demonstrated, then the mining project should not go ahead.

CIIC-SR is taking a step-by-step, precautionary, approach to project development and a conservative approach to environmental management to ensure preservation and protection of the marine environment is not compromised.

The key elements of the CIIC-SR environmental program are:

- Early, inclusive, transparent, and ongoing engagement with key stakeholders, ensuring their input is considered in project planning;
- A risk assessment approach to project development, including EIA development;
- Demonstration of a step-by-step, precautionary, approach to project development;
- Partnering with the academic community to conduct the research required for baseline and EIA studies and allowing collaborating researchers the freedom to publish their findings;
- Demonstration that environmental effects, such as the sediment plume, can be adequately predicted and monitored;
- Demonstration that the impacts to the seafloor do not represent “Serious Harm” to the marine environment.

Each of these elements is discussed in further detail below.

Early, inclusive, transparent, and ongoing engagement with key stakeholders, ensuring their input is considered in project planning

Meaningful engagement, i.e. truly listening to concerns and taking on board practical suggestions to deal with concerns raised is key to earning stakeholder trust and, ultimately, support. One of the ways CIIC-SR will earn this trust and support is through building positive relationships with stakeholders. One way to obtain feedback is through hosting workshops, ‘think tank sessions’ and asking for stakeholders to review and provide input into important documentation such as the EIS, EMP, MP and Closure Plans.

Additional multi-stakeholder workshops and/or information events will likely be planned around offshore campaigns to share knowledge gained to date and next steps.

A risk assessment approach to project development, including EIA development.

Incorporating an Environmental Risk Assessment (ERA) approach helps to prioritise environmental effects and ensures the EIA and resultant EIS focus on the key environmental issues and answer the key questions. An initial ERA for GSR’s CCZ project has been completed and reviewed by independent experts, including marine scientists with deep sea expertise. This will form the basis of the ERA for the Cook Islands Project. The ERA will be regularly reviewed and updated.

Demonstration of a step-by-step, precautionary, approach to project development.

CIIC-SR and GSR are demonstrating its step-by-step approach to project development through the Patania program. The precautionary approach is demonstrated by completing prior EIAs and monitoring each stage and incorporating learnings.

The precautionary approach is importantly demonstrated by employing conservative environmental management strategies (e.g. establishing set aside areas), particularly when knowledge is incomplete and there are a number of unknowns.

An additional way to deal with unknowns is to develop a series of hypotheses about the anticipated environmental effects and present these in the EIS (e.g. “the sediment plume will not impact the set aside area(s)”). The MP would then detail the monitoring required to demonstrate this.

Partnering with world renowned scientists to conduct the research required for baseline and EIA studies and allowing collaborating researchers the freedom to publish their findings

The aim is to follow the ISA’s (and any Cook Islands) EIA/EIS guidance as closely as possible, and partner with world renowned scientists to complete the required studies. This way, the studies remain independent, and it also allows CIIC-SR to meaningfully contribute to deep sea science and knowledge. To date, GSR has received proposals from a number of international world-renowned/tier 1 scientists. The aim is to do the science needed and get the science right to allow evidence-based decision making. To ensure transparency and independence, scientists will be free to publish their findings.

Demonstration that environmental effects, such as the sediment plume, can be adequately predicted and monitored

Modeling the impacts of and monitoring the Patania II and Patania III (SIT) trials provide important opportunities to build stakeholder confidence that environmental effects can be accurately predicted and monitored. While an EIS has been completed for the Patania II trial in the CCZ, another will need to be completed for the testing in the Cook Islands EEZ. The trials will need to be monitored in order to demonstrate that the impacts predicted by the relevant EISs are accurate and these results are to inform full-scale models and will be presented in the EIS for full-scale operations.

Demonstration that the impacts to the seafloor do not represent “Serious Harm” to the marine environment.

This aspect of the project is critical to get right. As discussed above, CIIC-SR will take a conservative approach to environmental management, which will likely, among other things, involve the establishment of set-aside areas to help ensure ecosystem integrity is maintained.

It is envisaged that any CIIC-SR EIS will present realistic and worst-case scenarios with respect to expected environmental effects. For example, it is understood that there will be a 12 to 24 month ramp up phase between the mining equipment arriving on site and the commencement of steady-state operations. During this time, it is reasonable to expect there may be some equipment failures (such as a riser failure, resulting in the release of its contents) and it is recommended the effects of these anticipated failures be modelled and presented in the EIS, as far as reasonably possible. This demonstrates an honest and transparent approach and in fact makes it easier for CIIC-SR to demonstrate compliance because the impact envelope will be larger than if only “perfect scenario” steady-state operations are presented.

Another way to demonstrate care for the environment and that Serious Harm will not occur is to consider rehabilitation options. Studies have shown time and again that once nodules are removed from the seafloor, any biota associated with them does not return. The biota relies on the hard substrate the nodules provide as their habitat. Experiments such as the DISCOL experiment demonstrated that after 26 years, the seafloor remains barren, and this finding has been used by scientists and NGOs to argue for why seabed mining should not take place. To help alleviate this concern, CIIC-SR will investigate deep seabed rehabilitation options that could entail, for example, the placement of artificial substrates (nodule substitutes) on the seafloor.

Another initiative GSR is exploring involves having a Net Positive Impact to Marine Biodiversity. The idea is to, overall, leave the health of the oceans better than how we found it. DEME’s efforts towards initiatives such as plastic and waste removal (e.g. DEC’s autonomous plastic collector

being trialed in the river Schelde) could, as an example, be scaled-up and leveraged. The idea is to "offset" the damage caused by mining the seafloor with a positive outcome for the oceans. This approach secures a net-positive effect for GSR's operations whilst supporting further refinement of marine waste collection techniques and propelling them towards a new level of market-readiness.

5. Economics and value of exploration/mining

Exploration revenue

For the exploration tenement area, CIIC-SR has been informed by the SBMA and the Seabed Minerals (Exploration Fees) Regulations 2020 about the applicable rates and lump sum as summarized on the Table 6-1 below:

- NZD 50,000 - due upon submission of final application
- NZD450 per block approved by the SBMA, due within 30 days, after grant of exploration licenses
- NZD80,000 due one year after granting of exploration licence and annually until license expires or is terminated

Section or regulation	Matter	Fee (NZ$)	2020 CIICSR Fee (NZ$)	2021 CIICSR Fee (NZ$)	2022 CIICSR Fee (NZ$)	2023 CIICSR Fee (NZ$)	2024 CIICSR Fee (NZ$)	2025 CIICSR Fee (NZ$)
Sec 64(f)	Application fee for exploration licence (non-refundable)	$50,000	$50,000					
Reg. 33(3)	Grant fee for exploration licence under Act (per block, CIICSR 262 blocks) (i) Licence area of up to 30,000 km^2; and	$450 per block		$117,900				
Reg. 44(4)	Annual licence fee under exploration licence **(CIICSR application licence for 5 years)**	$80,000 per year		$80,000	$80,000	$80,000	$80,000	$80,000
		Annual Applicable Fees NZD	**$50,000**	**$197,900**	$80,000	$80,000	$80,000	$80,000
		Annual Applicable Fees EU	**$28,361**	**$115,154.05**	$46,550.40	$46,550.40	$46,550.40	$46,550.40

Table 6- 1: Overview of the annual fee applicable to CIIC-SR [2020 – 2025]

CIIC-SR is not yet able to evaluate, at this stage of the project, the indirect financial benefit to the Cook Islands local industry by the support to the preparation and execution of the offshore campaigns. However, and as already demonstrated during our first offshore expedition in 2019, CIIC-SR is devoted to involving and support the local compagnies, especially the ones related to construction, naval support (bunkering), catering, lodging (…) It is estimated that approximatively 5 to 10% of the budget dedicated to the offshore expedition would be contributed to the CI economy. This is not considering a part of the overhead costs detailed in Section V of this application.

Mining revenue

Revenue from mining (e.g. through taxes and royalties) will not be realised until mining operations have commenced. Nevertheless, CIIC-SR has made some estimates of what could be expected as metal resource in the area under application.

The below table outlines the estimated potential resources that the area under application could contain. The estimated numbers made in the Cook Islands EEZ reserved area (initial area) are based on historical information, with an ("inferred") low level of confidence, not including the results of the 2019 CIIC-SR offshore campaign.

		Unit
Area	19,170	Km²
% Mineable	50%	
Mineable area	9,585	Km²
Abundance	27	kg/m²
Estimated quantity of PMN (wet)	204,000,000	Tonne (wet)
Water content	30%	
Estimated quantity of PMN (dry)	147,000,000	Tonne (dry)

The minerals we could expect to be able to be extracted from the polymetallic nodules are set out below.

	%	Unit (Tonne - dry)
Manganese	15.00%	22,050,000
Nickel	0.30%	441,000
Copper	0.10%	147,000
Cobalt	0.50%	735,000
Rare Earth Elements	0.19%	279,300

Given the demand for cobalt is on the rise, it is anticipated that the price of cobalt will also rise. CIIC-SR's initial estimates are that the overall economic viability will be positive for both CIIC-SR and the Cook Islands.

6. Potential adverse impacts and their mitigation

CIIC has tried to list the potential impacts of the exploration project and at the same time to develop possible solutions to control the risks and potential impacts.

- **Over-burdening of existing economic systems and local communities:**

This is a major concern with the potential development of the deep-sea mining industry, all stakeholders involved will have to consider the negative impact that the industry could have on the local economy, and more specifically on the work related to the Sea (fishing, diving…) and the local tourism, which is mainly based on tourism and minor exports made up of tropical and citrus fruit.

- **Environment:**

The main challenges will focus on the deep-sea direct and indirect impacts. Furthermore, the CO2 footprint generated by the offshore (harvesting-transport) and onshore (metallurgical process) activities will also be crucial parameters to optimize and monitor during exploitation. CIIC-SR has defined a preliminary approach to mitigate the environmental impacts related to the exploration works, and most specifically with the Patania II trial in the CI EEZ. GSR and CIIC-SR are also working intensively on the establishment of an environmental monitoring system for the exploitation phase, involving an autonomous and adaptive steering system. To do so the GSR project COMPASS seeks to develop the means to determine the most operationally efficient and environmentally responsible mining path, while guaranteeing safe execution in a way that automates the process.

- **Political / societal:**

Due to the scarcity of responsible onshore reserves, an energy transition from fossil fuels to a 100% renewable is under threat. New responsible sources are required to sustain global economic growth. Communication and transparency of DSM research will be important.

- **Risk Market:**

Due to an increase of the demand for critical metals, Nickel (infrastructure, batteries) and Cobalt (batteries) price may increase within the next 5 to 10 years. However, if no responsible sources of these metals are found, substitution and redesign may lead to a decrease in their use for some applications. Cobalt is particularly attractive to battery manufacturers due to its stability.

- **Competition:**

Competition between industries is rather limited at this stage, as mining has yet to occur at industrial scale and the ISA regulations are still under development. Some of the key-players are considering strategic partnerships to share risks.

The key opportunities for the JVC are set out below:

- **Cobalt demand and pricing:**

The cobalt market is one of the most promising over the coming years, as it greatly contributes to the green transition. However, more than 55% (80 kt/year) of the production is controlled by an unstable country (Democratic Republic of Congo), which could jeopardize the energy transition. Providing an alternative (deep-sea) resource would diversify the market and would help to meet the demand expected within the next 5 to 25 years.

- **Macro-economic effect for Cook Islands:**

The activities of the JVC have the opportunity to provide transformational change to the Cook Islands economy, as the JVC will be paying royalties and taxes to the CI Government, which could be a potential proportion of Government revenues. The JVC will be directly employing staff domiciled in the Cook Islands and its activities will also generate employment indirectly through its operations.

- **Training and development:**

The JVC's focus on developing staff will provide Cook Islanders world-class training and development opportunities through its partner GSR and other providers, across the deep-sea minerals sector.

7. Avoiding anti-competitiveness practices

CIIC-SR, joint venture between GSR-CI and CIIC, has been founded on an ethical chart which is reflected in the DEME document available on the link below:
DEME code of ethics_1.pdf (deme-group.com)

The document provides the code of ethics and business integrity that every company of the DEME-Group (including CIIC-SR) and every employee must follow. The code of ethics is based on STRIVE:

Our employees are trained and motivated to meet the challenges ahead. Individuality and diversity will be valued, and performance is recognized. Our relationships with suppliers, subcontractors, partners, and competitors reflect respect, understanding and sound business practice.

We observe all applicable laws and regulations of the countries in which we are active. We respect human rights and prohibit unlawful discrimination.

Antitrust violations distort the equal competition and level playing field between companies and can potentially impact the correct functioning of the economy as a whole.

We strive to do fair business with our stakeholders. In line with this DEME/GSR and CIIC-SR is acting within the boundaries of the applicable antitrust and competition laws when competing in the market. These laws prohibit a variety of business practices that may not always appear to be an issue at first sight, but that nonetheless prohibit or restrict free and fair competition. These laws are country specific and often very complex, with violations usually subject to severe penalties.

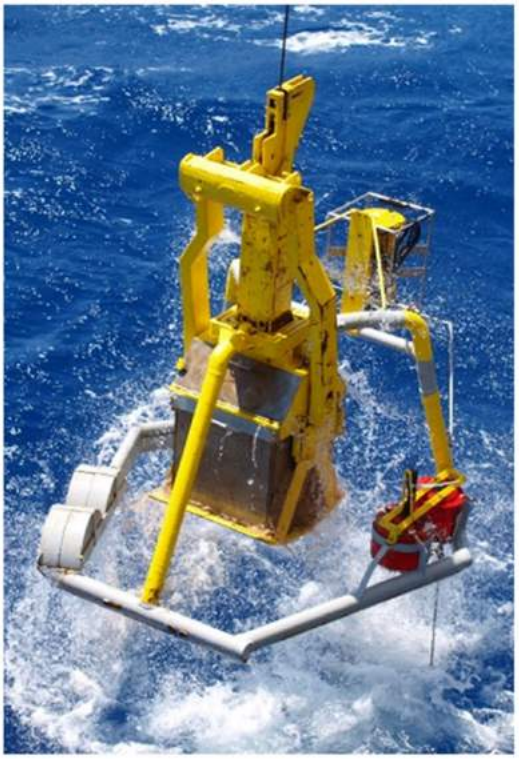
Understandings or agreements between competitors, either express or implied, either formal or informal, on pricing, terms or conditions of sale or service, production, distribution, territories, or customers, are always prohibited. As this area is not always straightforward, CIIC-SR will always seek the advice of a Compliance advisor in case of any doubts.

CIIC-SR will always refer to an Antitrust Policy, where guidance on pre-bidding communication with competitors, submission of individual bids, trade association activities and collecting and presenting market information.

CIIC SEABED RESOURCES LTD

Annex 6: Appendix 1

COMMUNICATIONS & ENGAGEMENT STRATEGY 2022-2025



Title:	Communications & Engagement Strategy 2022-2025
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Date:	24/01/2022
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Signed: ..... On Behalf of: CIIC-SR

Name: Eusenio Fatialofa..... Date: 24 January 2022

Introduction

CIICSR is a joint venture company (JVC) focused on responsible exploration and exploitation activities of the deep-sea for Polymetallic Nodules located in the international waters of the ISA's Cook Island licensed area of the Clarion Clipperton Zone (CCZ) and Cook Islands Exclusive Economic Zone (EEZ) reserved area.

The 5-year exploration workplan developed by CIIC Seabed Resources in the Cook Islands EEZ will be a step towards understanding the environment baseline conditions, with a focus on resource definition and oceanography studies. This emerging new industry has the potential to provide education and career pathway opportunities, but will require substantial investment, commitment, and the support of the wider community to make them a reality. The strategy seeks to build stakeholder support for the 5-year exploration project in the Cook Islands EEZ.

The purpose of this document is to outline the strategy for that communication. The strategy establishes baseline activities for communicating and engaging with various stakeholder groups and contains several key messages to be shared throughout the life of the project.

The CIIC-SR management is responsible for implementing this strategy. The CIIC-SR Board of Directors and management will collectively approve all reports, documents, and media statements prior to their release.

The activities with costs will require CIIC-SR management approval.

It is intended that this strategy be reviewed on a regular basis. Revisions to this document may take place over the course of the project subject to the approval of the CIIC-SR Management and Board of Directors.

The Communications Strategy consists of:

This Strategy should be read alongside other relevant documents, including:

- Cook Islands Government Communications Policy 2018

1. Objectives

The goal of this communications strategy is to enhance the project's implementation success by communicating effectively with those who have an interest in or may be affected by the project and/or its outcomes. The main objectives are:

1. Ensure know communication events and tactics are captured and referenced in forward planning.
    - Build and develop an events calendar from the baseline activities and project milestones.

2. To promote the 5-year exploration project and manage public perceptions
    - Build awareness of the project and increase buy-in/support and reduce/deal with false expectations.

3. To foster the commitment and support of the Cook Islands Government
    - Assure effective and responsible project implementation; enhance partnership with CI Government; build CIICSR reputation and capacity for successful project delivery; ensure contractual and policy objectives are achieved.

4. To engage and build support of key regulatory authorities
    - Regulatory requirements are met and in a timely manner, and the necessary consents/approval from those of authorities are obtained.

5. To effectively document the project for future developments and referencing
    - Fully documented processes, progress and lessons learned will improve future project delivery and provide referencing material for future generations.

2. Stakeholder analysis

Stakeholders are individuals, groups or organisation's that have an interest in the 5-year exploration project.

Project-related stakeholders include the people of the Cook Islands, the Government of the Cook Islands, politicians, prospective contractors and suppliers, regulatory authorities.

The following table defines the stakeholders and their perceived interest in the project. Their interest ultimately dictates the level of engagement and the information these stakeholders will require.

Stakeholders	Interests / Key Concerns	Stakeholder Tier
CIIC-SR Board and CIIC-SR Management	• Successful project delivery; • Marine scientific research - collecting environmental baseline data and resource information; • timely and cost-effective implementation. • Milestone dates (per Annex 2) will be achieved. • Spending against budget • Funding required for future developments	1
CIIC-SR JV Partners – CIIC and GSR-CI Ltd, GSR	• Project status/progress towards achieving key milestones; • Responsible spending; • High-level matters to be resolved; • Project progress and performance is to plan; • Resources appropriately allocated;	1

Stakeholders	Interests / Key Concerns	Stakeholder Tier
	• CIG's, CIIC's, GSR-CI's and GSR's reputation for professional project delivery is enhanced. • CIIC Quarterly risk reports and deep dive sessions with CIIC-SR management	
Cook Islands Government and Seabed Minerals Authority	• Project status/progress towards achieving key milestones (per exploration license); • Emerging new industry; • High-level matters to be resolved.	1
Ministry of Education, Rarotonga, and Aitutaki College's	• General interest in CIIC-SR's training opportunities • Providing career pathways in the DSM industry for Cook Island students;	2
Ministry of Finance	• Good financial and procurement governance. • Annual company tax filings	1
Rarotonga & Aitutaki Secondary Schools	• Career expo's; • School talks on STEM Education and potential career pathways; • Potential internships and scholarship opportunities.	2
Wider Cook Islands community, Pa Enua and Non-governmental organisations	• General interest in DSM industry; • Marae Moana and Marine protection	3
Regulatory authorities (NES, MFEM, MMR, Ministry of Transport)	• Compliance with the relevant Act's and regulations.	4
CI Private sectors – Contractors, suppliers, engineers, and specialists	• How and when they can be involved in the exploration offshore campaigns; • When the project will be tendered.	5

3. Communication Program

The activities below focus on meeting the objectives of this strategy and the interests of various stakeholders.

Tier	Approach	Information to be provided	Medium	Objective
Tier 1 CIIC-SR Board and Management; CIIC-SR JV Partners; CI Government and Seabed Minerals Authority, including Ministers and Ministries/ Agencies	Engage – full feedback	Status reports Progress against key performance indicators Progress overview Deviations from planned outcomes Activity details Activity progress, progress towards achieving key milestones	Regular and recorded CIIC-SR Board meetings Face-to-face meetings (or virtual meetings) Meetings (Discussions, decision-making, and reports) Six monthly progress reports Reporting as required Meeting minutes Project documentary/ records	1, 2, 3, 4 and 5

Tier	Approach	Information to be provided	Medium	Objective
Tier 2 Rarotonga and Aitutaki Secondary Schools	Inform – limit feedback	Offshore Exploration presentation STEM education, Career, and training presentation	Public Career Expo's presentations Face-to-face presentation to interested Rarotonga and Aitutaki based secondary schools	1,2
Tier 3 Wider Cook Islands community	Inform – limit feedback	CIIC-SR Short Public Summary – Exploration License Non-Technical Summary Environmental Management Plan Local engagement, training, and business development plan Regular and general updates on progress.	SBM website Advertisements Open hall consultation Media releases Project factsheet Project website	1,2
Tier 4 Regulatory authorities	Engage – full feedback	Detailed offshore exploration work plans showings conformity to regulatory requirements. Application forms	One-on-one meetings Written letters Permit applications	2, 3 and 4
Tier 5 Contractors and suppliers	Inform – limit feedback	Planned procurement & offshore timelines and approach-to-market. Specialist areas to be filled by private sector.	Advertisements Media releases Project website	1, 2

From this table, communication operational plans should be developed

4. Key messages

Concise and consistent messages will contribute to generating awareness, project promotion, and elimination of false expectations.

It is particularly important that those directly involved in the delivery of the project are consistent with what is being said in the public domain.

The following messages are short, memorisable statements for use in formal and information settings, and form the basis of project fact sheet:

Project Goal	CIIC-SR's Marine Scientific Research is focused on the collection and processing of baseline information related to the geological, oceanographical, and environmental conditions of the area under application. All work shall contribute to the end goals which are: • the characterization, understanding and mapping of the benthic and pelagic environment; • the evaluation of the PMN resource available; • and the assessment of the mining impacts on the surrounding environment and ways that these impact on the surrounding environment and ways that these impacts can be mitigated and monitored. The exploration activities support the outcomes of the CIIC-SR Business Plan and contribute to the Cook Islands Government SDG's and the aspirations of the Cook Islands, and the Cook Islands as a whole.

<table>
<tr><td>Rationale</td><td>The Covid-19 pandemic has impacted on the Cook Islands. The tourism industry for many years has been the largest component of the Cook Islands gross domestic product (GDP). The Cook Islands government looks to diversify the country's economy by developing the deep-sea minerals industry.

Lying on the seafloor within the Cook Islands EEZ at water depths between 5,000m and 6,000m is an abundance of polymetallic nodules containing critical metals such as Manganese, Nickel, Copper, Cobalt rare earth elements (RRE's).

These minerals play a crucial role in maintaining and improving the quality of life for a rapidly-growing and ever-urbanizing global population. They are vital for decarbonization and sustainable development. The driving demand for the minerals are:

Rapidly-increasing global population: By 2050 there will be 9.7 billion people living on this planet (a 32% growth in 35 years), inexorably increasing Demand for critical minerals.

Unprecedented Urbanisation: 66% of the world's population will live in cities by 2050. New primary sources of metal are essential for sustainable development.

Decarbonised Energy System: To meet our climate change objectives, we need to electrify transport and heating systems, requiring nickel and cobalt.</td></tr>
<tr><td>Exploration Workplan</td><td>5-year Exploration Work Plan period:
<table>
<tr><td>Year 1</td><td>2022</td><td>Preparation of and planning for the EEZ offshore campaigns with scientific partners.</td></tr>
<tr><td>Year 2</td><td>2023</td><td>Execution of an offshore campaign [CIICSRNOD23] dedicated to the resource definition (using multibeam, backscatter, AUV data, physical samples) and environmental studies (deployment of moorings, environmental sampling).</td></tr>
<tr><td>Year 3</td><td>2024</td><td>Execution of an offshore campaign [CIICSRNOD24], focused on environmental baseline studies within "areas of interest" defined with the results of the first expedition.</td></tr>
<tr><td>Year 4</td><td>2025</td><td>Intensive scientific laboratory and desk study and submission of the Environmental Impact Statement (EIS) for mining trials in the CI EEZ with GSR pre-prototype seafloor nodule collector PATANIA II.</td></tr>
<tr><td>Year 5</td><td>2026</td><td>Execution of an offshore campaign [CIICSRNOD26] involving a mining trial with the GSR pre-prototype vehicle PATANIA II and environmental monitoring of the trial.</td></tr>
</table></td></tr>
</table>

<table>
<tr>
<td>Project Financing</td>
<td>
Exploration and Environmental work programs
<table>
<tr><td>Year 1</td><td>Preparation of the offshore campaigns and scientific studies.</td><td>$ 255,000</td></tr>
<tr><td>Year 2</td><td>1st offshore expedition CIICSRNOD23 (Resource and baseline study) + post-study</td><td>$ 14,964,058</td></tr>
<tr><td>Year 3</td><td>2nd offshore expedition CIICSRNOD24 (Env. baseline study) + post-study</td><td>$ 15,804,920</td></tr>
<tr><td>Year 4</td><td>Desktop and laboratory studies</td><td>$ 3,865,363</td></tr>
<tr><td>Year 5</td><td>3rd offshore e testing of pre-prototype collector vehicle PATANIA II and equipment + env monitoring</td><td>$ 20,512,167</td></tr>
<tr><td colspan="2">Total (NZD millions):</td><td>$ 55,401,508</td></tr>
</table>
The financial table outlines the anticipated yearly expenditure for the five-year program of activities. This is an estimate based on experience in offshore operations. CIIC-SR will aim to optimize this expenditure. Optimization includes shared working with other contractors operating in the Cook Islands EEZ, where this may be mutually beneficial.

CIIC-SR wishes to emphasize that it considers the plan of work for this five-year exploration period and the projected concomitant investment to be contingent on:

the satisfactory progress of the regulations on exploitation.
the PMN resource availability.
the strategic partnership of CIIC-SR and its affiliates.
the metals market within the next coming years.

</td>
</tr>
</table>

More key messages should be developed to respond to stakeholder/public concerns or comments.

5. Key Dates

Stakeholder Tier	Period	Milestone
Tier 1 - CI Government, SBM	TBC	Exploration license granted by CI Government – 4 Feb 2022
Tier 2 – Rarotonga & Aitutaki secondary schools. Career Expo's and STEM Education presentation to year 9-13 students	TBC	Creating awareness of the 5-year exploration work plan. Potential career pathways, internship, and scholarship opportunities for students.
Tier 3 – Wider Cook Islands Community. Public Open Booth at SBM event.	TBC	Public Open Booth at SBM event
Tier 4 – Regulatory Authorities	TBC	Permits approved

6. Critical Risks

The following risks have the potential to affect successful implementation of the Activity and reinforce the need for effective communication with stakeholders. Refer to the Activity Risk Register for all risks identified for the Activity.

Risk Description	Risk Level	Proposed Risk Management
Public objections / complaints on redevelopment, leading to negativity in the media and during public consultations - delayed strategic plan adoption	High	Public consultation process must be effectively designed and delivered. Communications strategy to be implemented.
Misunderstanding of the 5-year Exploration work plan of the project (whether mistaken or deliberate)	Med	Clear and consistent messages about what is in work plan and what is not.
Delay to project due to protracted process	Med	Careful planning and messaging.
Stakeholders side-tracked on to other political issues	Med	Strong messages and repeating of objectives.
Misinformed project reporting to media/ external partners/ colleagues causing uncertainty of project performance - public/ partner criticism and reputation damages	Low	Effectively designed public consultation process. Implement communications strategy. Proactive provision of project updates to local media.

7. Key consideration

Protocol and point of contact

To ensure information is disseminated accurately and consistently, all media publications and reports must be approved for release by the CIIC-SR Management. A point of contact must also be established to ensure information flows in and out in a timely manner, and input from all relevant parties is obtained prior to finalisation and release.

Point of contact – Eusenio Fatialofa, CIIC-SR GM

Medium selection

A range of communication mediums for media releases and project updates are readily available or relatively easy to set up. The choice of medium should consider the intended audience and reach (national, age group), frequency and cost.

Options include:

- Television (CITV)
- Radio (Local Radio Stations and Pacific channels in New Zealand)
- Print (CI News, CI Herald, Advertising, CIIC newsletters).
- Digital media (websites, email distribution, Facebook, and other social media sites).

Language

The language and tone used in each release/publication/meeting should be tailored to suit the audience and the intended outcome, while ensuring the messages are clear and concise. Expert advice should be sought where audience/objective-specific releases are required.

8. Implementation costs

Communication will require the development of budget estimates for implementing this strategy is given below.

Activity	Input
Stakeholder / community presentations	Advertising, venue, and hosting.
Issue regular media releases (i.e. monthly-quarterly); distribute project fact sheet, printed and electronically, highlighting key messages.	Printing and distribution, advertising, communications advisor.
Provide local news media with bi-monthly/quarterly project updates for publication	Written content – Communications officer and Project Team
Compilation of video and photography snapshots and structured archival reports.	Videography and documenting project activities

9. Monitoring and review

It is expected that the CIIC-SR management will, on a monthly basis, review all issues related to communications and/or stakeholders. A revised approach may be considered when/if needed. Key monitoring factors will include:

- Negativity in the media
- Incorrect perceptions or negative comments in the public domain
- Formal complaints
- Positive remarks

All complaints must be lodged using a standard form and put into a tracking spreadsheet. The CIIC-SR management will review the register at each CIIC-SR Board meeting. Updating the register and reporting on issues/complaints resolution is the responsibility of the CIIC-SR management.

Appendix 1 – Communications Action Plan

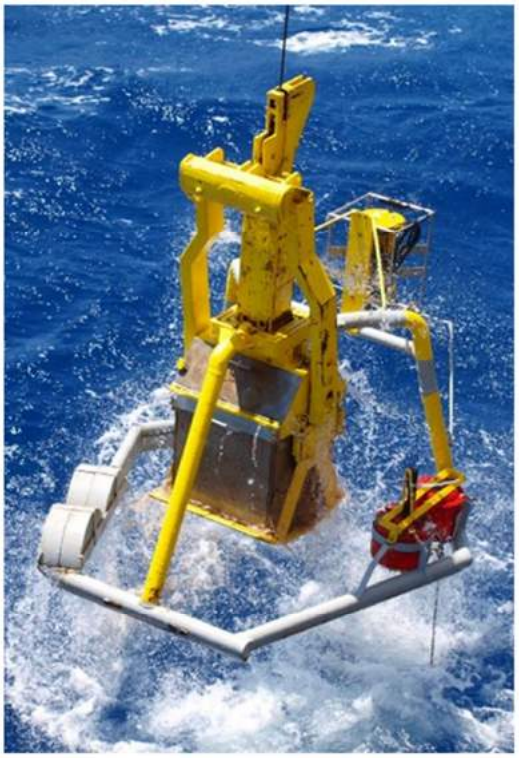
Tasks/Activities	Due date	Medium	Responsible for preparation	Responsible for approval
Community presentations CIIC-SR management agrees on audiences, order of presentations, facilitators, venue, and dates CIIC-SR prepares presentation for review/comment. Presentation preparations by CIIC-SR, i.e. venues, invitations, etc Presentations delivered and recorded.	TBC	SBM granting of Exploration License Open hall presentation	Eusenio Fatialofa	CIIC-SR Management
Media releases CIIC-SR agrees on key messages for the month/quarter/milestone CIIC-SR Project Team drafts media release and distributes for comment Communications advisor reviews release (if necessary)	5 April 5 July 4 October 18 January TBC	Print (CI News & Herald) Websites, email distribution, Facebook pages	Eusenio Fatialofa	CIIC-SR Management
Project update – to local media (once offshore campaigns begin)	Bi-monthly? TBC	Radio and print media		
Project factsheet PMU drafts project fact sheet CIIC-SR management to reviews draft and provides comment Communications advisor reviews draft (if necessary) Fact sheet printed (hard and electronically). E-copy uploaded to website.	TBC	Distribute at SBM event forums Websites Facebook pages	Eusenio Fatialofa	CIIC-SR Management
Public notices Notices issued in local media as required.	To be confirmed	Print (CI News & Herald) CITV		
Project documentary CIIC-SR Project Team drafts scope of services Quotations sourced Scope of services confirmed and implemented Packages delivered as agreed.	TBC	Videography & photography	Eusenio Fatialofa	CIIC-SR Management

CIIC SEABED RESOURCES LTD

Annexes of the CIIC-SR License for Exploration Activities

Annex 07

Terms and Schedule of Relinquishment



Title:	Annex 07 of the License for Exploration Activities
Author:	François Charlet – GSR Exploration Manager
Checked by:	Eusenio Fatialofa – CIIC-SR General Manager
	Samantha Smith–Head of Sustainability & External Relations
Date:	11/01/2022
Reference:	P03-CIICSR-EV-RPT-00001_Annex 07
Version:	2

Signed: ..... On Behalf of: CIIC-SR

Name: Eusenio Fatialofa.....Date: 10 January 2022

Terms and Schedule of Relinquishment

The CIIC-SR Licensed area is composed by 262 blocks, with a total surface area estimated to be 19,479 km^2 (Figure VII-1).

As per the Section 78 of the Seabed Minerals Act (2019), the Authority may require the license holder "to relinquish a percentage or portions of the licensed exploration area over a set time period:

a) In accordance with a schedule set by the Authority in the license, or
b) For a prescribed purpose and in a prescribe manner

For the purposes of subsection (1), the blocks to be relinquished must be:

a) Contiguous; and
b) Expressed by the exploration license holder by reference to 1 or more blocks. "

As per the *Guidelines for Application for the Grant of Exploration Licenses – Content of an Exploration Licence Application 7.7*, a schedule setting out the proposed relinquishment of blocks in the proposed exploration area is required to be submitted to the Authority.

The Cook Islands Seabed Minerals Authority in consultation with CIIC-SR have reviewed the area under application and due to the small area size, the Authority have allowed and agreed to CIIC-SR's relinquishment area of **0.00 km^2**. Not needing to relinquish part of the application area also assists in providing additional environmental management options, which is helpful given the exploration area is relatively small.

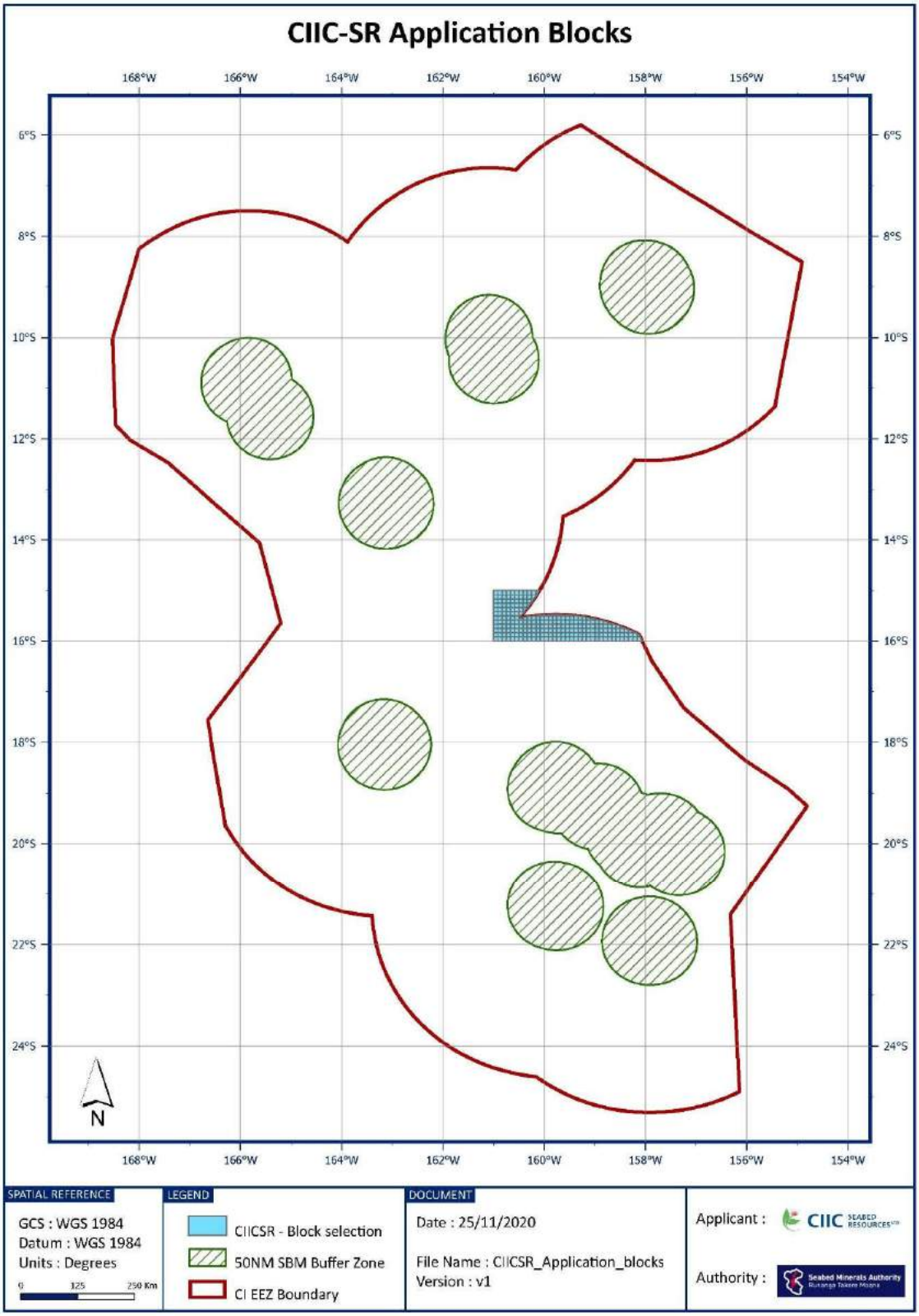


Figure VII- 1: Map of the Cook Islands Exclusive Economic Zone, including the CIIC-SR Application Blocks.