Note: This document is intended to act as a guide and the format provided is not strictly enforced. The response should be provided based on industry best practice and comply with the Project Execution Plan (PEP) requirements

The PEP is the proposal statement of work and should therefore provide sufficient information to allow Defence to have confidence in the intended achievement and how it will be accomplished

Defence Innovation Hub
Innovation Proposal

P20-00001
Sound navigation and ranging system for submarine detection

Project Execution Plan (PEP)

IMAGE OF TECHNOLOGY

Sonic Urchin Pty Ltd
123 Canberra Street,
Port Adelaide
SA, Australia 5015

Document Number: XXX XXX 001
Version: 0.2

Date: DD/MM/2021

Approvals

Document Owner	Role	Signed Date
Francis Smith	Project Manager	

Document Approval	Organisation Role	Signed Date

Version Control

Revision	Date	Author	Change Description
0.1	XX XXX 20	Francis Smith	Initial draft for Defence Innovation Hub
0.2	XX XXX 20	Francis Smith	Updated for Defence Innovation Hub

List of Acronyms

ADF	Australian Defence Force
ADFA	Australian Defence Force Academy
AGSVA	Australian Government Security Vetting Agency
CAD	Computer-Aided Design Computer-Aided Drafting
CCG	Change Control Group
CEO	Chief Executive Officer
CoA	Commonwealth of Australia
CONOPS	Concept of Operations
COTS	Commercial Off the Shelf
CRADA	Collaborative Research and Development Agreement
DCAC	Defence Common Access Card
DIH	Defence Innovation Hub
DIP	Defence Innovation Partnership
DISP	Defence Industry Security Program
DPN	Defence Protected Network
DSN	Defence Secret Network
DST	Defence Science & Technology
DT&E	Developmental Test & Evaluation
EMS	Engineering Management System
EW	Electronic Warfare
FIC	Fundamental Inputs to Capability
FPGA	Field-Programmable Gate Array
GFX	Government Furnished Assets
GPU	Graphics Processing Unit
IAW	in accordance with
ICT	Information and Communications Technology
IOC	Initial Operating Capability
IP	Intellectual Property
IPT	Integrated Project Team
IRaD	Internal Research and Development
MOESS	Miniaturised Orbital EW Sensor System Miniaturised Orbital Electronic Sensor System
PCB	Printed Circuit Board
PM	Project Manager
PMT	Project Management Tool
PPMS	Project Performance Management System

PRN	Protected Research Network
PSPF	Protective Security Policy Framework
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management System
R&D	Research & Development
RAAF	Royal Australian Air Force
RF	Radio Frequency
RMP	Risk Management Plan
RRM	Risk Reduction Mission
SDR	Software-Defined Radio
SRA	Systems Requirement Analysis
SRN	Secret Research Network
STEM	Science, Technology, Engineering and Mathematics
SWaP	Size, Weight and Power
T&E	Testing and Evaluation
TD	Technical Data
TMP	Technology Maturity Plan
TPM	Technical Performance Measure
V&V	Verification & Validation
WBS	Work Breakdown Structure

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1 Achievement of Phase Objectives

Sonic Urchin Pty Ltd is proposing to develop a sound navigation and ranging (SONAR) system for submarine detection. The detection of submerged objects using conventional methods is difficult due to the large attenuation of light and radio waves in water. Sound, on the other hand, is well known to be able to propagate a long distance in water and is widely used as a means to detect of ships and submarines. A reliable way of identifying the presence of a submarine would provide a significant tactical advantage for Defence.

The SONAR capability development is scheduled to run over several phases. The intent of each phase is to incrementally mature the technology in order to identify and mitigate risks. The outputs from each phase will assist with progressing the technology to the next phase. The scope of each phase may evolve as the technology matures, risks are identified and further opportunities for innovation are highlighted.

Phase 2 (this Phase) will provide the physical evidence of the capability and how the components can work in a system to realise the innovation. This will involve designing, manufacturing, testing and analysis of a scaled system and water tank experiments. This will help achieve the objectives as set out in CPS item 3:

1. Enable defence to gain an improved understanding of the technology involved in the proposal through demonstration and how the innovation would be taken forward to a mature product;

2. Further illustrate how the proposed innovation addresses defence capability needs, document how the innovation can improve these capabilities, including potential risks and limitation of the SONAR capabilities;

3. Examine the feasibility, schedule and pathways of the proposed innovation's integration into Defence applications and systems, ensuring that it aligns with Defence's naval vessels;

4. Continue to progress the maturity of the technology.

This document details the plan to realise the Phase 2 outcomes and objectives. This document is drafted in accordance with the Commonwealth's Project Execution Plan (PEP) requirements and in response to RFP P20-000001.

This PEP is intended to be the main management document for the innovation contract. The PEP will form part of the Contract Phase Statement (CPS) and is a living document that will need to be negotiated and amended as the project and technology advances.

2 Work Plan

2.1 Achieving Phase Requirements

In this section you should outline the planned project and engineering activities to meet the Phase Objectives.

Information: You may wish to present each of the Phase Objectives and the detailed engineering activities that you intend to perform that contribute to meeting these objectives.

This proposal has been developed by Sonic Urchin to address the requirements from the Commonwealth of Australia (CoA) for a Phase 2 Innovation Project (Technology Demonstration). The project is based upon demonstrating the concept of a SONAR capability. Our approach is to achieve the project objectives as described below. Sonic Urin has also developed milestones and Technical Performance Measures (TPMs) that are linked to completing these objectives.

Phase Objective 1: Enable Defence to gain an improved understanding of the technology involved in the proposal through demonstration and how the innovation would be taken forward to a mature product.

We will achieve this by:

a. Defence participation in Concept of Operations (CONOPS) development and Design Reviews;
b. Following a design and development period, we will run detailed Verification and Validation activities which will include scenario-based tests of the SONAR. Defence will be invited to attend these activities;
c. We will obtain the services of DST Group for guidance and advice on design of a scaled submarine model; and
d. Demonstration will be supported by the development of a detailed CONOPS and Technology Maturation Plan which are relevant to the project and published in the Defence Capability Plan. This will include further development of the SONAR roadmap.

As a part of meeting the Defence Innovation Hub (DIH) deliverables, we will also produce a final report that will outline how the next steps of the capability roadmap will be achieved to enable the technology to be developed to a mature product.

Phase Objective 2: Further illustrate how the proposed innovation addresses Defence capability needs, document how the innovation can improve these capabilities.

Sonic Urchin will link the innovation project to contemporary Defence projects by designing the test scenarios around related project requirements. The Roadmap development will investigate SONAR capability development within those projects. An initial high-level concept for that is included in the Commercialisation section of this PEP. Roadmap development will include the consideration of the limitation and risks

to support this technology both from a Defence and wider commercialisation perspective, which will be described in detail in the Technology Maturation Plan.

In particular, the tank test results will help resolve uncertainties in the previous Phase 1 theoretical study, including the sound scattering of a real submarine shape (as opposed to the theoretical solution from a simple cylinder), and the effect of a more realistic environment. This will help better quantify the capabilities at full scale, and identify risks (e.g. background interference) that may require early mitigation.

Phase Objective 3: Examine the feasibility, schedule and pathways of the proposed innovation's integration into Defence applications and systems

Basic integration of the components (i.e. sounder, listener and detection algorithm) will be carried out in a laboratory environment (i.e. the tank test) to illustrate the feasibility of the complete detection process.

Also, as a part of the RFP response, Sonic Urchin has outlined the roadmap for the capability development in the Commercialisation section. Part of this commercialisation is determining the technology's suitability for integration into Defence applications will be investigated via the estimations from the small-scale tests to full-scale tests. The estimates are in terms of the 'transmission losses' of the measured echoes, the 'scalability' of the setup to determine the feasibility of a full-scale system and the projected detection range of a full-scale system.

The next stage would be investigating the suitability of incorporating the system into an existing V-Class Destroyer. We will work with the key subcontractors and Defence to develop a schedule and pathway to integration.

Phase Objective 4: Continue to progress the maturity of the technology.

While the DIH Phase 1 work has enabled a TRL 3 to be achieved, the proposed Phase 2 work will progress the maturity of the innovation to TRL 5.

We will clearly articulate in the Technology Maturation Plan how it will progress the Commercial and Technology Readiness Levels of SONAR technology to not only be a commercially saleable item, but also how Sonic Urchin will synchronise the development with Defence Projects.

2.2 Work Breakdown Structure

Provide a work breakdown structure, which will provide a framework for Project planning, management and status reporting and for estimating costs, schedule and technical achievements at completion.

Information: The work breakdown structure should outline a hierarchy of subtasks branching from the project concept. The structure should contain at least three levels of division and if appropriate linked to section 1 Phase Objectives:

1. *Project concept/overall system (e.g. Unmanned Aerial System)*
2. *Major elements (e.g. Air Vehicle Design)*
3. *Subordinate components (e.g. Propulsion, Flight Control, and Airframe).*

Additional levels and branches should be included as necessary. An example of a work breakdown structure is provided below.

Our work breakdown structure is illustrated below, in Figure 1. Further information on time scale and subtasks are given in the Gantt Chart in Section 2.3.

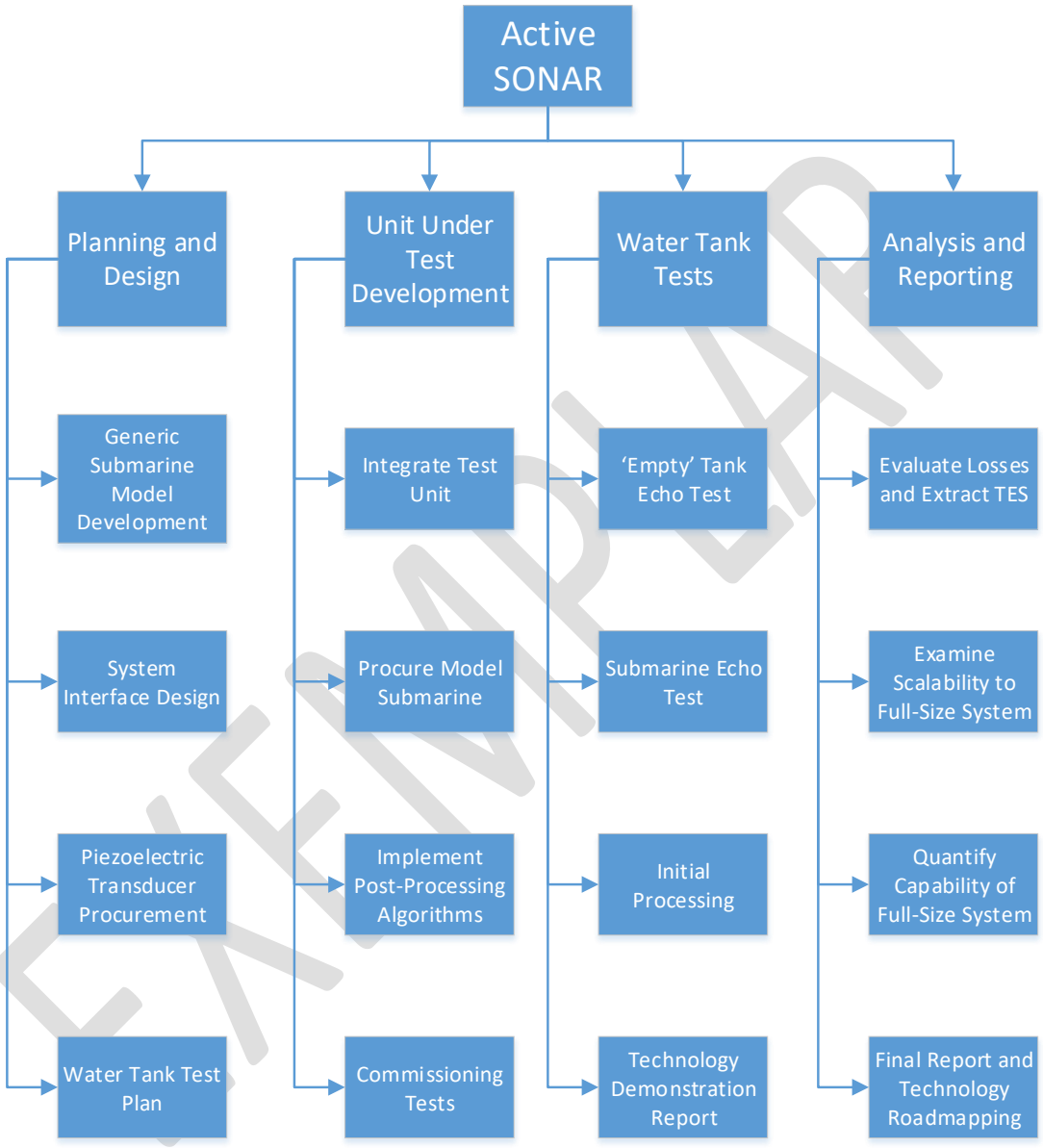
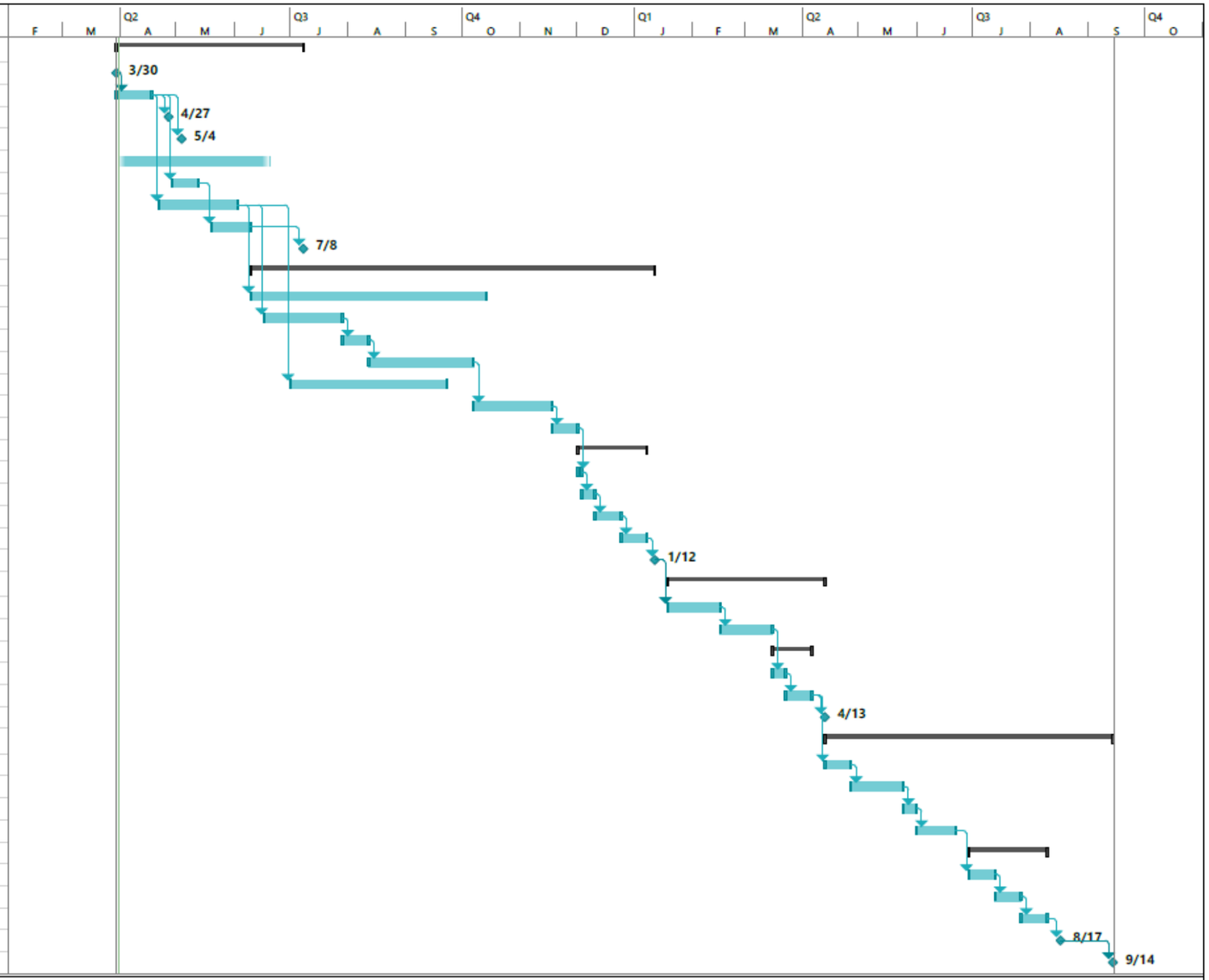


Figure 3 – Work Breakdown Structure

2.3 Project Schedule

Our Project Schedule, including milestone deliverables (highlighted in red), is illustrated in the Gantt Chart below:

ID	Task Name
1	**Planning and Design**
2	**Project Execution Plan**
3	CONOPs development
4	**CONOPs Report**
5	**Technology Maturation Plan**
6	Procurement of transducers
7	System inteface design
8	Generic submarine model development
9	Tank test requirements development
10	**Technology Demonstration Plan**
11	**Unit under Test Development**
12	Procurement of submarine model
13	Controller circuit development
14	Procurement of power pack
15	Watertight container development
16	Re-configure 'Eel' for active SONAR
17	Assemble 'unit under test'
18	Programming of detection algorithm
19	**Commissioning tests**
20	watertight
21	acoustic efficiency evaluation
22	frequency sweep
23	data sampling and logging test
24	**Unit Under Test Report**
25	**Water Tank Tests**
26	Background echo test
27	Target echo test
28	**Preliminary processing**
29	Isolate 'background'
30	Examine echo strength level
31	**Technology Demonstration Report**
32	**Analysis and Reporting**
33	Evaluate transmission losses
34	Derive target strength
35	Compare TES against theory
36	Project results to full-scale system
37	**Define full-scale capability:**
38	Detection range
39	Signal-to-noise ratio
40	Power requirement
41	Final Phase Report (draft)
42	**Final Phase Report (issue)**



Project: RFP exemplar MS Proje
Date: Tue 3/31/20

Task	Project Summary	Manual Task	Start-only	Deadline	
Split	Inactive Task	Duration-only	Finish-only	Progress	
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress	
Summary	Inactive Summary	Manual Summary	External Milestone		

Page 1

2.4 Performance Management

Provide a description of how the Participant will monitor and manage their own performance of the work under the contract.

Information: Performance Management is a business practice to measure, analyse and manage performance in order to manage risk, monitor cost and schedule and identify areas for improvement. You may wish to describe any approaches adopted by your business, including Earned Value Management or monitoring cost and time through a master schedule. At a minimum, a list of Key Performance Indicators should be provided (e.g. on time delivery, completion within or up to target cost and scope and quality) that demonstrate how the participant will manage their own performance. The participant may also wish to describe their overall project management approach for the innovation, including identification of how and when project performance is reviewed, who is involved in those reviews and how the outcomes of those reviews are implanted/tracked and communicated to Defence as required.

The progress of the project work will be monitored and managed using procedures defined in our ISO 9001:2015 accredited Quality Management System (QMS). The main items being:

a. Project Schedule;
b. Project Management principles and Earned Value Management techniques;
c. Meetings (project, technical, risk and financial);
d. Project Status Reports (Progress Reports);
e. Technical Performance Measures (TPMs);
f. Risk and Hazard Logs; and
g. Finance Systems.

We have developed a Project Schedule using Microsoft Project 2016 for the SONAR Project. The schedule will be the primary tool used to monitor and manage performance of work.

The Project Manager (PM) will liaise with the team to track progress against activities and TPMs. The PM will update the schedule weekly. Sonic Urchin's finance system (ERP) is used to track cost actuals which is updated fortnightly. The updated schedule together with the ERP data will be used to track the planned progress against actuals for schedules and costs. Earned Value Management (EVM) techniques will be used to monitor and control the performance of the project.

There are different levels of authority to deal with variance in the EVM score in terms of the budget and schedule. The PM has authority to deal with a 7% variance but if it is outside of this variance then it is escalated to the next authority level, which is the Project Board.

The Project Board is an important part of Sonic Urchin's assurance activities. The Project Board receives routine reports and attend status meetings on a monthly basis to ensure the project and risks are reviewed and active measures are applied to

managing issues. The Project Board can also apply more resources to the Project as required.

We will appoint a PM full time on this project. The PM will be supported by a project team.

2.5 Configuration Management

Describe how you will establish and manage the configuration of technology and documentation.

Information: configuration management establishes and maintains consistency for project documentation. This is achieved through a management approach which outlines the organisational system for documentation including how it is labeled, stored, updated and released. The configuration management approach should identify the items (technology and documents) to be managed, outline the methods by which they are managed and the control processes necessary for coordination and control. The following items may be considered when describing the configuration management approach:

- *The labeling and numbering scheme for documents and files*
- *How the identification scheme addresses versions and releases*
- *How will items be released*
- *Number of libraries and the types*
- *Details of backup and disaster plans and procedures*
- *The recovery process for any type of loss*
- *How the information is retained: i.e. on-line, off-line, media type and format*

Sonic Urchin maintains templates and configuration control of all documents in a Document Management System (DMS). The DMS is used to receive, track, manage and store documents and reduce paper. The system automatically keeps a record of the various versions created and modified by different users (history tracking). Emails are also stored within the system too.

The DMS contains all the templates and document history (up to 100 draft versions), as well as a unique registration identification number.

To assist finding and retrieving document, each document is labelled in the format [yyyymmmdd_v_a_b-Project_Number-Description]. The elements of these format are shown at Table 1.

Table 1 - Document Naming Convention

Data element	Format
yyyy	4-digit year
mm	2-letter month
dd	2-digit day

v	Version
a	Major
b	Minor

For emails, a similar label format is used but includes the time that the email was sent (in 24-hour format), who the email was from, who the email was to and a description of the email.

Our ISO 9001:2015 accredited QMS outlines the approval process (including versions and authorization to release documents), the backup of records and documents, disaster plans, all procedures (including security) and how the information is retained (including destroying of records and documents).

2.6 Risk Management

Provide details of a risk management process – which you will use for continued monitoring and management of technology risk profile (technological, developmental, production and market risks). Describe how you will identify, assess, mitigate, document and report Project risks and issues (relating to cost, scope, schedule, resources etc.)

Information: Risk management is an organisational process involving identification and classification of risks, and then development and implementation of risk mitigation strategies.

Identification of risks requires knowledge and understanding of both the project and the key stakeholders involved. A risk is any event that would result in negative consequences to the project if it were to occur. An example high level risk management process flow is shown below.

Figure 4 - Process Flow Risk Management

A risk register is a useful tool to identify and categorise key risks associated with the project. Risk mitigation strategies can be developed depending on the grading of risk, and their associated costs analysed. A risk register is also useful for communication regarding risk management for the project and mitigation strategies. The proposal would greatly benefit from the inclusion of a risk register.

An example risk register with corresponding risk scoring criteria is shown on the following pages.

Risk Scoring Criteria				
Likelihood of Impact:	**Level**	**Score**	**Description**	**Percentage**
	High (H)	6	More Likely to Happen Than Not	> 50%
	Medium (M)	4	Fairly Likely to Occur	20% - 50%
	Low (L)	2	Not Expected to Occur	< 20%

Severity of Impact:	**Level**	**Score**	**Description**	**Percentage**
	High (H)	3	Major effect on project	> 10%
	Medium (M)	2	Significant effect on project	5% - 10%
	Low (L)	1	Minimal effect on project	< 5%

Table 1 - Risk Scoring Criteria

Risk Identification Guidance	
Risk Score	The overall risk score is defined as the following: "Likelihood Value" x "Severity Value" The maximum risk score possible will be: 6 x 3 = 18.
Risk Identification:	Methods: Brain storming with team, individual interviews, design review, checklists, commercial review, review of assumptions list / issues list, FMEA analysis, etc.
Risk Description:	A description of the uncertain event that might happen during the programme.
Risk Cause:	A description of the likely cause of the uncertain event.
Risk Impact:	If the event occurs, describe the impacts of the risk on the project in terms of time or delivery delay, project cost increase, performance of the equipment / service. Not all of the risks will impact in all three areas.
Scoring Criteria:	Check guidance % against actual total project cost and time and enter actual cost and time values for judging H, M, L.
Risk Priority	Select all risks and sort data on Risk Score. This is one method of determining risk priority. You need to check the validity of risk priority by reviewing the risks with the team. Look for perceived important risks low in the register and perceived unimportant risks high in the risk register.

Table 2 - Risk Identification Guidance

Risk ID		**Risk Description**		**Impact Description**			**Risk Score**	**Risk Owner**	**Risk Reduction / Mitigation Measures**		**Category**	**Date Raised**
Guidance	Use unique 2 or 3 word concise title.	Describe the event that has a probability of effecting the project e.g If 'X' happens…..	Describe the cause behind the risk.	If 'X' happens then describe the effect 'Y' here.	Likelihood of Impact	Severity of Impact	Likelihood x Severity	Named individual (or a company – see note 1)	What are you going to do about it?' List possible mitigation actions	Either an individual (preferable) or a company.	Project specific categories where appropriate.	What date was the risk raised/closed?
e.g.	Loss of key personnel	SME leaves	Staff turnover	We lose the technical direction of our resident expert	L	H	6	PM	Create a resilient team - identify alternatives for all key positions; if no credible alternative exists internally, identify external options. Create a culture of knowledge transfer so not reliant on key individuals. Work with line managers to make sure staff are fulfilled and happy with their work	PM	Please enter any specific categories e.g. resources, scope, schedule, cost.	Raised: 01/01/2019
e.g.	Subcontractor Availability	Key subcontractors are unavailable	Commitments to other Defence projects LAND123.	We lose the ability to complete design of X	L	M	4	PM	Identify alternate subcontracts that are able to complete the work. Ensure weekly project meetings with subcontractor with an outline of progress to time, cost and schedule.	PM	Resources	01/01/2019
1	…						0					
2							0					
3							0					
4							0					

Table 3 - Example Risk Register

Note 1: If team members have not yet been identified then a position should be input temporarily and updated once individuals have been appointed. The use of a company name is not acceptable contractually and will need to be replaced with an individual's name before a contract can be agreed.

2.7 Project Location

Provide details of the location of work being undertaken to develop the Technology and deliver the Project.

Indicate what and how much work is being done where.

This proposed work will be carried out entirely in Australia, using in-country suppliers, with the exception of the piezoelectric transducers which will be sourced from the US as a Commercial Off The Shelf (COTS) purchase.

Most of the work will be on site of Sonic Urchin Pty Ltd's design and manufacturing facilities in Port Adelaide, South Australia but the testing will use Defence facilities located at Edinburgh, South Australia.

The other major work item will be the manufacturing of the scaled submarine model that will be carried out by our industry partner ZZZ Pty Ltd, whom we have an established working relationship with. The premise of ZZZ Pty Ltd's design and manufacturing facilities is in Dandenong, Victoria.

2.8 Security Management

Describe the Participant's approach to security management.

Information: Security management describes the policies for identification and protection of an organisations assets. You may wish to consider the following:

- *DISP Accreditation - the Defence Industry Security Program (DISP) is a program which ensures the Defence industry maintains its security responsibilities and safeguards the supply chain. A business may be required to maintain a DISP membership under certain circumstances.*
- *Security Clearance - A security clearance is a status granted to individuals allowing them access to classified information and resources after completion of a series of thorough background checks.*
- *Office Access - provide details of all personnel with office access for the duration of the project, or of how access to office premises is managed.*
- *Security of Documentation - provide details on the storage of secure documents during the project, and the process for the disposal of secure documents.*
- *Indicate what security measures you consider necessary to deliver the project and how you will put the required security measures in place.*

Note: Defence will advise if DISP Accreditation and Security Clearance are required. Respondents should advise if either are held for another Defence contract, quoting applicable references.

Sonic Urchin is a member of DISP, and our office in South Australia is accredited to the storage and processing of information up to FOUO. The work scope for the current phase is specifically designed to minimise the need for handling any information above this classification.

We are conscious that as the project will progress beyond Phase 2 development, the use of classified information, currently expect to be up to SECRET, will become inevitable. Our company Security Officer, Dr. Noel Jones, is highly conversant with the physical and procedural requirements. Upon award of this contract, Sonic Urchin will initiate discussions with DISP to ensure our facility will be ready for future work on completion of the current phase of work.

All our proposed core team members, as described in Section 3 below, are Australian citizens with NV1 clearance. In addition, we will select support team members with at least Base Clearance for this phase, with the intention to progress their NV1 Clearance applications (if necessary) to coincide with the next phase of development.

3 Resources

The PEP must identify the resources that the Participant will deploy to deliver the Project and develop the Technology during this phase.

3.1 Personnel (including subcontractors)

Provide details of all personnel involved including third party involvement.

You may wish to provide an organisational chart, showing the members that will be involved in the project. Details of their experience and role within the project should also be provided. Note that Defence Personnel should not be listed here and any collaboration with Defence should be indicated at section 5.

Our key personnel, and their roles and responsibilities are summarised in the table below:

Name	Role	Skills and experience	Responsibilities
Francis Smith	Project Manager	• RAN Officer for 10 years • PRINCE2 Qualified • Project Manager for XXX projects of $2m • Project Manager for our Phase 1 development	• Project Oversight • Direct Point of Contact with Defence • Review of deliverable compliance to QMS • Risk management • Commercial matters
Dr Jane Lighthill	Technology Lead	• PhD in Acoustics • 14 years of industrial experience • Lead developer of our 'eel' electronic listening device • Lead developer of our Phase 1 work	• Lead the design and development of the SONAR technology • Lead review meetings with Defence • Approval of technical deliverables
Mark Lam	Mechanical Design Lead	• BEng (Hons) in mechanical Engineering • 15-year experience in mechanical engineering design, including our 'Airtube Matrix'	• Lead the mechanical design of the 'pinger' • Development of the water tank testing and evaluation plan
Steve Jones	Electronic Design Lead	• BEng (Hons) in electronics • 8-year experience in electronic design • Specialist in piezoelectric transducers	• Lead the design of the piezoelectric hydrophone • Lead development of signal decoding
Ann Lewis	Systems Lead	• 20-year experience in systems engineering	• CONOPS development • Lead the development of Functional Performance Specification

		• Led the integration of our 'eel' device with the YYY platform • Led the requirements capture study in our Phase 1 development	• Technology roadmap and maturation plan development

3.2 Capital

Describe the tools, equipment, machinery, and buildings that will be utilised to deliver the project.

3.3 Financial Resources

Detail the financial resources which will be used for the project.

Full details of how the proposal is to be funded should be listed here. Eg: what percentage of funding is formed by this innovation bid, financial resources to be contributed by the respondent, financial resources to be committed by partners / other companies. Leverage of resources committed to other projects which will support this proposal could also be referenced.

3.4 Intellectual Property (IP)

Provide details of any IP that is significant in relation to the development of the Technology, but which is not being provided by the Participant or a Subcontractor.

Full details of IP involved in the proposal should be included here. Eg, if there is background IP it should be clearly described. IP to be created as a result of the work undertaken under this proposal should be identified, described in detail and intentions for its treatment listed. IP logging and schedule processes should also be listed, as well as intentions relating to updates in IP development and contractual compliance.

All significant Intellectual Property (IP) in relation to the development of the SONAR capability will be made available to the CoA for the purposes of this project. The IP rights will also apply to any subsequent development and commercialisation of the technology.

The IP is currently protected through trade secrets including device concept, design and internal fabrication know-how. The IP created in this work will relate to:

- Designing and manufacturing of a scaled 'generic' (unclassified) submarine model;
- Design and assembly of the SONAR system;
- The analysis of the echo signals from the submarine model; and

- The post-processing algorithm used to detect the submarine model echo from other background echoes.

Portions of this IP have already been developed during Phase 1 of a previous project.

3.5 Relevant Third Party Relationships

The PEP must describe any commercial relationships between the Participant and third parties associated with resourcing (including financial), development, distribution or marketing of the innovation. These relationships may include joint ventures, sub-contracting arrangements, and marketing intermediaries or investors with influence over the direction of the innovation. The PEP will describe how these relationships will be managed including with respect to performance and reporting.

There will be one main third party relationship during this phase of the project. Sonic Urchin has a current Non-Disclosure Agreement (NDA) with ZZZ Pty Ltd.

ZZZ Pty Ltd is a Melbourne based company, specialising in designing and manufacturing scale model ships and submersibles for testing. It will be a key subcontractor on this project and perform the manufacturing of the scaled 'generic' (unclassified) submarine model.

4 Commercialisation Planning

The PEP must describe how the Participant intends to commercialise the proposed innovation and monetise the value created by the Technology. The PEP must contain details of planning for other potential markets and opportunities for both the Participant and Defence to realise returns on investment. The PEP must describe how the Participant will assess and review any cost and schedule drivers that may influence selection of the preferred technology solution.

Note: for Phase 1 and 2 proposals a broad description of the intention to commercialise the final product should be provided. For Phase 3 and 4 proposals a detailed commercialisation approach and plan should be provided.

Factors to consider and detail:

- *Value proposition*
- *Market opportunity*
- *Future investment*
- *Value over time*
- *Competitor analysis*
- *Management capability*

4.1 Development Timeframe / Approach

Note: for Phase 1 and 2 proposals an outline of the overall timeframe with main development phases should be provided. For Phase 3 and 4 proposals a more detailed description of work completed to date and the scope of remaining phases with associated timescales should be provided.

The timeline for the full program to demonstrate the proposed capability is planned as follows:

Phase 1: Concept Exploration Phase has been completed;

Phase 2: Technology Demonstration Phase is the subject of this current DIH application and aims to demonstrate the capabilities of SONAR in a water tank environment which will be completed over 1.5 years;

Phase 3: Prototype System Phase will develop a full-scale prototype system will be produced. Testing will be conducted to demonstrate the detection of actual underwater vessels. This will be achieved by testing the system's capability to locate a known submarine wreckage, such as the HMS J7, which has recently been scuttled off Port Phillip. This will allow the capability of the system to be validated without compromising Defence resources or security. This phase of the program is expected to last 18 months, at a cost of $1m.

Phase 4: Integrated Capability Development Phase will integrate the prototype system into an existing V-Class Destroyer. It is proposed that sea trials will be carried out to locate an O-Class submarine under a set of defined manoeuvres. As this phase of the program will rely heavily on Defence collaboration, it is estimated that the phase will last up to 2 years, depending on the availability of vessels, and require funding of up to $2m.

4.2 Approach to Certification / Accreditation

Note: Not usually relevant for Phase 1 and 2 proposals but must be addressed for Phase 3 and 4 proposals.

5 Collaboration with Defence

The PEP must detail the Participant's expectations with respect to any involvement by Defence personnel including stakeholder engagement (or use of Defence resources) to help deliver the scope of work for this phase.

Access to Defence personnel, for any kind of engagement including stakeholder engagement, user needs assessments and user trials should be detailed in this section.

We expect that subject matter experts from the DST Group will be available to provide input and advice on further elicitation of requirements as outlined in Section 8.4. We propose this to take place in the form of two one-day workshops during our first stage of 'Planning and Design' activities. Further engagement of Defence stakeholders will be in quarterly review meetings at our office in South Australia. We expect this will include relevant representatives from the Defence Innovation Hub, DST Group and the SEA1234 Program Office.

5.1 Government Furnished Assets (GFX)

Provide details on Government Furnished Equipment, Facilities, Information, Material, Property and/or Software required. Include clear description/specification, as it applies, of the following:

- quantity required;
- justification of need;
- when are they required during the project and for how long;
- how they will be managed and used throughout the project;
- whether there are suitable alternatives not requiring Government Furnishing; and
- impact on project if Government Furnishing is not available.

Government furnishing describes Equipment, Facilities, Information, Material, Property and/or Software required that the participant requires from Defence for the purposes of achieving the goals of the project. An example includes access to Defence ranges or engineering drawings. It is critical that descriptions/specifications are provided against each; quantity, justification, when are they required during the project and for how long, how they will be managed and used throughout the project, whether there are suitable alternatives not requiring Government Furnishing and impact on the project if Government furnishing is not available. Failure to provide an appropriate level of detail will result in delays throughout the process.

An example Government Furnished Assets table is shown on the next page.

GFX Description	Quantity	Justification	Period required for	Management and use	Non GFA alternatives	Impact due to non-availability
Seawater tank testing facility at DSTG Edinburgh	1	Testing of model submarine target echo strength, required to validate theoretical calculations, and to facilitate the initial development of detection algorithms.	Sep – Dec 1933	Fitting of model submarine and SONAR test unit. DST resource to operate the tank facility during this period will also be required, although only occasionally as experimental configurations change with the test plan.	None	Unable to conduct laboratory tests to achieve TRL 5

Table 4 - Government Furnished Assets Table

6 Australian Industry Capability

The Participant must identify whether and how the Project will help build Australian defence industry capability (including skill development and other opportunities for Australian companies). The Participant must detail any other measures that will:

- Help develop Australian industry capability (detail your definition and/or interpretation);
- Foster innovation in the sector;
- Boost productivity;
- Increase Australian jobs;
- Develop new or existing Australian skills;
- Contribute to sovereign industry capability;
- Increase the capability of industry as a Fundamental Input to Capability.

This project will build Australian defence industry capability by creating an innovative and unique a sound navigation and ranging (SONAR) system for submarine detection.

This project will promote increased collaboration between ZZZ Pty Ltd, Sonic Urchin Pty Ltd and DST.

Sonic Urchin will perform the:

- Design of an interface system to convert electrical signals into desired inputs and outputs. At the heart of this system will be a tuned receiver circuit to selectively pick up signals at or around the transmission frequency;
- Develop a plan for water tank tests including the specification of test requirements. We propose that the Defence test facility at AAA will be used. Defence assistance in securing the use of the facility and technicians will be required;
- Construction of the combined sounder/receiver transducer system that will be carried out;
- Create a post-processing algorithm as identified during the previous work to efficiently evaluate the time delay and amplitude of the ‘echoes’

ZZZ Pty Ltd will be responsible for manufacturing of the scaled submarine model with input from DST on its design.

The project will up-skill employees in construction of the combined sounder/receiver transducer system; manufacturing of model submarines and creation of a post-processing algorithm for ‘active echo’ detection.

It is also our intention that further development beyond this phase will be carried out in Australia. In addition, it may also be possible to develop a commercial version of SONAR for other applications such as fishing and underwater surveys, which could provide further job opportunities and capability upskilling.

7 Technical Performance Measures (TPMs)

Provide a set of TPMs for the proposed scope of work and the commensurate technology maturity and complexity. Describe how the Participant will monitor the TPMs.

Information: Technical Performance Measures (TPMs) are metrics that allow the Participant and Defence to monitor how well a system is satisfying its requirements (especially program critical requirements) or meeting its goals. The key performance measures of the system should be identified and assessed. TPMs may include: power, weight, speed, accuracy, reliability, availability, response time, throughput, and human factors. TPMs are a useful way of tracking the technical health of the project and where trade-offs in system design are required.

The proposed Technical Performance Measures (TPMs) are described in the table below. It should be noted that all TPMs are based on projected parameters at full-scale.

TPM	Upper Threshold	Lower Threshold	Target Value	How will it be monitored?
Range of detection	5NM	2NM	2NM	Projected to full-scale, based on test results and at target power requirement
Bearing error	<10°	<2°	<5°	From test result.
Signal (at receiver) to background noise ratio, SNR	30dB	10dB	15dB	Projected receiver target pressure above typical ambient noise (assumed 70dB at 1kHz, and 50dB at 10kHz, re 1µPa)
Power requirement (electrical)	1000W	500W	500W	Evaluate acoustic efficiency of transducer, and use target measured SNR to back-calculate required input power.
Sonar frequency	1kHz	10kHz	4kHz	Sweep frequency experiment to confirm cut-off value when pressure reduces below threshold of 10dB signal-to-noise ratio.

Table 5 – Proposed TPMs

7.1 Reporting of TPMs

Describe how achievement or variation from the TPMs will be reported by the Participant to Defence.

8 User Needs and Requirements

8.1 Understanding of User Needs

Detail the Participant's understanding of the Defence user needs with respect to the proposed innovation.

User needs are not related to potential solutions and should articulate the high level expectations of the system in terms of objectives, environment and constraints, clearly identifying benefits to be delivered. They are normally defined from the perspective of the end-user, however, the respondent should detail any initial understanding of Defence needs through discussions or research with Defence.

An example of a user need for a new backpack may be "The backpack system shall assist in distributing loads evenly around the torso to allow for longer active wear time during deployment".

As South East Asian countries continue their natural process of military modernisation, there is a need for Australia to be a step ahead in its defence capability. Competing claims for territory and natural resources in South East Asia in recent years will also continue to provide a potential tension that could undermine stability. Given Australia has amongst the longest coastline of all countries in the world, a particular threat is in submarine warfare.

Submarine technologies have advanced significantly in the past decade, with platforms being able to travel deeper and for longer and producing less self-noise. Submarine weapons are also becoming more capable, with long range torpedoes capable of striking targets accurately from over a mile. A key limitation of the current technology is that detection devices are passive, i.e. they rely on the detection of self-noise generated by the target submarine itself. With a trend of increasing threat and decreasing detection capability, it means when a submarine is detected, it could already be too late to respond to a potential attack.

The proposed SONAR innovation will significantly increase the range of detection, thus, enabling the balance of sense and response to be restored. It is our intention to develop the system to specifically meet the needs and timescales of the SEA1234 Program for Future Destroyer, although, it is also our objective that the final product should be scalable and adaptable to any Defence platform.

8.2 User Communication

Detail how the Participant intends to work with Defence users to continually align the innovation to the user need (this may reference any collaboration with the relevant Defence section).

During our Phase 1 work, Sonic Urchin established a close working relationship with the DST Group and the SEA1234 Program Office. This will continue throughout Phase 2 to ensure user needs and requirements are continually aligned. In addition, monthly progress reports and quarterly progress meetings will be facilitated at our South Australian office to include Defence stakeholders.

8.3 Requirements and Specification Artefacts

Identify requirements and specification artefacts that already exist or are otherwise intended for development.

During the Phase 1 work, Sonic Urchin worked with DST Group to develop user requirements for the SONAR sounder. This is documented in *doc reference* for operational frequency, data sampling requirements, power requirement (theoretical), package size and operating conditions including both far and near fields.

8.4 Requirements Development

Describe how systems requirements and specifications will be adapted as Defence user needs evolve and mature.

Describe the relationship between test planning documents and requirements artefacts.

Over the course of the proposed Phase 2 work, we envisage that further requirements development will include the specification of key (generic) submarine features to be represented, the listening device requirements (to be adapted from our Eel device), and mechanical and electrical handling with respect to tank testing watertight requirements.

9 Systems Engineering Management

To support systems engineering management for this Phase, the PEP must detail the Participant's approach to facilitating the following Systems Reviews: Requirements Reviews, Design Reviews and Test Readiness Reviews. There should be close linkage between the project schedule, work breakdown schedule and systems engineering management.

The PEP must include detail of the Participant's System reviews, including entry and exit criteria, attendees, the Participant's nominated chair, decision makers and corrective action process.

The PEP must identify the Technical Documents and products under Configuration Control and a Configuration Control Board (CCB) (or equivalent) in place (with or without Defence representation as appropriate), which the Participant intends to use for technical decision-making.

Entry and exit criteria for each review must be identified and described.

Guidance can be found at ISO/IEC/IEEE 15288:2015, see https://www.incose.org/about-systems-engineering/se-standards or the

INCOSE Systems Engineering Handbook https://www.incose.org/products-and-publications/se-handbook

Entry criteria are minimum accomplishments that must be achieved prior to initiating the review process.

Exit criteria constitutes a series of accomplishments that must be achieved in order to progress to the next stage of the project. Each review requires different entry/exit criteria in order to progress. An example of criteria is provided at table 2 below.

Note the Innovation Contract includes further guidance on requirements driven by the innovation phase to be undertaken. The examples below should be read in combination with those requirements and tailored accordingly.

Please note, Defence attendance at reviews is subject to operational requirements, and may be by teleconference at Defence's discretion.

The following is required for each review.

Requirement Reviews	
Entry criteria	*Functional requirements identified; Indicative performance measures documented* *Functional requirements linked to Participant's defined User Need*
Exit criteria	*Functional requirements are agreed to by Defence*
Attendees	*Participant personnel as required*

	Capability Sponsor (or delegate as appropriate) *DIH representative*
Nominated Chair	*Participant Engineering Manager*
Decision makers	*Participant Engineering Manager* *Capability Sponsor*
Corrective action process	
Technical documents and products for decision making	*Documentation required under the Innovation Contract prior to requirements review.*
Design Reviews	
Entry criteria	*Requirements traceability / verification matrices.* *Hazard analysis contributing to system safety program, including disclosure of design actions undertaken to eliminate or mitigate risks SFARP.* *Evidence that requirements informing procurement or manufacture of supplies are adequately defined and documented.* *Configuration management of design during development.* *Supporting procedures, plans or instructions have been defined – and where necessary – developed and approved.* *Actions from SRR are complete.* *Actions from previous design reviews (if applicable) are complete.*
Exit criteria	*Agreement that the design is in a state to proceed to manufacture / fabrication / build.* *Agreement with the approach to collecting design verification evidence.*
Attendees	*Participant personnel as required* *Capability Sponsor (or delegate as appropriate)* *DIH representative* *User representatives* *Test SMEs*
Nominated Chair	*Participant Engineering Manager*
Decision makers	*Participant Engineering Manager* *Capability Sponsor*
Corrective action process	
Technical documents and products for decision making	
Test Readiness Reviews	

Entry criteria	*Test Plan* *Safety Management Plan / Risk Management Plan for test activity* *Actions from previous reviews completed*
Exit criteria	*Agreement with outcomes of planned test* *Agreement with test outline, personnel supporting, method and schedule* *Agreement to provide requested GFM* *Agreement with management of safety risks for planned test*
Attendees	*Participant personnel as required* *Capability Sponsor (or delegate as appropriate)* *DIH representative* *Test SMEs – relevant to capability* *Representative users*
Nominated Chair	*Participant Engineering Manager*
Decision makers	*Participant Engineering Manager* *Capability Sponsor*
Corrective action process	
Technical documents and products for decision making	

Table 7 – Requirements Review: An example of criteria

10 Safety Management

This section is focused on understanding the respondents approach to managing system safety during the innovation activity. System safety is a discipline that seeks to identify hazards and assess and mitigate associated risks encountered in the development, test, production, use (including use by the intended operator, storage, transport, actions required to configure the system prior to use), and disposal of defence systems. It considers the hazards to all people who may be affected by the realisation of a safety risk during the systems lifecycle.

10.1 Safety Requirements

Describe the safety requirements and internal safety standards/processes implemented/to be implemented. The PEP must also include an initial Safety Risk Assessment applicable to the proposed activities under this phase. This risk assessment will be used to determine the level of rigour required in the management of safety within this phase.

10.2 Hazard Analysis

Describe the planned process for hazard analysis.

A hazard is any real or potential condition which could cause harm to any person. Uncontrolled hazards pose a risk of injury and should be identified and controlled accordingly. The hazard management system should consider safety hazards that exist across all activities that will be undertaken during the innovation phase. It should include design related hazards, functional hazards and operational hazards to personnel across the lifecycle.

An example of a hazard register with corresponding risk assessment matrix is shown below. The Severity Categories table, Probability Levels table, and the Risk Assessment Matrix have been taken directly from Military Standard 882E[1] *(an industry standard).*

Severity Categories			
Description	**Severity Category**	**Mishap Result Criteria**	
Catastrophic	1	Could result in one or more of the following: death, permanent total disability, irreversible significant environmental impact, or monetary loss equal to or exceeding $10M	
Critical	2	Could result in one or more of the following: permanent partial disability, injuries or occupational illness that may result in hospitalisation of at least three personnel, reversible significant environmental impact, or monetary loss equal to or exceeding $1M but less than $10M	
Marginal	3	Could result in one or more of the following: injury or occupational illness resulting in one or more lost work day(s), reversible moderate environmental impact, or monetary loss equal to or exceeding $100K but less than $1M	
Negligible	4	Could result in one or more of the following: injury or occupational illness not resulting in a lost work day, minimal environmental impact, or monetary loss less than $100K	
Probability Level			
Description	**Level**	**Specific Individual Item**	**Fleet or Inventory**
Frequent	A	Likely to occur often in the life of an item	Continuously experienced
Probable	B	Will occur several times in the life of an item	Will occur frequently.
Occasional	C	Likely to occur sometime in the life of an item	Will occur several times.
Remote	D	Unlikely, but possible to occur in the life of an item.	Unlikely, but can reasonably be expected to occur.
Improbable	E	So unlikely, it can be assumed occurrence may not be experienced in the life of an item.	Unlikely to occur, but possible.
Eliminated	F	Incapable of occurrence. This level is used when potential hazards are identified and later eliminated.	Incapable of occurrence. This level is used when potential hazards are identified and later eliminated.

Table 8 – Hazard Categories and Probability Indicators

RISK ASSESSMENT MATRIX				
SEVERITY / PROBABILITY	Catastrophic (1)	Critical (2)	Marginal (3)	Negligible (4)
Frequent (A)	High	High	Serious	Medium
Probable (B)	High	High	Serious	Medium
Occasional (C)	High	Serious	Medium	Low
Remote (D)	Serious	Medium	Medium	Low
Improbable (E)	Medium	Medium	Medium	Low
Eliminated (F)	Eliminated			

Table 9 – Risk Assessment Matrix

Note: This Risk Assessment Matrix has been provided as an example and along with other safety management and hazard analysis guidance in this document is taken directly from Military Standard 882E[1] (an industry standard).

Hazard Register Example*												
ID	**Hazard**	**How might they be harmed?**	**Unmitigated Risk**			**Existing Controls**	**Action Required**	**Mitigated Risk**			**Completion deadline**	**Completion Date**
			Hazard Severity	**Probability**	**Risk Matrix Outcome**			**Hazard Severity**	**Probability**	**Risk Matrix Outcome**		
1	Trips	Potential injury from tripping and falling	3	C	**Medium**	Wear appropriate PPE. Use designated walkways	Inform personnel of potential hazard	3	C	**Medium**	Ongoing	
2	Electricity	Electrocution could occur	2	C	**Serious**	Electrical insulation.		2	C	**Serious**	Ongoing	
3	Chemicals	Skin contact, inhalation or ingestion of toxic chemical may cause harm	4	D	**Low**	Labelling of toxic chemical materials. Requirement to wear PPE.	Brief staff on procedures if contact with chemical occurs	4	D	**Low**	Ongoing	
4	Faulty equipment	An individual using the equipment may be harmed if the fault results in injury	2	B	**High**		Tagging and removal of faulty equipment from site	2	F	**Eliminated**	10/11/18	8/11/18
5	Loss of separation	System physically strikes a member of the test team	2	D	**Medium**	Geo – fencing	Operate behind safety barrier. Increase separation distance.	2	E	**Medium**	Ongoing	

Table 10 - Example of a Hazard Register

**This is one example of a possible method for hazard analysis. Please present the hazard analysis as is appropriate for the specific project.*

10.3 WHS Compliance

Describe the processes and procedures for ensuring compliance with WHS legislation.

10.4 Safety Requirements and Standards

Describe the safety requirements and safety standards implemented/to be implemented

10.5 Reporting

Describe the processes for incident reporting. Describe the processes for safety reporting, including the criteria for reporting the identification of new risks or changes in risk assessments

11 Handling of Deliverables

The PEP must specify the return policy for deliverables, including for disposal.

The standard requirement is that Defence will have the option to return any physical deliverables delivered to Defence, including for disposal, within 12 months of the finalisation of the contract phase. The PEP should indicate adherence to this standard, or explain why a deviation is necessary and how the equipment would be managed in this instance.

12 Technical Data (TD)

The PEP must describe the Participant's general approach to providing TD which will be listed in the TD Schedule (noting that prior to the commencement of work under a resultant contract only currently extant TD should be listed in the TD Schedule, which will be updated as TD is generated during the life of the project). The PEP must also include an overview of all TD that is covered by clause 4.2 of the Innovation Contract. In the final PEP, Defence may identify any Technical Data (which does not fall into the categories set out in clauses 4.2(a) to (d) of the Innovation Contract) that will otherwise need to be included in the TD Schedule.

13 Intellectual Property (IP)

The PEP must detail how the Participant intends to monitor and identify all IP used or created under or in connection with the Innovation Contract. The PEP must also describe the Participant's overall approach to ensuring compliance with its obligations under the Innovation Contract in respect of IP.

An example of monitoring and identifying all IP is to maintain an IP register throughout the course of the project.

All Background IP, Foreground IP and Third-Party IP shall be defined and registered in accordance with IP Management procedures.

To manage all relevant IP records:

a. An IP register will be kept identifying the use of IP throughout the course of the project.
b. This will track and categorised into three types of IP: external, background, and novel. When novel IP is found then it will be further described through the use of the standard IP Disclosure Form,

We and the Defence Innovation Hub shall:

a. Register the Background IP in the IP Register within 60 days of it being provided under the Contract; and
b. Participate in meetings (as required) in which Background IP that is not already recorded will be reviewed, agreed and recorded.

The focus area is the creation of novel and the PM is responsible for the management of IP associate with this project.

Reference

[1] US Department of Defence Standard Practice. *MIL-STD-882E: System Safety*. 11 May 2012