ENVIRONMENTAL IMPACT STATEMENT

The Sea Lion Field
Northern Development Area, Phase 1 & 2

Non-Technical Summary

July 2024

Environmental Impact Statement: The Sea Lion Field Northern Development Area, Phase 1 & 2

Navitas Petroleum Development and Production Limited.

Project	Area	Discipline	Doc Type	Doc. Number	Sheet
SLN	REG	ENV	RPT	00001	00

Acknowledgments

Thanks are extended to the: Falkland Islands Government Fisheries Department, Falkland Islands Policy and Economic Development, including the Environment Unit, Falkland Islands Public Works Department, Falkland Islands Department of Natural Resources, Andrea Clausen, Nomali Port, Steuart Barlow, Dani Baigorri, Robert King, Hayden Eldridge, Rebecca Piontek, Debbie Barlow, Maeve Daly-Llamosa, Roddy Cordeiro, Zac Stephenson, James Greenland, Laura Yon and SAERI staff who provided additional data used in the assessment.

Thanks go to the Joint Nature Conservation Committee and Falklands Conservation allowing access to the Seabirds at-Sea Team survey dataset in previous Sea Lion EIAs. These data are presented again here but no re-analyses were conducted. The original project was sponsored by Falklands Conservation with funding coming from Falkland Islands Government and FOSA (Falklands Offshore Sharing Agreement) in the first year.

This document has been prepared by SAERI (Falklands) Ltd. SAERI is the South Atlantic Environmental Research Institute.

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

1 Non-Technical Summary

1.1 Introduction

Navitas Petroleum Development and Production Ltd. (hereafter referred to as Navitas) is proposing to develop the Sea Lion Field Northern Development Area in the North Falkland Basin (NFB) with a view to the long-term production and export of oil. A phased development process is proposed.

Navitas will conduct all operations in compliance with its Health, Safety and Security Policy (HS&S) and its Environmental and Biodiversity (E&B) Policy, which requires that Navitas do all that is reasonably practicable to prevent major accidents and minimise environmental impacts.

In line with Falkland Islands legislation and its Operating Management System (OMS), Navitas has conducted a full Environmental Impact Assessment (EIA) of The Sea Lion Field Northern Area Development, Phase 1 & 2 (hereafter referred to as the 'Phase 1 & 2 Development').

The EIA was carried out in line with:

- Falkland Islands Government (FIG) Hydrocarbons Environmental Impact Assessment Guidance Note (FIG, 2016e).

The detailed outcomes of the EIA process are reported in the Environmental Impact Statement (EIS) and the key outcomes are summarised in this Non-Technical Summary (NTS). Following submission to FIG a copy of the full EIS is available on request from the Navitas office in Stanley (sealion.enviro@navitaspet.com).

1.1.1 Historical context

The NFB licences were previously held by Premier Oil Exploration and Production Limited (POEPL) working with their Joint Venture partner Rockhopper Exploration. Exploration drilling campaigns were carried out by Rockhopper in 2010 - 11 and by POEPL in 2015-16. Plans for the development of the Sea Lion project, with a view to production, commenced in 2012. An EIS for POEPL's plan for the Sea Lion Development was submitted and formally accepted by FIG in 2020 (Premier, 2020).

POEPL was bought by Navitas Petroleum in September 2022 and was renamed Navitas Petroleum Development and Production Limited, such that Navitas now operates the NFB licenses. All intellectual property previously owned by POEPL in relation to the Sea Lion Project is now owned by Navitas. As a result, Navitas has access to all preparatory processes and documentation developed under POEPL, all reports and surveys commissioned in support of the Sea Lion Development, as well as all 'lessons learned' throughout the process.

Since Navitas acquired the NFB licences, the proposed Sea Lion Development has further evolved and has been optimised in terms of:

- A reduction in number of wells and subsea infrastructure,
- The design of the wells uses 'Open Hole Gravel Pack' (OHGP) completions in the production wells, which are installed where the well meets the hydrocarbon reservoir, and which do not require conventional explosive perforation guns,
- The proposed daily production figures and hence the size and efficiency of the Floating Production, Storage and Offload (FPSO) vessel such that the forecast atmospheric emissions per barrel are reduced, and
- A longer proposed Field Life with increased recoverable resources.

As a result of these changes, it is necessary to conduct another EIA and submit a revised EIS to FIG.

1.1.2 Purpose of the EIA

The main purpose of the EIA is to answer the following six questions:

1. What is the context within which the proposed Development is being carried out?
    a. What do the '**Regulations**' and the '**Navitas OMS**' require?
2. What does the Phase 1 & 2 Development involve?
    a. What activities are involved in the proposed Development? In other words, what is the '**Phase 1 & 2 Development Description**'?
    b. Are any mitigation measures built-in to the basis of design to minimise interactions with the environment and the human population? In other words, what are the '**Base-Case Mitigations**'?
3. What do the stakeholders think about the proposed Development?
    a. What do the Falkland Islands Government (FIG) and its statutory consultees think? What do the Falkland Islands public think? The answers to these questions were invited during '**Scoping and Previous Statutory Consultations**'.
4. What are the existing environmental and social attributes and sensitivities in the area?
    a. What is known about the local environment and the local human population? For example, what species of marine mammals or seabirds, are found in the area? When are they there? What are they doing there? How important is the population that could be impacted upon? Do they have international or local protected status? This is called the '**Environmental and Social Baseline**'.
5. What are the environmental and social impacts and risks associated with the project activities?
    a. How might the Development interact with the environment and / or the human population? In other words, what are the associated '**Environmental and Social Aspects**'?
    b. How are the impacts and risks assessed? In other words, what is the '**Impact and Risk Assessment Methodology**'?
    c. What impacts and risks are associated with the planned activities and accidental or unplanned events? Are the potential impacts and risks significant? What are the '**Key Findings of the EIA**'?
6. What is Navitas doing to reduce the potential impacts and risks?
    a. What if an impact or risk is considered to be significant despite compliance with legislation, the use of industry-standard practice and the 'base-case' mitigation measures? Will additional actions be taken to remove, minimise or monitor the impact or risk?
    b. All mitigations and monitoring commitments will be summarised in the '**Project-Specific Environmental Monitoring and Management Plan (EMMP)**' which will remain 'live' (be continually reviewed and updated) for the life of the field.

Numerous steps are involved in conducting an EIA and in answering the questions above. This NTS briefly outlines the planned Development and describes the key outcomes of the EIA.

1.2 The Sea Lion Field

The Sea Lion Field is an oil field. Oil and gas are trapped in underground sandstone rocks approximately 2.5 km below the seabed, in water depths of approximately 450 m. It is likely that there is a gas accumulation (or 'gas cap') overlying some of the oil. The existence of the gas cap will be determined during the Development drilling operations. The field is located approximately 220 km to the north of the Falkland Islands in Block 14 / 10. Navitas propose the development of the Sea Lion Field in accordance with the Production Licence areas PL032 and PL004b granted by the Falkland Islands Government (Figure 1-1).

The Sea Lion Field is the first potentially commercially viable hydrocarbon discovery in the NFB and was discovered by Rockhopper Exploration plc in 2010. With regard to oil production, a Field Life of 30 years has been projected and it is estimated that the Phase 1 & 2 Development can recover approximately 306.9 million stock tank barrels (MMstb) of oil in this time.

The crude oil discovered in the Sea Lion Field has a high wax content such that it needs to be kept at an elevated temperature throughout the production and export process to ensure that it can flow.

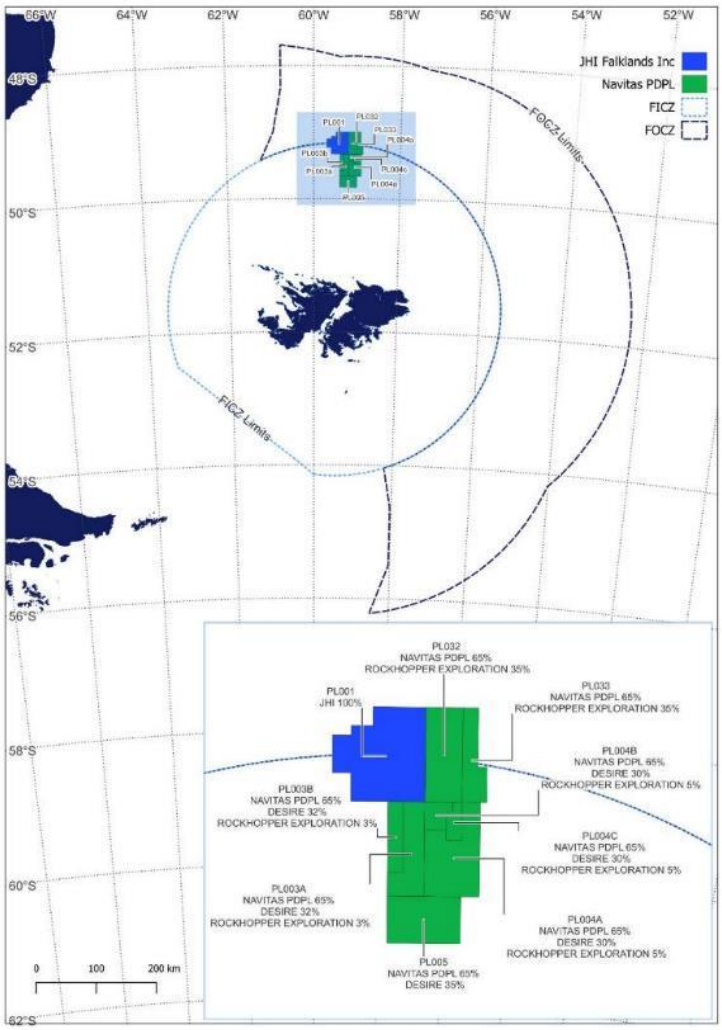

Figure 1-1: North Falklands Basin Licence Block Locations

1.3 EIA Context

To answer 'Question 1' above, the following information summarises FIG's regulatory requirements, and those of the Navitas OMS, both of which define the context within which the EIA has been carried out. Full details on both are provided in Chapter 3 of the EIS.

1.3.1 Regulatory overview

The Falkland Islands is one of 14 UK Overseas Territories (UKOT) as defined under the British Overseas Territories Act 2002.

The Environmental Charter is a joint agreement between FIG and the UK Government that was signed in 2001. The Charter lists ten guiding principles and 11 commitments therein. All commitments are intended to ensure effective environmental management within the Islands.

Environmental legislation that applies to Oil and Gas (O&G) activities within the Falkland Islands is based upon the regulatory requirements for the United Kingdom Continental Shelf (UKCS).

Legal compliance and the preparation of required consents will be based on current FIG legislation (where it exists) with reference to UK legislation and guidance. In the event that FIG legislation is enacted in the future, reference to UK legislation will not be required.

Existing Falkland Islands legislation relevant to the O&G industry is as follows:

- Offshore Minerals Ordinance 1994 (1997 and 2011 Amendments).
- Offshore Petroleum (Licensing) Regulations 1995 (2000, 2004 and 2009 Amendments).
- Petroleum Survey Licences (Model Clauses) Regulations 1992.
- Maritime (Amendment) Ordinance 2019.
- Maritime (Oil Pollution Preparedness, Response and Co-operation Convention) Regulations 2019.
- Deposits in the Sea (Exemptions) Order 1995.
- Marine Mammals Ordinance 1992.
- Conservation of Wildlife and Nature Ordinance 1999.
- Fisheries (Conservation and Management) Ordinance 2005.
- Endangered Species Protection Ordinance 2015.
- Planning Ordinance 1991.
- Planning (Environmental Impact Assessment) Regulations 2015.
- Falklands Interim Port And Storage System (FIPASS) Ordinance 1989.
- Harbours and Ports Ordinance 2017.
- Maritime (Registration of Ships) Regulations 2019.
- Merchant Shipping (Confirmation of Legislation) (Falkland Islands) Order 2018.
- Offshore Installations (Prevention of Fire, Explosion and Emergency Response) Order 2008
- Offshore Installations (Safety Case) Order 2008.
- Falkland Islands Environmental Trust Ordinance 2021.
- Maritime (Port State Control) Regulations 2021.

Specific guidance on the Falkland Islands EIA process and the development of the EIS is provided in:

- FIG Hydrocarbons Environmental Impact Assessment Guidance Note (FIG, 2016e).

1.3.2 Navitas Operating Management System

As in all of its O&G activities, Navitas will, as a minimum, adhere to its own corporate Health, Safety and Security (HS&S) Policy and Environment and Biodiversity (E&B) Policy *via* the processes set out in the OMS. The application of the OMS framework throughout the lifecycle of the Phase 1 & 2 Development will ensure environmental management is considered at every stage.

With regard to managing environmental impacts, the OMS provides a framework for operational controls to prevent and reduce impacts and risks by:

- Preventing, minimising or remediating an impact,
- Preventing, or reducing the likelihood of unplanned events, and
- Minimising the severity of effects in the event of an incident.

Operational controls include a hierarchy of Elimination, Substitution, Engineering and Administrative Controls. Elimination and substitution controls are built-in to the project basis of design such that the project will always endeavour to minimise impacts and risks. During the EIA process, where impacts or risks are deemed significant despite the base-case mitigations and industry-standard safeguards, it is necessary to determine what additional, project-specific, controls may be required. All additional project-specific controls intended to prevent or mitigate impacts and risks will be utilised where they are deemed to be 'reasonably practicable'.

The OMS provides for incident management and monitoring, emergency response and safety and environmentally critical equipment with regular measurement and reporting against plans and objectives.

The OMS will apply through all subsequent Phases of the Development. Full details on the Navitas OMS are provided in Section 3.2 of the EIS.

1.4 The Sea Lion Field Northern Area Development, Phase 1 & 2 - Development description

To answer ‘Question 2’ above, the following sections provide a summary of:

- The activities that will be required during the proposed Phase 1 & 2 Development to enable the production of oil from the Sea Lion Field, and
- The base-case mitigations that are built-in to the basis of design.

The full Phase 1 & 2 Development Description is provided in Chapter 5 of the EIS.

1.4.1 Activities associated with the Development

1.4.1.1 Drilling and installation of subsea infrastructure

The proposed Phase 1 & 2 Development is expected to consist of 23 completed wells comprising 16 Oil Production (OP) wells, six Water Injection (WI) wells and a remote Gas Injection (GI) well, drilled by a Mobile Offshore Drilling Unit (MODU) over six drill centres. If the remote GI well has insufficient gas flow, an additional remote GI well will be drilled, although only one of these will be completed. Further, based on historical data from drilling in the Sea Lion Field, there is a contingency for two potential redrills in the event of technical problems. Therefore, while there may be up to 26 penetrations, only 23 wells will actually be completed and operated. The MODU will be anchored to the seabed and surrounded by a 500 m exclusion zone, supported by up to two support vessels and an Emergency Response and Rescue Vessel (ERRV).

A Floating, Production, Storage and Offload (FPSO) vessel (Figure 1-2 below) will be used to produce the fluids from the wells. The FPSO will be anchored to the seabed, within a 1,275 m radius exclusion

zone. The OP and WI well drill centres will all be within a 2 - 5.5 km radius around the FPSO and the remote GI well location is approximately 8 km from the FPSO.

After First-Oil there will follow two periods of Simultaneous Operations (SIMOPS) as the FPSO commences with production from the first tranche of wells while the MODU continues to drill the remaining wells and installation of subsea equipment takes place.

Wells are normally 'cleaned up' once completed to remove unwanted solids and liquids. With the use of Open Hole Gravel Pack (OHGP) completions, it is anticipated that the wells will be cleaned up by flowing them directly to the FPSO prior to being brought on for production. However, a contingency is retained to flow four wells (3 x OP and 1 x GI well) back to the MODU should it be considered necessary. Flow-back / testing of these wells will require flaring off of the product from the MODU, for approximately one day per well.

To support the Development, ten subsea manifolds and an array of subsea pipelines, 'umbilicals', 'risers' and associated supports (e.g. sandbags, clump weights etc.) will be installed to connect the wells at the seabed with the FPSO at the surface.

While drilling of the wells is underway, installation of the subsea production facilities will be undertaken by dedicated installation vessels.

It is anticipated that four Large Transport Vessels (LTVs) will be used to support the construction and installation operations, with a maximum of two vessels anchored in Berkeley Sound at any one time, for a combined total period of *c.* 13 months. These LTVs will act as 'floating storage barges' from which equipment will be collected and taken out to the Sea Lion Field for installation.

It is anticipated that drilling will start approximately 17- 20 months after project sanction. When drilling starts, only the MODU, its support vessels and the installation vessels will be in the Field.

1.4.1.2 Hook up and commissioning of the FPSO vessel and First-Oil

Oil production and processing will be carried out from the FPSO ship-shaped vessel which will be anchored to the seabed *via* a turret and surrounded by a 1,275 m radius exclusion zone, which is effectively 500 m beyond the installation extremities (including the hose and tanker during crude oil offload). The term 'Hook Up and Commissioning' (HUC) refers to the process by which the FPSO is connected to the subsea wells, *via* the manifolds and the pipelines, umbilicals and risers through the turret mooring buoy (Figure 1-2).

During the commissioning process, the gas injection system will also be commissioned which will involve flaring gas from the GI well for 30 days.

It is expected that 'First-Oil' will occur approximately 33 months after project sanction.

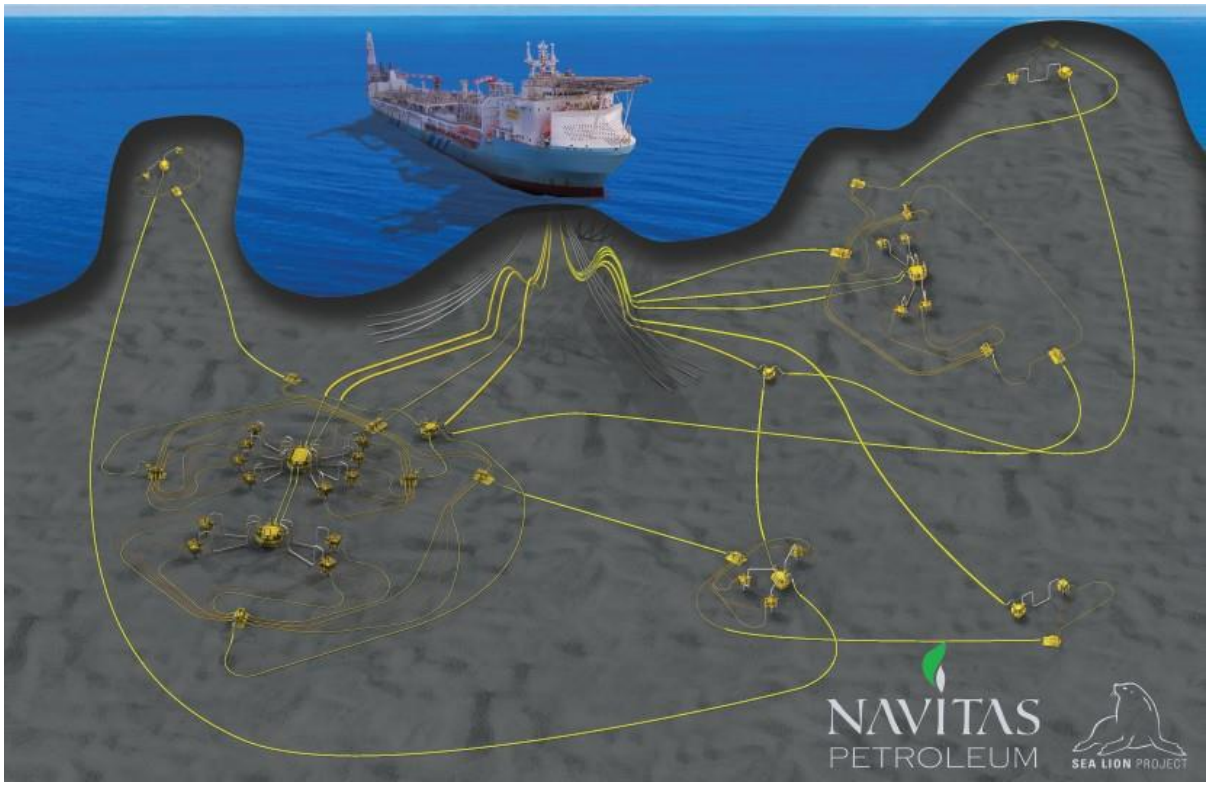

Figure 1-2: Showing the FPSO and the Phase 1 & 2 Development Field layout

1.4.1.3 Simultaneous operations (SIMOPS)

After 'First-Oil' there will follow a period of SIMOPS with the MODU continuing to drill the remaining wells while the FPSO produces from the wells which have already been drilled. During SIMOPS, both the MODU and the FPSO will be supported by two support vessels and an ERRV.

Once all the wells have been drilled, the MODU will leave the Sea Lion Field and only the FPSO and its support vessels will remain.

1.4.1.4 Production

The OP wells will produce reservoir fluids to the FPSO. The total produced fluids will consist of:

- Crude oil (the desired product),
- Associated hydrocarbon gas (arising from the gas cap in the reservoir, (if present) and gas dissolved in the oil which is liberated as the oil flows to surface i.e. the gas that is 'associated' with the oil production), and
- Water (a by-product of the oil production which is referred to as 'produced water').

These three products will be separated and treated on the FPSO:

- The oil will be stabilised (i.e. made ready for export) and transferred to storage tanks within the FPSO hull for subsequent offloading and export (Section 1.4.1.5),
- The associated gas from the production wells will be used:
  - As fuel to heat and power the FPSO, and
  - For 'gas lift' in the oil production wells, which reduces the density of the oil enabling it to flow at higher production rates.

Note: During normal operations any excess associated gas will be re-injected back into the reservoir *via* the remote GI well(s). In the event of a deficit in associated gas, the required gas volumes will be supplemented with gas brought back up from the designated GI well.

Note: The produced water will be cleaned to remove dispersed oil and any solids (e.g. sand, if present). During normal operations, produced water will be re-injected *via* the WI wells (in combination with treated seawater) to maintain pressure in the reservoir, thereby optimising oil recovery.

1.4.1.5 Oil export

The crude oil will be directly offloaded from the FPSO to the purchaser's Conventional Trading Tanker (CTT) at the Sea Lion location and from there will be exported to market. To ensure that the offloading operating conditions are maintained within strict limits, direct offtake will require an Offshore Support Vessel (OSV, i.e. a pull back tug) to attend the CTT offshore, in addition to the presence of the ERRV, which is always on standby.

1.4.1.6 Logistical support

The logistics and infrastructure support required by the Sea Lion Phase 1 & 2 project includes:

- Port facilities and onshore supply base: including the Temporary Dock Facility (TDF) already established in Stanley Harbour together with onshore laydown yards, storage bases and offices in the Gordon Lines area of east Stanley,
- Use of vessels: for the movement of materials and equipment, installation of the infrastructure and support,
- Personnel transportation facilities: including fixed-wing flights, helicopters and land transportation, and
- Use of resources: e.g. accommodation, freshwater, electricity, fuel, roads and waste management / disposal facilities.

1.4.1.7 Decommissioning

At the end of Field Life, expected to be 30 years after commencement of production, the FPSO and all associated subsea infrastructure and pipelines, will be decommissioned and removed from the NFB in accordance with regulatory requirements in place at that time. Decommissioning will be subject to a separate EIA, submitted at a time to be agreed with FIG (most commonly a few years prior to the cessation of production).

1.4.2 Base-case mitigations

FIG legislation, Navitas's corporate standards and industry-standard practices will be followed to reduce the potential impacts associated with the above planned activities, and to minimise the likelihood and / or consequences of unplanned events or accidents. The legislation and industry-standard practices relevant to each activity are detailed in the impact and risk assessment chapters of the EIS (Chapters 10, 11 and 12).

It is important to note that, where possible, a number of best-practice mitigations are built-in to the design of the facilities. These serve to minimise the impacts of the Development by reducing the outputs or activities that might lead to impacts in the first place (e.g. technologies to reduce the amount of gaseous emissions). These are referred to as the base-case mitigations and are summarised in Table 1.1.

Table 1.1: Summary of the mitigations built-in to the Phase 1 & 2 Development basis of design

Project activity	Mitigations built-in to the Phase 1 & 2 basis of design
General	• All materials, fittings and system contents contained in the FPSO hull will be non-toxic, non-smoke emitting, fire retardant or 'low flame spread'.
Drilling and production	**The following will reduce the amount of atmospheric emissions:** • The main fuel supply for the FPSO will be produced gas, use of which will be facilitated by the availability of three Dual Fuel GTG Turbines, • Use of waste heat recovery to reduce the need for active heat generation and therefore to reduce fuel consumption / CO_2 emissions, • No planned flaring during ongoing well testing throughout Field Life, • No routine flaring during normal production (notwithstanding the flare pilot light), • Use of a Flare Recovery Package during normal operations, • No venting from the FPSO during normal production, • Follow international standards for piping, valves etc. and best practises for integrity management e.g. UK Step Change Hydrocarbon Toolkit, • Use of Vapour Recovery Package (VRP) during normal operations, • Use of a vapour balancing system to pass blanket gases from the FPSO cargo tanks to the CTT cargo tanks, when available, during transfer of oil, • The use of passive heat retention systems wherever possible to maintain working temperatures and flow assurance, thereby preventing energy expenditure, and its associated emissions, on active heating systems, • Use of Open Hole Gravel Pack (OHGP) completions which minimise downhole debris and reduce the requirement for well clean-up to the MODU, and thus the likelihood of associated flaring. The base-case is for the wells to be flowed straight back to the FPSO (**Note:** there is a contingency flow / test four wells to the MODU if considered necessary which would require flaring), • Use of F-Gases with the lowest Global Warming Potential, • Back-up inert gas generator for use as gas blanket in the event that the VRP malfunctions to prevent venting of hydrocarbon gas, and • Use of Marine Gas Oil instead of Intermediate Fuel Oil (i.e. a lighter fuel) when operating inshore. **The following will reduce the volumes of drilling discharges:** • Use of seawater sweeps, bentonite and WBM for tophole drilling, and • Batch drilling to optimise drilling mud use. **The following will reduce the volumes of, or negate the need for, discharges of oil and chemicals to sea:** • Produced Water Reinjection (PWRI) as a base-case to alleviate the need to discharge produced water to sea during normal production operations, • Subsea and topside technical flow assurance measures, e.g. insulation and heating, will minimise the use of flow assurance chemicals, • Diversion of produced water to slops / off-spec tanks for retreatment in the event that PWRI is down and produced water is out-with discharge specifications, and • Oil in ballast tank detection on the FPSO. **The following will reduce the volume of oily waste returned to shore:** • Use of a Thermomechanical Cuttings Cleaner (TCC) during drilling which will clean-up drill cuttings on the rig so they may be discharged to sea, reducing the amount of oily waste sent to shore for treatment. **The following will reduce the volume of waste being returned to the UK for disposal:** • Use of FIG municipal waste facilities. **The following will reduce the competition for resources:**

Project activity	Mitigations built-in to the Phase 1 & 2 basis of design
	• Use of buffer storage water tanks at the TDF, the mud plant and potentially the at-shore bulk supply base to ensure management of peak water use requirements.
Oil spill prevention measures	**Note:** many industry-standard preventative mitigation measures must be built-in to the basis of design. Therefore, there are very few 'extra' base-case mitigation options available and the standard requirements are summarised below: **Preventative measures built-in to the FPSO include:** • Cargo and fuel tanks of the vessel will be double skinned, • Bunding of all liquid containing equipment and chemicals, • Open deck drains to catch and collect spills to a dedicated slops tank, • High level tank filling alarm and emergency shutdown of the process, • FPSO offloading hose quick-break connectors to prevent spills on unplanned disconnection, and • Automatic Identification Systems and Marine Procedures to prevent collisions. **Preventative measures built-in to the well design include:** • Development of the appropriate, and peer reviewed, well design, • Use of appropriately weighted drilling muds, • The use of appropriate mud additives to ensure over-balanced drilling, and • Use of Blow-Out Preventers and production X-mas trees. **Preventative measures built-in to the CTT nomination and selection include:** • Cargo tanks, and potentially the fuel tanks, of the vessel will be double-skinned, • Vetting and auditing prior to acceptance of the nominated vessel, • Transfer of Falkland Islands' authorised Berthing Master / Pilot and assistant to CTT to manage the offshore direct offtake operation, • Cargo tank hi level and hi-hi level alarms to prevent overfilling, • Bunding of all liquid containing equipment and chemicals, and • Open deck drains to catch and collect spills to a dedicated slops tank.

1.5 Scoping consultation

To answer 'Question 3' above, the following section describes the scoping consultation processes, which were carried out to identify any concerns that the stakeholders (including the Falkland Islands public and consultees) had regarding the Phase 1 & 2 Development. The consultations were carried out in line with the FIG EIA Guidance (2016e) and were intended to:

- Inform the stakeholders about the proposed Development,
- Identify stakeholder concerns, and
- Ensure that the EIA adequately addresses stakeholder concerns.

As advised by the FIG EIA Guidance (2016e), the stakeholders consulted by Navitas included:

- Local authorities,
- Conservation groups,
- Naturalists,
- Special interest groups,
- Other users of the sea, and
- The general public.

Scoping consultations for the (then) Phase 1 Development proposed by POEPL were carried out between 2014 and 2016, prior to formal submission/s of the EIS and the statutory consultations that followed in 2018 and 2020. Further scoping consultations were carried out by Navitas in 2023 to present detail on, and elicit response to, the optimised development basis of design (presented in this

EIS). Details on the pre-submission scoping consultations and their outcomes, are provided in Chapter 6 of the EIS.

During scoping consultations, numerous questions were asked, and issues raised by the stakeholders. All representations were taken into account during the EIA process and are recorded in the EIS. The key issues that were identified as areas of concern over the course of the scoping consultations (2014 – 2023) were:

- Control of vessels and general management in Berkeley Sound,
- Oil spill mitigations and clean-up:
  - The impact of this particular type of crude on the marine environment.
- Onshore infrastructure,
- Environmental offsetting,
- Decommissioning,
- Jobs, employment and numbers of people, and
- Standards and governance.

Note: following formal submission, this EIS will undergo a formal 42-day statutory consultation process. The outcomes of this formal consultation, and Navitas's responses to any representations, will be recorded in Chapter 17 of the final EIS.

Note: two previous versions of this EIS (Premier, 2018 and 2020) have already been through this process.

1.6 Environmental and social baseline description

To answer 'Question 4' above, the following sections aim to summarise the current environmental and social baseline information. It is necessary to describe the baseline in sufficient detail to:

- Understand what is currently present i.e. the 'baseline'. For example, what benthic (seabed) communities, fish, birds, marine mammals are in the area? What is the current condition of the seabed? What resources are available in the Falkland Islands for the local human population, and who else uses the offshore and inshore locations?
- Understand the sensitivity of the receptors. For example, what are the population sizes of the species present? What are they doing there? Are they vulnerable, are they protected, are they commercially important or of value for other users? Are stakeholders concerned?
- Determine whether there are data gaps and if, or how, these could affect confidence in the impact and risk assessments, and
- Provide a reference point of comparison for future monitoring that will be carried out by Navitas to determine whether or not the Phase 1 & 2 Development has had any discernible environmental or social impacts, and to validate the results of the EIA.

1.6.1 Key environmental sensitivities

Understanding the attributes of the NFB, the Sea Lion Field and Berkeley Sound area was informed by:

- Extensive literature reviews,
- Historical environmental surveys conducted in the area by various parties since the mid-1990's, and
- Further surveys carried out by Rockhopper and POEPL between 2012 and 2019.

Note: The survey reports can be requested from sealion.enviro@navitaspet.com.

The Patagonian Shelf, on which the Falkland Islands archipelago is located, is one of the most biologically productive areas in the South Atlantic. Two marine ecosystems, the sub-Antarctic ecosystem and the southern temperate ecosystem, are separated by a transition zone, which runs through the Falkland Islands. Further, the area is dominated by two different oceanic currents.

The resulting mixing of water masses produces areas of high biological productivity, including one on the edge of the Continental Shelf to the south of the Sea Lion Field. This productivity supports a high biomass of plankton in the NFB, which forms the basis of marine ecosystem food chains, upon which many species of larger animals such as fish, seabirds and marine mammals depend.

The inshore area of Berkeley Sound is important given its regular use by the fishing and tourism industries, as well as by wildlife. The Sound is used by a variety of protected marine mammals and protected birds. Moreover, the entrance to Berkeley Sound is flanked by two National Nature Reserves (Volunteer Point and Cow Bay, and the Kidney Island Group), which are also classified as Important Bird Areas (IBAs).

Potentially sensitive habitats identified within Berkeley Sound that are equivalent to those of conservation significance in the UK, as defined by the Offshore Marine Conservation of Habitats Regulations (which implement the EC Habitats Directive), include biogenic reefs (reefs created by living organisms), geogenic reefs (created by geological processes) and kelp forests.

The key biological sensitivities of the Falkland Islands offshore environment and Berkeley Sound are summarised in Table 1.2 and Table 1.3, respectively. In order to provide an overview of the environmental sensitivities, the tables indicate the relative importance of each month, regardless of the particular species, fishery or site that is driving the sensitivity.

Table 1.2: Summary of key environmental sensitivities in the Sea Lion Phase 1 & 2 Development area

Environmental baseline and sensitivity at Sea Lion											
Low[1]				Medium[1]				High[1]			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Plankton: Plankton comprises of small to microscopic plants (phytoplankton) and animals (zooplankton) that drift in the surface layers of the sea. Phytoplankton require sunlight, like all other plants, to survive, and zooplankton graze upon the phytoplankton or prey on other zooplankton. The oceanic fronts around the Falkland Islands result in nutrient rich waters which create an area of very high phytoplankton productivity immediately to the north of the Islands (and approx. 60 km to the south of the Sea Lion Field). This phytoplankton productivity is seasonal and in turn supports complex communities of zooplankton, which then support complex pelagic (in the water column) and demersal (near the seabed) ecosystems.											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Marine flora: Not applicable to offshore location.											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Benthic fauna: Benthic fauna are those animals which live on, or below, the seabed. Overall, benthic fauna around the Sea Lion area is very uniform, with polychaetes (i.e. marine worms) and crustaceans (e.g. crabs) being the two most abundant groups present, followed by molluscs (e.g. clams).											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fish and shellfish: The convergence of the temperate and sub-Antarctic regions in the Falkland Islands archipelago results in the presence of species belonging to both. The six sub-Antarctic, and seven temperate, fish and squid species found in abundance in Falkland Islands' waters primarily utilise the NFB as feeding grounds, migrating in and out of the area as food availability changes and to follow seasonal spawning migrations. Other species feed in the area as juveniles and move to deeper waters as they mature and become adults. This results in seasonal changes in the fish assemblages across the ecosystem.											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seabirds: Over 70 % of the global population of black-browed albatross breed on the Falkland Islands with a significant proportion of the global populations of gentoo and rockhopper penguins doing the same. The waters surrounding the Falklands also support numerous species that breed elsewhere. Of the species recorded in the Sea Lion area, the Atlantic petrel, grey-headed albatross, and northern royal albatross are all listed as 'Endangered' on the IUCN Red List, and the southern rockhopper penguin, white-chinned petrel, southern royal albatross and the wandering albatross are listed as 'Vulnerable'.											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Marine mammals: Confirmed records indicate that 25 species of cetacean (whales, dolphins and porpoises) occur within Falkland Islands waters and three species of pinniped (seals) breed on the Islands. Many of the cetacean species are rare and inconspicuous and some are only known from stranded animals. Of these 25 cetacean species, one species is listed as 'Endangered' on the IUCN Red List, namely the sei whale, and two species, the fin and sperm whales, are listed as 'Vulnerable'.											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Conservation sites: There are no designated marine protected areas in Falkland Islands waters. The Falkland Islands Government (FIG) has identified several areas as proposed Marine Managed Areas, for which a public consultation was held in 2022 (consultation report and scientific evidence to support Marine Managed Areas is available *via* FIG website https://www.falklands.gov.fk/policy/environment/marine-managed-areas-consultation-report). Policy work is ongoing (as of 2024) but it is anticipated the proposed Marine Managed Areas will be designated. Non-statutory Key Biodiversity Areas (KBAs) have also been identified for sei whales and seabirds around the Falkland Islands (Weir 2021, Handley *et al.* 2023). On land, a number of Important Bird Areas (IBAs) have been designated. Additionally, a network of National Nature Reserves (NNR) and Important Plant Areas (IPAs) protect many of the most important seabird breeding sites and areas supporting native flora respectively.

[1] Note that the terms Low, Medium and High in this context provide a guide only as to the general sensitivity / abundance as it is relevant to each receptor. Specific sensitivities of each receptor to each environmental impact are explored in full within the EIS.

Table 1.3: Summary of key environmental sensitivities in Berkeley Sound

Environmental baseline and sensitivity in Berkeley Sound											
Low[1]				Medium[1]				High[1]			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Plankton: Plankton comprises small to microscopic plants (phytoplankton) and animals (zooplankton) that drift in the surface layers of the sea. The most conspicuous component of the inshore zooplankton community is lobster krill, which is an important prey species for higher predators (such as penguins and whales).											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Marine flora: Marine plants are the major primary producers in the marine environment. The most common species of seaweed within the Falklands are the giant kelp and the tree kelp, which are found around the entire Falklands coastline. Kelp is a habitat forming species and is a very important part of the inshore ecology.											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Benthic Fauna: Benthic fauna are those animals which live on, or below, the seabed. Berkeley Sound supports a wide range of benthic habitats (including biogenic and geogenic reefs), each supporting a characteristic range of species. Although none of the species found is rare or protected under any Falkland Islands legislation. Work is ongoing to identify important marine areas, and as such work develops, new designations can be incorporated in the ongoing management of the project *via* the EMMP and the 5-yearly review of the EIS.											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fish and shellfish: The most conspicuous species found inshore off the east coast is loligo squid, which play a key role in the inshore ecology as predator and prey. In addition, loligo support the second largest fishery in the Falklands. Loligo are known to migrate inshore to spawn, although the key spawning sites remain unknown. Periods of 'high sensitivity' reflect the spawning periods of the two loligo cohorts. There are several species of shellfish found within Berkeley Sound that are commercially exploited elsewhere but not currently in the Falklands.											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seabirds: Berkeley Sound encompasses significant breeding populations (>1 % of the national population) of gentoo and rockhopper penguins and a far higher proportion of the national populations of king penguins, sooty shearwaters and white-chinned petrels. In addition to king and gentoo penguins, there are large resident populations of imperial and rock shags and Falkland steamer ducks, which are present year-round. Of the species breeding in Berkeley Sound the white-chinned petrel and southern rockhopper penguin are listed as 'Vulnerable' on the IUCN Red List.											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Marine mammals: Berkeley Sound supports small breeding populations of South American sea lions (Diamond Cove), South American fur seals (Volunteer Rocks) and is likely to have breeding populations of											

Environmental baseline and sensitivity in Berkeley Sound											
Commerson's and Peale's dolphins. Conspicuous seasonal visitors include sei whales, which are most numerous in the late summer and autumn. Several other species of large whale have been recorded within Berkeley Sound including southern right and Antarctic minke whales. An unprecedented influx of southern right whales was recorded during the winter of 2017.											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Conservation sites: The entrance to Berkeley Sound is flanked by two National Nature Reserves (Volunteer Point and Cow Bay, and the Kidney Island Group), which are also classed as Important Bird Areas, and a proposed Marine Management Area has also been put forward.											

[1] Note that the terms Low, Medium and High in this context provide a guide only as to the general sensitivity / abundance as it is relevant to each receptor. Specific sensitivities of each receptor to each environmental impact are explored in full within the EIS.

1.6.1.1 Data gaps

1.6.1.1.1 The Gap Analyses Programme

The Falkland Islands Offshore Hydrocarbons Environmental Forum (FIOHEF) was established in 2011 to facilitate discussion of environmental issues relating to current and future hydrocarbon activities in the Falkland Islands. FIOHEF established a subcommittee, the Gap Analyses Group, to examine the data gaps that needed to be filled in order to better inform and monitor the potential environmental impacts from offshore hydrocarbon activities in the Falkland Islands.

Data gaps of most relevance to the Development were identified and prioritised according to the urgency with which it was perceived that the data was required:

- Offshore benthic ecosystems with regard to collation of data, infaunal sampling, sedimentology and chemistry,
- Oceanography in relation to oil spill modelling with regard to hydrographic dynamics, temporal and water column dynamics,
- Seabirds with regard to priority species and temporal movements, and
- Marine mammals (seals, dolphins and whales) with regard to populations and breeding activity, spatial and temporal distributions.

This programme is now complete.

1.6.1.1.2 Key data gaps relevant to the Sea Lion EIA

The GAP project is complete and it is considered necessary to acknowledge the outstanding and project-specific data gaps that have been identified during the Sea Lion EIA process. Note that most of the below were out of the scope of the GAP project.

The key data gaps of relevance to the Sea Lion EIA are:

- General:
  - Predicting the likelihood of introducing invasive species,
  - Auditory sensitivity of penguins and marine mammals,
  - Quantifying the impact of bird strikes,
  - Impact of long-term noise and actual noise outputs from the operations, and
  - Impact of Sea Lion crude oil on pinniped fur.
- Offshore environment (NFB and Sea Lion Field):
  - Inter-annual distribution and abundance of marine mammals in the NFB,

- Seabird distribution and abundance, and
- Benthic habitats and fauna at the Sea Lion drill centre and flowline locations specifically.

- Inshore environment (Berkeley Sound):
  - Location(s) of Loligo (*Doryteuthis gahi*) spawning grounds (this work has been progressed through the GAP project and other projects, but the delineation of the spawning grounds remains a gap in knowledge. Survey data shows that Loligo do lay their egg clusters on hard surfaced down to approximately 80 m), and
  - Inter-annual distribution and abundance of marine mammals.

1.6.1.1.3 Management of data gaps within the Sea Lion EIA

Data gaps identified during the EIA process are specified in the respective impact and risk assessment chapters in the EIS (Chapters 10, 11 and 12). While a precautionary approach was taken during all the impact and risk assessments, it is important to note that the identification of data gaps was pivotal in determining the level of confidence in the assessment, as is described in the EIA Methodology (Chapter 8 of the EIS).

Where data gaps had the potential to undermine assessments of the 'Sensitivity of Receptor' or the potential 'Severity of Effect' associated with an activity, the confidence in the assessment was indicated to be either 'Probable' or 'Uncertain' (as opposed to 'Certain'). In turn, the level of confidence in the assessment was used to inform the monitoring requirements for each potential impact / risk (see again the EIA Methodology in Chapter 8 of the EIS).

To enable identification and agreement on reasonably practicable monitoring options, a workshop to consider the contents of an Environmental Monitoring and Management Plan (EMMP) to accompany the Sea Lion oil field Environmental Impact Statement (EIS) was held in Stanley, Falkland Islands on 23-25 April 2019. It was attended by 25 interested stakeholders, comprising FIG, POEPL, industry bodies and NGOs. Consideration was given to eleven environmental impacts from the Sea Lion development where there was potentially a need for further certainty as to the actual impact. The Summary EMMP tables, which have been reviewed and updated by Navitas, are provided below (Section 1.8; Chapter 15 in the full EIS). International researchers will continue to be engaged in the EMMP process through workshops and collaborative peer review so the work has international standing and transparency.

1.6.2 Key social sensitivities

As of the 2021 census, the permanent population of the Islands stands at 3,142 (2,818 excluding residents at the Mount Pleasant Complex (MPC)). The majority of the population resides in the capital, Stanley, which is the main town on the Islands and is situated on East Falkland. The key social sensitivities of the Falkland Islands are summarised in Table 1.4.

Table 1.4: Summary of key social sensitivities in the Sea Lion Phase 1 & 2 Development area

Social baseline and sensitivity											
Low[1]				Medium[1]				High[1]			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Commercial fisheries: The two most important fisheries within the Falklands Exclusive Economic Zone (EEZ) are the jig fishery for Argentine shortfin squid and the trawl fishery for Loligo squid, which together accounted for 49.5 %, 25.1 % and 5.2 % of the 2013-2022 catch by weight respectively. There is also a fleet of trawlers that operate over the Falklands continental shelf that target a range of finfish species. Currently, the only other fishery in the Falklands EEZ is the longline fishery for Patagonian toothfish, which operates in deeper waters (> 600 m).											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Tangible property and resources: There is a range of onshore infrastructure on the Falkland Islands that will be utilised during the Phase 1 & 2 Development, which could lead to competition for resources with other users of these facilities. The main areas of potential impact include the use of: port facilities, supply routes, airports and airlinks, the road network, accommodation, freshwater and electricity supply. During the austral summer period, accommodation, flight availability and freshwater may all be less available.											
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Tourism: The majority of tourists visiting the Falkland Islands arrive on cruise ships. Many cruise ships visit locations in the west of the Islands to see wildlife and most vessels visit Stanley. Within Stanley, there are a number of businesses and individuals that support tourist excursions to locations within driving distance of the town. Many of these sites are important for the wildlife that they support; however, they are also important recreational sites for residents.											
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Marine archaeology: The UK Hydrographic Office Wreck site database indicates that there are 177 wrecks recorded within Falkland Islands waters, with records dating from the 1800s to present day. There are six recorded wrecks within 100 nautical miles of the proposed drilling sites; the closest of these wrecks is located approximately 50 nautical miles from the nearest well site. Two wrecks were identified within the Berkeley Sound survey area: the trawler Ocean 8 to the north-west, and the Blakeney to the south-east.											

[1] Note that the terms Low, Medium and High in this context provide a guide only as to the general sensitivity as it is relevant to each receptor. Specific sensitivities of each receptor to each social impact are explored in full within the EIS.

1.7 Environmental and social impact and risk assessment

To answer 'Question 5' above, the following section provides:

- A description of how the activities associated with the proposed Phase 1 & 2 Development may interact with the environment e.g. the environmental and social aspects, impacts and risks,
- A brief summary of the EIA methodology,
- Key findings of the EIA including:
  - An overview of the overall EIA findings with regard to the initial and residual assessments, and
  - Narratives on the residual impacts (planned activities) and risks (unplanned / accidental activities) which remain of '**Moderate**' significance or above.
- A summary of all residual impacts and risks from all activities.

1.7.1 Environmental and social aspects, impacts and risks

All of the activities that will be carried out in the proposed Development have the potential to interact with the environment and the human population. The ways in which the Development activities may interact, and the potential impacts and risks associated with these interactions, were identified during an ENVironmental Impact IDentification (ENVIID) workshop (see Chapter 9 of the EIS).

In summary, the ways in which the planned Phase 1 & 2 activities and unplanned / accidental activities may interact with the environment and the human population are as follows:

- Environmental aspects:
  - Artificial light,
  - Disturbance to wildlife from use of helicopters,
  - Disturbance to the seabed / placement and removal of objects on the seabed,
  - Underwater noise offshore,
  - Underwater noise inshore,

  - Drill cuttings and mud discharges to sea,
  - Operational discharges to sea,
  - Thermal discharges,
  - Atmospheric emissions,
  - Waste,
  - Collisions between vessels and marine mammals,
  - Introduction marine non-native species, and / or
  - Introduction of terrestrial non-native species.
- Social aspects:
  - Disturbance to other users of the sea offshore,
  - Disturbance to other users of the sea inshore,
  - Competition for resources:
    - Accommodation,
    - Freshwater,
    - Electricity,
    - Air-links, and
    - Use of roads network.
  - Disturbance to the human population through:
    - Light, and
    - Helicopters and noise.
- Accidental events offshore, inshore and at-shore:
  - Loss of control leading to oil / chemical spill,
  - Small spills contributing to chronic oil pollution, and / or
  - Fuel spill either from bunkering operations or from an accidental event.

Each activity carried out during the Development may lead to one or more of the aspects above and one or more associated impact or risk. For example, the use of vessels will result in the presence of artificial light, underwater noise, impacts to other users of the sea and atmospheric emissions whilst also carrying the risk of collisions and the introduction of marine invasives. Therefore, the project activities, their associated environmental aspects and the environmental receptors on which they may impact upon are presented in Figure 1-3.

Note: under the FIG EIA Guidance Notes (FIG, 2016e) and in consultation with FIG (November, 2015) socio-economic impacts, such as tax revenues, wages, land values, were considered to fall outwith the scope of an EIA.

Identification of Environmental Aspects

Project activities	Environmental Aspects														
	Artificial light offshore	Helicopter disturbance onshore	Seabed disturbance offshore	Underwater noise	Drill cuttings and mud discharge	Operational discharges	Thermal discharges	Atmospheric emissions	Waste	Collision with marine mammals	Marine species introduction	Terrestrial species introduction	Increased vessel presence	Competition for onshore	Oil spill
Drilling operations	✓		✓	✓	✓			✓	✓				✓	✓	✓
Subsea works[1]	✓		✓			✓		✓	✓				✓	✓	✓
FPSO HUC[2]	✓					✓		✓	✓				✓	✓	✓
SIMOPS[3]	✓		✓	✓	✓	✓	✓	✓	✓				✓	✓	✓
Production	✓			✓		✓	✓	✓	✓				✓	✓	✓
Oil export	✓	✓								✓	✓		✓		✓
Fixed-wing flights								✓				✓		✓	
Helicopter use	✓	✓		✓				✓						✓	
Vessel use	✓			✓		✓		✓	✓	✓	✓	✓	✓	✓	✓
Decommisioning[4]															

[1] Installation of subsea infrastructure

[2] Hook-up and Commissioning

[3] Simultaneous drilling and production operations

[4] Subject of a separate EIA

Identification of Environmental Impacts

Environmental aspects	Environmental receptors which may be impacted upon during planned activities and unplanned and accidental events:																		
	Physical				Biological								Social						Stakeholder concern?
	Seabed (including	Water quality	Regional air quality	Global atmosphere	Marine flora	Plankton	Benthos	Fish / squid	Seabirds	Marine mammals	Designated sites	Biosecurity	Landscape / seascape	Human population	Other users of the sea	Tangible property / resources	Archaeology		
Artificial light						✓		✓	✓	✓			✓	✓					✓
Helicopter use				✓					✓	✓				✓		✓			✓
Seabed disturbance	✓	✓			✓		✓	✓											
Underwater noise						✓		✓	✓	✓									✓
Drill cuttings and mud	✓	✓			✓	✓	✓	✓	✓	✓		✓							✓
Operational discharges	✓	✓			✓	✓	✓	✓	✓	✓									✓
Thermal discharges	✓	✓				✓	✓	✓											✓
Atmospheric emissions	✓	✓		✓		✓	✓		✓					✓					✓
Waste				✓					✓	✓	✓	✓	✓			✓			✓
Marine mammal collision										✓									
Marine invasive species					✓	✓	✓	✓				✓							✓
Terrestrial invasive species											✓	✓	✓	✓		✓			✓
Increased vessel presence				✓						✓		✓	✓	✓	✓	✓			✓
Competition for onshore resource														✓					✓
Oil spill	✓	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓			✓

Figure 1-3: Project activities and the identification of environmental aspects and the receptors, upon which they may impact

1.7.2 Impact and risk assessment methodology

To understand the impact and risk assessment process and the summary results presented below, it is necessary to appreciate that:

- Impacts to the environmental and human population may result from planned activities, and
- Each activity carries the risk of impacts occurring during unplanned and / or accidental events.

As shown in Figure 1-4, the impact is assessed by considering the 'Sensitivity of the Receptor' and the 'Severity of Effect' on that receptor. This then leads to an overall 'Impact significance Rating' ranging from '**Very Low**' to '**High**'.

Impacts of unplanned or accidental events are assessed in the same way while the significance of the risk associated with these events takes account of the 'Likelihood' of the event occurring. Taking account of both the Impact Significance and the 'Likelihood of Occurrence' the 'Significance of Risk' is then rated, again ranging from '**Very Low**' to '**High**'.

*Significance of the **impact***	=	*The **sensitivity** of the receptor to the environmental aspect*	x	*The **severity** of the effect on the receptor*		
*Significance of the **risk***	=	*(----------Impact----------) The **sensitivity** of the receptor to the environmental aspect*	x	*The **severity** of the effect on the receptor*	x	*The **likelihood** that an unplanned or accidental event will occur*

Figure 1-4: Illustration of the impact assessment for planned events and the risk assessment for unplanned and accidental events

When carrying out the EIA, the impact and risk assessments are each conducted twice:

- The first assessment takes account of the legal requirements and industry-standard practices as well as the mitigations which are built into the base-case (see Section 1.4.2 above). The latter are included as these are already in place and are often included to minimise outputs e.g. emissions, discharges etc. This assessment describes the significance of the initial impact or risk (i.e. '**Very Low**' to '**High**').
- The second assessment takes account of any additional project-specific mitigations which are considered reasonably practical to further reduce the initial impacts and risks which were considered to be significant (i.e. '**Moderate**' or above). Project-specific mitigations are those which are used in addition to any mitigations required by legislation either in the Falklands or the UK and / or are currently considered to be standard industry practice in the Falklands. This second assessment describes the significance of the residual impacts and risks.

All residual impacts and risks will be reduced to a level that is 'As Low As is Reasonably Practicable' (ALARP) throughout the EIA process and throughout the life of the Development.

The mitigation measures and commitments are listed in the Environmental Monitoring and Management Plan (EMMP) described in Section 1.8.1 below.

1.7.3 Offsetting

Section 64C of the Offshore Minerals Ordinance states that EISs must contain a description of measures proposed to "*eliminate or reduce significant adverse effects…remedy those effects and offset them*." Appendix 2 to the FIG Hydrocarbons Environmental Impact Assessment Guidance Note (EPD, 2015) provides offsetting guidance. ExCo paper 124/16 (FIG, 2016d) details FIG's recommendations for further developing offsetting guidance and suggested the establishment of an Environmental Fund.

ExCo paper 124/16 (FIG, 2016d) states that hydrocarbon development should seek meaningful offsetting of any impacts that cannot be avoided or mitigated, specifically in relation to greenhouse gas emissions and biodiversity (FIG, 2016d). The options for offsetting of these impacts include:

- Direct offsetting, i.e. the operator develops local projects to offset, like-for-like, the impacts arising from the Development that cannot be avoided or mitigated,
- Indirect offsetting, i.e. implementing measures that do not directly compensate for the impacts / risks identified, but may provide opportunities to achieve environmental benefits and improve the environment in the longer-term, or
- An environmental fund whereby the operator contributes to a fund with a non-governmental panel to direct, manage and oversee various offsetting projects.

The Operator is required to demonstrate how offsetting measures have been considered which may further reduce significant adverse residual impacts identified in the EIS.

Navitas has ambitions for significant future local offsetting programmes, however these need to be informed by feasibility along with empirical data. Navitas will commit to an Internal Carbon and Biodiversity offsetting Fund (see section 1.7.3) that will lay the foundations to inform scaling for island-wide restoration to achieve carbon and biodiversity benefits. Therefore, the Internal Environmental Carbon and Biodiversity offsetting Fund is a precursor to inform any offsetting initiatives.

The section below details the offsetting options considered by Navitas and the reasons for the approach being proposed.

1.7.3.1 Review of offsetting options

Following elimination and / or reduction of all the impacts and risks identified for the Sea Lion Field, Navitas conclude that only tangible significant impacts /risks (impacts / risks assessed as 'Moderate' or above), may be offset.

Navitas has reviewed its significant residual impacts / risks (Section 1.7.4.2), and explored practicable, effective and locally beneficial direct offsetting measures in relation to these.

1.7.3.1.1 Direct offsetting

Direct or 'like for like' offsetting means compensating for impacts / risks to the environment at one site through activities that specifically address the nature of the impact in the local area. For example, this might include re-forestation of a nearby area where trees have been cleared for a construction site. For each residual impacts / risks assessed as 'Moderate' or above, Navitas has looked for practicable, local, environmentally beneficial and effective opportunities to directly offset them (Section 8.11 of full EIS). However, for each of the significant residual impacts / risks, Navitas has not at this time identified direct 'like for like' offsetting that is feasible, effective or reasonably practicable. The reasons for this are:

- It has not been possible to sufficiently quantify the impact / risk, and / or
- Navitas has not been able to conceive of a suitable project to achieve like for like offsetting,
- Navitas has conceived of but has not yet been able to determine feasibility, empirically define or formulate direct offsetting projects.

In addition, Navitas conclude it is not possible to offset accidental events; that is where the impact may or may not happen, such as an oil spill. There is the risk of a spill occurring but it is not possible to state if, when and what the impact of that spill might be, thus the impact is risk assessed in terms of the likelihood of it occurring. The impact itself is very difficult to quantify, and any efforts to remediate an impact that has arisen as the result of a risk, e.g. an oil spill, is considered 'remediation' as opposed to offsetting.

While potential offset initiatives have been identified in relation to atmospheric emissions, it has not been possible at this time for Navitas to determine the feasibility of these projects to confirm and quantify the benefit to the local environment, and that they are practicable for Navitas to implement. As such, while Navitas is committed to offsetting where practicable and to securing a positive environmental legacy, Navitas will not commence direct, like-for-like, offsetting for the residual significant impacts / risks from the Sea Lion Development until such time that identified initiatives have been further developed and proved, and it has been demonstrated that they are practicable and achievable within the Falkland Islands environment.

Navitas is also committed to exploring indirect offsetting opportunities locally. Indirect offsetting refers to implementing measures that do not directly compensate for the impacts / risks identified above but may provide opportunities to achieve environmental benefits and improve the environment of the Falklands in the longer-term. These may include habitat restoration projects, pest and invasive species eradiation / control and conservation, biodiversity educational initiatives and the research required to inform them.

FIG's offsetting guidance requires proposed offsetting projects to be; described in detail (including costs and timelines), to be realistic, practicable and effective, be as quantitative as possible, additional to current projects / schemes or funding sources, and to provide a level of redundancy. Navitas cannot make *ad hoc* commitments to indirect offsetting projects that are not fully understood, and at this stage it has not been able to develop potential indirect offsetting projects to the level of maturity required by the EIA guidance. Given this, as a first step Navitas will commit to an internal fund which will initially identify schemes, undertake research as necessary and develop local indirect offsetting initiatives for future funding support.

Navitas will undertake future operator-led direct and indirect offsetting in the Falkland Islands including carbon and biodiversity offsetting that includes Falklands-specific habitat restoration projects. To enable this Navitas will create an internal fund which will initially be used to commission research and feasibility studies that lead to pilot offsetting schemes that can be expanded to enable large scale in-Falklands habitat restoration (e.g. carbon sequestration) and biodiversity offsetting. Navitas will monitor opportunities to fund / undertake direct and indirect offsetting throughout Field Life. There will be regular monitoring and reporting on performance of offsetting initiatives.

1.7.4 Key findings of the EIA

1.7.4.1 Overview of EIA findings with regard to the initial and residual assessments

A total of 133 impacts and risks were assessed.

During the initial assessment:

- 65.6 % of the impacts and risks assessed were considered to be **Very Low** or **Low**. While no additional, project-specific, mitigations were considered necessary for these impacts and risks, all will be subject to ongoing reviews to ensure that they remain ALARP,
- 27.6 % of the impacts and risks were considered to be of **Moderate** significance,
- 3.7 % were **Upper Moderate**,
- 1.5 % were **High**, and
- 1.5 % were considered **Beneficial**.

Where initial impacts and risks were Moderate or above, project-specific mitigations were identified and those that were considered to be 'reasonably practicable' were factored into the residual assessment to reduce all the impacts / risks to ALARP. This resulted in an overall reduction in the number of 'High' impacts and risks (Figure 1-5).

Based on the residual assessment:

- The number of **Very Low** and **Low** impacts / risks increased to 67 %,
- The number of **Moderate** impact / risks remained at 27.6 % because two Upper Moderates were reduced to Moderate,
- The number of **Upper Moderate** impacts / risks remained at 3.7 % because two High risks were reduced to Upper Moderate,
- The number of **High** impacts / risks was reduced to 0 %, and
- The number of **Beneficial** impacts remained at 1.5 %.

A summary of the impacts and risks that were **Moderate** or above during the initial assessment and were reduced in the residual assessment due to the project-specific mitigation commitments is provided in Table 1.5.

The impacts and risks, which remained significant despite the use of industry-standard mitigations and the commitment to reasonably practical project-specific mitigations, are described in more detail below.

A summary table showing all the residual impacts and risks to all the receptors is provided in Table 1.7 (in Section 1.7.5) below.

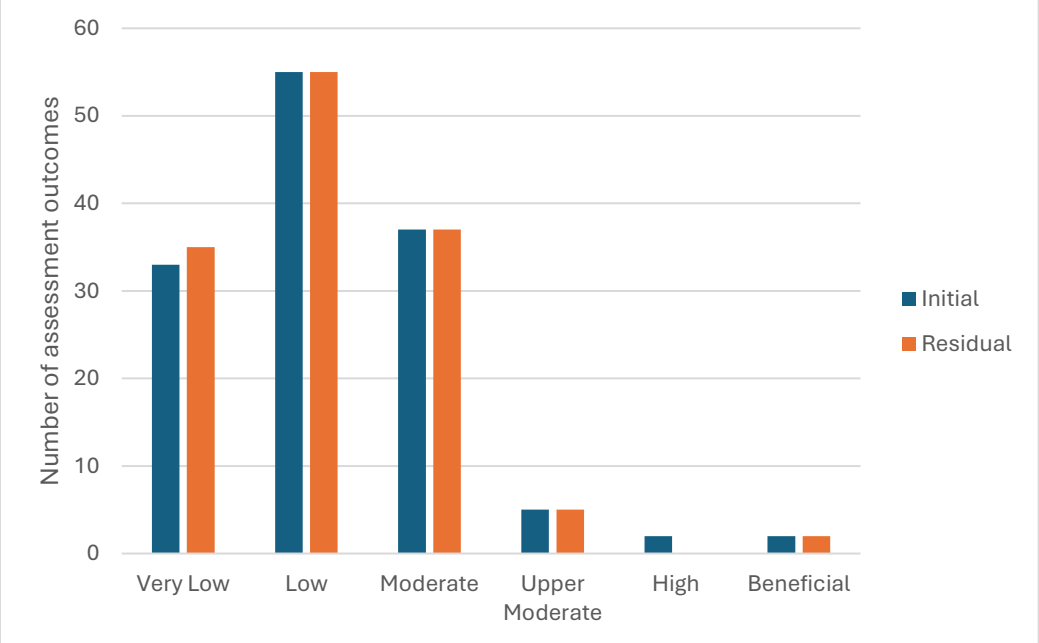

Figure 1-5: Illustrating the difference between the initial and residual impact and risk assessment outcomes.

Table 1.5: A summary of the impacts and risks that were initially identified as being of Moderate significance or above and which were reduced following commitment to reasonably practical project-specific mitigations

Impact / risk	Initial assessment[1]	Key project-specific mitigation summary	Residual assessment[2]	Section
Collision between marine mammals and vessel inshore.	**Upper Moderate**	Reduction of vessel speed to maximum eight knots.	**Moderate**	**Section 10.11**
Risk of marine invasive species from biofouling on LTVs.	**Upper Moderate**	Hull inspection of LTVs and potential hull cleaning if necessary.	**Moderate**	**Section 10.12**
Use of freshwater resources during Stages 1 and 2 (a & b)	**High**	Ensuring reliability of water supply, offtake limits, pre-filling of MODU and vessels and re-stocking from incoming vessels. Use of seawater where possible.	**Upper Moderate**	**Section 11.4**
Competition with domestic energy needs	**High**	Sustainable and energy efficient design, Off-peak power utilisation, and standby diesel fueled electricity generators.	**Upper Moderate**	**Section 11.5**
Disturbance to the human population from operations noise at the TDF and supply base	**Moderate**	Activity restrictions and minimising noise at night	**Very Low**	**Section 11.9**
Disturbance to the human population from LTV operations noise in Berkeley Sound	**Moderate**	Activity restrictions and minimising noise at night	**Very Low**	

[1] Taking account of regulatory requirements, industry-standard practices and base-case mitigations.
[2] Taking account of reasonably practicable project-specific mitigations.

1.7.4.2 Significant residual impacts and risks

The significant residual impacts and risks are summarised in Table 1.6. The sections below summarise only the residual impacts and risks that remained significant following project-specific mitigation. Note that the full EIS describes the initial and residual assessment outcomes for all the environmental and social aspects (Chapters 10, 11 and 12).

Significant residual impacts and risks are those that have been reduced to ALARP but are still considered to be '**Moderate**' or '**Upper Moderate**', primarily because of:

- The limited options for effective and reasonably practicable project-specific mitigations, and / or
- The use of a precautionary approach during the assessment when faced with data gaps, which leads to higher levels of uncertainty.

In each summary below, only the highest impact or risk is presented. For example, where underwater noise may affect diving seabirds and marine mammals, only the impact to marine mammals is described in the sections below as this was assessed as the greatest potential impact.

Table 1.6: A summary of the residual impacts and risks that, while considered to be ALARP, remain significant

Impact / risk	Residual assessment[1]	Section
Impacts and risks associated with planned activities		
Risk of large-scale bird-strikes due to artificial light offshore.	**Moderate**	**Section 10.1**
Risk of small-scale bird-strikes due to artificial light offshore.	**Moderate**	
Risk of large-scale bird-strikes due to artificial light inshore.	**Moderate**	
Behavioural disturbance to marine mammals from underwater noise offshore.	**Moderate**	**Section 10.4**
Impacts of drill cuttings discharge on benthos including burial of benthic fauna, modification of habitat, toxicity and oxygen depletion.	**Moderate**	**Section 10.6**
Impacts from Phase 1 & 2 atmospheric emissions on global warming.	**Moderate**	**Section 10.9**
Impacts from Phase 1 & 2 atmospheric emissions on ocean acidification	**Moderate**	
Indirect impact from atmospheric emissions associated with the combustion of sold product.	**Upper Moderate**	
Use of regulated landfill for waste disposal (while following the waste hierarchy as far as possible)	**Moderate**	**Section 10.10**
Risk of collision between marine mammals and vessels *en route* between the field and Stanley	**Moderate**	**Section 10.11**
Risk of collision between marine mammals and vessels in Berkeley Sound	**Moderate**	
Risk of introducing marine invasive species in Sea Lion in-field vessels	**Moderate**	**Section 10.12**
Risk of introducing marine invasive species in by *ad hoc* freighters	**Moderate**	
Risk of introducing marine invasive species to Berkeley Sound via LTVs	**Moderate**	
Risk of introducing marine invasive species in-field by CTTs	**Moderate**	
Risk associated with non-native terrestrial species arriving on air freight	**Upper Moderate**	**Section 10.13**
Competition for freshwater resources – water use for MODU drilling and vessel top-up and for onshore yards and accommodation (Stages 1 and 2)	**Upper Moderate**	**Section 11.4**
Competition for freshwater resources – water use for offshore vessel top-up and onshore yards and accommodation (Stage 3)	**Upper Moderate**	
Competition with domestic electricity needs	**Upper Moderate**	**Section 11.5**
Competition for use of road network	**Moderate**	**Section 11.7**
Disturbance to the human population from light at supply bases and TDF	**Moderate**	**Section 11.8**
Disturbance to the human population from light in Berkeley Sound	**Moderate**	
Risks associated with accidental events		
Accidental releases of Sea Lion oil to sea offshore	**Moderate**	**Section 12.1**
Accidental releases of inshore Marine Gas Oil (MGO) to sea offshore	**Moderate**	
Accidental release of MGO inshore	**Moderate**	**Section 12.2**
Day-to-day small leaks and spills at-shore	**Moderate**	**Section 12.3**

[1] Taking account of regulatory requirements, base-case mitigations, industry-standard mitigation *and* reasonably practicable project-specific mitigations.

1.7.4.2.1 Artificial lights offshore and inshore

Throughout the Phase 1 & 2 Development, installations and vessels will add to the existing levels of artificial light both offshore and inshore, and this was raised as a concern by stakeholders during consultations in 2014, 2015 and 2016 (see EIS Chapter 6). Further, while flaring is not expected to occur during normal operations, a pilot light will be permanently lit, and flaring may be necessary during planned or unplanned equipment outages. Flaring during well tests and well clean-up may also be

required for all production wells and is retained within the Development Description (Chapter 5) as a contingency.

During the hours of darkness, artificial light will attract plankton, fish and squid but the impact upon seabirds is considered to be of greatest concern. Lights will attract and / or disorientate seabirds (small petrels) and there is the potential for these birds to collide with the lights or vessel superstructures. This phenomenon is known as 'bird-strike'.

Bird-strikes may result in mortality through direct collision. Birds may suffer injuries or hypothermia, should feathers become contaminated with residues on the deck of a vessel. The occurrence of seabird collisions will depend upon a combination of factors including the species and abundance of birds in the area at the time, and local weather conditions. Small nocturnally active petrels are most susceptible during periods of poor visibility.

Taking account of the sensitivity of bird species which may be susceptible, the potential severity of effect of multiple bird-strikes, the fact that some artificial lighting on vessels and installations cannot be reduced or altered without compromising safety, and also adopting a precautionary approach, the residual risk of bird-strikes is considered to be '**Moderate**' (see EIS Section 10.1).

1.7.4.2.2 Underwater noise offshore

Underwater noise will be generated by the use of vessels throughout the Phase 1 & 2 Development and will be continuous throughout the life of the project. Noise pollution and its effects on sensitive receptors was raised as a concern by stakeholders during consultations in 2014 and 2015 (see EIS Chapter 6). While underwater vessel noise may impact upon fish, squid and diving birds, it is most likely to have a consequential impact upon marine mammals, through disturbance and / or changes in behaviour.

When assessing the impact of sound on any animal, it is necessary to compare the sounds being made with the thresholds above which the animal may exhibit behavioural reactions to disturbance or experience hearing loss / injury. It is also necessary to consider how close the animal needs to be to the source of the noise for it to experience the sound at levels above the disturbance and injury thresholds.

Modelling was carried out to assess the impact of different sound sources on the different receptors e.g. fish, seabirds, marine mammals, at different distances. Based on the modelling results and available information, the worst-case impact of underwater noise is that of a spread of near-stationary sources of vessel noise at the Phase 1 & 2 Development site (e.g. from the dynamically positioned tug tending the CTT, or the CTT accelerating / decelerating on approach or exit) and its potential long-term effect on marine mammals.

Given the conservation status of the whale species that may be affected, data gaps in marine mammal distribution in the NFB, lack of knowledge of the long-term impact of continuous noise and difficulties in effectively mitigating this impact, the precautionary approach dictates that the residual impact rating remains '**Moderate**' (see EIS Section 10.4).

1.7.4.2.3 Discharge of drill cuttings

Drilling of the Development wells will result in the discharge of drilling muds and rock cuttings in the proximity of the well. Water Based Mud (WBM) and cuttings will be discharged directly to seabed whilst drilling the top sections of the wells. Cleaned Non-Aqueous Drill Fluid (NADF) cuttings will be discharged from the bottom sections of each well. Prior to discharge, NADF cuttings will be returned to the MODU where they will be cleaned by a Thermo-mechanical Cuttings Cleaner (TCC). The cuttings will be cleaned to ensure there is <0.5 % oil (by weight on dry cuttings) remaining, following which the cuttings will be discharged to sea.

Whilst the discharge of cuttings may impact water quality, plankton, fish and squid, the greatest impact will be to the benthic community in the area. These impacts can arise from smothering, changes to habitat, reduction in oxygen availability and the toxic effects of residues associated with the cuttings.

Modelling was carried out to determine the extent of the impacts of the cuttings in the vicinity of the wells. Although there are no known species of conservation importance in the area, the specific location of the Sea Lion Development has not yet been surveyed such that there are minor data gaps and thus a precautionary approach was taken. Using the precautionary approach, and due to the extent and duration of the impacts, the residual impact to benthic fauna is considered to be '**Moderate**' (see EIS Section 10.6).

1.7.4.2.4 Atmospheric emissions (climatic factors)

Nearly all activities associated with the Phase 1 & 2 Development will result in atmospheric emissions and this was raised as a concern by stakeholders during consultations in 2015 and 2016 (see EIS Chapter 6). Emissions will result from power generation on the MODU and FPSO, the flare pilot light on the FPSO and the use of all vessels, fixed-wing flights and helicopters. There is also a contingency to flow / test four wells to the MODU if this is considered necessary.

Atmospheric emissions include gases which lead to global warming and ocean acidification, the best known of which is Carbon Dioxide (CO_2).

A number of emissions reduction measures are built-in to the Phase 1 & 2 project, as shown Table 1.1 above. Moreover, in line with its HS&S and E&B Policies, and in recognition of Net Zero, Navitas will endeavour to minimise emissions, where possible, through operational control measures, monitoring and reporting and periodic reviews to determine whether or not the emissions remain ALARP. Emissions estimates based upon the Phase 1 & 2 Development indicate a carbon intensity of 25.8 – 35.2 kg CO_2 equivalent per barrel of oil produced.

Nonetheless, while the estimated worst-case percentage contribution of Sea Lion emissions is minimal when compared to UK emissions, and the new development has been designed with efficiency in mind, owing to the sensitivity of the global environment as a receptor, the residual impacts of the contribution of atmospheric emissions to both global warming and ocean acidification are considered to be '**Moderate**' (see EIS Section 10.9).

Emissions associated with the combustion of sold product are outwith the control of Navitas. Nonetheless, these were estimated for the P10, P50 and P90 production cases under the worst-case assumption that 100 % of the sold product will be combusted. While emissions from combustion of the expected Sea Lion production per day represents only 0.03 % of global daily emissions (assuming all globally produced oil is similarly combusted), in absolute terms this is still a significant contribution and to take a precautionary approach, the impact was considered to be '**Upper Moderate**' (see EIS Section 10.9).

1.7.4.2.5 Waste management

Waste by-products will result from nearly every activity carried out during the Phase 1 & 2 Development and waste management was raised as a concern by stakeholders during consultations in 2015 and 2016 (see EIS Chapter 6). Waste from the Development will include domestic and marine wastes, solid wastes, produced water, drainage water, ballast water, domestic wastewater, food, sewage discharges and drill cuttings. Some of these wastes are hazardous, some are non-hazardous and some may be legally discharged to sea provided they undergo proper treatment. Produced water, drainage water, ballast water and drill cuttings are all described in separate chapters. With the exception of drill cuttings (see above) the associated impacts were 'Low' such that they are not detailed in this NTS beyond their inclusion in Table 1.7 below.

Of greater significance, is the generation of solid operational wastes, all of which will be returned to shore for disposal at the FIG waste management facility or, in the event that the planned municipal facility is not yet available, for incineration at the supply base or deposition to landfill in the UK. To ensure the responsible management of waste, and compliance with Navitas's Duty of Care obligations, Navitas will develop and implement a project-specific Waste Management Plan (WMP) prior to the start of operations.

Navitas is committed to using the planned FIG Waste Management Facility to treat and dispose of all incinerable project wastes that have no re-use or recycling outlet locally. In the event that the FIG Waste Management Facility is unavailable, Navitas will discuss other options with FIG, such as the possibility to install a temporary incinerator at the supply base for the burning of suitable waste streams with resultant ash from the incineration process returned to the UK for disposal.

Navitas will not make use of the Eliza Cove or Mary Hill Quarry sites and will export wastes, if necessary, in compliance with all applicable international and national waste shipment regulations. Throughout the Development the 'Waste Hierarchy' will be utilised and annual waste targets will be set, to maximise waste reduction and recovery.

Waste facilities in the Falkland Islands are currently very limited. Plans approved by FIG should deliver a new municipal integrated waste facility that is capable of receiving the waste from the Sea Lion Phase 1 & 2 Development. Although it is not Navitas's preferred option for the disposal of wastes, should the municipal facilities not be ready when the project starts, some waste will need to be sent to landfill in the UK. Landfill is an unsustainable practice and therefore, although the quantities of waste are comparatively small, landfill space in the UK remains limited such that the worst-case residual impact of waste generation is considered to be '**Moderate**' (see EIS Section 10.10).

1.7.4.2.6 Risk of injury to marine mammals via collisions in-transit and inshore

There is a risk of vessel collision with marine mammals and this was raised as a concern by stakeholders in the 2016 scoping consultations (see EIS Chapter 6). Vessels will be used offshore and inshore throughout the Development and pose a risk to marine mammals in the area through collision.

Offshore vessels will transit from the Sea Lion Field into Stanley on a regular basis and though they are some of the smaller vessels used in the project, they will be operational year-round and so there is a possibility they will overlap with large whales, e.g. sei whales (IUCN 'Endangered') and southern right whales.

Some of the inshore vessels involved in the construction phase (e.g. the LTVs) will be considerably larger than vessels employed in the offshore aspect of the project. These vessels are required to transit to, and anchor in, Berkeley Sound where there is a seasonally high likelihood of encountering sei and southern right whales.

In line with the industry-standard guidelines, all vessels coming into Stanley will be limited to 10 knots on entering the proposed Marine Management Area (pMMA). However, in line with project-specific mitigations, vessels coming into Berkeley Sound will reduce their speed further to eight knots. These relatively slow vessel speeds will reduce the likelihood of collisions and the energy behind any impacts, thus reducing the potential for lethal injury.

While the use of industry-standard guidelines, reduced vessel speeds and the use of Marine Mammal Observers will all lessen the likelihood and impact of collisions, the sensitivity of the whale species that may be affected (e.g. sei whales), the limited maneuverability of very large whales (e.g. right whales), the unpredictable nature of cetacean behaviour in general and data gaps in the knowledge of whale distribution mean that while the risk has been reduced to ALARP, the residual risk remains '**Moderate**' for both offshore and inshore vessels (see EIS Section 10.11).

1.7.4.2.7 Risk of introducing marine invasive species

The arrival of vessels into Falkland Islands waters from elsewhere in the world may lead to the introduction of non-native marine species and biosecurity was raised as a concern by stakeholders during consultations in 2014, 2015 and 2016 (see EIS Chapter 6). The introduction of non-native species can result from discharged ballast waters or from biofouling present in the 'nooks and crannies' of a ship's hull. In the event that non-native species are introduced, there is then the potential that they may become established and spread. If this occurs, they are referred to as 'invasive species' and can dramatically alter the local ecosystem and / or outcompete native species altogether, negatively impacting the local biodiversity. Once established, marine invasive species are virtually impossible to eradicate.

The likelihood of such a species being introduced, and then becoming invasive, depends upon numerous factors e.g. whether the species comes from a similar climate and ecosystem, whether the ship passed through different climates *en route* (e.g. the Tropics) and whether or not the vessel is repeatedly 'new' to the Falkland Islands.

Industry-standard and project-specific mitigation measures regarding ballast water management and antifouling of vessels go a long way to reducing the likelihood of species introduction, which may or may not then become invasive. However, the greatest risk comes from third-party vessels such as the purchaser's CTT over which Navitas does not have full control over and above contractor vetting and selection processes. On balance, given that species invasion can be difficult to detect in the short-term and can have severe effects on biodiversity which are almost impossible to reverse, the worst-case residual risk of marine species invasion is considered to be '**Moderate**' (see EIS Section 10.12).

1.7.4.2.8 Risk associated with non-native terrestrial species arriving on freight

Bringing freight into the Islands to support Navitas's operations carries the risk of introducing non-native, potentially invasive species in the cargo. As with marine invasives, if invasive species were introduced during the Phase 1 & 2 Development the impact on the ecology of the Islands through parasites, disease, competitors or predators may not be immediately evident but may have long-term implications. Initially the impact may not be felt locally, however, once established invasive species may spread 'naturally' or with anthropogenic assistance to other parts of the Falklands archipelago. If found, potentially invasive species can be removed but they can be very difficult to detect and then eradicate.

Vessels and charter flights will be arriving in Stanley and Mount Pleasant throughout the life of the Development and a large amount of cargo will be taken onshore. The transportation of invasive species to the Falklands has happened in recent years, and the introduction of invasive species has occurred in the O&G industry elsewhere in the world, such that the risk is considered possible during the Phase 1 & 2 Development. A Biosecurity Management Plan will be implemented during the Phase 1 & 2 Development to help prevent non-native and potentially invasive species being introduced. However, due to the potential impacts of invasive species and the fact that invasives have been introduced in the past, the risk of non-native species introduction is considered '**Upper Moderate**' (see EIS Section 10.13).

1.7.4.2.9 Competition for freshwater resources

Onshore infrastructure associated with the Development (e.g. the onshore supply base and the TDF) will require connection to the existing Stanley water utilities. In addition, the onshore water supply will be required to support a proportion of water use by offshore assets including vessels, the MODU's drilling requirements for muds, cements, brines and domestic use.

The FIG owned Stanley water filtration plant is the single water supplier and has a fixed capacity which is limited by the existing utility infrastructure. Water is therefore considered a limited resource. Any use of water by the Development activities or assets which is above the current baseline Stanley usage has the potential to lead to competition with the local users in Stanley.

Competition for water resources will be particularly high during the drilling stages of the Phase 1 & 2 Development and in the event that demands during these stages exceed supply, impacts upon volume will be immediately apparent to consumers and businesses. The Stanley water supply is already near capacity and, to accommodate the Development, the existing system may need to operate at a temporary deficit for short durations if no changes are made to the current FIG system.

Throughout the project, the water supply to Stanley will always be prioritised over that provided to the TDF such that the impacts of any water shortage will be felt by the Phase 1 & 2 Development rather than the Stanley users. Nonetheless, the overall significance of the impact of water competition on the human population is '**Upper Moderate**' (see EIS Section 11.4).

All additional project-specific mitigation measures, including providing a freshwater buffer tank at the TDF and planning and logistics to reduce water use during the drilling phases, will be discussed further with FIG.

1.7.4.2.10 Competition for electricity

Onshore and at-shore infrastructure in support of the Phase 1 & 2 Development will require connection to the existing electrical power grid of Stanley. FIG is the single energy utility supplier and has a fixed power capacity from a finite number of generators at the Stanley power station and wind turbines located a few miles out of town.

Electricity is an essential utility upon which almost all daily activity depends in an increasingly electronic age. Stanley's current baseline capacity is such that it may be unable to sustain peak demand spikes in the short-term and therefore must be considered a finite resource. The use of electricity by Navitas therefore has the potential to be unsustainable in the immediate term. Overall demand from Stanley plus the Phase 1 & 2 Development has the potential to exceed the available capacity in the system. While Navitas will have back-up generators available at the onshore base, Navitas will liaise closely with FIG to ensure that energy supply and demand are in balance. These discussions will include those based on FIG's planned future development of power capacity.

Nevertheless, while development of a new FIG power station may alter the impact assessment by altering the baseline capacity against which usage is compared, these changes are currently outwith Navitas's control and cannot be used as a mitigation within this assessment. Therefore, the impact of competition for electrical energy on the human population of the Falkland Islands is considered to be '**Upper Moderate**' (see EIS Section 11.5).

1.7.4.2.11 Competition for use of road network

All stages of the Sea Lion Phase 1 & 2 Development will require the use of the existing road network for the movement of personnel to, from and within Stanley, for the haulage of equipment, and transport of supplies and waste between a range of different locations. Whilst road capacity and use cannot be accurately quantified, increased utilisation may be detrimental to the road surfaces and may also result in increased necessity for remedial repairs. Further, additional traffic, congestion and vehicles seeking parking may also create a nuisance to the local population and the issue of road use was raised as a concern during scoping consultations (see EIS Chapter 6).

An increase in traffic of up to 17 % in Stage 1 and Stage 2 (a & b), and 11 % in Stage 3 (up to 30 years) is predicted, which could result in some degree of congestion at peak times and lessen parking availability which may cause inconvenience to other road users.

A Traffic Management Plan (TMP) will be put in place for operations, as was done for the exploration campaigns, to minimise the impacts from operational road use in this area. The TMP will highlight operating hours, signage, allowable routes, warning devices, clothing and pedestrian precautions for Navitas staff and contractors. However, owing to the sensitivity of the receptor and the extent and duration of traffic increases, the residual significance of the impact of road use on the human population is still considered to be '**Moderate**' (see EIS Section 11.7).

1.7.4.2.12 Disturbance to the human population from light

Throughout the Phase 1 & 2 Development the onshore supply base and port facilities in Stanley, as well as the vessels in Berkeley Sound, will create artificial light. All of these sources have the potential to create light pollution and a nuisance to local residents. It was noted during previous scoping consultations that light from the TDF, vessels and yard is noticeable to Stanley residents (see EIS Chapter 6).

To ensure a safe operation, minimum levels of lighting are required on the TDF and at the supply base as well as in Berkeley Sound on the LTV storage vessels. In compliance with safety legislation, the light levels may not be reduced below that minimum. However, mitigation measures are proposed to ensure all lights are facing inwards and to reduce light pollution both by directionally blocking lights and turning them off when not required.

Nonetheless, due to the sensitivity of the receptor (the residents of Stanley and Berkeley Sound), the longevity of the potential disturbance in Stanley and the fact that proposed mitigation measures have not proven to be fully effective during previous campaigns, the residual impact of light pollution and nuisance to the human population is considered to be '**Moderate**' (see EIS Section 11.8).

1.7.4.3 Significant residual risks associated with accidental events

1.7.4.3.1 Accidental releases of crude oil or MGO to sea offshore

All offshore O&G operations carry the risk of oil spills and this was raised as a concern by stakeholders during consultations in 2014, 2015 and 2016 (see EIS Chapter 6). The impacts of any given spill depend upon the type of the oil, the size and source of the spill, the prevailing winds and currents, water depth, proximity to the shoreline or to concentrations of receptors offshore, and numerous other factors. Depending upon these factors, the spill may impact upon biological, social and environmental receptors.

Lessons learned from oil spill events around the world have led to stringent industry-standard practices that are required to minimise both the likelihood of occurrence of an oil spill and the consequences of such an event should it occur. Many of these preventative industry-standard practices are built into the design of the facilities (Section 1.4.2 above) and were therefore taken into account during the initial risk assessment.

With regard to the wells, industry-standard oil spill prevention measures range from the way the wells are designed to the use of blow-out preventers and operational control procedures that ensure that good oilfield practice is followed in all activities that could carry the risk of a large or small spill (Section 1.4.2 above). Further, the well designs must be peer reviewed by an independent well examiner and the UK Health and Safety Executive (HSEx) to ensure that the risk of an uncontrolled release is minimised.

With regard to the FPSO, the industry-standard preventative requirements built-in to the design range from double-skinned and double-bottomed cargo and fuel tanks to the use of AIS and marine procedures intended to prevent collisions (Section 1.4.2 above). The FPSO is detachable should there be a risk from iceberg movement.

A range of different offshore oil spill scenarios were modelled to determine the behaviour of spills that could occur if the above preventative mitigation measures fail. The modelled scenarios included spills of reservoir oil from a well blow-out, loss of the FPSO cargo tank inventory, and spills of MGO during bunkering operations. The results of these models were used to inform the impact assessments with regard to the 'Severity of Effect' of a spill.

The measures intended to minimise the consequences of an oil spill are based upon the outcomes of the spill models, as well as industry-standard practice. An Oil Pollution Emergency Plan (OPEP) that covers the offshore operations will be submitted to FIG before operations commence and will detail the organisational responsibilities, immediate and long-term actions, reporting requirements and resources available to ensure the effective and timely management of any spills. The Sea Lion OPEP will be compatible with the FIG National Oil Spill Contingency Plan (NOSCP). Resources available, and described within the OPEP, will range from equipment held on-site by Navitas to international resources which can be brought in to track and monitor spill trajectories and / or equipment that will be deployed to stem the release of oil if necessary.

Mitigation measures to prevent the occurrence of spills and to minimise the consequences are designed based on the outcomes of the modelled oil spill scenarios, the full details of which are provided in Section 12.1 of the EIS.

Taking account of the predicted fate of Sea Lion crude and MGO in the event of a release (as indicated by the models), the worst-case potential impacts of an oil spill would be to fish, seabirds, marine mammals, fisheries and the human population (in terms of potential impact upon tourism through public perception of a spill, even if none were to reach the shore). The sensitivity of each of these receptors to an oil spill was assessed during the EIA and ranged from '**High**' to '**Very High**' (see EIS Section 12.1).

The impact of spills (i.e. the 'Sensitivity of Receptors' x 'Severity of Effect') on all the potential receptors was assessed for each spill scenario. The large volume crude spills (e.g. well blow-out, crude inventory loss) and spills that create a 'sheen' on the water (e.g. fuel spills) resulted in impacts of '**Upper Moderate**' and '**High**' significance to the more sensitive receptors.

As described in Section 1.7.2, the risk assessment process applies the likelihood of a spill occurring to the impacts associated with the spill. In the case of offshore spills, the 'Likelihood of Occurrence' was estimated based on statistical information on the frequency of incidents as well as specific Collision Risk Assessments for the Sea Lion Field activities. Based on these statistics, the likelihood of offshore spills ranges from '**Very Unlikely**' (e.g. for full loss of the FPSO crude inventory) to '**Possible**' (e.g. for a spill during transfer of crude from the FPSO to the CTT). Therefore, the risk assessment results in a worst-case residual risk of '**Moderate**' (see EIS Section 12.1).

1.7.4.3.2 Accidental releases of MGO to sea inshore

The risk of oil spill in Berkeley Sound was raised by stakeholders during consultations in 2014, 2015 and 2016 (see EIS Chapter 6). The potential sources of inshore spill include the arrival and manoeuvring of the LTVs prior to anchoring, intermittent visits from OCVs, and the presence of non-Navitas third-party vessels. Therefore, the events that may result in an MGO spill in Berkeley Sound include fuel bunkering incidents and potential vessel collisions.

With regard to mitigation, industry-standard collision prevention measures including Automatic Identification Systems (AIS) and marine procedures will be used (Section 1.4.2 above). Also, Navitas will 'vet' all vessels prior to their use for project activities.

The LTVs will be vetted and audited to assess:

- Verification of compliance with all relevant MARPOL Annex requirements and other IMO requirements,
- Verification of compliance with mandatory shipping requirements e.g. The Oil Companies International Marine Forum Ship Inspection Report Programme (SIRE), International Association of Classification Societies (IACS) etc.,
- Verification of the Shipboard Oil Pollution Emergency Plan (SOPEP), and
- Specific checks to ensure the vessel's equipment is suitable for the operation with regard to risk management and insurance requirements.

Two inshore oil spill scenarios were modelled to determine the behaviour of spills that could occur if the above preventative mitigation measures fail. The modelled scenarios were spills of MGO from bunkering incidents and vessel collisions. The results of the modelling were used to inform the impact assessment with regard to the 'Severity of Effect' of a spill.

An OPEP that covers the inshore operations will be submitted to FIG before operations commence.

Mitigation measures to prevent the occurrence of spills and to minimise the consequences are designed based on the outcomes of the modelled oil spill scenarios and full details are provided in Section 12.2 of the EIS.

Taking account of the predicted fate of MGO in the event of a release in the Sound (as indicated by the models), the worst-case potential impacts of spills are to fish and squid, fisheries, seabirds, marine mammals, coastal ecology and the human population (in terms of potential impact upon tourism). The sensitivity of each receptor within Berkeley Sound was assessed during the EIA and ranged from '**High**' to '**Very High**'.

The impact (i.e. the 'Sensitivity of Receptor' x 'Severity of Effect') on all the potential receptors in and around Berkeley Sound was assessed for both spill scenarios. The larger volume spill resulted in residual impacts of '**High**' and '**Upper Moderate**' significance to the more sensitive receptors.

Estimation of the 'Likelihood of Occurrence' of inshore spills was based on statistical information on the frequency of incidents. The assessment of the worst-case residual risk was '**Moderate**' for a spills of MGO (see EIS Section 12.2).

1.7.4.3.3 Day-to-day small leaks and spills at-shore

Small scale spills and leaks may occur through the presence and / or the day-to-day use of equipment onshore and at-shore (e.g. cranes, generators, vehicles etc.). Specifically, spills and leaks that may result from the presence and / or use of equipment include losses of chemicals or fuel oil (MGO). Any unintentional at-shore release which reaches the water, however small, will contribute to chronic pollution of the marine environment. Stanley Harbour supports a population of flightless Falkland steamer ducks, and is utilised by Commerson's and Peale's dolphins and South American sea lions. Although the number of animals present is not significant in terms of the Falklands populations, all of these are included in the list of priority conservation species and therefore the sensitivity of receptors is considered to be '**High**'.

While any such leaks are likely to be contained on the superstructure of the TDF where they will rapidly evaporate and are amenable to clean-up, some may reach the water. The scale of such leaks / spills is unlikely to warrant the deployment of a full oil spill response, although localised spill kits would be utilised to reduce the severity of any effect. While there is some uncertainty regarding the potential impacts of some of the fluids used during operations on the TDF, the environmental impact of any small leak or spill will be localised, short-term and fully reversible once activity ceases and, on balance, the severity of effect is considered to be '**Minor**'.

During the 2015 exploration campaign, two small incidents occurred which lead to leaks which did not reach the water. These events may occur less than once per year but could occur more than once over 10 years in the event that operational controls failed; therefore, the likelihood of small-scale spills or leaks occurring and contaminating the environment is '**Possible**'.

Therefore, the residual risk associated with day-to-day small spills is assessed as '**Moderate (9)**' (see EIS Section 12.3).

1.7.5 EIA outcomes summary

Table 1.7 shows the significance of the worst-case residual impacts and risks associated with all activities on all receptors. The overall significance of impacts associated with each activity is based upon the greatest impact / risk. In other words, if an oil spill is identified as having a greater impact on seabirds than on the benthos, then the impact to seabirds dictates the overall significance of oil spills. Definitions of each significance category are provided in Table 1.8.

Table 1.7 also indicates which of the aspects were initially raised as a concern by stakeholders during the scoping consultations (EIS Chapter 6) to enable easier review by stakeholders of the EIA outcomes for their particular area of concern.

Table 1.7: Summary of the worst-case residual impacts / risks to each receptor for all The Sea Lion Northern Area Development, Phase 1 & 2 activities, and an indication of whether they were raised as a concern by stakeholders during informal scoping consultations[1]

Activity	Residual Environmental Impact / Risk																	Worst-case Residual Impact / Risk	Raised by stakeholder during scoping
	Physical						Biological						Social						
	Seabed (and soil)	Water quality	Regional air quality	Global atmosphere	Marine flora	Plankton	Benthos / habitats	Fish / cephalopods	Seabirds	Marine mammals	Designated sites	Biosecurity	Land / seascape	Human population	Other sea users	Tangible property / resources	Archaeological		
Residual environmental impacts and risks associated with planned activities and unplanned events																			
Artificial light and the risk of bird-strikes inshore and offshore																			✓
Disturbance to wildlife from helicopter use																			✓
Disturbance to seabed																			-
Seabed disturbance - risk of dropped objects																			-
Underwater noise offshore																			✓
Underwater noise inshore																			✓
Discharge of drilling mud and cuttings																			✓
Operational discharges																			✓
Operational discharges – risk of PWRI malfunction																			✓
Thermal discharges																			✓
Atmospheric emissions (climatic factors)																			✓
Atmospheric emissions from combustion of sold product																			-
Atmospheric emissions – risk of blowdown / venting / release of F-Gas																			✓

Activity	Residual Environmental Impact / Risk																	Worst-case Residual Impact / Risk	Raised by stakeholder during scoping
	Physical						Biological						Social						
	Seabed (and soil)	Water quality	Regional air quality	Global atmosphere	Marine flora	Plankton	Benthos / habitats	Fish / cephalopods	Seabirds	Marine mammals	Designated sites	Biosecurity	Land / seascape	Human population	Other sea users	Tangible property / resources	Archaeological		
Waste generation																			✓
Waste - risk of loss of waste / improper segregation																			✓
Risk of marine mammal collision inshore and offshore																			✓
Risk of introducing marine invasive species																			✓
Risk of introducing terrestrial invasive species																			✓
Residual social impacts and risks associated with planned activities and unplanned events																			
Presence of FPSO / MODU and vessels offshore and impact on other users																			✓
Collision between vessels and FPSO / MODU																			✓
Presence of vessels inshore and impact on other users																			✓
Collision between vessels inshore																			✓
Competition for resources – accommodation																			✓
Competition for resources – freshwater																			✓
Competition for resources – electricity																			✓
Competition for resources – air links																			✓
Use of road network																			✓
Disturbance to the human population – light																			✓
Disturbance to the human population – noise																			✓

Activity	Residual Environmental Impact / Risk																	Worst-case Residual Impact / Risk	Raised by stakeholder during scoping
	Physical						Biological						Social						
	Seabed (and soil)	Water quality	Regional air quality	Global atmosphere	Marine flora	Plankton	Benthos / habitats	Fish / cephalopods	Seabirds	Marine mammals	Designated sites	Biosecurity	Land / seascape	Human population	Other sea users	Tangible property / resources	Archaeological		
Residual risks associated with accidental events																			
Oil spill - offshore																			✓
Fuel Oil spill - inshore (MGO)																			✓
At-shore spill of liquid fuel or chemicals																			✓
Spill of chemical at onshore supply base																			✓

Very Low | Low | Moderate | Upper Moderate | High

[1] Assessment of the Impact Significance is detailed in this EIS. Initial views of key stakeholders were sought during the scoping consultation process (Chapter 6) and thereafter, the EIS was updated wherever applicable in response to comments / information received from the previous public consultation. Comments received through the formal communication and consultation process are detailed in Chapter 17.

Table 1.8: Definitions of significance categories

Significance Level		Impact / Risk Definition
Unacceptable	High	Action required to eliminate impact or risk *via* project design or to reduce it to an acceptable level *via* additional mitigation measures and controls which aim to minimise consequence where feasible, effective and reasonably practicable. If impact cannot be reduced, the project cannot proceed.
ALARP Region (Impact tolerable if demonstrably ALARP)	Upper Moderate	Impacts assessed as "Upper moderate" may not be tolerable. Action is required to eliminate or reduce impact *via* project design and / or additional mitigation measures and controls, which aim to minimise consequence where feasible, effective and reasonably practicable. Impacts remaining within this category are considered to be within the upper reaches of tolerability and are placed here owing to the combination of a precautionary approach based upon data gaps and / or a lack of further reasonable mitigation options. Where the impact is ALARP and remains within this category, regular reviews (at a minimum of annually) will be held to determine whether the impact can be further reduced based upon the availability of new data and / or new technology. If the impact cannot be further reduced, consideration may also be given to offsetting of the impact (see Section 1.7.3).
	Moderate	Impacts assessed as "Moderate" require action to identify opportunities for improvement *via* project design, additional mitigation measures and controls which aim to minimise consequence where feasible, effective and reasonably practicable. Where the impact is ALARP and remains within this category, it will be subject to regular ALARP reviews as described above.
	Low	Impacts assessed as "Low" are with the levels of existing natural environmental variability. No project-specific mitigations will be implemented over and above industry-standard measures and controls unless it is stated as a requirement in conditions to approval or Falkland Islands Legislation and / or approved policy. Nonetheless, impacts shall be regularly reviewed to ensure that suitable controls remain in place and shall be subject to continuous improvement where opportunities exist.
Broadly acceptable	Very Low	Impact barely detectable. No additional actions required beyond industry-standard measures and controls. Nonetheless, impacts shall be periodically reviewed to ensure that suitable controls remain in place and shall be subject to continuous improvement where opportunities exist.
	Beneficial	Has a positive effect.

1.8 Environmental Monitoring and Management

To answer 'Question 6' above, the following sections describe what Navitas propose with regard to mitigating, monitoring and managing the potentially significant impacts and risks associated with the Phase 1 & 2 Development throughout its lifecycle.

In support of the EIS submission, Navitas has, to date, developed:

- Preliminary offshore, inshore and onshore Oil Pollution Emergency Plans, and
- A preliminary Environmental Monitoring and Management Plan (EMMP) (Chapter 15).

These documents will be used to develop more detailed project-specific management plans in the event of approval and sanction of the project, and before operations commence.

The following project-specific management plans will be in place by the time operations commence and are under development:

- EMMP (see Section 1.8.1 below),
- Bird Strike Management Plan (BSMP),
- Waste Management Plan (WMP),
- Harbour Management Plan (HMP),
- Biosecurity Management Plan (BMP),
- Traffic Management Plan (TMP),
- Oil Pollution Emergency Plan (OPEP),
- Wildlife Response Plan (WRP), and
- Iceberg Management Plan (IMP).

1.8.1 Environmental Monitoring and Management Plan

Various commitments have been made by Navitas which aim to reduce the residual environmental impacts and risks. These commitments are detailed in the impact and risk assessment chapters of the EIS (10, 11 and 12), and will be recorded in the overarching EMMP.

These commitments are in addition to the mitigation measures built-in to the design of the facilities (Section 1.4.2 above) and the industry-standard and legislative requirements (detailed within the EIS) all of which are considered to be a 'given'.

The specific purpose of the EMMP is to detail the actions / plans required to:

- Measure and monitor the impacts (primarily the 'Severity of Effect') of the Development, thus ground-truthing the EIA,
- Check the efficacy of the project-specific mitigations in place,
- Apply adaptive management options to further reduce impacts, and
- Fill spatial / temporal data gaps, where needed, to increase the level of confidence in the impact / risk assessment outcomes.

Should the monitoring of impacts indicate that the significance of the impacts and risks predicted in the EIS are not appropriate, and / or that mitigation is not effective, a revised mitigation measure and / or monitoring regime will be required.

1.8.2 EMMP Workshop

A workshop to consider the contents of an Environmental Monitoring and Management Plan (EMMP) was held in Stanley, Falkland Islands on 23-25 April 2019. It was attended by 25 interested stakeholders, comprising FIG, POEPL, industry bodies and NGOs.

The keys aims of the EMMP workshop were to agree:

- Priorities for monitoring,
- Planned surveys, monitoring and data collection,
- Regularity of surveys, monitoring and data collection,
- Methods for surveys, monitoring and data collection,
- Reporting of data,
- Intervention thresholds and the associated adaptive management options, and
- Governance (who will oversee the work).

At the Workshop, consideration was given to environmental and social impacts from the Sea Lion Development where there was potentially a need for further certainty as to the actual impact.

The Summary EMMP tables are provided in Section 1.8.3 and Chapter 15 in the full EIS.

In the event that the Development is approved and sanctioned, the EMMP will be transferred into a live document, which will provide details on:

- Specific roles and responsibilities,
- Timelines, deadlines and 'frequency of execution' for actions identified, and
- Progress and completion for use throughout the life of the field.

1.8.3 Preliminary EMMP

While the EMMP is ultimately a live document throughout the life of the Development, Table 1.9 provides a summary of the commitments made by Navitas which have been identified during the EIA process. As described above, a full copy of the EMMP will be made available prior to commencement of the project, upon request from Navitas (sealion.enviro@navitaspet.com).

Information arising from the EMMP commitments will be reported to the EMMP group *via* agreed reporting protocols. Where necessary, amendments will be discussed and the EMMP actions updated accordingly.

Table 1.9: Summary of environmental monitoring and management commitments

Environmental Aspect	Key monitoring and management commitments
Environmental impacts and risks associated with planned activities and unplanned events	
Physical presence - artificial light	• Investigate use of alternative spectrum ('green') lighting, • Investigate pilot-free flare design using an automated ignition system, • Seabird and Marine Mammal Observers (SMMOs) regularly on board project vessels, and • Development and implementation of the Bird-Strike Management Plan (BSMP).
Physical presence - helicopter use	• Monitor regularity of complaints received.
Physical presence - Disturbance to seabed	• Visual (ROV) pre-drill survey before drilling. • Seabed surveys of benthos and sediment chemistry throughout the Development.
Underwater noise	• Measurement of underwater noise during construction, • Ground truthing of noise levels once into production, • Investigate low noise thrusters and propellers on any Navitas operated vessels, and • SMMOs on board specific vessels and during certain activities.
Discharge of drilling mud / fluid and cuttings	• Seabed surveys of benthos and sediment chemistry throughout the Development, • Visual (ROV) pre-drill surveying, • Post-drilling cuttings pile analysis, and • Use and discharge of muds will be monitored on board throughout drilling.
Operational discharges	• Monitoring of all chemical discharges, • Oil in produced water (not normally discharged) concentrations included in environmental Key Performance Indicators (KPIs), • Risk Based Approach to ascertain the composition of produced water, • DREAM modelling of produced water once sampled and composition known, and • Produced water re-injection uptime included in environmental KPIs.

Environmental Aspect	Key monitoring and management commitments
Waste generation	• Work collaboratively with FIG on the potential for development of improved waste facilities in the Falkland Islands, • Compliance with the specific requirements of the Phase 1 & 2 Waste Management Plan, • Education of offshore and onshore personnel e.g. inclusion in all personnel inductions, • Education of all personnel on the consequences for wildlife and landscape that can result from loss of waste to sea and inclusion of this in all FPSO and MODU inductions, • Use of educational posters about the potential consequence of loss of waste, • Potential for litter pick-up drives / incentives for local beauty spots and protected sites, and • Periodic reviews on whether or not impacts of waste remains ALARP.
Atmospheric emissions	• Recording and monitoring of all emissions and fuel use, and • Uptime of gas re-injection included in environmental KPIs.
Marine mammal collision	• SMMOs regularly on board project vessels, and • Education and awareness for mariners. All collisions will be report to FIG and the IWC via: www.iwc.int\ship-strikes or shipstrikes@iwc.int.
Introduction of non-native marine species	• Specific inclusion of each vessel's ballast water management system, exchange plan, record book and biofouling management plan (BFMP) and logbook in selection and pre-mobilisation HSE audits, • Ballast water sampling programme for OCV / PSVs entering the Falklands nearshore environment, • Non-native species monitoring programme, and • Settlement plates and pathways analysis in the event of any incursions.
Introduction of non-native terrestrial species	• Implementation of the Biosecurity Management Plan (BMP).
Social impacts and risks associated with planned activities and unplanned events	
Competition for resources	• Monitoring of accommodation use and socio-economic impact on the rental market, • Use of onshore water supply will be monitored at all infrastructure locations, • Energy use will be monitored onshore and at the TDF, • Any incidental usage of existing air-links will be recorded, and

Environmental Aspect	Key monitoring and management commitments
	• Off peak power utilisation.
Disturbance to the human population	• Monitor regularity of complaints received from local residents, • Noise and light monitoring during operations to validate predictions and inform ongoing practices, • Baseline levels of noise, and light to be better established, • Routine sampling and quality tests will be undertaken on all fuel supplies as part of procurement processes and audits, and • AIS based survey of shipping traffic at the Sea Lion location.
Risks associated with accidental events	
Oil spills	• Further research into the effect of Sea Lion crude on pinniped fur, • Regular oil spill response equipment exercises to be conducted, • Efficacy tests of oil spill response equipment, • Maintain continuous and live hydrodynamic model, once into production compare modelled rates with actual flowrates, and • Survey effort to improve knowledge of species distributions of seabirds and marine mammals *via* SMMOs on project vessels.

1.9 Overall conclusion

The use of vessels, fossil fuels and onshore resources (e.g. water and electricity) is necessary to carry out any O&G operation and the generation of some waste, which cannot be re-used, recycled or converted to energy is unavoidable. Similarly, the use of third-party vessels from elsewhere in the world will always carry some risk of non-native species introduction and all oil production and export operations carry the risk of oil spill events. It is, therefore, not possible to carry out O&G operations without some degree of environmental and / or social risk and impact.

In summary following the EIA process, and the adoption of ALARP mitigations, thirteen residual impacts and risks have been assessed as significant:

- Impacts - Planned activities:
  - Artificial light offshore and inshore - **Moderate**,
  - Underwater vessel noise offshore - **Moderate**,
  - Drill cuttings discharges – **Moderate**,
  - Atmospheric emissions (climatic factors) - **Moderate**,
  - Waste management (contingent export to UK with unrecoverable waste going to UK landfill) – **Moderate**,
  - Collisions with marine mammals inshore – **Moderate**,
  - Introduction of marine invasive species - **Moderate**,
  - Introduction of terrestrial invasive species – **Upper Moderate**,
  - Competition for freshwater resources – **Upper Moderate**,
  - Competition for energy resources – **Upper Moderate**,
  - Competition for use of roads – **Moderate**, and
  - Disturbance to the human population from light – **Moderate**.
- Indirect impacts outwith Navitas's control:
  - Atmospheric emissions associated with the combustion of sold product – **Upper Moderate**.
- Risks - Unplanned / accidental events:
  - Oil spill offshore, inshore and at-shore - **Moderate**.

Navitas believe that:

- All impacts and risks associated with The Sea Lion Field Northern Area Development, Phase 1 & 2 have been identified and robustly assessed,
- Impacts and risks which are ALARP and are considered to be of low significance are sufficiently controlled, and
- Impacts and risks that are currently ALARP but remain significant will be further reduced wherever practicable throughout the life of the Development.

Navitas will continue to do all that is reasonably practicable with regard to monitoring and management to minimise environmental impacts / risks during the Phase 1 & 2 Development.

All impact and risk assessments will be periodically reviewed to ensure that the controls remain in place and that activities leading to potentially significant impacts and risks are subject to continuous improvement where opportunities exist.

1.10 Formal stakeholder consultation

1.10.1 Representations by stakeholders

HOLD

1.10.2 Responses by Navitas

HOLD

This page is intentionally blank

Navitas Petroleum Development and Production Ltd.
www.navitaspet.com