1 INTRODUCTION

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1 INTRODUCTION

1.1 PURPOSE OF THE EIA REPORT

This Environmental Impact Assessment Report (EIA Report) has been prepared by Aquatera Ltd and Western Isles Marine and Environment Ltd on behalf a consortium, led by Comhairle nan Eilean Siar ('the Developer') (CnES), who is submitting a planning application under the Town and Country Planning (Scotland) Act 1997 (as amended) for permission to construct and operate a sub-orbital[1] sounding or research rocket[2] launch facility in North Uist Outer Hebrides, Spaceport 1 ('the Project').

The EIA Report has been undertaken in accordance with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (the 'EIA Regulations') to support the accompanying planning application for the development. An EIA is required where a development is likely to have significant effects on the environment by virtue of factors such as its nature, size or location. The proposed development does not fall directly under either Schedule 1 (mandatory EIA) or Schedule 2 (thresholds and criteria for classifying development as Schedule 2 development) of the EIA Regulations. However, the proposals have undergone the process of EIA due to the nature of the proposals, proximity to sensitive areas (as defined by the EIA Regulations) and to address issues raised by statutory consultees and local stakeholders. A full summary of the project background and rationale for the development is presented in Chapter 3: Site Selection and Alternatives.

The EIA Report presents the results from the EIA of the Project; a process which draws together, in a systematic way, an assessment of a development's likely significant environmental effects. This ensures that the importance of the predicted effects, and the scope for reducing any adverse effects through avoidance or mitigation, are fully understood by stakeholders and the planning authority before it makes its decision. Information and conclusions on likely significant effects presented in this document will be taken into consideration by the planning authority and their advisors as part of the determination process of the planning application.

The main findings and conclusions of the EIA Report are also presented in a Non-Technical Summary (NTS) in Annex A.

The EIA Report will support a number of other licensing regimes that apply to the Project, including the Space Industry Regulations 2021 and the Marine (Scotland) Act 2010. Further details on relevant legislation and consents are presented in Chapter 2: Legislation and Policy, and relevant individual technical chapters.

1.2 THE DEVELOPER (APPLICANT)

Comhairle nan Eilean Siar (CnES) is leading a consortium, including key stakeholders in the UK and international space sector, to develop a sub-orbital spaceport at Scolpaig on the north-west coast of North Uist. The Spaceport 1 consortium consists of CnES, Highlands and Islands Enterprise (HIE), QinetiQ Group plc, the Rhea Group and Commercial Space Technologies Ltd (CST).

[1] The Space Industry 2018 Act defines sub-orbital craft as capable of operating above the stratosphere i.e., the vehicle will fly into space but will not enter orbit.

[2] Instrument-carrying rockets designed to take measurements and perform experiments during a sub-orbital flight at a height of 30 to 90 miles above the surface of the earth.

Comhairle nan Eilean Siar – CnES (Western Isles Council) is the local authority for Na h-Eileanan an Iar council area of Scotland. CnES leads the consortium for the development and is the landowner of the Scolpaig Farm area.

Highlands and Islands Enterprise – HIE is the Scottish Government's economic and community development agency for the Highlands and Islands area. HIE's role is to develop sustainable economic growth across the region through creating infrastructure for future investment, assists large and small businesses with growth area. HIE is a consortium member for the Spaceport development

QinetiQ Group plc - QinetiQ has a long-term partnering agreement providing UK MOD with innovative and realistic test and evaluation of military and civil platforms, systems, weapons and components on land, at sea and in the air. The company operates the MOD Hebrides Range, located in South Uist which comprises a deep range for complex weapons trials and in-service firings, and an inner range for ground-based air defence Test and Evaluation. The facilities include, tracking radar facility, telemetry, optical instrumentation and support services.

Rhea Group - RHEA Group is a multinational space-engineering and security company which provides bespoke engineering solutions, systems development and security services for space, military, government and other critical infrastructure.

Commercial Space Technologies Ltd - Commercial Space Technologies provides the space industry with launch brokerage, management and consultancy services. The company is engaged in numerous fields of activity, supporting players in both upstream and downstream space markets, service providers in the insurance and legal sectors, space agencies (such as NASA, ESA and UKSA) and new entrants to the industry.

1.3 PROJECT OVERVIEW

The Developer proposes to construct and operate a sub-orbital spaceport facility (the Project) at Scolpaig on the north-west coast of North Uist. The purpose of the Project is to provide infrastructure for the launch of sub-orbital sounding or research rockets with up to 10 launches planned per year for the permanent Project. The Project site is part of Scolpaig Farm, which CnES took ownership of in 2019. The total application site area is 1.7 Ha. The location of the Project is presented in Figure 4-1 and 4-2.

The Project will include the installation of a concrete launch platform with integrated sump, pollution control and management system comprising of a storage tank and deluge facility, upgrade of an existing farm track and causeway, upgrade of one farm building (byre), provision of car parking adjacent to the site entrance and a car parking area at Scolpaig Farm buildings. The key components and site layout of the Project are presented in Figure 4-3 and detailed in the Drawings Pack (Figure 0020 - 0027 and Figures 0035 -0040).

Full project details from construction and operation to decommissioning phase are described in detail in Chapter 4: Project Description.

1.4 PROJECT BACKGROUND

The Developer submitted a request for scoping opinion for a spaceport development at Scolpaig in 2018 (Ref: 18/00234/SCO_L). The scoping report presented proposals for a larger, orbital development. CnES provided a "Scoping Opinion" for a spaceport facility at the proposed application site on 2 August 2018. Responses from a range of statutory and non-statutory consultees were received.

Following a review of the emerging market and opportunities and interaction with other potential space launch infrastructure, the Developer revised the development proposals to substantially reduce the overall site footprint and submitted a planning application in June 2019 for a smaller sub-orbital spaceport development (Ref: 19/00311/PPD). In response to stakeholder feedback and public responses, centred around the need for additional information, the Developer has withdrawn this application.

The Developer is now submitting an application for a revised project design for a sub-orbital spaceport, which is supported by this EIA Report and information to support a Habitats Regulations Appraisal (HRA)[3] (Annex B). Further details on the site selection process, alternatives considered and rationale for the Project are detailed in Chapter 3: Site Selection and Alternatives.

1.5 STRUCTURE OF THE EIA REPORT

This EIA Report communicates the process and findings of the EIA. The EIA process represents an assessment of the potential effects of the Project on the environment. It is shaped by the advice received through the formal Scoping Opinion for the initial proposed development, where relevant to the current proposals, and further pre-application consultation with stakeholders. The findings of the assessments are presented in Chapters 7 to 21 of this EIA Report (Volume 1), with accompanying figures, drawings and visualisations in Volume 2. All supporting studies are provided as Appendices in Volume 3. In addition, further information to support the EIA Report and planning application are provided as Annexes in Volume 4. The structure of the EIA Report is detailed below in Table 1-1.

1.6 COPIES OF THE EIA REPORT

Following submission of the planning application, the EIA Report and supporting documents will be available for public view online and to download from:

CnES planning portal at: https://planning.cne-siar.gov.uk/PublicAccess/

A paper copy of the EIA Report will be available to view during normal opening hours at:

Lionacleit Community Library
Located inside: Sgoil Lionacleit
Lionacleit
Isle of Benbecula
HS7 5PJ

Digital copies on USB for £5 or paper copies also available for £250 on request from:

Alison MacCorquodale, Economic Development Officer, CnES: AlisonMacCorquodale@cne-siar.gov.uk

[3] Required under the Conservation (Natural Habitats, &c.) Regulations 1994 for European Sites.

Table 1-1 Structure of the EIA Report

VOLUME 1	EIA REPORT
Chapter 1	Introduction
Chapter 2	Legislation and Policy
Chapter 3	Site Selection and Alternatives
Chapter 4	Project Description
Chapter 5	Consultation Process
Chapter 6	Approach to EIA
Chapter 7	Community, Recreation and Tourism
Chapter 8	Landscape and Visual Amenity
Chapter 9	Land Use and Utilities
Chapter 10	Archaeology and Cultural Heritage
Chapter 11	Traffic and Transport
Chapter 12	Aviation, Radar and Telecommunications
Chapter 13	Marine Users and Assets
Chapter 14	Ornithology
Chapter 15	Terrestrial Ecology
Chapter 16	Marine Ecology
Chapter 17	Hydrology, Hydrogeology and Geology
Chapter 18	Air Quality and Heat
Chapter 19	Noise and Vibration
Chapter 20	Climate Change
Chapter 21	Environmental Management and Monitoring

VOLUME 2	FIGURES AND DRAWINGS
Figures	EIA Figure Pack
Drawings	Site Drawings and Plans
Visualisations	Visualisation Pack
VOLUME 3	**APPENDICES**
Appendix 5-1	Review of Planning Representations
Appendix 7-1	Socio-Economic Analysis
Appendix 7-2	Outline Habitat and Amenity Management Plan
Appendix 10-1	Archaeology Gazetteer
Appendix 13-1	Maritime Management Procedures
Appendix 14-1	Ornithology Technical Report
Appendix 14-2	Ornithology Confidential Annex
Appendix 15-1	Vegetation Survey (Phase 1/NVC)
Appendix 15-2	Otter Survey (2019)
Appendix 15-3	Otter Survey (2021)
Appendix 17-1	Outline Hazardous Materials Management Plan
Appendix 17-2	Water Management
Appendix 17-3	Test Excavations and Soil Profiles
Appendix 18-1	Detailed Dispersion Modelling
Appendix 19-1	Noise Technical Report
Appendix 21-1	Risk Register
VOLUME 4	**ANNEXES**
Annex A	Non-Technical Summary (NTS)
Annex B	Information to Inform HRA
Annex C	Schedule of Mitigation
Annex D	Scoping Opinion (2018)
Annex E	Stakeholder Consultation Record

1.7 CONTRIBUTERS TO THE EIA

The EIA was coordinated by Aquatera Ltd and Western Isles Marine and Environmental Ltd. The EIA team includes a number of organisations with specialist and competent expertise, presented below. The diverse team ensured assessments were undertaken by the appropriate consultants with extensive knowledge and expertise in their field. Details on the individuals contributing to the EIA are provided in Table 1-2.

Aquatera Ltd

Aquatera Ltd., based in the Orkney Islands, provides environmental expertise and operational support for a range of offshore and land-based activities throughout Scotland and internationally. Aquatera works with a range of sectors from

government and agencies, local government, private companies to universities and other research institutes. Aquatera has an extensive and proven track record in environmental management in the terrestrial and offshore environment, with a particular focus on providing support to developers through the project design and consenting process including: site selection and feasibility, environmental and technical surveys, EIA, Habitats Regulations Appraisal (HRA), consents management and environmental monitoring. Aquatera jointly coordinated the delivery of the EIA Report, provided technical review and advisory role, and prepared the following chapters: Community, Recreation and Tourism; Landscape and Visual Amenity; Land Use and Utilities; Traffic and Transport; Aviation, Radar and Telecommunications; Marine Users and Assets; Marine Ecology; and Climate Change.

Western Isles Marine and Environment Ltd

Western Isles Marine and Environment Ltd. is an environmental consultancy based on the Isle of Lewis, providing a range of locally based services through its small team and network of subcontractors. Since its inception in 2018 the company provided support for range of organisations from local community trusts to global multinational firms across a number of disciplines including archaeological assessments, ecological surveys, ornithological surveys, project development, planning and EIA support. WI Marine and Environment jointly coordinated the delivery of the EIA Report, provided a technical review and advisory role, coordinated local input and knowledge, and prepared the following chapters: Project Description; Site Selection and Alternatives; Hydrology, Hydrogeology and Geology; Accidental and Unplanned Events and a number of supplementary appendices.

Fraser Architecture

Fraser Architecture is a North Uist based, award winning practice established in 2008 and is founded upon 29 years of experience of design and procurement across the Outer Hebrides. The practice has developed a very diverse project portfolio which reflects the collective skills of their team. As well as private and community projects the practice has delivered specialised commercial and defence projects including infrastructure for the Terrier Orion launch from RA Range Hebrides in 2015, the first launch into space from UK soil.

Atlantic Ecology

Atlantic Ecology Limited is a consultancy based in Scotland that specialises in ornithological consultancy services, for both offshore and onshore projects. Atlantic Ecology works alongside larger consultancies, meeting their requirements for specialist independent advisory, impact assessment and survey services. Although Atlantic Ecology takes on work across the UK and overseas, it focusses on projects in Scotland especially those that have an emphasis on seabirds, breeding waders and birds of prey. Recent projects have included survey and impact assessment studies for onshore and offshore windfarms, tidal stream arrays, marine fish farms and hydro-electricity projects, and undertaking site condition monitoring surveys of nature conservation sites designated to protect important bird populations.

Arcus

Arcus, an ERM Group company, is a specialist environmental, engineering and planning consultancy, which specialises in high profile and potentially sensitive developments across a variety of sectors. Arcus's headquarters are in York, with its largest office based in Glasgow. Arcus' UK Ecology team is made up of a total of 17 specialist ecologists and ornithologists, all of whom are members of the Chartered Institute of Ecology and Environmental Management (CIEEM). As such, all work is undertaken following the CIEEM Code of Professional Conduct. Arcus's team also include expert acoustics consultants who work in all aspects of noise and vibration. From scoping and consultation, through background noise assessments and acoustic design, to noise modelling and production of noise impact assessments.

Mabbett and Associates Ltd

Mabbett, Environmental Consultants and Engineers, is a UK based speciality firm that provides integrated environmental, quality, health and safety consultancy, engineering including principal designer and training services in the UK and worldwide in association with affiliate firm, Mabbett & Associates Inc. The Mabbett team routinely delivers seamless value-added professional expertise that clearly focuses on key issues. Team Mabbett assists clients to meet their business objectives, legislative requirements and helps to improve profitability, competitiveness and sustainability.

Cambridge Environmental Research Consultants

Cambridge Environmental Research Consultants (CERC) provides environmental software and services for air pollution problems for cities, industries and airports. CERC provides expertise in atmospheric flows and dispersion as part of their air quality consultancy. They have extensive experience in carrying out detailed modelling to assess impacts, for permitting or planning, or providing expert advice, relating to industrial emissions, emissions management and inventories of toxic pollutants and greenhouse gases. CERC is also a world leading developer and supplier of environmental software, including ADMS (Atmospheric Dispersion Modelling System), which enables them to apply tailored solutions to commercial and research projects. CERC has provided air quality consultancy services for a range of clients from private companies to UK government departments and agencies, local government, international government and agencies, and universities.

Guard

GUARD Archaeology Ltd was set up in 2011, replacing Glasgow University Archaeological Research Division (G.U.A.R.D.), which, after 22 years of business, ceased to operate in 2010. GUARD Archaeology Ltd specialises in the management of archaeology and cultural heritage projects, providing comprehensive archaeological services for a range of private sector and public sector groups across Scotland. GUARD Archaeology Ltd is a Registered Organisation with the Chartered Institute for Archaeologists (CIfA) and adheres to the standards of professional conduct outlined in the CIfA Code of Conduct and CIfA Standards and Guidance.

Highland Ecology

Highland Ecology are based in central and western Scotland, with many years of experience carrying out work throughout Scotland and also England. The business undertakes a wide variety of services, ranging from Ecological Clerk of Works (ECoW) on construction sites to baseline vegetation surveys on uninhabited islands in the Outer Hebrides. Staff have substantial experience working for Scottish Natural Heritage (now NaturesScot) carrying out baseline National Vegetation Classification (NVC) surveys throughout Scotland, providing unique insight and experience in the natural and semi-natural habitats and the effects of land management.

MKA Economics

MKA Economics support projects by appraising their economic viability, socio-economic value and advising on their delivery. The company works across sectors and geographies and has a particular specialism in arts and culture, events, food and drink, renewables, sport and tourism. MKA Economics is currently retained by HIE and SSE on their Economic Impact Frameworks. MKA Economics is also a member of the Economic Development Association Scotland (EDAS) and Aberdeen and Grampian Chamber of Commerce (AGCC).

Table 1-2 EIA team, relevant experience and contribution to the EIA Report

Company	Role	Qualifications and Experience	Contribution
Aquatera Ltd	Project Manager and Senior Consultant	MSc Marine Resource Management and BSc (Hons) Sustainable Environmental Management, 8 years EIA and consultancy experience. Project management, EIA coordination and chapter author roles for range of sectors including wave and tidal energy, floating wind, onshore wind and marine aquaculture throughout Scotland. Wider experience in site selection and optioneering, development of environmental management and monitoring plans, stakeholder engagement, baseline survey planning, and involved in a number of national and European strategic environmental research programmes relating to environmental impacts of marine renewables.	Project management and joint coordination of the EIA Report, technical review and advisory role, stakeholder consultation. Preparation of several assessments, technical reviews and input to a number of EIA chapters and supporting documents.
WI Marine and Environment Ltd	Project Manager	The co-project manager is a Chartered Environmentalist and full member of the Institute of Environmental Management and Assessment (IEMA). Has an MSc in Marine Resource Development and Protection and a BSc (Hons) in Tropical Environmental Science. Has accumulated over 18 years' experience across onshore renewables, offshore renewables, aquaculture and project development, including developing projects involving novel technologies.	Joint coordination of the delivery of the EIA Report, provided a technical review and advisory role, and prepared a number of the assessments as part of the EIA Report.
Aquatera Ltd	Expert Consultant	MRes Environmental Biology and BSc (Hons) Zoology, 16 years ecological survey and EIA experience. Ornithological specialist with a broad ecological background; providing expert ecological advice and support for numerous EIAs and development of environmental monitoring plans. Planned, undertaken, and managed all of Aquatera's ornithological survey and consultancy work for onshore wind, aquaculture and other energy and infrastructure development projects.	Preparation of the Marine Ecology assessment, technical review and advisory role for Ornithology and HRA.
Aquatera Ltd	Senior Consultant	MSc with qualifications from National University of Ireland Galway, Imperial College London and Loughborough University. Experienced consenting manager with 15 years' experience of successfully delivering the required EIA documentation and planning permissions in the renewables, oil & gas, and transport industries.	Preparation of the following assessments: Community, Recreation and Tourism; Traffic and Transport; Land Use and Utilities; Aviation, Radar and Telecommunications; Climate Change.

Company	Role	Qualifications and Experience	Contribution
Aquatera Ltd	Consultant	BSc (Hons) in Marine Science and MSc in Marine Biodiversity and Biotechnology. Three years EIA and benthic survey experience with Aquatera. Strong grounding in marine biological and ecological disciplines, addressing potential environmental impacts of marine renewables. Currently provides support for a number of projects including EIAs for proposed renewable energy and marine aquaculture projects, with a focus on benthic ecology and water quality topics, as well as producing a number of benthic survey reports to support planning applications.	Preparation of the Benthic Ecology and Fish Ecology assessments (in Marine Ecology) and support on Community, Recreation and Tourism.
Fraser Architecture	Architect (Partner)	The project designer has been a practising Architect for 35 years. Studied at Robert Gordon's Institute of Technology in Aberdeen and has practiced in Shetland and the central belt of Scotland. With diverse experience in the private and public sector throughout the Western Isles, has an understanding of cultural and environmental context, the challenges of climate, the local building industry and the statutory considerations which impact upon design. His experience includes other vertical launch infrastructure works.	Project design and drawings, production of visualisations, including the interpretation of hazardous materials management specification into a design response.
Atlantic Ecology	Ornithologist	The project ornithologist and has a PhD in Zoology and BSc Joint Honours in Zoology & Botany and is Managing Director of Atlantic Ecology Limited, a Scottish-based ornithological consultancy setup in 2016. 32 years' work experience, initially as a research biologist with working for universities and RSPB Scotland and since 2005 as an ornithological consultant. Has wide experience with impact assessments and surveys for onshore projects including large wind farms (e.g., Viking Wind farm on Shetland), hydro-electric schemes, transmission line projects, and site condition monitoring surveys of designated sites. Has a particular knowledge relating to the wildlife of the Outer Hebrides gained principally through long-term studies into the breeding waders of the Uist machair (PhD study followed ten years later by five further years of study for RSPB), and also through diver surveys.	Led on all aspects of the ornithology related to the Scolpaig Space Port Project, including advising and managing baseline bird survey requirements, designed and overseen the bird survey work, analysed and written up the survey results, and undertaken the assessment of potential impacts of the project on ornithology interests (i.e., EIA and HRA).

Company	Role	Qualifications and Experience	Contribution
Arcus	Principal Ecologist	The Associate Director MRes BSc (Hons) CEnv MCIEEM for Arcus Consultancy Services Ltd undertook the ecological impact assessment. Is a licensed protected species ecologist, an accredited Chartered Environmentalist (CEnV), and a full member of the Chartered Institute of Ecology & Environmental Management (CIEEM), as well as an elected member of CIEEM Scottish Member Committee. Has a BSc (Hons) in Environmental Biology and MRes in Ecology and Environmental Biology with over 12 years' experience in ecological consultancy, and over 10 years' experience of carrying out EcIA for projects across Scotland, including the Highland and Islands.	Arcus led and prepared the Ecological Impact Assessment.
Arcus	Acoustic Consultant	The Acoustic Consultant has seven years' experience as an Acoustic Consultant and is a member of the Institute of Acoustics (IOA). The assessment was supervised and reviewed by a Principal Acoustic consultant with Arcus, who has over ten years' experience and is also a member of the IOA.	Undertook desk-based assessment and modelling of a range of rocket specifications to inform the noise impact assessment and EIA chapter collation.
Mabbett Environmental Consultants and Engineers Ltd	Senior Safety Engineer and Project Manager	Associate Member of the IChemE and has over 12 years' experience in process safety and risk analysis across a variety of high-hazard industries. Qualifications include a Bachelor's degree in Chemical Engineering (Honours), and postgraduate Master's degree in Safety and Risk Management (with Distinction). Serving as Senior Safety Engineer within Mabbett's process safety division, responsibilities include technical delivery of a wide range of COMAH-related safety studies inc. hazard identification, qualitative and quantitative risk analysis, and general health and safety legal compliance. Also serves as Mabbett's lead consultant on COMAH projects and has extensive experience in areas of Safety Report preparation, major accident hazard scenario development and risk frequency analysis.	Mabbett representatives provided advice, guidance and recommendations to ensure site infrastructure and associated operations were compliant with regulation and best practice, including COMAH Regulations.
Mabbett Environmental Consultants and Engineers Ltd	Senior Safety Engineer	The Senior Safety Engineer currently serves as the Director of Mabbett's Safety division. Chartered Chemical Engineer and a Member of the Institute of Chemical Engineers (IChemE), with over 13 years' experience in the fields of process and occupational safety, process engineering and environmental, health and safety legal compliance. Responsibilities include both the technical QA/QC and project management of a variety of safety consultancy projects, to include a number of COMAH-related projects. An IChemE-trained HAZOP Team Leader.	

Company	Role	Qualifications and Experience	Contribution
Mabbett Environmental Consultants and Engineers Ltd	Senior Director	The Senior Director is a Chartered Engineer, Fellow of the Institute of Chemical Engineers (IChemE) and full Member of the Institute of Air Quality Management (MIAQM). One of Mabbett's longest-serving staff members and serves on the company's Board of Directors. Oversees the Engineering and Safety Groups at Mabbett in role as Senior Director. This involves acting in a leadership role on a diverse range of engineering, environmental and safety projects. Is Mabbett's Principal Air Quality Consultant, and regularly undertakes and oversees air quality assessments in support of proposed new developments and existing industrial facilities.	The Senior Director provided environmental consulting support on this project, mainly in relation to air quality. Role included helping to define an appropriate approach/ methodology for the air quality assessment, one which adequately identifies and evaluates the key risks to local human health and the environment from the proposed operations.
Highland Ecology	Ecologist	The Ecologist is a member of the Chartered Institute for Environmental and Ecological Monitoring (CIEEM), is qualified in biological surveying and is a member of the British Ecological Society. Previous experience includes vegetation survey work for a range of renewables developments, site condition monitoring. Other specialisms include Environmental Clerk of Works (ECoW), conservation management plans, alien plant survey and EIA.	Highland Ecology undertook the vegetation survey (Phase 1 and NVC) and reported the results as a Technical Appendix to the EIA.
CERC	Senior Consultant	The Senior Consultant at CERC has 16 years of air quality consultancy experience, and has worked on a wide range of air quality assessment projects at CERC. Actively involved in training and technical support for CERC's models and other software, and has trained and advised many consultants, researchers and regulators, both in the UK and internationally. Is a full member of the Institution of Environmental Sciences (IES) and the Institute of Air Quality Management (IAQM) and has a degree in Chemistry with Environmental Science and a PhD in atmospheric dispersion.	CERC carried out air quality assessment of the exhaust emissions of sounding rockets. Detailed dispersion modelling, using CERC's ADMS 5 model, of the worst-case scenario(s), and assessment of the air quality impact on human health and ecological receptors.
Guard Archaeology Ltd	Archaeologist	GUARD Archaeology's Consultancy Project Manager is responsible for managing desk-based assessments, environmental impact assessments and archaeological fieldwork. Has an MA joint honours in Archaeology and Classical Civilisation and a PG Dip in Aerial Photography with Geophysical Survey in Archaeology. Member of the Chartered Institute for Archaeologists and a Fellow of the Society of Antiquaries of Scotland. Has over 19 years acquired extensive experience in all aspects of archaeological work from a wide range of rural and urban archaeological projects in Scotland, Northern Ireland, England and Sardinia. Has written numerous archaeological assessment reports and had papers published in a variety of monographs and journals.	The PM undertook all aspects of the Scolpaig Archaeology Heritage Assessment including the baseline research, walkover survey and the assessment of potential direct and indirect effects of the proposal upon the archaeological resource.

Company	Role	Qualifications and Experience	Contribution
MKA Economics	Socio-economic Consultant	The Socio-economics Consultant has over 20 years post qualifying experience and brings high level experience in economic development projects. Core strengths include economic development, market appraisal, public/private funding, economic and financial appraisal of projects, including, commercial developments, residential schemes, renewable energy, transport and infrastructure, SME support programmes and labour market initiatives. Full Member of the Economic Development Association Scotland (EDAS) and the Institute for Economic Development (MIED). He was a Board Director with Forth Valley Social Enterprise (FVSE) from 2015 to 2018 and is a Planning Aid Scotland (PAS) Volunteer.	MKA economics undertook and reported the socio-economic analysis.

2 LEGISLATION AND POLICY

CONTENTS

2 LEGISLATION AND POLICY

2.1 INTRODUCTION

This chapter provides an overview of the overarching legislative and policy context relevant to the Project. The chapter also outlines how the Project is compliant with and contributes towards achieving key policy targets against relevant local, regional and national planning policy.

Key legislative and regulatory requirements for the consent of the Project include:

- Town and Country Planning (Scotland) Act 1997;
- Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Space Industry Act 2018 and The Space Industry Regulations 2021; and
- Marine (Scotland) Act 2010 and Marine and Coastal Access Act 2009.

2.2 LEGISLATIVE FRAMEWORK

2.2.1 Town and Country Planning (Scotland) Act 1997

Planning permission for the proposed development is sought under the provisions of the Town and Country Planning (Scotland) Act 1997 (as amended).

2.2.2 Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017

The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 transpose the requirements of the EIA Directive 85/337/EC (as amended) into the Scottish regulatory system. The Directive sets out a procedure, known as Environmental Impact Assessment or 'EIA' which is a means of drawing together, in a systematic way, an assessment of a project's likely significant environmental effects. This helps to ensure that the importance of the predicted effects, and the scope for reducing any adverse effects, are fully understood by the public and the competent authority before it makes its decision.

The proposed development does not explicitly fall under either Schedule 1 (mandatory EIA) or Schedule 2 (thresholds and criteria for classifying development as Schedule 2 development) of the EIA Regulations. However, the Applicant has subjected the development to the process of EIA due to the nature of the proposals, proximity to sensitive areas (as defined by the EIA Regulations) and to address issues raised by statutory consultees and local stakeholders.

2.2.3 Space Industry Act 2018 and Space Industry Regulations 2021

Under the regulations, facilities supporting the launch of sub-orbital and orbital Launch Vehicles (LVs) will require a Spaceport Operator (SO) to obtain a Spaceport Licence, based on the submission of a Safety Case. Both the Spaceport Operator and the accompanying Safety Case will continually be assessed by the Civil Aviation Authority (CAA) as regulator, to ensure compliance with relevant statutory requirements. Reviews of the safety case can be triggered by a range of events including - amongst others - a different launch vehicle operating from the site or if new information

relating to safety matters arises. The Spaceport Licence will also require a dedicated Assessment of Environmental Effects (AEE), which is anticipated to be met by this EIA Report[1].

In developing the Regulations, the UK Government has acknowledged that prescriptive requirements when dealing with spaceflight may not fully capture the pace of emerging technologies or best practice (DfT, 2020). Subsequently, the regulations provide a general framework designed to accommodate the pace of technology development and best practice, primarily through the key licence requirement of the continually reviewed Safety Case, underpinned by monitoring and enforcement powers. Licence conditions may be set by CAA requiring the environmental effects to be considered continually during the lifetime of the licence with Spaceport Operator and Launch Operator being responsible for complying with any licence conditions and monitoring requirements that have been set (DfT, 2020).

Consent under the Space Industry Regulations will be sought following determination of the planning application.

2.2.4 Marine (Scotland) Act 2010 and Marine and Coastal Access Act 2009

A marine licence will be required from Marine Scotland - Licensing Operations Team (MSLOT) for deposits of objects into the marine environment as a result of launch activities. Deposits within 12 nautical miles (nm) fall under the Marine (Scotland) Act 2010), from 12 nm to 200 nm under Marine and Coastal Access Act 2009, and beyond 200 nm of the Scottish coast falls under article 21(2) of the Marine Scotland Act 2010. A marine licence is likely to be required for each launch event, and possibly for each stage of deposit depending which regulation they fall under, for the deposit of launch stages into the sea. A marine licence will be applied for following the determination of the planning application.

Consultation with MSLOT confirms that the Project is not screenable under The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017, however, MSLOT recommends that the characteristics of the Project and potential impacts associated, caused by parts of the launch vehicles being deposited into the sea, should be fully considered in this EIA Report.

2.2.5 Additional legislative requirements

An outline of other key legislative requirements is presented in Table 2-1.

Table 2-1 Additional consenting requirements

Legislation	Relevant Authority	Relevance to application
Air Navigation Order 2016 / Air Navigation (Amendment) Order 2017	CAA	The regulation of sub-orbital flights may be managed under an Air Navigation Order. The Spaceport may seek to undertake launches utilising the Air Navigation Order regulatory framework, instead of the Spaceport Industry Regulations 2021 (described below). It is the intention of Spaceport to comply with the more rigorous of the stipulations from both regulatory frameworks. A Safety Case will also be required under these regulations.

[1] Guidance for the Assessment of Environmental Effects (Dft, 2020) accompanying the draft Space Industry Regulations 2021 indicates that an EIA Report is likely to be sufficient to be meet this requirement.

Legislation	Relevant Authority	Relevance to application
Transport Act 2000	CAA	The Airspace Change Proposal (ACP) process is employed to consider any changes to airspace use. Changes to the design of UK airspace are required to follow the airspace design process of the CAA. The CAA, as the UK's independent aviation regulator, has responsibility for deciding whether to approve changes proposed to the design of airspace over the UK – the airspace structure and instrument flight procedures within it. For this development there is a requirement for the periodic, and for short periods of time, closure of the airspace above and to the west of the Scolpaig area. Two ACPs are currently progressing to facilitate this first, an ACP to permit use of the airspace under a Temporary Danger Area regime (which is a temporary airspace arrangement); and second, an ACP to permanently change to the relevant airspace. The ACPs are at 'Step 4: Submit Proposal to CAA' and 'Step 2a: Develop and Assess' respectively
Water Environment (Controlled Activities) (Scotland) Regulations 2011	SEPA	CAR licence authorisation from Scottish Environment Protection Agency (SEPA) may be required for management of discharges, abstractions and morphological alterations to surface waters. The Applicant will apply separately for this consent but has consulted with SEPA as part of the EIA process to ensure project design and mitigation measures are in place to minimise potential impacts on the water environment. A CAR licence application for the upgrade of the existing culvert will be made to SEPA should planning consent be granted. A CAR registration or licence may be required for the soakaway system.
Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) - Habitats Regulations Appraisal	NatureScot and CnES (planning authority)	Habitats Regulations Appraisal (HRA) required to identify potential connectivity with sites within the UK site network, a national network of protected sites developed under the European Commission Habitats Directive (Directive 92/43/EEC) and the Birds Directive (79/409/EEC). The planning authority must consider whether any plan or project will have a "likely significant effect" on a European Site, if so, they must carry out an "appropriate assessment". The HRA will enable the planning authority to undertake this process, with input from statutory advisor NatureScot. The Applicant submits a report with information to inform the HRA alongside the EIA Report (Annex B: Information to Inform HRA).

Legislation	Relevant Authority	Relevance to application
Conservation (Natural Habitats, &c) Regulations 1994 (as amended) / EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the Habitats Directive) - European Protected Species Licence	NatureScot / Marine Scotland	Certain species listed under Annex IV of the Habitats Directive and the Habitats Regulations are given special protection as European Protected Species (EPS). Where EPS are present, such as cetaceans, otters or many bat species, licences issued by NatureScot or Marine Scotland to permit works that will affect them will only be granted subject to specific tests being met. Any requirement for an EPS Licence will be consulted upon with NatureScot/Marine Scotland. Following planning consent, the formal EPS licensing process will be followed to secure any authorisations required.

A range of other statutes / regulatory processes relate to specific chapter topics and to site operation and activities, including waste management and duty of care, trade effluent discharges, implementation of maritime exclusion zones, the storage of hazardous materials, health and safety, and transmission licences. These are covered in further detail across individual chapter assessments and associated appendices.

2.3 DIRECTIVE COMPLIANCE

2.3.1 Water Framework Directive

The Water Framework Directive (WFD) (2000/60/EC) is a European directive which aims to protect and improve the water environment. Its key aims are to prevent deterioration and enhance status of aquatic ecosystems, including groundwater; promote sustainable water use; reduce pollution; and contribute to the mitigation of floods and droughts.

The Water Environment and Water Services Act (Scotland) 2003 transposes the Water Framework Directive (WFD) (2000/60/EC) into Scottish legislation. Key water bodies are monitored under river basin management plans. The Water Environment (River Basin Management Planning: Further Provision) (Scotland) Regulations 2013, elaborates on provisions of Water Environment and Water Services Act 2003 to further transpose provisions of the WFD.

The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) – more commonly known as the Controlled Activity Regulations (CAR) apply regulatory controls over activities which may affect Scotland's water environment. The regulations cover rivers, lochs, transitional waters (estuaries), coastal waters, groundwater, and groundwater dependent wetlands.

An assessment of potential impacts on the water environment has been undertaken with mitigation and management measures proposed to ensure there are no likely significant effects arising from the construction, operation and decommissioning phases of the Project. These include pollution control measures during construction and site operation; management measures for the storage, use and transport of hazardous materials; and minimisation of flood risk and protection of groundwater dependent terrestrial ecosystems through project design. A CAR licence application will be made to SEPA, where required, and General Binding Rules (GBR) followed for certain activities. Refer to the Chapter 17: Hydrology, Hydrogeology and Geology for a full assessment.

2.3.2 Marine Strategy Framework Directive

The Marine Strategy Framework Directive (MSFD) requires the UK to put in place measures to achieve or maintain good environmental status (GES) in the marine environment by 2020. The MSFD is transposed by the Marine Strategy Regulations 2010, providing a UK-wide framework for meeting the requirements of the Directive.

As a member of the EU, the UK was required to collaborate with other Member States in the north east Atlantic, to monitor, assess and report progress towards GES; and to implement a programme of measures to achieve or maintain GES targets. Beyond EU-exit, the UK continues to develop its marine strategy with other countries in the north east Atlantic, through the OSPAR Convention.

The UK Marine Policy Statement explains the high-level aims of the MSFD. National and regional marine plans then break these down into detailed activities. Project compliance with Scotland's National Marine Plan is analysed in section 2.4.3.

OSPAR Convention

The OSPAR Convention is the mechanism by which 15 Governments & the EU cooperate to protect the marine environment of the North-East Atlantic[2]. Contracting Parties of the OSPAR Convention commit to take all possible steps to prevent and eliminate pollution and take the necessary measures to protect the maritime area against the adverse effects of human activities so as to safeguard human health and to conserve marine ecosystems and, where practicable, restore marine areas which have been adversely affected (OSPAR Commission, 2007).

Specific obligations covering the North-East Atlantic include a number of Annexes related to prevention and elimination:

- Annex I: Prevention and elimination of pollution from land-based sources;
- Annex II: Prevention and elimination of pollution by dumping or incineration;
- Annex III: Prevention and elimination of pollution from offshore sources;
- Annex IV: Assessment of the quality of the marine environment; and
- Annex V: Extends the cooperation of the Contracting Parties to cover all human activities that might adversely affect the marine environment of the North-East Atlantic.

Nature Conservation Marine Protected Areas (NCMPAs) designated in Scottish waters under the Marine (Scotland) Act 2010 and the UK-wide Marine and Coastal Access Act 2009 are helping the UK to meet the OSPAR MPA commitment. The NCMPAs have been formally adopted as OSPAR MPAs, which contribute to the network of sites across the North-east Atlantic Ocean. The same is true of existing marine UK network sites[3] – marine Special Areas of Conservation (SACs) and marine Special Protection Areas (SPAs).

The Project's Marine Operating Area includes 'Region III: Celtic Seas' and 'Region V: Wider Atlantic' and encompasses a number of MPAs, including SAC and SPA. The Project aims to minimise potential pollution of marine waters by retrieving LV stages, wherever practicable and feasible to do so. Potential impacts on marine water quality have been scoped out

[2] The fifteen Governments are Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

[3] The UK site network means the network of SACs and SPAs in the UK's territory consisting of Natura 2000 sites designated before EU exit day and any European Sites, European Marine Sites and European Offshore Marine Sites designated after EU Exit.

of the EIA as no likely significant effects on water quality or ecological status are anticipated due to the small scale, small quantities and inert nature of the majority of any deposits associated with the LV stages. All seabed deposit will be licensed by Marine Scotland.

2.3.3 Waste Directive

The Waste Framework Directive (75/442/EEC) is a European directive which sets the basic concepts and definitions related to waste management, including definitions of waste, recycling and recovery. Waste generated during the lifetime of the Project will be managed in accordance with legislative requirements and the waste hierarchy principles, as defined in the EU Waste Framework Directive, to ensure sustainable use of resources and minimise environmental impacts.

Relevant waste management legislation includes: Environmental Protection Act 1990; Environmental Protection (Duty of Care) (Scotland) Regulations 2014; and Waste (Scotland) Regulations 2012.

The generation of waste will be minimised through implementation of a Site Waste Management Plan (WMP), which will submitted to the planning authority and SEPA for approval (see Chapter 21: Environmental Management and Monitoring for further information). The WMP will identify and quantify all major waste streams; include principles and procedures for waste minimisation, waste separation, storage and disposal; and detail relevant legislative obligations, guidelines and best practice. Waste prevention and minimisation will be the priority strategy during all project phases, with disposal considered as a last resort. Waste generated during the construction period that cannot be safely re-used will be either recycled through appropriate recycling providers or disposed of at licensed waste management facilities.

2.4 PLANNING POLICY AND GUIDANCE

2.4.1 Scotland's Third National Planning Framework (NPF3)

The National Planning Framework 3 (NPF3)[4] is a long-term strategy for Scotland. NPF3 identifies national developments and other strategically important development opportunities in Scotland. It is the spatial expression of the Government's Economic Strategy, and of plans for development and investment in infrastructure.

NPF3 notes *'our spatial strategy emphasises the importance of our islands and coast as an economic opportunity and a resource to be protected and enjoyed'*. It also states that *'a sustainable, economically active rural area, which attracts investment and supports vibrant growing communities is essential to our vision'*. In line with this, progressing new opportunities such as this Project will help to deliver sustainable economic growth, attract and retain population and supporting services in rural island communities such as the Outer Hebrides.

2.4.2 Scottish Planning Policy

Scottish Planning Policy (SPP) is a statement of Scottish Government policy on how nationally important land use matters should be addressed across the country. SPP introduces a presumption in favour of development that contributes to sustainable development.

Policy Principles relating to Promoting Rural Development (Paragraph 75.) state that the planning system should:

[4] https://www.gov.scot/publications/national-planning-framework-3/

- In all rural and island areas promote a pattern of development that is appropriate to the character of the particular rural area and the challenges it faces.
- Encourage rural development that supports prosperous and sustainable communities and businesses whilst protecting and enhancing environmental quality.

In terms of delivery SPP (Paragraph 77.) states that '*In remote and fragile areas and island areas outwith defined small towns, the emphasis should be on maintaining and growing communities by encouraging development that provides suitable sustainable economic activity, while preserving important environmental assets such as landscape and wildlife habitats that underpin continuing tourism visits and quality of place.*'

Policy Principles relating to Supporting Business and Employment (Paragraph 93.) state that the planning system should:

- Promote business and industrial development that increases economic activity while safeguarding and enhancing the natural and built environments as national assets.
- Give due weight to net economic benefit of proposed development.

The Town and Country Planning (Scotland) Act 1997 requires planning applications to be determined in accordance with the development plan unless material considerations indicate otherwise. As a statement of Scottish Ministers' priorities, the content of the SPP is a material consideration that carries significant weight.

2.4.3 Scotland's National Marine Plan

Scotland's National Marine Plan (NMP) sets out a national strategy and overarching framework for all marine activity in Scottish waters. It facilitates sustainable development and use of Scottish seas in a way that will protect and enhance the marine environment whilst promoting both existing and emerging industries. The plan covers both Scottish inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles).

Planning authorities have a duty to make decisions in accordance with the NMP policy documents where proposed activities are in, or impact, the marine environment. Proposals should conform with all relevant policies of the marine plan, taking account of economic, environmental and social considerations and demonstrate how the proposals will contribute to achieving objectives in the NMP. Relevant NMP policies and how the Project is compliant are summarised in Table 2-2.

Table 2-2 NMP policies

NMP policy	Project appraisal
GEN 2 Economic benefit: Sustainable development and use which provides economic benefit to Scottish communities is encouraged when consistent with the objectives and policies of this Plan	Socio-economic analysis suggests a number of significant positive impacts associated with the establishment of a Spaceport in the area, including: • Employment - 26 FTEs • Turnover - £6.6 million • GVA - £2.6 million • Income - £1.2 million A range of wider, longer term and harder to measure socio-economic benefits pertinent to this proposal include: • Supporting new economic growth and employment opportunities, to an area which is economically fragile • Further the tourism sector and aid its post-pandemic recovery, notably business tourism in the local area, whilst not harming the leisure tourism appeal of the sector, The business model is founded on the principles of public participation and community benefit.
GEN 9 Natural heritage: Development and use of the marine environment must: (a) Comply with legal requirements for protected areas and protected species. (b) Not result in significant impact on the national status of Priority Marine Features. (c) Protect and, where appropriate, enhance the health of the marine area.	An assessment of potential impacts on the marine ecological environment has been undertaken for protected areas, including MPAs, and SPAs and SACs contributing to the MPA network, and protected species including cetaceans, seals at designated haul outs and PMFs. The assessment concludes that no likely significant effects are anticipated from the operational launch activities associated with the Project, through disturbance or deposit of materials in the marine environment.
GEN 11 Marine litter: Developers, users and those accessing the marine environment must take measures to address marine litter where appropriate. Reduction of litter must be taken into account by decision makers.	Any deposits associated with the stages of launch vehicles will be licensed through MSLOT. It is likely that the majority of LV stages will be recovered as they will hold important data and equipment, however, booster stages or payload fairings may not be recovered. Where LV stages are not designed for retrieval, the stage will be designed to sink to prevent hazard to mariners from floating marine debris and will contain limited residual quantities of fuels.
GEN 12 Water quality and resource: Developments and activities should not result in a deterioration of the quality of waters to which the Water Framework Directive, Marine Strategy Framework Directive or other related Directives apply	No significant effects on marine water quality or ecological status of the water environment have been identified and therefore scoped out of the assessment. However, all launches will be separately licensed via Space Industry Regulations 2021 and a marine licence will be required for all seabed deposits from MS-LOT, to ensure no significant effects on water quality. Potential sources and pathways of surface water pollution (ultimately discharging into coastal waters) have been identified (sediment generation during construction, storage and use of hazardous materials, exhaust gases from propellants). Relevant mitigation has been developed and set out in the relevant chapters, including a fully integrated pollution control system.

NMP policy	Project appraisal
GEN 13 Noise: Development and use in the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects.	Acoustic disturbance to seal species during the operational phase has been covered in the assessment and no significant effects concluded. Acoustic disturbance (including underwater noise) from jettisoned components has been scoped out of the assessment due to the nature of the acoustic noise generated and the spatial and temporal spreading of launch events such that any noise will be temporary and very unlikely to repeat in the same area or lead to disturbance effects.
GEN 14 Air quality: Development and use of the marine environment should not result in the deterioration of air quality and should not breach any statutory air quality limits.	Impacts on air quality arising from exhaust gases have been assessed with no significant effects concluded. Due to the high level of combustion efficiency required for launches, a number of propellant mixtures do not include fossil fuels, although kerosene-based fuels can be adopted.
FISHERIES 1: Taking account of the EU's Common Fisheries Policy, Habitats Directive, Birds Directive and Marine Strategy Framework Directive, marine planners and decision makers should aim to ensure: • Existing fishing opportunities and activities are safeguarded wherever possible.	To minimise and avoid disruption, Maritime Management Procedures will include a suite of measures to engage with the maritime community, provide prior notification of launches, live communications during and after a launch. Only limited areas of the planned flight path for a launch will be restricted by temporary exclusions until the area is deemed safe to transit. Consultation with local fisheries representatives, has been initiated and to date, indicative agreements have been made for a Dedicated Fisheries Forum and commitment to explore opportunities for charter vessels (where feasible) to support Spaceport operations. Consultation will continue throughout the development process and prior to launch activities to minimise further disruption as far as practicable. With the implementation of proposed mitigation and management measures the assessment concludes no significant effects. Potential impacts on marine ecology and important fish habitats are assessed in the EIA and no significant effects concluded.
FISHERIES 2: The following key factors should be taken into account when deciding on uses of the marine environment and the potential impact on fishing: • The cultural and economic importance of fishing, in particular to vulnerable coastal communities. • The environmental impact on fishing grounds (such as nursery, spawning areas), commercially fished species, habitats and species more generally.	
REC & TOURISM 2: The following key factors should be taken into account when deciding on uses of the marine environment and the potential impact on recreation and tourism: • The extent to which the proposal is likely to adversely affect the qualities important to recreational users, including the extent to which proposals may interfere with the physical infrastructure that underpins a recreational activity. • The extent to which any proposal interferes with access to and along the shore, to the water, use of the resource for recreation or tourism purposes and existing navigational routes or navigational safety	Maritime Management Procedures in place during a launch event, including prescribed flight paths, prior notifications of launches, exclusion zones and maritime surveillance, will ensure that no vessel or marine asset is at risk of direct strike by a jettisoned stage. The procedures also ensure disruption to recreational users is minimised. No impacts on access to harbours, ports or anchorages have been identified.

NMP policy	Project appraisal
TRANSPORT 1: Navigational safety in relevant areas used by shipping now and in the future will be protected, adhering to the rights of innocent passage and freedom of navigation contained in UN Convention on the Law of the Sea (UNCLOS). The following factors will be taken into account when reaching decisions regarding development and use: • The extent to which the locational decision interferes with existing or planned routes used by shipping, access to ports and harbours and navigational safety. This includes commercial anchorages and defined approaches to ports. • Where interference is likely, whether reasonable alternatives can be identified. • Where there are no reasonable alternatives, whether mitigation through measures adopted in accordance with the principles and procedures established by the International Maritime Organization can be achieved at no significant cost to the shipping or ports sector	A detailed analysis of the risk to marine users and assets does not form part of the EIA process. Each launch will be regulated via a launch licence issued to the Launch Operator from the Civil Aviation Authority (under the Space Industry Regulations 2021), and a marine licence from Marine Scotland (under the Marine (Scotland) Act 2010). As part of the regulatory process for each launch, a detailed and quantitative assessment of navigational risk will form a core part of a Safety Case associated with each launch activity, ultimately ensuring the risk to mariners is as low as reasonably practical. The consenting process for each launch involves close consultation with maritime stakeholders to agree and develop appropriate mitigations, including a legally prescribed 'Relevant Agreement' with specific maritime safety bodies. Maritime Management Procedures in place during a launch event, including prescribed flight paths, prior notifications of launches, exclusion zones and maritime surveillance, will ensure that no vessel or marine asset is at risk of direct strike by a jettisoned stage. A notification and retrieval process will also be in place for floating launch vehicle (LV) stages, ensuring risk of collision is minimised as far as practicable. The procedures also ensure disruption to marine users is minimised through advanced notification.
TRANSPORT 6: Marine planners and decision makers and developers should ensure displacement of shipping is avoided where possible to mitigate against potential increased journey lengths (and associated fuel costs, emissions and impact on journey frequency) and potential impacts on other users and ecologically sensitive areas	
DEFENCE 1: To maintain operational effectiveness in Scottish waters used by the armed services, development and use will be managed in these areas: • Firing Danger Areas (Map 13): Development of new permanent infrastructure is unlikely to be compatible with the use of Firing Danger Areas by the MOD. Permitted activities may have temporal restrictions imposed. Proposals for development and use should be discussed with the MOD at an early stage in the process. • Communications: Navigations and surveillance including radar: Development and use which causes unacceptable interference with radar and other systems necessary for national defence may be prohibited if mitigation cannot be determined. Proposals for development and use should be discussed with the MOD at an early stage in the process.	Spaceport 1 plans to utilise the MOD Hebrides Range to support sub-orbital launch activities, utilising the controlled air and sea space and leveraging the existing range tracking, telemetry and flight termination systems on a procurement as needed basis. Therefore, any scheduling and operational conflicts will be resolved through this process. The SO will have an agreement in place with the Defence Infrastructure Organisation's MOD Safeguarding Department on operations and will liaise with the MOD to ensure there is no conflict with planned activities. This will include a 3-month notification period. Each launch will be separately licensed, and MOD consulted through these regulatory processes. Measures are in place to ensure there is no risk to other maritime activities with implementation of Maritime Management Procedures. A safety case will be undertaken for every launch to ensure risks are as low as reasonably practical.

2.4.4 Space Industry Act 2018– Environmental Objectives

The Department for Transport (DfT) has produced draft guidance that sets out the environmental objectives established by the Secretary of State under section 2(2)(e) of the Space Industry Act 2018, *Guidance to the regulator on environmental objectives relating to the exercise of its functions under the Space Industry Act 2018* (DfT, 2021). The purpose of this guidance is to provide the regulator and the public with clarity on the government's environmental objectives relating to spaceflight and associated activities in the UK. Under section 11 of the Space Industry Act 2018, the regulator has a duty to take account of an assessment of environmental effects (AEE), submitted as part of an application for a spaceport or launch operator licence, when deciding to grant the licence or impose any conditions on the licence.

The objectives in the guidance are consistent with the environmental topics that must be addressed in an AEE. This EIA Report addresses the relevant environmental topics and is anticipated to provide sufficient information to satisfy the requirements of an AEE for the Project as part of the future application for a Spaceport Operator's Licence under the Space Industry Regulations 2021.

The purpose of the guidance is to ensure that the space sector can make an important contribution to the UK economy in a sustainable way; and that the environmental impact of spaceflight activities is minimised and mitigated as much as it is practicable and realistic to do so.

This guidance has taken into account the government's broader approach to the environment, and in particular it draws on the UK governments 25 Year Environment Plan which sits alongside the government's Industrial Strategy and Clean Growth Strategy (DfT, 2021).

The environmental objectives for spaceflight, and how the Project addresses these are detailed in Table 2-3.

Table 2-3 Space Industry Act 2018 environmental objectives

Environmental Objective	Project Appraisal
Minimise emissions contributing to climate change resulting from spaceflight activities.	Potential emissions, particularly greenhouse gases such as carbon dioxide and nitrous oxides that are known to contribute to climate change, arising from the Project's spaceflight activities have been quantified and their potential impact assessed in Chapter 18: Air Quality and Heat and Chapter 20: Climate Change. The majority of project infrastructure is based on existing infrastructure. The infrastructure is not located in areas of blanket bog / peatland. A small proportion of rocket fuels adopt hydrocarbon-based fuels as a propellant (kerosene). Due to the high levels of efficiency required for rocket fuels, non-fossil fuels are more frequently adopted as an alternative (hydrogen peroxide, liquid O_2). Due to the relatively small scale of operations for sub-orbital activity and associated small quantities of emissions, no likely significant effects are anticipated. Sub-orbital launches play an important role in the wider space sector supply chain, in testing space flight and launch vehicles intended for the growing orbital deployment market. A major use of sub-orbital vehicles is also as scientific sounding rockets i.e., weather observations, plasma physics, research in the study of the upper atmosphere, remote sensing of natural resources and micro gravity research.

Environmental Objective	Project Appraisal
Protect human health and the environment from the impacts of emissions on local air quality arising from spaceflight activities.	Potential emissions arising from the Project's launch activities have been assessed in a dedicated chapter on air quality emissions. The assessment concludes all Predicted Environmental Concentration (PEC) of substances were comfortably below relevant air quality standards, even with conservative assumptions made in the assessment (and as such the actual impacts are likely to be less than has been shown), LV flight activities would not appear to present any significant risk to local human health or the environment, and the overall impact from air quality and heat is therefore evaluated as not significant in the context of the EIA Regulations. Refer to Chapter 18: Air Quality and Heat.
Protect people and wildlife from the impacts of noise from spaceflight activities.	Noise modelling has been undertaken for launch noise generation and sonic boom. Launch noise generation is below the 110 dB criteria at all identified receptors, and would only be experienced during the launch event, which is limited to 120 seconds at any one time, up to 10 times per year (worst case scenario). Sonic boom generation relevant to certain LV specifications only and will have a duration of <1 second. All residential receptors fall below significant threshold criteria in context of EIA. Therefore, no likely significant effects anticipated. Potentially significant effects arising from noise on birds and otter have been mitigated to reduce the potential for disturbance. Mitigation includes a disturbance prevention zone (corncrake) and otter monitoring zone. Acoustic disturbance to seal species during the operational phase has been covered in the assessment and no significant effects concluded. Acoustic disturbance (including underwater noise) from jettisoned components has been scoped out of the assessment due to the nature of the acoustic noise generated and the spatial and temporal spreading of launch events such that any noise will be temporary and very unlikely to repeat in the same area or lead to disturbance effects. Refer to Chapter 19: Noise, Appendix 19-1: Noise Technical Report, Chapter 14: Ornithology, Chapter 16: Marine Ecology

Environmental Objective	Project Appraisal
Protect the marine environment from the impacts of spaceflight activities.	Jettisoned stages of LVs will be designed for recovery or to sink to the seabed. Each launch will be individually regulated by MS-LOT under the Marine (Scotland) Act 2010 to ensure that deposits are licensed in accordance with the National Marine Plan and that impacts on the environment (human and natural), including other legitimate uses of the sea, are minimised or avoided. Impacts on marine water quality scoped out, due to very low residual quantities of fuel involved and low frequency of launches. To minimise and avoid disruption to marine users, Maritime Management Procedures will include a suite of measures to engage with the maritime community, provide prior notification of launches, live communications during and after a launch. Only limited areas of the planned flight path for a launch will be restricted by temporary exclusions until the area is deemed safe to transit. Consultation with local fisheries representatives has been initiated and to date, indicative agreements have been made for a Dedicated Fisheries Forum and commitment to explore opportunities for charter vessels (where feasible) to support Spaceport operations. Consultation will continue throughout the development process and prior to launch activities to minimise further disruption as far as practicable. With the implementation of proposed mitigation and management measures the assessment concludes no significant effects. Impacts are assessed in Chapter 13: Marine Users, Chapter 14: Ornithology and Chapter 16: Marine Ecology.

2.4.5 Outer Hebrides Local Development Plan 2018 (OHLDP)

The OHLDP was adopted by the Council in November 2018. Consideration must be given to relevant policies contained with the OHLDP during the design of the Project. Table 2-4 outlines how the proposed Project is complaint with relevant policies within the OHLDP.

Table 2-4 OHLDP policies

Statement/Policy Content	Project Appraisal
All development proposals will be assessed against the capacity of the surrounding landscape to accommodate the development. Development proposals should avoid raised or high level locations to minimise visual impact.	Due to the relatively small scale of the permanent infrastructure and temporary nature of operational infrastructure associated with the Project, which is also considered of nominal scale, no likely significant effects on landscape and visual amenity are anticipated. Landscape and visual amenity have been scoped out of the EIA.

Statement/Policy Content	Project Appraisal
Development proposals for non-residential uses on green field sites must demonstrate a clearly justified need for the proposed development in that location, unless directed by the Wind Energy spatial strategy.	For reasons of flight safety, the north of Scotland is considered the only feasible launch region of the British Isles. The SCEPTRE project (SCEPTRE, 2017) identified the Scolpaig site as one of several sites in the north of Scotland suitable to achieve launches to commercially desirable orbits. Development at Scolpaig was evaluated to provide substantial additionality to existing UK launch infrastructure, serving the sub-orbital market and differentiating the development from other proposed orbital launch facilities in Scotland. Significant benefits also arise from the opportunity to share the existing MoD Hebrides Range infrastructure and personnel, substantially reducing capital and operational costs, and generating a more competitive and economic solution for launch providers. The ability to share the Hebrides Range infrastructure generates a number of unique selling points which substantially strengthens the overall case to develop a small launch site in North Uist (see Chapter 3: Site Selection and Alternatives for further details).
Policy PD2: Car Parking and Roads Layout Road design and car parking should be suited to the type, location, scale and circumstances of the development.	The first 5 m of the access track, measured from the A865, will be finished with a hard-wearing surface such as Bitmac or concrete, to minimise the risk of damage to the roadside. Access road longitudinal gradient falls away from the main road at the tie in, therefore no risk of surface water flowing from access on to main road. Surface water from access road will be routed toward natural overland drainage via roadside ditches/swales. The upgraded road access track will improve access for walkers, cyclists and those with mobility issues, with safer road access through implementation of road widening for visibility splay at the site entrance. Public parking spaces will also be provided at the site entrance (10 spaces, including accessible parking).
Policy PD6: Compatibility of Neighbouring Uses All development proposals shall ensure that there is no unacceptable adverse impact on the amenity of neighbouring uses. Where appropriate, proposals should include mitigation measures to reduce the impact on the amenity of neighbouring uses.	No significant effects identified for neighbouring land uses. Traffic and Transport is scoped out of the EIA. On the day of a launch event, traffic management measures comprising a clearway and one-way system will be in place along the A865 leading to the Project to avoid potential opportunistic spectators parking vehicles and blocking the road, which will ensure safe access is maintained for emergency services and local access is maintained (both of which will be able to continue along the road as normal). Access will therefore be maintained for all neighbouring land uses, and the traffic management measures will only be in place for the duration of the launch and lifted as soon as possible (not anticipated to be more than 1 to 1.5 hours), up to 10 times per year.

Statement/Policy Content	Project Appraisal
Policy ED1: Economic Development Development sites, in other locations, will also be considered in recognition of the diverse nature of economic activity within the Outer Hebrides.	The Spaceport 1 proposal has been identified as a high priority project within Comhairle nan Eilean Siar's economic development plans. It is also an important aspect of the local Community Development Plan which supports the regional aim of creating more than 1,500 new jobs across the islands to help mitigate against a declining population, especially the outward migration of younger people. Socio-economic analysis suggests a number of significant positive impacts associated with the establishment of a Spaceport in the area, including: • Employment - 26 FTEs • Turnover - £6.6 million • GVA - £2.6 million • Income - £1.2 million A range of wider, longer term and harder to measure socio-economic benefits pertinent to this proposal include: • Supporting new economic growth and employment opportunities, to an area which is economically fragile • Further the tourism sector and aid its post-pandemic recovery, notably business tourism in the local area, whilst not harming the leisure tourism appeal of the sector, The business model is founded on the principles of public participation and community benefit.
Policy EI 1: Flooding Development proposals should avoid areas susceptible to flooding and promote sustainable flood management. Development proposals should have regard to the probability of flooding from all sources. Where a proposal could lead to an increase in the number of persons affected or buildings at risk of being damaged by flooding then the submission of suitable information, which may include a Flood Risk Assessment will be required to demonstrate compliance with Scottish Planning Policy (SPP). <u>Allowances for Climate Change</u> The following allowances, or subsequent revised allowances, for climate change should be used when calculating estimated design flood levels: • Fluvial: at least 20% should be added to the estimated design flood peak; • Coastal: The following UK Climate Change Projections (UKCP09) sea level rise projections should be used to derive an allowance above the extreme still water design flood level: ○ North Uist and Berneray - 0.53m	A Flood Risk Assessment was undertaken to determine the impact on the flood response of Loch Scolpaig of the proposed widening of the causeway and associated box culvert installation. The structure of the existing causeway and culvert system across Loch Scolpaig currently restricts the movement of water between the two sides of the loch. Subsequently each loch ('upper' and 'lower' systems) behaves semi independently of each other and are assessed to represent two different sub catchments, in addition to exacerbating localised flooding at the road. The replacement of the culvert is anticipated to remove periodic flooding of the road and unite the two lochs into one hydrological system therefore reducing flooding risk. The culvert has been sized to convey 1:200 flow with sufficient freeboard to minimise risk of future overtopping. Access road longitudinal gradient falls away from the main road at the tie in, therefore no risk of surface water flowing from access on to main road. Surface water from access road will be routed toward natural overland drainage via roadside ditches/swales.

Statement/Policy Content	Project Appraisal
Policy EI 2: Water and Waste Water New developments will be required to adopt the principles of Sustainable Drainage Systems (SuDS). The Comhairle will support retrofitting of SuDS and the controlling of surface water through the use of permeable surfaces and green roofs.	Roadside drainage will comprise a Type 1 verge allowing sheet flow of surface water from the road. Under normal weather conditions this will allow initial separation of particulates within the verge. Ditching/swales will follow the same gradient as the access road. Check dams will be used to control the flow rate within the drainage channel as well as providing some attenuation capacity. The natural topography either side of the access will be used to identify appropriate outfall points along the route for roadside drainage to allow overland flow and filtration of surface water between outfall points and the receiving loch.
Policy EI 3: Water Environment Development proposals should avoid adverse impact on the water environment. All proposals involving activities in or adjacent to any water body must be accompanied by sufficient information to enable a full assessment to be made of the likely effects, including environmental effects, of the development. Where a site contains or is adjacent to a watercourse or the sea then all the following must be demonstrated: • the site layout avoids development within the water environment unless the location is essential for operational reasons • Engineering activities such as culverts, bridges, watercourse diversions, bank modifications or dams should be avoided unless there is no practicable alternative • the management or enhancement of existing and new habitats • no significant effect both during construction and after completion on: • Water quality in groundwater, adjacent watercourses or areas downstream; • Existing groundwater abstractions within 250m; • Water quantity and natural flow patterns and sediment transport processes in all water bodies. • For Major developments, where a site contains or is adjacent to a wetland or boggy area then a Phase 1 habitat survey should be carried out for the whole site and a 250m buffer around it. • Where a Groundwater Dependent Terrestrial Ecosystem is identified then the site layout should avoid it and drainage designed to ensure groundwater flows to the habitat are maintained.	The Site is located adjacent to Loch Scolpaig. The causeway that bisects Loch Scolpaig forms part of the existing access track. Infrastructure within 50 m of a watercourse is limited to existing road upgrades, a layby and temporary construction area for managing sedimentation arising from culvert replacement operations. The replacement of the culvert has potential to increase sedimentation of the loch system, however an outline method statement has been provided outlining the pollution control measures to reduce sedimentation to the loch during the culvert replacement. Proposed mitigation measures will ensure that there will be no significant adverse effects on water quality. A dedicated pollution containment system and associated management arrangements have been designed into the infrastructure to accommodate typical / standard spillages arising from the site. A drainage and containment tank system has also been developed for non-standard launch activities involving high quantities of HTP, and to contain firefighting water run off should there be a fire / explosion. With the proposed pollution control measures, impacts on surface water and groundwater are concluded to be negligible (negative) and not significant, with proposed mitigation. No abstractions were recorded within the catchment of the development. No significant effects are anticipated on any receptors of the water environment (see Chapter 17: Hydrology, Hydrogeology and Geology). An NVC survey was carried out in September 2020, identifying potential GWDTE within the threshold buffer of development excavations. Impacts on GWDTE are assessed in Chapter 15: Terrestrial Ecology and are scoped out following a detailed analysis of potential GWDTE vegetation communities within the advised buffer area that were subsequently assessed to not be groundwater fed.

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Policy EI 7: Countryside and Coastal Access Development proposals must be located to ensure the Hebridean Way, the Core Path network and established and functional access points to water are kept free of obstruction unless it can be demonstrated that it can either: a) retain the existing path or water access point while maintaining or enhancing its amenity value; or b) ensure alternative access provision that is no less attractive and is safe and convenient for public use.	The Project site is part of the former Scolpaig Farm, which was purchased by CnES on 6th June 2019 having formerly been under private ownership. CnES plans to allow grazing through a Short-Limited Duration Tenancy throughout the site as well as maintaining pedestrian access through Scolpaig Farm to Scolpaig Bay for walkers and other recreational users. There are no Core Paths within the site, however, the wider path network (contributing to the OH Core Path network) follows the coastal perimeter of the site with connections south to the A865 via Scolpaig Farm (following the farm access track) and also Griminish to the east (following the access track). Access will only be restricted during a temporary period of the construction phase for public safety and during launch activities, for a short period on the day of a launch for public safety and site security (up to 10 days per year).
OHLDP Policy EI 11: Safeguarding: For all development proposals the planning authority will take account of the advice of the relevant agencies with regard to safeguarding and consultations zones notified by the Health and Safety Executive (HSE), CAA, Highlands & Islands Airports Limited (HIAL), NATS, Ministry of Defence (MOD), and Meteorological Technical Sites (i.e. Met Office radars).	A Spaceport Programme Schedule will be agreed with the MOD to safeguard assets and to minimise the impact of the development on operational capability of those assets, therefore no significant effects are concluded. The Airspace Change Proposal process will ensure that suitable mitigation will be agreed and implemented in consultation with aviation and defence stakeholders such that no significant residual effects result of the operation of the proposed development. Potential impacts on telecommunications and meteorological radars have been scoped out from further assessment due to distance from sensitive receptors. The Project also lies outside the CAA safeguarding consultation zone centred around Benbecula Airport. Consultation with NATS, HIAL and Met Office stakeholders confirmed that no telecommunication or monitoring assets would be impacted by the proposed Project. However, these stakeholders will continue to be consulted, as appropriate, throughout the various licensing process for launches and no significant effects are concluded.
Policy EI 12: Developer Contributions The Comhairle may negotiate with developers a fair and reasonable contribution towards infrastructure and/or services required as a consequence of the proposed development. The contributions will be proportionate to the scale and nature of the development (including cumulative) and will be addressed through planning conditions or through a legal agreement if appropriate.	The Project presents an opportunity to bring the public, private and community sectors together. A Community Interest Company (CIC) was set up in 2017 as the operating entity for the Spaceport 1 initiative, founded on the principles of public participation and community benefit, with both the local authority (CnES) and the community receiving a share of profits each year to support future growth and development. The Developer commits to undertaking an assessment of all affected road surfaces and strengthening where any damage was to occur. The Developer will be prepared to contribute to road repairs due to the increased pressure on the surfaces from repeated heavy loads under agreement from CnES.

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Policy NBH1: Landscape Development proposals should relate to the specific landscape and visual characteristics of the local area, ensuring that the overall integrity of landscape character is maintained. The Western Isles Landscape Character Assessment (WI-LCA) will be taken into account in determining applications. Development proposals should not have an unacceptable significant landscape or visual impact. If it is assessed that there will be a significant landscape or visual impact, the applicant will be required to provide mitigation measures demonstrating how a satisfactory landscape and visual fit can be achieved. National Scenic Areas Development that affects a National Scenic Area (NSA) will only be permitted where: a) the objectives of designation and the overall integrity of the area will not be compromised; or b) any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by social, environmental or economic benefits of national importance. Wild Land Development proposals should be able to demonstrate no unacceptable adverse impact on the character of areas of Wild Land.	Potential impacts on landscape and visual amenity have been scoped out of the EIA in consultation with NatureScot and the planning authority/the Comhairle due to the relatively small scale of the permanent infrastructure and temporary nature of operational infrastructure, which is also considered of nominal scale. The Project is not located within a National Scenic Area or Wild Land area.
Policy NBH2: Natural Heritage Development which is likely to have a significant effect on a Natura site and is not directly connected with or necessary to the conservation management of that site will be subject to an Appropriate Assessment by the Comhairle. Development which is likely to have a significant effect on a Natura site will only be permitted where: a) an Appropriate Assessment has demonstrated that it will not adversely affect the integrity of the site; or b) there are no alternative solutions; and c) there are imperative reasons of overriding public interest, including those of a social or economic nature; and d) compensatory measures are provided to ensure that the overall coherence of the Natura network is protected.	A Habitats Regulations Appraisal (HRA) has been undertaken for the Project and concludes that there will be no adverse effects on the site integrity of any SACs or SPAs (see Annex B: Information to Inform HRA). North Uist Machair and Islands Ramsar site has the same boundary as North Uist Machair and Islands SPA; both sites were considered in the assessment. The Project is not within a SSSI or NNR although there are several SSSIs in the wider vicinity, the nearest of which is Vallay SSSI designated for habitat features. Vallay SSSI is located 2.75 km from the Project on the Isle of Vallay and as such there is no connectivity between the SSSI and the Project therefore there are no likely significant effects anticipated. The islands of Causamul and Haskeir, located off the west coast of North Uist, 8km and 13km, respectively from the proposed launch site are designated along with the islands of Gasker, Coppay, Shillay and Flodday as part of the Small Seal Islands SSSI, a group of six islands that collectively support one of the largest grey seal pupping sites in the Western Isles. No significant effects on grey seals are anticipated.

Statement/Policy Content	Project Appraisal
Development that affects a Site of Special Scientific Interest (SSSI) or National Nature Reserve (NNR) will only be permitted where: a) the objectives of designation and the overall integrity of the area will not be compromised; or b) any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by social, environmental or economic benefits of national importance. All Ramsar wetland sites are also Natura sites and/or Sites of Special Scientific Interest and are included in the statutory requirements noted above. Development that affects a Marine Protected Area will only be permitted where there is no significant risk of the activity hindering the achievements of the conservation objectives of the Nature Conservation Marine Protected Area (NC MPA) or: c) there is no alternative that would have a lesser impact on the Conservation objectives of the NC MPA; and d) the public benefit outweighs the environmental impact; and e) the applicant will arrange for measures of equivalent environmental benefit to offset the anticipated damage Where there is good reason to suggest that a European Protected Species (EPS) is present on site, or may be affected by a proposed development, the Comhairle will require any such presence to be established and, if necessary, a mitigation plan provided to avoid or minimise any adverse impacts on the species, prior to determining the application. Planning permission will not be granted for development that would be likely to have an adverse effect on a species protected under the Wildlife and Countryside Act 1981 (as amended in Scotland)* unless the development is required for preserving public health or public safety. For development affecting a species of bird protected under the 1981 Act there must also be no other satisfactory solution. Development proposals should avoid having a significant adverse effect on, and where possible should enhance, biodiversity and ecological interests of the site. Developers are encouraged to assess the impacts of their proposed development on UK	The Space Launch Hazard Area overlaps with two MPAs these are: West of Scotland MPA and Geikle Slide and Hebridean Slope MPA. The assessment determines that the Project will not significantly hinder the aim to achieve favourable condition of qualifying features within overlapping or nearby designated sites. Otter is an EPS. Detailed otter surveys were undertaken, based on the identification of signs and resting places. A detailed assessment of the potential impacts on otter has been carried out, and construction phase protection and post-consent monitoring measures have been recommended to safeguard the species and ensure legal compliance of development construction and operation. Otter mitigation proposals have been agreed and incorporated into the development of the Otter Monitoring Area and the Otter Protection and Monitoring Plan (OPMP) which includes the requirement for operational monitoring for otter to safeguard the species and ensure the legal compliance of launches with EPS legislation. All cetacean species (whales, dolphins and porpoises), occurring in Scottish waters are EPS. The assessment concludes there will be no significant adverse effects on cetaceans as a result of the Project. The Wildlife and Countryside Act 1981 (As amended) (WCA) prohibits disturbance of species listed on Schedule 1 when they are breeding. A Breeding Bird Protection Plan will be implemented which will include measures to ensure that no breeding Schedule 1 species are disturbed. Bird species not listed on Schedule 1 receive general protection under the WCA including the prohibition of the destruction or harm of adults, young, eggs and active nests, and any actions that would prevent adult birds from accessing their nests or young. Corncrake is listed on Schedule 1 of the WCA. Species-specific mitigation measures will be implemented for Corncrake to ensure that in advance of the breeding season, vegetation within 10 m of the area potentially directly affected by construction activities will be kept short (<10cm) by regular mowing, thus making it unattractive for breeding corncrakes. During operation of the Project, vegetation sward height within approximately 150 m of the launch platform will be kept short (<10 cm) during the breeding season (April – August, inclusive) to deter breeding corncrake. Tall grass habitat will be created elsewhere at Scolpaig Farm to ensure there continues to be suitable habitat for corncrake locally available. The assessment concludes that there will be no significant adverse effects anticipated.

Statement/Policy Content	Project Appraisal
Biodiversity Action Plan (BAP) priority species and habitats and Local BAP habitats and species. Developers should refer to the Scottish Biodiversity List** for a full list of animals, plants and habitats considered to be of principal importance for biodiversity conservation in Scotland (this list includes all UK priority species)	A Habitat and Amenity Management plan will be developed post-consent to expand the current habitat enhancement proposals and integrate these with commitments arising from the EIA / planning process as part of a wider HAMP. Under CnES ownership, the site is currently being managed to allow access for recreational use, community grazing opportunities, and enhancement of habitats in consultation with the RSPB. An outline HAMP outlining key commitments and principals is provided in Appendix 7-2 and will be development post consent in conjunction with a consultative Advisory Group. Coordination and management of the HAMP will be delivered by an Environmental Officer contracted by Spaceport 1.
Policy NBH4: Built Heritage All Development Development which preserves or enhances the architectural, artistic, commemorative or historic significance of built heritage assets will be supported. Where there is clear evidence of historic significance, development which would have a substantial adverse impact on this significance will only be permitted where it can be demonstrated that: (a) all reasonable measures will be taken to mitigate any loss of this significance; and (b) any lost significance which cannot be mitigated is outweighed by the social, economic, environmental or safety benefits of the development. Listed Buildings The Comhairle will seek to manage the special architectural and historical interest of listed buildings and their settings.	A Historic Building Recording (HBR) survey of the farmhouse, the farm buildings, the enclosure and the drystone dyke will be carried out prior to the commencement of any works relating to the proposed development in order to record the present state of the structures so any resulting change to these as a result of site activities is monitored. The HBR survey will be repeated at a timeframe to be agreed with WICAS. A programme of archaeological works will be carried out in accordance with a Written Scheme of Investigation (WSI) in order to establish the presence or absence of cultural heritage remains or deposits within areas of the project site that will be subject to ground disturbance. The evaluation will comprise 10% of the project footprint. An archaeological watching brief will be carried out during all ground breaking work on site. Where possible any cultural heritage remains will be preserved in-situ through avoidance of direct effects. Where this is not possible, preservation through record, using some or all of the following methods; archaeological survey, building recording, evaluation, excavation, post-excavation analyses and publication, should be achieved following consultation with the WICAS in accordance with SPP and PAN 2/2011.
Policy NBH5: Archaeology Where a development proposal is likely to negatively affect any regionally or locally important archaeological remains, applicants may be required to undertake archaeological assessment.	Parts of the enclosure (CHS30) and dyke (CHS 31) are directly impacted by the construction of the access track and may be also impacted by the construction of the launch pad soakaway. These features will be buried with sand. Protection for farm buildings and other historic features within, and adjacent to, the project site will be agreed with WICAS to prevent accidental damage from construction activities.

2.5 REFERENCES

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3 SITE SELECTION AND ALTERNATIVES

CONTENTS

3 SITE SELECTION AND ALTERNATIVES

3.1 INTRODUCTION

Regulation 5(2)(d) and Schedule 4 of The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 requires a developer to provide a description of the reasonable alternatives considered, relevant to the proposed Project and its specific characteristics. The rationale should include an indication of the main reasons for selecting the chosen option, including a comparison of the alternative options and environmental effects. The purpose of this chapter is to identify the steps that have been considered in the selection and design evolution of the Project, including the range of technical requirements for a Spaceport facility.

3.2 NEED FOR DEVELOPMENT

The global space economy is projected to grow from an estimated £270 billion in 2019 to £490 billion by 2030, with the UK share currently estimated to be £16.4 billion and employing 45,000 people (HM Government, 2021). The importance of this sector is anticipated to continue as a critical infrastructure and public service requirement to meet growing communication needs, weather forecasting, national security and internet coverage. The last quarter of 2020 saw 354 small satellites[1] launched into orbit around the world, the highest recorded from any quarter in the past (Catapult, 2020).

3.2.1 Access to Space / Sub-orbit

Flexible access to space has been identified as one of the key challenges in meeting UK aspirations to capture a substantial part of the global space market (PWC 2018, SpaceTec 2021), particularly for launch vehicles with smaller payloads. Although there are numerous launch sites located around the world, infrastructure is typically tailored to operate for a specific type of launch vehicle, and in contrast to historic launch activity, much of the growth over the next five years is expected to be generated from the deployment of 'small satellite mega constellations', with continual cycles of activity to replenish and maintain existing units. Subsequently, small satellites, or 'micro-lifts' with a payload capacity of less than 500 kg are expected to be the key driver for increased launches in the future, with as much as 80% of the demand stimulated by earth observation needs and communications (PWC, 2018).

The orbital and sub-orbital launch sector represent two slightly different growing markets, with the global market for sub-orbital launches now estimated at £10 billion (Launch UK, 2019). However similar locational and access constraints for launches are experienced by the sub-orbital market, with the absence of launch infrastructure in the UK described as a key 'fracture' in the wider UK space supply chain (Launch UK, 2019).

Subsequently, there has been increasing interest in dedicated small launch vehicles and supporting infrastructure, whose main clients can provide a simpler and more focused service (Brand *et al*, 2018). However, despite the relatively modest demands of these launches, there are limited European facilities available to service the market demand for small payload launch facilities, and the number of potential locations where suitable facilities could be built is severely constrained by technical, geographic and safety considerations. A consultation exercise undertaken in 2018, for example, indicated that access is one of the biggest challenges for small satellite operators, and that a range of different launch options would support cost reductions in the sector (PWC, 2018).

[1] Small satellites include the following subclassifications: mini satellite (100 kg-500 kg, micro satellite 10 kg – 100 kg, nano satellite 1 kg – 10 kg, and pico satellite 0.1 kg – 1 kg)

3.2.2 Policy Rationale

There is strong public policy support at both the UK and Scottish level to develop space as a market opportunity for the UK. In summary however, the UK Government supports the growth of the sector to capture 10 % of the global space market by 2030, and through the National Space Policy sets out a series of commitments to preserving, promoting and growing the sector (House of Commons, 2021).

The recently published UK National Space Strategy (HM Government, 2021) acknowledges the role that the space sector plays in the UK economy, worth over £16.4 billion per year and employing over 45,000 people as scientists, engineers and entrepreneurs. Upgrading the UK's space capabilities forms a key part of the strategy, with support facilities considered an important part of growing the UK as a science and technology superpower, and specifically capturing the European market in commercial small satellite launch capabilities. The importance of sub-orbital launches in science and technology research is also highlighted. Key actions as part of a 10-point plan include supporting space-related businesses build up world class clusters of expertise, to connect and level up locally led space ecosystems across the UK, fighting climate change and improving public services.

A Strategy for Space in Scotland (Space Scotland, 2021) sets out the ambition for the space sector to contribute in excess of £4 billion to the Scottish economy and secure a five-fold increase in the current workforce[2]. Current estimates suggest the space sector contributes £880 million GVA for the Scottish economy, associated with a sustained annual growth rate of 12% since 2016, and with the number of space businesses operating in Scotland increasing by 65% since 2016. Key actions outlined by the strategy to support the sector include developing space enterprise infrastructure and launch sites to provide direct support to the sector. The strategy also sets out measures to support the sustainability of the space activity to contribute towards Net Zero ambitions and developing STEM (Science, Technology, Engineering and Mathematics) initiatives.

3.2.3 Local Economic and Policy Rationale

The priorities and strategic direction of the Comhairle for the period 2017-21 was set out in its Corporate Strategy, 'Creating Communities of the Future'. At that time, the key external challenges facing the Comhairle related to population, the economy, legislative change and public sector financial constraints. Despite this, the strategy recognised that there were also opportunities that the Comhairle should proactively capitalise on.

In April 2017, the Comhairle submitted the 'Spaceport 1' bid seeking UK Space Agency (UKSA) grant funding to establish a vertical, orbital satellite launch facility in North Uist.

The Spaceport 1 project was recognised by the Comhairle as an opportunity that had the potential to address depopulation and demographic imbalance by creating jobs and local educational, apprenticeship and training opportunities that retain young people and an economically active population. At that time, it was also acknowledged that the Comhairle played a vital role in supporting SMEs and the local construction industry to contribute to the development of major local capital projects.

Whilst the UKSA bid was unsuccessful and the project has been significantly scaled back since 2017, the Spaceport 1 sub-orbital development is still very much aligned with the Comhairle's strategic aims.

Triggered by the COVID-19 pandemic, the Comhairle refreshed its Corporate Strategy for the period 2020 – 2022. Entitled 'Recovery and Renewal', the Comhairle recognises that whilst some progress has been made to overcome the

[2] Approximately 8000 employees in 2017/18.

challenges facing the islands, the challenges presented by an ageing population and population decline remain. An overreliance on public sector employment at a time when public sector budgets are declining year-on-year is also of significant concern.

'Recovery and Renewal' sets out the Comhairle's ambition to maximise economic opportunity by focussing on high value growth sectors to reduce the economic disparities between the islands and the rest of Scotland. Local business diversification, resilience and local supply chains will be supported by the Comhairle to ensure people have access to higher value and more diverse economic opportunity.

Spaceport 1 is viewed by the Comhairle as a transformative economic opportunity which will contribute towards addressing the challenges and achieving the aims set out in the 2020 – 2022 Strategy.

3.2.4 Technical Rationale

Space activities currently support navigation, weather forecasting, power grid monitoring, financial transactions, and public services. Satellites also support television services to UK households as well as other digital communications. Space technologies are also estimated to underpin approximately £360 billion per year of wider economic activity (HM Government, 2021). Previously, the income of the UK space industry was dominated by broadcasting and communications, which represented 70 % of space industry income by capability (London Economics, 2018). However, the rapid growth of the sector is transforming access to space, with miniaturisation, reusability and regulatory reform reducing previous barriers to access, and enabling new entrants and services to be developed. High profile projects such as Starlink - a satellite internet constellation operated by SpaceX – now provide satellite internet access to most of the Earth via 1,600 mass produced satellites (Starlink, 2021). Similarly, a recent contract was awarded to UK based company InSpace Missions based on demonstrating 10 gigabits per second optical communications from orbit, 139 times faster than the average UK home broadband (InSpace, 2021).

Sub-orbital launches play an important role in the wider space sector supply chain, in developing, demonstrating and refining orbital launch systems, procedure development, verifying systems in an operational environment, and testing space flight and launch vehicles intended for the growing orbital deployment market. In addition to the role of sub-orbital launches within the wider space supply chain, a major use of sub-orbital vehicles is, in their own right, as scientific sounding rockets. Sounding rockets are adopted for a range of applications including for weather observations, plasma physics, research in the study of the upper atmosphere, astronomy, remote sensing of natural resources and micro gravity research (NASA, 2015). Equipment designed for orbital experimentation and measuring, including environmental monitoring are also tested and developed using sub-orbital flights.

3.3 SITE SELECTION

At an early stage of the site selection process, various assessments have identified the far north of Scotland as one of only a few regions that could potentially support a vertical orbital launch facility, with potential to combine access to both lower earth and sun-synchronous orbits whilst complying with regulatory requirements[3]. Two of the key reports defining the potential for Scolpaig (and other potential sites) are outlined below.

[3] Regulations require that spacecraft do not fly over populated areas for a substantial distance, the open ocean around the north and west of Scotland provides launchers a clear, unobstructed route into orbit, while other sites would potentially require dog leg turns, restricting payload size.

It is important to note that whilst the following analysis refer to site selection requirements for *orbital* developments, which is the basis of the original development proposals for the site, the search criteria for *sub-orbital* sites have broadly similar requirements to orbital launches, including unobstructed trajectories.

3.3.1 Sceptre Analysis (2017)

The SCEPTRE (SCEPTRE, 2017) project was undertaken to investigate the key challenges associated with the introduction and operation of commercially viable *orbital* launch services within the UK, with 'Access to Space' identified as a key issue. The report also analysed the orbits that could potentially be accessed from a UK launch site and evaluated a number of specific site options. Analysis concluded that the UK was considered geographically well placed to launch to both polar and sun-synchronous orbits, which are in high demand from growing communications and earth observation markets.

For reasons of flight safety, the north of Scotland is considered one of the only feasible launch regions of the British Isles. Launches to commercially desirable orbits can be achieved from a number of sites identified in the north of Scotland on the mainland and islands, specifically in Shetland (Saxa Vord), Orkney, Sutherland (various locations in the Moine peninsula) and Hebrides (Ness, Aird Uig and Scolpaig). However, the SCEPTRE analysis ruled most sites out as potential development locations due to cost of range solutions and technical aspects around specific orbits / trajectories.

3.3.2 Brand Analysis (2018)

A subsequent analysis undertaken by Brand (2018) identified trajectory limitations associated with the Faroes and the effect of downrange oil fields impacting the viability of other sites identified as favourable in the SCEPTRE project. As indicated in Section 3.3, this analysis concluded that previous trajectory analysis may not fully apply to a European context, and dog leg trajectories could meet applicable safety requirements (Brand *et al*, 2018). It is possible to have a wider range of launch trajectories, which is not possible for a number of other locations due land overflight/safety limitations. This adds further flexibility advantages to Scolpaig regarding downrange clearances and weather restrictions. The analysis also highlighted the strong case for developing Scolpaig based on existing range capabilities and relevant local skills.

3.3.3 North Uist

The SCEPTRE report suggested that Saxa Vord (Shetland), Moine (Sutherland) and Scolpaig (North Uist) met basic technical criteria as a potential *orbital* launch site. In the absence of detailed UK requirements for assessing launch range safety, guidance derived from the USA was used as a basis for constructing an orbital launch safety corridor as part of the processes of assessing the feasibility of each site. Under this analysis, Scolpaig in North Uist was evaluated as the least favourable of three potential sites assessed in Scotland, due to the potential need for launch vehicles to undertake additional manoeuvres, termed 'dog leg trajectories'[4] to meet USA safety requirements. Following the SCEPTRE analysis, a HIE funding competition for a Scottish Spaceport, held in 2018, was awarded to a region in Sutherland to develop an *orbital* launch facility (HIE, 2018).

At the time, the award of funding to an alternative location prompted a review of the proposals at Scolpaig both in terms of the business case and technical feasibility of the project. In terms of the business case, an internal analysis (HIE, 2018) identified an increasing market demand for differentiated launch infrastructure to meet the rapidly growing

[4] In order to ensure the safety of populations located north of Scotland, notably the Faroe Islands and Iceland, some launch trajectories require the launch vehicles to perform a dog leg manoeuvre effectively reducing the payload that can be placed in a given orbit. Sites which offer direct trajectories (without manoeuvres offer greater market potential (SCEPTRE, 2017).

requirements need for *sub-orbital* launches including test and sounding rockets. In parallel, further review of the business case and challenges associated with commercial access to space from the UK presented a more detailed consideration of the trajectory issues originally identified at Scolpaig (Brand, 2018).

Overall, the development at Scolpaig was evaluated to provide substantial additionality to existing UK launch infrastructure, serving the *sub-orbital* market and differentiating the development from other proposed *orbital* launch facilities in Scotland. Significant benefits also arise from the opportunity to share the existing MoD Hebrides Range infrastructure and personnel, substantially reducing capital and operational costs, and generating a more competitive and economic solution for launch providers. The ability to share the Hebrides Range infrastructure generates a number of unique selling points which substantially strengthens the overall case to develop a small launch site in North Uist, summarised below.

MoD Hebrides Range Facilities

No site analysed under the SCEPTRE report had full existing capability for launches, the MOD range in the Hebrides was found to offer substantial benefits, particularly in the reduction of both the capital cost of installing the range infrastructure, and also the reduction in the operational costs of the launch facility. Sub-orbital launches require tracking, telemetry, flight termination systems, segregated air and sea space, systems interoperability testing and validation mission data packs, and many of these specialist services and infrastructure can be provided by existing capabilities within the Uists associated with MoD Hebrides Range Facilities and St Kilda Radar. QinetiQ Ltd is a consortium member of the Spaceport 1 initiative, recognising the value generated by retaining high paid professional jobs within QinetiQ, which operates the MoD Hebridean Missile Test Range, and the potential to create new complementary jobs in the space sector.

3.4 ENVIRONMENTAL CONSTRAINTS

Whilst the specific selection of Scolpaig has been driven by technical feasibility and geographic location, human and environmental constraints have potential to be prohibitive to the development of a launching facility. Key environmental constraints considered in the site location and design include:

- **Proximity to residential receptors -** the closest residential receptor is located approximately 890 m from the planning boundary. This is sufficient distance from the boundaries of the maximum proposed Safety Clear Zones, and to mitigate the acoustic impact of launches.
- **Natural Heritage (Designated Sites)** - the site is adjacent to the West Coast of the Outer Hebrides Special Protection Area (SPA), and approximately 2.8 km from North Uist Machair and Islands SPA and North Uist Machair SAC. Impacts on the SPAs and SAC have been fully assessed in Chapter 14: Ornithology and Chapter 15: Terrestrial Ecology and information to inform Habitats Regulations Appraisal (HRA) is provided in Annex B: Information to Inform HRA.
- **Landscape (Designated Sites)** - part of the site was originally located within the South Lewis, Harris and North Uist National Scenic Area (NSA). Following revision of the site after the 2018 Scoping Exercise (Section 3.5), the planning boundary and infrastructure has been revised to avoid designated areas for natural heritage or scenic / landscape qualities.
- **Cultural Heritage (Designated Features)** – there are no designated archaeological features located within the planning boundary. However, several designated features are located within Scolpaig Farm. Both designated and undesignated cultural heritage features are addressed in Chapter 10: Archaeology and Cultural Heritage;
- **Aviation, Telecoms and Military**: the site does not infringe on safeguarding surfaces for any airport, does not fall within any Met Office Consultation Zone or impact meteorological radar. Potential impacts on the Remote Radar

Head Benbecula Air Defence Radar at South Clettraval are addressed via a separate agreement with the Ministry of Defence (MOD);

- **Peat** - there are areas of blanket bog located to the north and east of Scolpaig Farm, around, and on the flanks of Beinn Scolpaig (Chapter 15: Terrestrial Ecology). No infrastructure is proposed on areas of peat;
- **Surface waters** - key infrastructure, including the launch pad and areas designated for the storage of hazardous materials are located at distances greater than 50 m from surface waters.

3.5 SITE DESIGN EVOLUTION

3.5.1 Scoping Report Design

A Request for a Scoping Opinion was submitted to the planning authority in June 2018 (18/00234/SCO_L) outlining the original proposed project layout and approach to EIA. Figure 3-1 illustrates the original project proposal, which was intended to be delivered across multiple phases. The original design focused on two launch pads from which vertical launch vehicles could be deployed into orbit to deploy satellites. Ancillary infrastructure included two assembly buildings, an operations area, on site access roads to connect locations for tracking radar pads, a fuel store and an administration / security building at the entrance to the site.

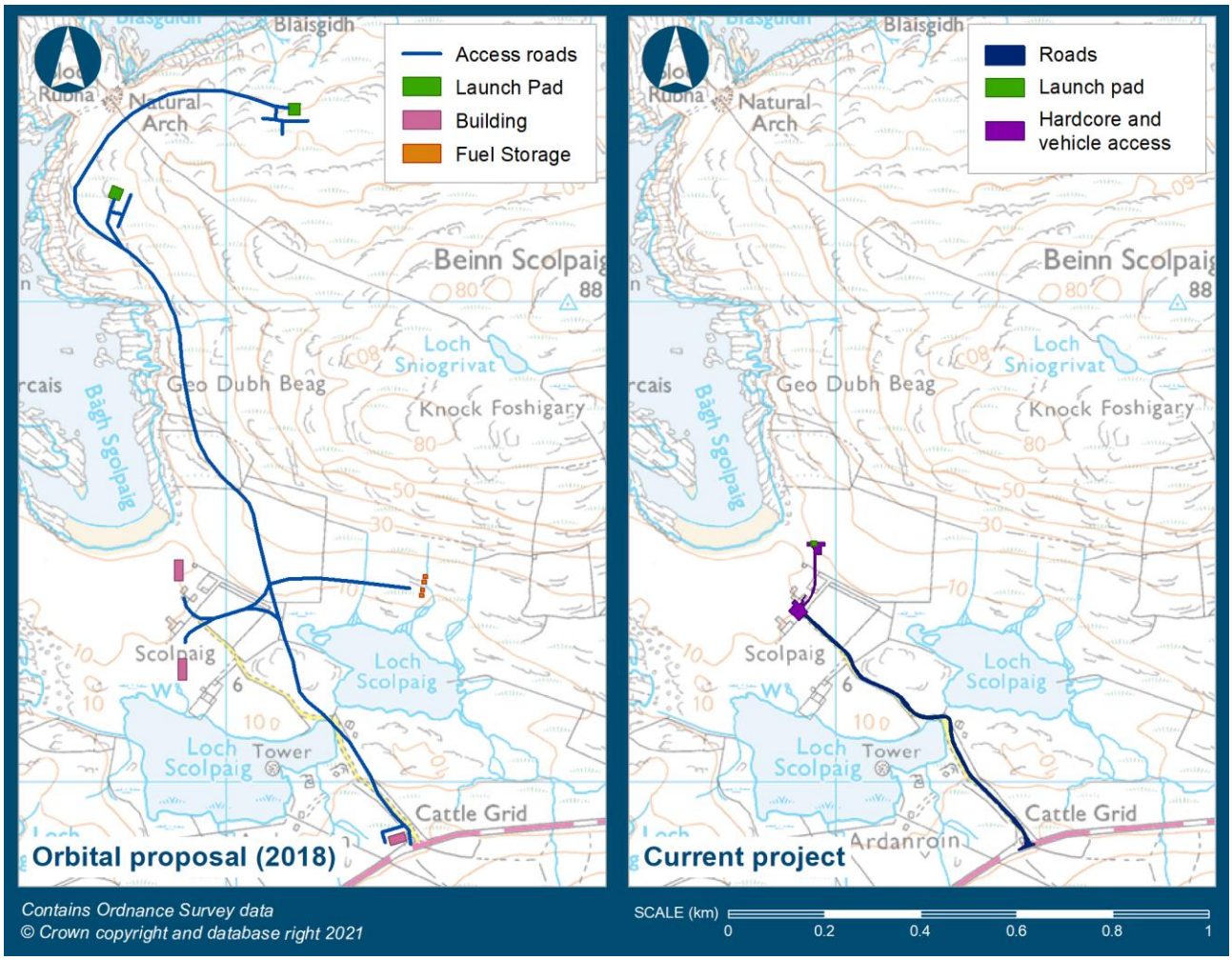

Figure 3-1 Project evolution

As indicated in Section 3.3, the basis of the original site design outlined in the Scoping Report, was to provide launch infrastructure for *orbital* vehicles launches. Following a review of the emerging market and opportunities and interaction with other potential space launch infrastructure i.e., Sutherland, a full revaluation of the project proposals was undertaken. The revaluation concluded that the emerging needs of a growing *sub-orbital* market would provide sufficient differentiation and diversification of launch opportunities, and at a reduced project scale to the proposals outlined at the Scoping stage.

On the basis of the reduction of the scale and nature of the proposed activities, a planning application was submitted with a revised project layout and accompanying description in June 2019 (19/00311/PPD). The planning application was not supported by an Environmental Impact Assessment (EIA) Report on the basis that the reduced scale of development was not perceived to constitute a Schedule 1 or Schedule 2 development and subsequently was not perceived to require EIA. A comparison of the Scoped project proposal against the submitted planning proposal is provided in Figure 3.1. Key changes from the original project proposal, scoped in 2018 are summarised in Table 3-1.

Table 3-1 Summary of key design changes from 'scoped' proposal, against the withdrawn 2019 planning application.

Infrastructure	Scoped Proposal (2018)	Withdrawn Planning Application (June 2019)
Assembly Buildings	2	1
Launch Pads	2	1
New Access Tracks	2,915 m	130 m
Fuel Storage Facility	1	0
Tracking Radar	0	4/5
Public Parking	None	5 spaces
Pollution Management Infrastructure	None	None

In response to stakeholder feedback and public responses centred around the need for additional information, the consortium has taken forward an EIA to support a new, updated planning application. The subsequent refinement of design in response to changing launch operator needs and environmental information is summarised below.

3.5.2 Design Evolution: 2019 Planning Submission to Current Iteration

The site design has undergone several further revisions since submission of the planning application in June 2019 (19/00311/PPD). Site design changes have been driven by a review of launch operator needs, environmental information, further consultation with statutory / non-statutory stakeholders and an external review of the design on the basis of hazardous material storage and use. A summary of the design modifications since submission of the planning application in June 2019 is provided in Table 3-2 below. The full range of modifications to the project to reflect mitigation and management of hazardous substances are set out in Chapter 17: Hydrology, Hydrogeology and Geology.

Existing Infrastructure

The existing infrastructure has been used as much as possible as part of the new development; the current track running from the existing main road to the farmhouses will be upgraded, the existing farmhouse complex will also be modified to provide a suitable hardstanding and turning area for vehicles. One existing building will be modified to provide a communications centre, workshop, and storage area (non-hazardous materials and pump set) for launch operators.

New Infrastructure

New infrastructure comprises the launch pad, launch pad loading area, approximately 130 m of new access track between the proposed turning area and the launch platform and pollution control infrastructure. The siting of the launch pad is based on a centralised location within the CnES ownership boundary of Scolpaig Farm, enabling the Spaceport Operator to implement the maximum anticipated access restrictions or Safety Clear Zone (a maximum 430 m. Chapter 4: Project Description) when necessary and within the ownership boundary of the farm.

Table 3-2 Summary of detailed design changes following submission of planning application

Title	Description	Date	Justification	Environmental Benefits
Site Entrance	Provision of accessible parking.	January 2019	Accessible parking space included in design to address feedback from CnES Technical Services.	Increase access opportunities for site for persons of limited mobility.
Temporary Construction Support Area	Area assigned west of Loch Scolpaig to support causeway upgrade.	September 2020	Temporary construction area for supporting equipment (pumps, storage) added to manage environmental management and mitigation requirements associated with causeway construction.	Designated area for the treatment of surface waters to protect Loch Scolpaig water quality.
Secondary layby / parking area	New layby construction designed east of Loch Scolpaig and associate underground ducts.	September 2020	To provide parking facilities for launch vehicles (as a requirement of launch operators) and emergency services. Underground ducts to provide option to extend electricity provision from extension launch platform to parking area and allow launch personnel to withdraw to suitable distance from a launch.	Underground ducts installed on the upstream side of causeway in line with SEPA recommendation.
Laybys	Two additional layby areas created.	September 2020	Provision of additional laybys to provide temporary parking and passing places during launch preparation activities and launch events and storage locations for temporary infrastructure.	Additional passing places to reduce congestion during site operations and potential vehicle overrun on verges.

Title	Description	Date	Justification	Environmental Benefits
Layby	Third layby area created	October 21	Additional layby area to provide further location option for vehicle parking, emergency vehicles and temporary infrastructure.	Additional passing places to reduce congestion during site operations and potential vehicle overrun on verges, in addition to further options for emergency vehicle requirements.
Loch Scolpaig Causeway	Revision from 2 x culverts to provide box culvert.	September 2020	Causeway upgrade proposal to ensure adequate strength for proposed vehicular activity and reduce potential for road flooding.	Culvert re-designed to provide sufficient flow to mitigate potential flooding issues and return the loch to one hydrological unit.
Vehicle Access and Farmstead Turning Area	Inclusion of one accessible parking space.	January 2020	Response to feedback from Technical Services, CnES.	Increased access opportunities for site for persons of limited mobility.
	Extend hardstanding area to include access to storage shed.	September 2020	Response to potential launch operator requirements to temporarily store components in covered shed area.	Increased access opportunities for potential workers on site.
	Installation of hardstanding for temporary storage of containers.	September 2020	Response to requirements for temporary storage facilities for fuel mixes[5].	Dedicated storage area for residual fuels following fuelling activities.
New Access Road	Reprofile road levels.	January 2020	Reprofiling road level and positive reuse of excavated materials.	Reuse of excavated sand to protect archaeological feature adjacent to farmstead.
	Movement of road 8 m to west.	January 2020	To accommodate new launch pad location.	No Change.
Tracking Radar	Removal of concrete bases to support tracking radar.	January 2020	Client requirements revaluated, main radar support systems available from MoD Hebrides Range and St Kilda Range. Close range temporary radar requirements will be met via systems installed on mobile units / vehicles.	Removes the need for vehicular access to additional points around the site. Reduces habitat loss and requirements to excavate peat.

[5] This requirement is a secondary pollution control measure, shipping containers will incorporate internal pollution prevention measures outlined in Appendix 17-1: Outline Hazardous Materials Management Plan.

Title	Description	Date	Justification	Environmental Benefits
Launch Pad	Moved 15 m west	January 2020	The launch pad location was modified to ensure that measures for the implementation / management of a maximum Safety Clear Zone (maximum range of 430 m) is fully within CnES owned land.	No change.
	Installation of drainage system.	September 2020	Drainage and collection system (5000 litre tank) to manage spillages and dilution requirements.	System modified in October 21
	Increase of launch pad area	October 2021	Launch pad increased in size to accommodate full suite of launch vehicle fuelling infrastructure.	Any spillages generated during fuelling will be retained on the launch pad, which has dedicated spill management measures integrated. Removes potential pollution reaching groundwater.
	Insert launch pad sump	October 2021	Integration of 1 m^3 sump within launch pad to contain spills associated with standard (excludes high volumes of HTP) fuelling.	Dedicated mechanism to contain spillages on the launch pad and remove potential for pollution reaching ground and surface waters.
	Containment tank	October 2021	Installation of a 63,500 litre containment tank as part of integrated pollution control system.	Containment and storage facility for potential catastrophic events (hydrogen peroxide spillages) and / or contain firefighting water runoff to remove potential for groundwater / surface water pollution.
	Sprinkler System	October 2021	Sprinkler socket set installation to provide deluge water for launches using high volumes of hydrogen peroxide.	Remote deluge system for hydrogen peroxide to address potential for large spillages.
	Soakaway	September 2020	Soakaway installed to manage runoff from concrete pad.	Updated October 21

Title	Description	Date	Justification	Environmental Benefits
	Soakaway	October 2021	Soakaway modified to include disposal option for degraded hydrogen peroxide.	Enables safe and efficient disposal of degraded HTP.
	Tether points	September 2020	Tether point locations modified to accommodate new launch pad location.	Updated October 21
	Tether Points	October 2021	Tether points number increased from 3 to 12 and arranged in radial arrangement around launch pad.	To provide a greater range of options for tower positioning.
	Hardstanding	October 2021	Hardstanding surrounding launch pad increased to accommodate maximum size of articulated vehicle.	Appropriate hardstanding for full range of vehicles and integrated towers expected on site.
Upgraded byre	Upgrading of existing byre.	October 2021	Byre upgraded to house a pump set for water storage tank (sprinkler system and containment tank pre-fuel), provide options for covered workshop area and non-hazardous material and equipment storage.	Pump set supports integrated pollution management system.
Communications Room	Communications room integrated into upgraded byre.	October 2021	New 4 m x 3 m communications room integrated into upgraded byre, with 2.5 m antennae.	To provide permanent communications facility for range and Spaceport management operations.
Public Parking	Additional and modified spaces	October 2021	In response to greater recreational use of the site including larger vehicles and vans.	Reduced congestion on road and provide greater accessibility to the site for public recreational use.
Pipework	Additional pipework	October 2021	Water pipework from Scolpaig Farm to water storage tank. Conveyance pipework for pollution control system.	Supporting infrastructure for pollution control, to remove potential for ground / surface water pollution.
Upgraded byre drainage	Soakaway	November 2021	1 m x 2 m x 0.3 m soakaway included to disperse of roof drainage.	Appropriate disposal and removal of roof drainage.

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4 PROJECT DESCRIPTION

CONTENTS

4 PROJECT DESCRIPTION

4.1 INTRODUCTION

Comhairle nan Eilean Siar (CnES) is currently leading a consortium comprising CnES, Highlands and Islands Enterprise, QinetiQ Group Plc, RHEA Group and Commercial Space Technologies Ltd. to build a new, permanent spaceport facility at Scolpaig on the northwest coast of North Uist (the Project). The purpose of the Project is to provide infrastructure for the launch of sub-orbital[1] sounding or research rockets[2]. This chapter describes the key aspects of the proposed Project including site location, project infrastructure, the construction phase, and the range of proposed operational activities anticipated at the site. This chapter is supported by the following documents:

- Drawing Pack (Figure 0020 - 0027 and Figures 0035 -0041) comprising detailed drawing, sections and elevations of the proposed development;
- Appendix 13.1: Maritime Management Procedures; and
- Chapter 17: Hydrology, Hydrogeology and Geology;
- Appendix 17.1: Outline Hazardous Materials Management Plan;
- Appendix 17.2: Water Management;
- Chapter 21: Environmental Management and Monitoring; and
- Annex C: Schedule of Mitigation.

4.2 SITE LOCATION

The development site, which is located on part of the former Scolpaig Farm, is situated northwest of the A865 in the northwest corner of North Uist on the Atlantic coast (Figure 4.1). The site is located approximately 20 km from the ferry port of Lochmaddy and 20 km from Benbecula Airport. The proposed launch pad grid reference is NF 295 547.

Scolpaig Farm and surrounding area is predominantly rough grazing land with small areas of machair. The coastline is rugged with steep cliffs and occasional white sandy bays. The land is dominated by three small hills; Beinn Scolpaig (88m), to the north of the A865, and Beinn Riabhach (117m) and Carra-crom (120m), to the south. The area is popular with walkers, both visitors and locals, throughout the year.

The existing track runs over rough moorland from the A865 in a northwest direction until it reaches a short causeway, which incorporates a culvert over Loch Scolpaig. The track then runs northwest over farmland to the existing Scolpaig Farm buildings which - except for one byre, they are largely derelict. The total land area of Scolpaig Farm is approximately 276 ha and the total application site area is 1.7 ha.

The proposed project (Figure 4.2) is located within part of the former Scolpaig Farm, which was purchased by CnES on 6th June 2019 having formerly been under private ownership. Prior to the purchase of Scolpaig Farm, the site was under a relatively intensive and continually grazing regime until October 2019. Following the transition of ownership to CnES, a 'kissing gate' was installed at the site entrance, facilitating public (pedestrian) access to the site. In addition to

[1] The Space Industry 2018 Act defines a sub-orbital craft as capable of operating above the stratosphere i.e., the vehicle will fly into space but will not enter orbit.

[2] Instrument-carrying rockets designed to take measurements and perform experiments during a sub-orbital flight at a height of 30 to 90 miles above the surface of the earth.

the open recreational use and following requests from the local community to have access to the site for grazing, a Short-Limited Duration Tenancy for agricultural purposes is in the process of being established. The grazing and cutting regime will incorporate habitat enhancement measures developed in conjunction with the RSPB including species rich grassland, wader wetlands and corncrake habitat. The implementation of the grazing and cutting regime is expected to modify the baseline environment from 2022.

4.3 CONSENTING AND REGULATION

The Space Industry Act 2018 regulates all spaceflight activities taking place in the UK. The Act is supported by the Space Industry Regulations 2021, which came into force in July 2021. Each launch will be regulated via a launch licence issued to the Launch Operator (LO) from the Civil Aviation Authority (under the Space Industry Regulations 2021) or, alternatively, a permission granted under the Air Navigation Order 2016 (Air Navigation (Amendment) Order 2021), and a marine licence from Marine Scotland under the Marine (Scotland) Act 2010.

Under the Space Industry Act 2018, facilities supporting the launch of sub-orbital and orbital Launch Vehicles (LVs) require a Spaceport Operator (SO) to obtain a Spaceport Licence. The primary regulatory authority is the Civil Aviation Authority (CAA), who - in addition to authorising the operation of a Spaceport - will also require a licence for the Launch Operator (LO) for each launch, and the Range Operator (RO) for management of the range.

The Air Navigation Order (ANO) is an alternative permission for a launch. The process for an ANO is similar to the SIA in that a LO is compelled to submit a Safety Case, and a marine licence under the Marine (Scotland) Act 2010 is required for launches with a maritime launch trajectory. The spaceport is currently in the process of securing a spaceport licence to undertake launches under both regulatory systems[3]. A summary of the key consents and regulatory systems are presented in Chapter 2: Legislation and Policy.

4.3.1 Safety Case

The Safety Case is the main way in which an applicant for a Spaceport Licence identifies potential hazards and risks and demonstrates how these risks will be managed. It forms the core part of the Spaceport Licence and is supported by evidence demonstrating the necessary steps to manage all risks to both public safety and the environment. The focus of the Safety Case is in managing potentially catastrophic events rather than minor risks (Department of Transport, 2020).

The assessment made in the Safety Case will determine the actions to take in an emergency, the level and type of rescue, and emergency support required in the form of an Emergency Response Plan, which also forms part of the licence, as do security arrangements. Once the licence is granted, the Safety Case will be used as the basis for ongoing monitoring and assessment. Licence conditions will also be set by CAA requiring environmental effects to be continually considered during the lifetime of the licence with the Spaceport Operator (DfT, 2020).

4.3.2 Assessment of Environmental Effects

An Assessment of Environmental Effects (AEE) also forms part of the licence application for the Spaceport and is taken into account by the CAA in terms of deciding whether or not to grant a licence, and what conditions may be attached to

[3]The SIA is only relevant to vehicles that have specific apogee thresholds.

this. The main requirements for the AEE are likely to be met by an EIA Report[4]. Guidance for the AEE acknowledges the uncertainty around launch vehicles and indicates that a reasonable worst-case scenario based on a representative launch vehicle can be adopted for the assessment (DfT, 2020).

4.3.3 Review and Enforcement

Under Section 3 of the Space Industry Act 2018, it is a criminal offence to operate a spaceport in the UK without a licence for launches licensed under the Space Industry Act 2018, it is also an offence to make a false statement for the purpose of obtaining a licence. For a licensed spaceport, both the SO and the accompanying Safety Case are reviewed by CAA as regulator, to ensure compliance with relevant statutory requirements. Reviews of the Safety Case can be triggered by a range of events including a change to the operations or infrastructure, or if new information relating to safety matters arises.

4.4 PROJECT SUMMARY

The purpose of the Project is to provide permanent infrastructure for the sub-orbital launch of sounding or research[2] LVs. A summary of the site selection process and rationale for the project is provided in Chapter 3. Site Selection and Alternatives.

Permanent infrastructure is illustrated on Figure 4.3 and comprises new parking at the site entrance, upgraded access tracks to the existing farm buildings with three new laybys. The existing culvert across Loch Scolpaig will be replaced and a new turning / parking area is proposed adjacent to the existing farm buildings. One existing building ('byre 2') will be upgraded to form a workshop, communications room and storage. A new access track is proposed to run from the turning area to a concrete launch pad, surrounding by a hardstanding pad loading area. New pollution management infrastructure comprises an integrated launch pad sump and drainage system, a water storage tank, containment (liquid storage) tank and soakaway.

A maximum of ten launch events a year will be undertaken by a range of LOs with LVs of varying specifications. LOs may use the site for the static testing of rocket systems or alternatively, each LV will be launched on a predesignated trajectory limited to orientations to the west, and northwest of Scolpaig (Figure 4.4). Separate stages of the LV will fall to the sea in pre-designated Exclusion Zones ranging up to 250 km from the site (the nature of these deposits is detailed in section 4.5.1, Table 4-1). Notification and marine management procedures have been developed to manage maritime safety based on launch specific 'Exclusion Areas', 'Warning Areas' and Restricted Zones within the Space Launch Hazard Area[5] (Figure 4.5 and Appendix 13.1 Maritime Management Procedures).

The nature and specification of LVs will vary, and the site is designed to provide a generic infrastructure venue to meet a range of LO requirements. Launches will be supported by the MoD Hebrides Range[6] which has existing capability and

[4] Guidance for the Assessment of Environmental Effects (DfT, 2020) accompanying the Space Industry Regulations 2021 indicates that an EIA Report is likely to be sufficient to be meet this requirement.

[5]The area where the licensee's range control services consist of, or include identifying a volume of airspace or an area or areas of land or sea falling within the designated range (a "hazard area") which require to be made subject to restrictions, exclusions or warnings for keeping the area clear at relevant times of: (a) persons or things that might pose a hazard to the operator's spaceflight activities; and (b) persons or things to which the operator's spaceflight activities might pose a hazard (as defined by the Space Industry Regulations 2021.

[6] The MoD Hebrides Range is located in South Uist, off the northwest coast of Scotland and consists of a deep range for complex weapons trials and in-service firings, and an inner range for ground-based air defence Test and Evaluation (LTPA, 2020).

protocols in place for range management services, equipment and personnel. A detailed description of the following project components is provided in section 4.5 below:

- Launch Vehicles;
- Materials and Storage;
- Permanent Infrastructure; and
- Temporary (Launch Event) Infrastructure.

4.5 KEY PROJECT COMPONENTS

4.5.1 Launch Vehicles

The Project will provide generic infrastructure that will be available for use to a range of LOs with LVs of differing specifications. LVs anticipated at the site will represent the smallest class of LV, termed micro-lift[7], for the purposes of deploying testing equipment or instrumentation to sub-orbital positions, with payloads weights ranging from 2 kg to 100 kg. The range of representative LV specifications expected at the site is provided below and example LVs within that range are presented in Image 4-1. As the LV specification anticipated at the site is expected to substantially range in its characteristics, the impact assessment is based on the worst-case scenario for each parameter:

- Max diameter: 196 mm to 712 mm;
- Lift off mass: 150 kg to 2.5 tonnes;
- Payload mass: <2 kg to 100 kg;
- Control: guided and unguided[8]; and
- Stages: single-stage LV (booster with payload) or two-stage LV (booster and sustainer).

[7] Small satellites are subdivided into the following categories, micro satellite 10 kg – 100 kg, nano satellite 1 kg – 10 kg, and pico satellite 0.1 kg – 1 kg.

[8] Guided vehicles are those where the fins and/or rocket nozzles move to manoeuvre the LV into the correct trajectory during the powered and cruise phases of flight. Unguided vehicles have no such moving parts, with the trajectory dependent on the position and orientation of the launch.

Image 4-1 Examples of representative LV's expected at the site, ranging from the smallest class (left) to the largest class (right)

Launch Vehicle Components

A LV typically comprises one or more stages, the payload fairings[9] and the payload. The first, or 'booster' stage is ignited at launch, and burns through powered ascent until its propellants are exhausted. The first stage is designed to provide maximum thrust and enable lift off from the launch pad. Once the fuel has been exhausted, the booster would configure for separation and the first stage would be jettisoned to fall within a pre-designated splashdown area in the Atlantic Sea, west or northwest of the Project site. Should the LV incorporate further stages, following exhaustion of propellants, the first stage separates, and the second (sustainer) stage is ignited to deploy the payload into position. Further separation stages may be required for the payload fairings and the payload (Image 4-2). Meteorological instrumentation may be deployed to establish environmental conditions at altitude. Details of how these areas are managed from a marine safety perspective are summarised in Section 4.6.7, and described in detail in Appendix 13.1 Maritime Management Procedures.

[9] The nose cone used to protect a payload against pressure and heating during launch.

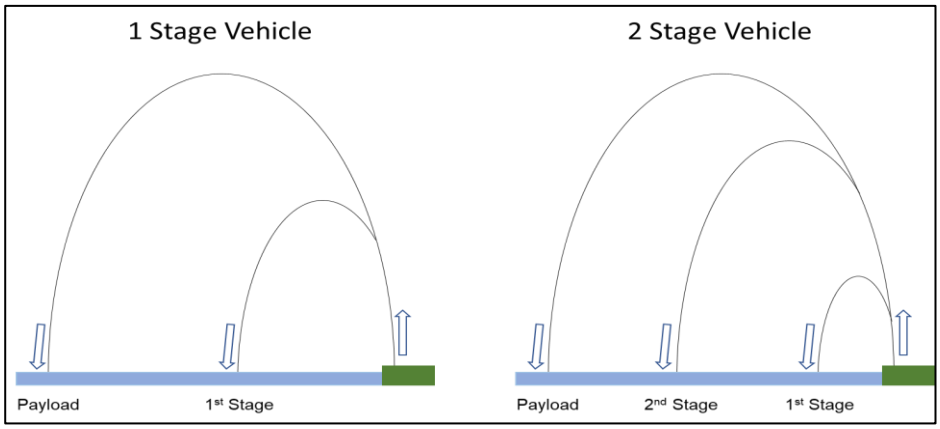

Image 4-2 Basic trajectories for one-stage and two-stage launch vehicles

In addition to a licence under the Space Industry Act 2018 / Space Industry Regulation 2021 (or Air Navigation Order) from the UK CAA, consent will also be required from Marine Scotland - Licensing Operations Team (MS-LOT) under the Marine (Scotland) Act 2010 (as amended). Each launch which will be independently assessed for a licence, including the jettisoned stages of each LV to determine any specific licensing conditions and/or requirements associated with each launch, and associated activity.

Stages

The first, or 'booster' stage is ignited at launch and burns through powered ascent until its propellants are exhausted. Typical structural materials for each stage of LV comprise aluminium, polymers, epoxy, vinyl ester, polyester resins and fibres, carbon and aramid in line with the high quality required in the aerospace industry. The jettisoned stages of each LV also generally include engines, fuel tanks, batteries and electrical components. By the point of jettison, each stage is designed to consume all the fuel located within the tanks. Typical materials associated with each stage are set out in Table 4-1 and described below.

Payload

The nature and composition of the payload can be variable and is based on the client requirements of the LO. For sub-orbital launches expected at the site, these are expected to comprise of atmospheric monitoring instrumentation, imaging systems, security equipment and communication technology. Sub-orbital launches may also be adopted to test or verify systems before advancing to orbital development, consequently some LV's may not carry a dedicated payload. Payloads (with accompanying booster or sustainer) are generally designed for recovery as they are likely to contain important data and equipment, therefore will contain a parachute for descent (recovery process detailed in section 4.6.9).

Payload Fairings

The payload fairing protects the payload against pressure and heating during launch. It is typically a cone shaped object which is jettisoned into the sea during a launch event, in addition to the LV stage(s).

Table 4-1 Example stage components based on a representative 1-stage and 2-stage deployment

LV model	LV specification	No. deposits	Components deposited	Fuels/ substances	Speed at impact
1-stage LV	10.8 m length x 0.712 m diameter 2.5 tonnes lift off mass	2	Booster and payload*: • 9.7 m x 0.7 m • 787 kg • Carbon composite and aluminium composite components. • Small metal (steel) and plastic components associated with the fuelling system and the payload. • Small circuit boards/electronics associated with systems control and telemetry.	Fuel – kerosene (residual <18 kg) Oxidiser – hydrogen peroxide (residual <12.1 kg)	~10.5 m/s (23 mph)
			Payload fairing (cone): • 1.1 m x 0.5 m/0.1 m • Composite shell	None	~53.6 m/s (120 mph)
2-stage LV	6.45 m length x 0.196 m diameter 150 kg lift off mass	2	Booster: • 2.65 m x 0.20 m • 7075 aluminium (~30 kg) • Small metal (steel) and plastic components associated with the motor and fuelling system. • Small circuit boards/electronics associated with systems control and telemetry.	Fuel - Hydroxyl Terminated Polybutadiene (residual <5 kg) Oxidiser – hydrogen peroxide (residual <4 kg)	~212.7 m/s (475 mph)
			Sustainer and payload*: • 3.62 m x 0.15 m • 7075 aluminium (~30 kg) • Small metal (steel) and plastic components associated with the motor and fuelling system and the payload. • Small circuit boards/electronics associated with systems control and telemetry.	Fuel - Hydroxyl Terminated Polybutadiene (residual <4 kg) Oxidiser – hydrogen peroxide (residual <3 kg)	~17.9 m/s (40 mph)
*Designed for recovery by parachute					

Propellants

The propellants used for rocket launches are a combination of fuel and oxidisers[10], which may be liquid or solid. Four typical propellant mixes anticipated for use at the site are listed below:

- Hydroxyl Terminated Polybutadiene[11] (HTPB) / High Test Peroxide (HTP)[12];
- High Test Peroxide (HTP) / Kerosene;
- Nitrous Oxide / High Density Polyethylene (HDPE); and
- Ammonium Perchlorate / Aluminium Powder / Hydroxyl Terminated Polybutadiene (HTPB).

The above propellant/oxidiser combinations reflect those most likely to be used in LVs at the Spaceport, however other potential propellants mixtures may be adopted by individual clients, not covered within the four representative fuels above (e.g., sorbitol, paraffin, and aluminium powder). The maximum volumes of mixtures likely to be brought onto site for four representative propellants are outlined in Table 4-2 below. This includes the 'worst case scenario' for the largest specification of LV proposed to be launched from the site, which also provides details on the range of fuel requirements for three typical LVs to illustrate the nature and range of fuels anticipated to be used and stored on site.

Table 4-2 Fuel quantities for four representative launch vehicles with four typical propellant / oxidiser mixes expected on site

Propellant	Total Representative Mass (Kg) (Launch Vehicle 1)	Total Representative Mass (Kg) (Launch Vehicle 2)	Total Representative Mass (Kg) (Launch Vehicle 3)	Total Representative Mass (Kg) (Launch Vehicle 4)	Worst Case Fuel Requirements (Kg)
Nitrous Oxide	-	-	4	-	**4**
Sorbitol	-	-	-	-	**58**
Paraffin	-	-	-	-	**8**
Ammonium perchlorate	-	-	-	85	**8**
HTP	60	1431	-	-	**1431**
HTPB	10	-	-	-	**10**
Kerosene	-	191	-		**191**
HDPE	-	-	0.9	-	**0.9**
Aluminium powder	-	-	-	20	**20**
HTPB	-	-	-	50	**50**

[10] Combustion is a chemical process in which a substance reacts rapidly with oxygen and gives off heat. The original substance is called the fuel, and the source of oxygen is called the oxidiser. In rocket propulsion systems, the oxygen source can come from a range of reactive substances including hydrogen peroxide, nitrous oxide, aluminium perchlorate etc. Oxidisers can be bound in inert materials to form a solid.

[11] HTPB is a liquid rubber used as a binder in solid rocket propellant, binding the oxidising agent, fuel and other ingredients into a solid but elastic mass and acts as a fuel in such mixtures.

[12] HTP is a highly concentrated solution of hydrogen peroxide with the remainder consisting predominantly of water. It is used as a propellant for HTP rockets and torpedoes and some high-performance engines.

4.5.2 Materials and Storage

The nature of propellants is highly diverse and rapidly evolving, with specific fuel mixtures bespoke to each launch vehicle. The LO may require various other hazardous materials to be located on site, in solid, liquid or gaseous states. Other typical propellant constituents and potentially hazardous materials are set out in Table 4-3. Spaceport clients will be expected to use propellants in line with the maximum materials inventory. However, should new materials be proposed at the site, the implications of their use and management will be reviewed against relevant legislation, assessed in consultation with SEPA, and where required, trigger a review of the Spaceport Safety Case (Chapter 17: Hydrology, Hydrogeology and Geology).

Designated materials storage areas are illustrated on Figure 17.6. Table 4-3 details the full materials inventory – including the range of possible propellants / oxidisers - and associated physical hazards. This list of materials is representative of the range of materials that may be required to support the launch of varying specifications of LV.

Table 4-3 Representative materials to be handled on site during launch

Material	Physical Hazard
Hydroxyl Terminated Polybutadiene (HTPB)	Combustible Liquid – Flash point >113ºC
High Test Peroxide 90%	Oxidiser Liquid. Severe detonation hazard when mixed with organics Combustible Liquid – Flashpoint of 82-85ºC
Kerosene	Combustible Liquid – Flash point 82ºC
Powdered aluminium	Flammable Solid (Category 1) – H228 Substance and mixture in contact with water emit flammable gases (Category 2) – H261
Ammonium perchlorate	Oxidiser
Sorbitol	No hazard
Paraffin (need state, oil or wax)	Combustible Liquid – Flash point 215ºC
Nitrous oxide	Oxidiser compressed gas
Oxygen	Oxidiser compressed gas
Helium	Inert compressed gas
Nitrogen	Inert compressed gas
Diesel	Combustible Liquid – Flash point >56ºC

The site may be required to handle small quantities of inert liquid gases, which are used for purging or pressurising fuel systems e.g., oxygen, nitrogen or helium. These will be stored in standard industrial gas cylinders within mobile units provided by the LO.

The LO may choose to store certain materials at existing storage facilities at the MoD Hebrides Range in South Uist until required (subject to MOD approval). The circumstances for use of existing facilities at the Range would depend on timing of arrival of the fuel, the volume of fuels, storage requirements, and duration of the storage period, which may range from a day for some materials up to two weeks, however the operational policy of the Spaceport would seek to minimise the duration and nature of onsite materials storage.

Storage and Management of Fuels and Oxidisers

A third-party process engineering review of the storage and management proposals was carried out by Mabbett & Associates Ltd. Actions arising from the review are integrated into the current project design and infrastructure. An Outline Management Plan for Hazardous Substances is provided in Appendix 17.1 and Figure 17.6 illustrates key pollution control and management areas.

In summary, containerised propellant mixes (fuels and oxidisers) will be directed to the concrete launch pad area on arriving at site. Standard spill kits and procedures will be prepared for the specific types of fuels anticipated at each launch and recorded via the LO Safety Case, which forms part of the license for the launch. The concrete launch pad has a series of pollution control measures designed into the structure including an integrated sump system to collect spillages <1 m^3, and a drainage channel to a liquid storage / containment tank for scenarios requiring pre-dilution of spillages (e.g., HTP). Following the fuelling procedures, residual propellants / empty containers will be stored at a designated area adjacent at the vehicle turning area, by the existing farm buildings (Figure 17.6).

Legislative Compliance

The quantity of dangerous substances to be handled on site at any one time may result in the site operating as a Major Accident establishment under the Control of Major Accident Hazards (COMAH) Regulations 2015, and requiring to hold a 'hazardous substance consent', as required by the Town and Country Planning (Hazardous Substances) (Scotland) Regulations 2015. Both regulations apply to sites that hold a significant quantity of hazardous substances, in excess of controlled quantities. An assessment of the materials inventory against COMAH thresholds indicates that none of the proposed materials or volumes exceed the lower-tier COMAH threshold, for example, the COMAH threshold for high test peroxide is 50 tonnes, the maximum quantity expected on site is 1.4 tonnes. The amount to be held on site for all proposed inventory materials are several orders of magnitude less than the threshold. It is not expected that any substance will exceed the COMAH threshold as a single material or under the aggregation rule[13], nor will a Hazardous Substance Consent be required. The full assessment of the materials inventory against COMAH thresholds is provided in Appendix 17.1 Outline Hazardous Materials Management Plan.

4.5.3 Infrastructure

Permanent infrastructure

Permanent infrastructure relates to the infrastructure which will be in place over the duration of the project lifetime. The proposed surface infrastructure is summarised below and illustrated in the Drawings 0020 - 0022:

- **Launch Pad** – a 10.1 x 13.1 m^2 (132.3 m^2) reinforced concrete pad incorporating an integrated sump with removable open grid cover, and perimeter drainage channel with removable bolted covers. The sump is fitted with shut off valve, and has controllable drainage to the soakaway (Figure 0026);
- **Pad Loading Area** – a 452 m^2 area of crushed rock hardstanding surrounding the launch pad for vehicle turning and tower installation (Figure 0027);

[13] The aggregation rule is only for determining if the COMAH Regulations apply and at which tier and will not be needed in every situation. If an establishment has one substance present above the upper-tier threshold, it is immediately upper tier and aggregation is irrelevant. However, an establishment with no single substance above the upper-tier threshold could still be an upper-tier establishment if the aggregation rule gave a result equal to or greater than 1. Similarly, a site that holds dangerous substances but doesn't have one single substance present above the lower- threshold could still be a lower-tier establishment if the aggregation rule gave a result equal to or greater than 1.

- **Tether Points** – array of twelve concrete 1 m x 1 m x 0.75 m tether points with inset tie ring surrounding the launch pad for securing launch tower/ rail (Figure 0027);
- **Socket Set and Supply** – pumped water supply to socket set surrounding launch pad for launch pad water spray system for water deluge system (Figure 0027);
- **Containment (Liquid Storage) Tank –** galvanised steel sectional tank of 63,500 litre capacity with a galvanised steel cover with access hatch and vents, approximately 8.2 m x 11.4 m (Figure 0027);
- **Soakaway –** below ground clean crushed rock soakaway approximately 10 m x 18 m x 1 m (Figure 0022 and 0027);
- **Water storage** – galvanised water storage tank on block piers on concrete base 5.4 m x 5.4 m with new underground water supply from farmhouse (Figure 0022 and 0039);
- **Fencing –** 1.1 m high rylock stock proof fencing surrounding farmstead hardstanding area and launch pad infrastructure, with two galvanised steel field gates, approximately 502 m in length (Figure 0022);
- **Upgraded byre** – incorporating new access, windows, storage, workshop, communications room, water pump set, and 2.5 m VHF cable on gable end (Figure 0035-0039). Roof drainage discharges to a soakaway north of the water storage tank (1 m x 2 m x 0.3 m) (Figure 0022);
- **Vehicle Turning Area, Storage and Parking**: 855.6 m^2 for vehicle turning, equipment assembly, storage and access to the equipment storage, (Figure 0022);
- **New access track** – approximately 130 m of new access track between the existing farm buildings and launch pad, approximately 3 m wide (Figure 0024);
- **Culvert Upgrade** – the existing submerged culvert forming part of the causeway between 'upper' and 'lower' Loch Scolpaig will be replaced with a larger box culvert (Figure 0024);
- **Upgraded access track and associated laybys** – upgrade and widening of the existing access road from the A865, including a visibility splay at the site entrance and three new laybys to include additional options for launch and emergency vehicle parking (Figure 0024);
- **Parking** – additional car parking spaces, including accessible parking will be provided at the site entrance (10 spaces in total). These spaces will be available to the public when there are no launch restrictions. Additional car parking space for the launch operator will be provided at the hardstanding area adjacent to farm buildings (Figure 0024);
- **Power and Fibre Optics** – the existing 11 kV supply will be reinstated to the farm house and extended to the byre and launch pad. Underground ducting will provide fibre optics communications to the laybys/ parking along the access track, to the byre and launch pad (Figure 0021 and 0022).

A full description of the permanent infrastructure is provided in section 4.8 and construction and installation of infrastructure in section 4.9.

Temporary (Launch Event) Infrastructure

Whilst the requirements of each launch event will vary, the maximum infrastructure to support individual launch events may include some or all of the following components:

- **Fuel filling system** – a mobile system designed for short term fuel storage and filling / draining hose within a modular container system will be transported directly to the launch pad area on arrival;
- **LV Launch Tower and Transportation** –a temporary launch tower may be integrated in the LV transport system or assembled on the launch pad. The tower will comprise a steel lattice structure or rail of a maximum 20 m height;
- **Command / Control Centre** – a mobile type unit designed for the centralised control of launch;
- **Oxidiser filling system** – mobile unit designed for the short-term storage, filling and draining of oxidiser;
- **Compressed gas supply** – a compressed helium gas system;
- **Staff and welfare units** – up to 2 mobile welfare units and portable toilets installed at site for each launch event;

- **Shipping Containers -** launch events may require the additional temporary installation of up to two 6.1 m x 2.5 m x 2.6 m containers for the storage of the launch operator's equipment. These containers will be removed from the site during extended periods of site inactivity; and
- **Standby diesel generation -** a mobile (towed) diesel generator will be placed on standby for emergency and/or specialist power requirements.

The exact specification and dimensions of the temporary (launch event) infrastructure will vary with each LO. The majority of infrastructure is anticipated to be portable and containerised. Renderings of typical temporary launch infrastructure are provided in the Visualisation Pack.

4.6 LAUNCH OPERATIONS

4.6.1 Launch campaign

It is important to note that each launch event will be separately regulated under the Space Industry Act 2018 / the Space Industry Regulations 2021 by the CAA or, alternatively, the Air Navigation Order. For operations that involve LV stages entering the marine environment, a licence under the Marine (Scotland) Act 2010, will also be required from Marine Scotland.

A launch campaign comprises the complete process from the inception of planning to the launch event (initial discussions with the regulators, contract discussions with the SO / consultees, launch rehearsals, the launch event to site demobilisation and post launch notifications). A description of the general preparatory activity prior to, including and following a representative launch event is set out below. The full range of activities associated with each launch event are summarised in the following sections:

- Outline safety analysis and discussion with the regulator(s);
- Planning and scheduling;
- Notifications;
- Launch event preparation;
- Launch rehearsals;
- Launch Event;
- Post Launch Activities; and
- Operational traffic.

4.6.2 Outline safety analysis and discussion with the regulators

Before any other launch project activity is undertaken, the LO and RO will determine whether a Safety Case can be made/established for the proposed launch, in conjunction with the SO. This includes consideration of the launch vehicle, proposed propellants, planned flight profile and the associated safety considerations. Once these details are reviewed, the LO discusses the launch project with the regulator at a pre-application meeting, generally also attended by the SO and RO.

4.6.3 Planning and scheduling

Planning and scheduling activities are initiated, to include the following activities:

- Appraisal and Contract Agreement;

- Schedule of Preparatory Events;
- Safety Case development;
- Concept of Operations development;
- Licensing and Approvals;
- Logistics;
- Communications;
- Site preparation;
- Incident planning and rehearsals:
- Pre-launch, launch and back-up procedures;
- Site demobilisation.

Appraisal and Contract Agreement

Discussions between the SO, LO, RO and launch stakeholders will be initiated to agree any specific terms or requirements necessary to deliver the launch. The Spaceport will appraise LO proposals for the following:

- Transport to Site – transport of fuels and propellants with be the responsibility of the LO, however the Spaceport will assess proposals to ensure they comply with relevant regulations, including the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG Regs) and the European agreement (ADR). The SO will support the LO with terrestrial and marine logistics arrangements which may require dedicated charter vessel (further details are in Appendix 17.1: Outline Hazardous Materials Management Plan).
- Transport within the Site – LO proposals will be evaluated to ensure safe transit of dangerous goods whilst on site.
- Materials Inventory and Storage – the proposed materials inventory, management and handling requirements will be assessed, including accompanying Risk Assessments prepared by the LO. The specific requirement of each material will be assessed e.g., gas storage requirements, ventilation and other environmental controls. The SO will evaluate proposals against Safety Clear Zone boundaries, and any requirement for a Dangerous Substances Explosive Atmosphere Regulations (DSEAR) Hazardous Area Classifications if necessary.
- Fuelling Operations – the proposed fuelling strategy will be appraised to ensure site pollution prevention controls are sufficient to contain any potential spills and de-fuelling procedures (where required) in the case of a launch cancellation.
- The LO's launch procedures, including safety contingencies.

Each launch will require a dedicated licence from the CAA. Relevant documentation relating to the launch licence will be reviewed as part of the appraisal process to identify issues specific to the interaction with the Spaceport.

Schedule of Preparatory Events

A Schedule of Preparatory Events will be prepared by the LO in collaboration with the SO and RO, setting out how long, to the nearest day, before the launch the scheduled event is due to take place.

Safety Case Development

The Safety Case is the main way in which an LO identifies potential hazards and risks associated with the launch campaign, and demonstrates how these risks will be managed. It forms the core part of the launch licence and is supported by evidence demonstrating the necessary steps to manage all risks to both public safety and the environment, to ensure risks are as low as reasonably practical (ALARP). The focus is to ensure the design, construction, operation and maintenance of any launch vehicle and mission management has taken safety into consideration. The same

principals apply to the design, construction, operation and maintenance of ancillary equipment associated with the launch (fuel storage and other equipment associated with ground operations). The development of the Safety Case is anticipated to be a collaborative and iterative process between the RO, SO, LO and consultees.

Concept of Operations development

The launch event will be captured in a detailed Concept of Operations document. This defines stakeholders, roles and responsibilities of personnel, the detailed programme of activity, communications networks and protocols, the countdown procedures, risks and mitigations associated with the specific launch and actions in the case of an incident.

Licensing and Approvals

Prior to the launch event, pre-application consultation will be undertaken with key regulators, specified below, to support the process for obtaining necessary launch specific approvals. Responsibility for consultations and securing the necessary approvals will be undertaken jointly between the LO and the SO:

- Civil Aviation Authority (CAA) – as the key regulatory body, the CAA will primarily liaise with the LO, in the context of the Spaceport as an existing licensed facility. However, the CAA will require evidence of interaction with the Spaceport to demonstrate that specific locational requirements have been integrated into the LO Safety Case;
- Marine Scotland - Licensing Operations Team (MS-LOT) will regulate – via a marine licence – issues associated with the stages and payload of the launch vehicle deposited in the sea;
- Maritime Coastguard Agency (MCA) – via a marine licence, the MCA will comment on issues relating to the safety of navigation and search and rescue, and ensuring the marine environment, including the impact on shipping and environmental quality is adequately considered;
- Ministry of Defence (MoD) – the MoD will require a Spaceport Programme Schedule to be submitted and approved in advance, specifying details of radar units, technical details of the LV, launch preparation schedule, details on the tower, trajectory and recovery protocols.
- OFCOM – local radio communication licences, including requirements for local site communications with personnel, and with the LV / LV flight termination system will be secured. The responsibility for securing communications will be dependent on the nature of operations and be the SO, LO and RO.
- Scottish Health and Safety Executive (SHSE) permission / licence – on those occasions when a SHSE licence may be required.

In addition, a series of planning, incident response and consultation meetings will be held with the Western Isles Emergency Planning and Co-ordinating Group (WIEPCG)[14]. The WIEPCG meets statutory obligations to be prepared, to respond to, and mitigate the effects of any potential emergencies in the Western Isles[15]. Consultation at an early stage with this group ensures an integrated emergency management approach to any potential issues associated with the launch campaign. The purpose of engagement with the WIEPCG will be to prepare for launch-specific incident planning requirements, public access, traffic management, pollution response and emergency standby arrangements.

4.6.4 Notifications

Key stakeholders are involved in the planning process from inception of the launch campaign, and at designated points prior to a launch event. A Notification Plan has been developed as part of the Maritime Management Procedures

[14] Membership of the WIEPCG comprises Comhairle nan Eilean Siar, Highlands and Islands Enterprise, HM Coastguard, NHS Western Isles, Police Scotland, Scottish Environment Protection Agency, Scottish Ambulance Service.

[15] This planning process brings together all first responders including Police, Fire, Ambulance, Coastguard, Health Board, Local Authorities, Public Utilities, Government Departments, Industry and the Voluntary Agencies.

(Appendix 13.1) in line with guidance from the MCA and includes key community stakeholders in addition to statutory consultees. In summary, consultation protocols are set out below;

- Maritime Stakeholders – a series of notification protocols form part of a formal agreement with the UK CAA, UKHO and MCA as part of an 'Agreement with Relevant Authorities'. In addition, a wider Notification Plan contains agreed processes for alerts and associated timescales including an advance alert service. Prior to a launch event relevant notifications will be issued including Notice to Mariners (NtM) and Navigation Warnings (NavWarning);
- Air Stakeholders - Notice to Airmen (NOTAM); and
- Community – an Advance Alert / Pre-Launch Contact service will be put in place to directly notify key stakeholders including emergency services, hauliers and closest residential receptors. The wider community will also be notified via updates on social media platforms.

4.6.5 Launch Event Preparation

Launch preparation activities will be progressed in line with the Schedule of Preparatory Events developed earlier in the Launch Campaign. In summary, these preparations comprise the delivery and installation of temporary launch infrastructure to site, launch vehicle assembly. The processes are detailed below:

- Establish an Exclusion Area (onshore);
- Transport of materials and equipment to Site;
- Site Mobilisation;
- Interoperability, communication and static testing;
- Incident planning and rehearsals;
- Maritime and terrestrial notifications
- Fuelling; and
- Emergency Procedures.

Establish an Exclusion Area (onshore)

An Exclusion Area will be will be established based on the Safety Case[16] for a range of operations including propellant loading and static engine testing, fuel / oxidiser storage as well as the launch itself and ensures that the risk to any person from blast overpressure, fragmentation debris or thermal radiation is as low as is reasonably practicable.

A representative Exclusion Area will not exceed 430 m, and approximately 40 m to 160 m for storage of hazardous materials e.g., hydrogen peroxide (H_2O_2)[16], and may be delineated by physical demarcations during a launch (e.g., flags, signage), monitored and / or enforced by security personnel. There is a legal obligation to monitor and enforce the boundary under the Space Industry Act 2018.

Before, during and after launch activities, the site may hold a number of 'dangerous substances' as defined by the Dangerous Substances Explosive Atmosphere Regulations (DSEAR) 2002 and include combustible liquids, oxidisers and compressed gases. There may be a requirement to implement zoned areas with additional ignition control requirements,

[16] For the onshore zone this is likely to include a 'Safety Clear Zone' (SCZ). The SCZ is a defined area based on the more conservative calculation of 1) peak incident overpressure or 2) hazardous fragment distance - Federal Aviation Administration – Office of Commercial Space Transportation (FAA-AST) guidance.

limiting the use of electrical and mechanical equipment in the vicinity of the storage. There areas are expected to fall within the Exclusion Zone.

Transport of Materials and Equipment to Site

The movement of materials and equipment to the site will be the responsibility of the LO, however proposals for the movement of equipment will be reviewed by the SO. Hazardous materials will be delivered by the manufacturers chosen road haulier on a designated vehicle, with the appropriate safety documentation. On arrival at the site, the SO will supervise the safe unloading and storage of materials. The Fire Service will be notified of the arrival on the island of the fuels, and that the fuels are in transit to the site. Spaceport personnel may lead the vehicle in convoy to the site should this be a requirement agreed with WIEPCG.

A dedicated Hazardous Materials Management Plan (Appendix 17.1) outline proposals for the transport, storage and pollution control associated with the proposed material inventory at the site. The management of materials will form part of a detailed Safety Case, which will form part of the license submission to the Civil Aviation Authority (CAA) and will be subject to ongoing review under the relevant regulations, including requirements of the Space Industry Regulations 2021. A detailed risk assessment as part of a ground safety analysis will also be required for every launch, for the identification and elimination/reduction of hazards and risks associated with the operation of the Spaceport under the principles of ALARP (as low as reasonably practicable). An outline risk register is provided in Appendix 21.1 Risk Register and includes control measures to ensure safe transit of materials to the Spaceport.

The most appropriate method of transportation of any materials to the islands will be determined by the Spaceport Operator and Launch Operators, on a case-by-case basis, in consultation with stakeholders, including CalMac and WIEPCG. Certain equipment and materials will require to be transported by dedicated charter vessel to avoid impacting on existing ferry services.

Site Mobilisation

Site mobilisation covers the range of activities associated with establishment of the LO on site, including the delivery of vehicles, materials and equipment to site. This also includes the assembly or erection of the launch tower and requirements related to security (e.g., temporary fencing or marking of areas) and signage (public access and hazardous materials).

Interoperability, Static and Environmental Testing

Interoperability testing will be undertaken to establish and test the interface between equipment and devices between the LV and the payload/ ground support equipment. Static testing may be undertaken and / or a 'dry' dress rehearsal of the launch procedure, including attaching the vehicle to the launch tower assembly.

4.6.6 Launch rehearsals

In the period running up to a launch event, stakeholders will be required to attend launch planning events. A desk-top walk through of the launch day activities will be undertaken, to ensure all stakeholders are familiar with the launch activities and their roles in normal, and any emergency processes. Approximately two weeks to launch, a second run through of the launch day will be conducted, with a number of emergency procedures raised, and responses discussed and planned. In the final days before launch a full-dress rehearsal of the launch will be undertaken in *real time*, with failures incorporated into the pre-launch processes, launch countdown and post-launch processes to rehearse incident response.

Emergency Preparations

Consultation with the WIEPCG will establish launch specific emergency and standby requirements, with scenario planning covering incidents and accidents. These are likely to include traffic management provision and the positioning of emergency equipment into standby.

4.6.7 Launch Event

The duration of the launch event refers to the preparations on the day of the launch. Key activities are summarised below under the following sections:

- Spectators;
- Traffic Management;
- Fuelling;
- Maritime Safety;
- Land and inshore area; and
- Airspace Safety.

Spectators

The public will not be encouraged to observe launches and dedicated traffic management measures will ensure a continual flow of traffic to remove opportunities to park in close vicinity to the site during the launch event. Observations of the launch will be by invitation only and only authorised personnel will be allowed to enter the site.

Traffic Management

Traffic management measures are not required in terms of the operations of the Spaceport site from a launch safety perspective. However, Western Isles Emergency Planning Coordinating Group (WIEPCG) has stipulated that precautionary measures be put in place to manage against the risk of potential congestion arising from incidental spectators or vehicles (more generally) stopping or parking in laybys causing obstruction on single track roads.

Police Scotland will be responsible for monitoring the route and have stated that for each launch event management measures will include:

- A dedicated police patrol to monitor traffic during a launch event.
- A temporary clearway (no stopping) along the A865 (from Clachan to Lochmaddy via the west-side of North Uist) during each launch day. This is to ensure traffic flow is maintained along this route for the benefit of all road users and will promote the existing Highway Code responsibilities for vehicles on single track roads - i.e. no stopping on the single track road, the verge or in passing places and will be strictly enforced with the police having power to move/remove vehicles.
- Proactive media releases to notify local community of planned launch days and discourage motorists from causing congestion along the route.
- As an emergency planning measure only, a Temporary Traffic Regulation Order (TTRO) will be applied for, which will include powers for the police to invoke a road closure, in the unlikely event that traffic congestion could lead to potential obstruction or danger for road users.

The efficacy of these measures will be reviewed following initial launches with the WIEPCG, with the opportunity to step-down measures, if appropriate for future launches.

Fuelling

Containerised fuelling systems will be brought directly to the launch pad upon entering the site. The transfer of fuel into the stages of the rocket will be undertaken by dedicated fuelling personnel from the ground and, if required, from a raised platform, potentially supported by a mobile oxidiser filling system and mobile pressurisation system. A dedicated fuel filling unit will be provided by the LO for short term fuel storage, fuelling and de-fuelling of the LV. Following the fuelling process, the unit will be transferred to the dedicated fuel storage area adjacent to the farmstead hardstanding.

Maritime Safety

Launch trajectories (and relevant safety buffers, see Appendix 13.1 Maritime Management Procedures) will be contained within the boundary of a Space Launch Hazard Area (SLHA) (Figure 4.4). LV flight trajectories may range up to 250 km from the launch pad, depending on the nature of the LV. Flight paths and trajectories will also vary by launch vehicle, and each launch event will require authorisations from the CAA to ensure appropriate measures for airspace safety for each event. Planned flight paths and subsequent deposits are intended to remain well within the UK Exclusive Economic Zone (EEZ) (Figure 4.4). The boundary of the SLHA has been defined to avoid crossing the EEZ.

A detailed procedure for controlling access to specific areas of the sea has been agreed with the MCA and forms a core part of the launch Safety Case, which will include a navigational risk assessment (Chapter 13: Marine Users and Assets, Appendix 13.1 Maritime Management Procedures). Exclusion Zones[17] and Warning Zones[18] will be defined based on the Safety Case for each launch, and a full description of these areas is provided in Appendix 13.1: Maritime Management Procedures. A representative illustration of a typical launch is provided in Figure 4.5, illustrating a typical temporary designation process for maritime safety. Processes for monitoring inshore and offshore areas, post launch procedures and emergency / unplanned events are also set out. Maritime exclusions are expected to last up to 4 hours, although nearshore areas are likely to be open substantially quicker following a launch event.

Land and Inshore Area

The Safety Case will define an Exclusion Zone around the launch pad. The area will be demarcated (e.g., gates and flags) to confirm boundaries/ geographic extent of the Land Danger Area and will be continually monitored by personnel and / or other remote methods (e.g., CCTV). The inshore area will form part of the Exclusion Zone and will be monitored by a patrol vessel.

Airspace Safety

An Air Danger Area[19] will be activated, based on the existing complex used by the MOD Hebrides Range. Individual sections of this area (D701) will be activated via notice to airmen (NOTAM) prior to the launch. Bespoke areas of airspace outside the D701 complex can also be segregated via a Temporary Danger Area (TDA). Some flight trajectories may enter Irish airspace, and established protocols to manage this interface are currently in place (Chapter 12: Aviation, Radar and Telecommunications). Surveillance of the airspace via radar will be undertaken by the RO to continuously monitor for the presence of other airspace users.

[17] An area of sea space in (or over) which hazardous activities dangerous to the passage of surface vessels can occur, and to which access is controlled to manage risk to life

[18] An area of sea space in (or over) which activities can occur, however risk is considered to be below the level that would require it to be a Sea Danger Area. Access to Sea Notification Areas is not controlled.

[19] A volume of airspace in which hazardous activities dangerous to the flight of aircraft can occur at specified times, and to which access is controlled to manage risk to life.

4.6.8 Flight Termination

Prior to and during the launch event, the LO will continuously monitor the launch and flight in real-time to ensure that any malfunctions are detected. An automated or personnel decision to terminate the flight may be carried out if considered that the flight cannot be continued safely (Chapter 20: Climate Change). This may result in stages of the LV containing residual fuel returning to the sea in the event of termination. A launch specific licence obtained from MS-LOT will include a description of the potential for residual fuels and other consumables that may be deposited in the sea / on the seabed.

4.6.9 Post Launch Activities

Following the completing of a launch event the following activities are anticipated:

- Recovery;
- Post Launch Notifications;
- Site Demobilisation.

Recovery

In most cases, a parachute recovery system will provide a low-speed descent touchdown of the different stages of the LV, in addition to any onboard payloads. Separate stages of the LV, the payload fairings and payload may not always be recovered from the sea. However, for those that are recovered from the sea, a charter vessel will be deployed to recover stages of the LV when required. Individual launch licensing arrangements with MS-LOT will reflect a worst-case scenario, planning for the loss of all stages, and maximum fuel loss. Stages of the LV not planned for recovery will be designed to sink, and a process for deposit charting has been agreed with the MCA / UKHO (Appendix 13.1: Maritime Management Procedures).

Post Launch Notifications

A procedure has been developed to confirm to key stakeholders (including the MCA, Local Coastguard station, UKHO, NLB and Air Traffic Control) that the launch operation is complete, that debris has landed and remains as predicted and that no further assessment is required (Appendix 13.1: Maritime Management Procedures).

Demobilisation

Site demobilisation covers the removal of all vehicles, units, materials and equipment from site. This also includes the removal of the launch tower and the temporary requirements related to security (e.g., flags and signage). The launch pad will be cleaned to remove any residue related to exhaust gases from the launch, and runoff water contained within the dedicated sump system. The SO will be responsible for the emptying and disposal of any fuel/water mix in the sump via tanker discharge or other contained disposal method (e.g., inert absorbent material) and disposed of as special waste.

4.6.10 Operational traffic

During a launch campaign, various temporary infrastructure will be transported to the site by HGV and LGV and removed when the campaign is complete (if another campaign is not due to begin). No abnormal loads will be required for launch activities at the spaceport. The site preparations for each launch will vary between launch operators and launch vehicles. Site mobilisation will require the delivery of a range of containerised and portable infrastructure, up to a maximum of 15 units, including fuelling systems, staff and welfare units, shipping containers, launch vehicle and tower. It is likely that many of the deliveries will be combined, for example, the launch vehicle and the tower are often integrated into one complete system. Material deliveries are also likely to be integrated into the mobilisation, however there may be

separate deliveries. Daily personnel movements during the launch campaign are expected to be restricted to a small number of standard vehicles or Light Goods Vehicles each day.

The most appropriate method of transportation of any materials to the islands will be determined by the Spaceport Operator and Launch Operators, on a case-by-case basis, in consultation with stakeholders, including CalMac and WIEPCG. Certain equipment and materials will require to be transported by dedicated charter vessel to avoid impacting on existing ferry services.

4.7 ORGANISATION AND MANAGEMENT

4.7.1 Spaceport Roles and Responsibilities

The development will be under the ownership of CnES and will be leased to "Spaceport 1" a distinct commercial entity and designated Spaceport Operator (SO). Under the new regulations, facilities supporting the launch of Space Industry Act regulated sub-orbital and orbital LVs require a SO to obtain a Spaceport Licence. The Space Industry Regulations[20] 2021 also place a number of specific requirements in terms of the management of the Spaceport including 'prescribed personnel'. A detailed analysis of personnel requirements has been undertaken and includes:

- **Launch Director / Spaceport 1 Team Lead**; overall lead, responsible for maintaining the Spaceport management system and ensuring that the activities are undertaken in compliance with licence requirements;
- **Business Development and Media**; client management, community, media and non-statutory stakeholder engagement;
- **Security Manager**; responsible for all security aspects of the development, site preparation and demobilisation;
- **Health and Safety Officer**; responsible for the development, operation and continuous improvement of the safety management system, and will act as a focal point for safety management issues within the organisation;
- **Environmental Officer**; dedicated to managing the site for community access, agricultural use, habitat enhancement, access and other aspects related to the Habitat and Amenity Management Plan;
- **Administration**: document control and organisational administration support;
- **Operational (various)**; includes Training Manager and Safety Manager roles;
- **Temporary (various**): includes site security and support roles for each specific launch event.

Additional staff are anticipated following an initial operational period of 1-2 years to extend support for customers, develop engagement science / STEM, and expand in-house commercial capabilities.

4.7.2 Other Roles and Responsibilities

Launch Operator

The key responsibility associated with the launch lies with the Launch Operator (LO). The LO usually represents the organisation that has designed the launch vehicle and subsequently has a duty to demonstrate the technical and operational capability for undertaking launch events, and the submission of a detailed Safety Case with an accompanying flight safety analysis[21] and a ground safety analysis to the regulator (CAA).

[20] The Spaceport may seek to undertake launches utilising the Air Navigation Order regulatory framework. It is the intention of Spaceport to comply with the more rigorous of the stipulations from both regulatory frameworks.

[21] The flight safety analysis should be based on a fully quantitative assessment.

Range Operator

A Range Control Licence is required for facilities that are responsible for managing zones subject to restriction, exclusions, or warnings for keeping the area clear. Range services extend to planning and coordinating arrangements for operation, ensuring relevant notifications are issued as well as meteorological information. A Range Control Licence will be held by QinetiQ, as Range Operator.

4.7.3 Operational Management

Spaceport Manual

A Spaceport Manual forms one of the statutory requirements, and the contents of this will include the relevant information on the management and organisational structure, including the duties and responsibilities of staff. It will also describe the spaceport services and facilities, operating procedures and restrictions.

Safety Management System

A Safety Management System based on EASA 'Easy Access Rules for Aerodromes' and CAP795 will set out in detail the lines of responsibility, accountability and processes to ensure risk controls effectively, and will form part of the overall Safety Case issued to the regulator for the Spaceport Licence.

Emergency Response Plan

The SO will have in place an Emergency Response Plan (ERP), which will interact with the LO Emergency Response Plan. Spaceport ERPs have similar requirements for aerodromes and the Control of Major Accidents and Hazards Regulations 2015, including provision for rescue and firefighting services on site. The level and type of this provision will be determined in the Safety Case and agreed with WIEPCG.

Site Security

A Spaceport Licence currently requires at least one prescribed personnel responsible for security. Outside launch preparation activities and launch events, the site will be open to the public, although additional measures to manage amenity and access may be put in place to support conservation objectives (Chapter 15: Terrestrial Ecology and Chapter 7: Community, Recreation and Tourism).

Environment

As indicated in Section 4.7.1, a dedicated Environmental Manager will have a remit covering agricultural tenancy management, public access, habitat management and other aspects related to the Habitat Amenity Management Plan (an outline plan is provided in Appendix 7.1). In addition, the Environment Manager will have a duty to manage the implementation of any planning conditions and commitments made in the EIA Report related to natural and cultural heritage resources within the site, including monitoring activities.

4.7.4 Duration

No more than 10 individual launch events are expected per year. Each individual launch event is expected to last no more than one day; however, the on-site preparation requirements would last up to a maximum of two weeks. This period would include the process outlined in 'Launch Event Preparations' in Section 4.6.5 above i.e., from the point of entry to site (mobilisation) to removal of all equipment and materials following a launch event (demobilisation). However, weather considerations or delays relating to launch activities may require that temporary infrastructure remain on site for slightly longer periods for an individual launch event, to allow for back-up launch days. Details on public access restrictions whilst equipment is mobilised on site differs from restrictions during the launch event and are described in detail in Section 4.7.7.

General Operation

Hours of Operation

Hours of Operation: Any operations will be carried out between the hours of 0700 – 2100 Monday to Friday, 0800 – 1900 Saturday with no Sunday working.

4.7.5 Operational Lighting

There will be no permanent operational lighting on the site. Temporary lighting may be required in line with monitoring and security arrangements during launch preparations.

4.7.6 Maintenance

Maintenance of the infrastructure will be focused on pollution control measures / launch pad drainage system and Loch Scolpaig Outfall.

- Pollution control system - the system will be functionally tested to ensure that the system operates as expected on demand. Maintenance will also include the clearance of windblown sand from the rocket launch platform, sump system, socket / sprinkler set and the area surrounding the containment tank. A site log sheet detailing how often the pollution prevention and drainage measures will be checked and maintained which will be kept on site ready for inspection at any time.
- Loch Scolpaig outfall, drainage channel and culvert – monitoring the status of the outfall and clearance of debris from the channel with a digger.

Other checks and repairs include general site repairs (fencing, road drainage, communications building and culvert inspections), and ensuring that gates are closed / in good repair.

4.7.7 Public Access

The *Space Industry Act 2018* (clauses 39 to 41: *Powers to obtain rights over land*) grants powers to the Secretary of State to make orders in relation to land, in favour of a qualifying person i.e., the Secretary of State, SO or RO, for the purposes of spaceflight activity. These include powers to obtain rights over land and to temporarily restrict the use of land to ensure safe and efficient use for spaceflight activities and prevent a launch from endangering persons or property.

Provision for public access is being made with the construction of 10 parking spaces at the site entrance and installation of a pedestrian gate to the farm track. Vehicular access will be restricted to Spaceport-related vehicles only. An exception being those with grazing livestock on the wider CnES-owned land or those undertaking conservation activities relating to habitat management on site. Pedestrian access is currently through Scolpaig Farm along the access track to Scolpaig Bay (a route which contributes to the wider path network) and will be maintained throughout much of the year. There will be some restrictions during the construction phase and operations, when there is a planned launch event, for public safety (Section 4.6.7).

Construction period

Access to the wider path network may be limited through the farm road access from the A865 for a temporary period during construction works for public safety, such as the road and causeway culvert upgrade works. This is likely to be limited to a period of up to 20-24 weeks. Where it is possible to open pedestrian access on this section of the farm road during the construction phase, following completion of the access upgrades, appropriate fencing and signage will be erected for public safety. Alternative access routes to Scolpaig Bay are presented in Chapter 7: Community, Recreation and Tourism.

Specific site management measures will be determined by the appointed contractor during construction and in accordance with the relevant health and safety requirements.

Operational period

Following construction, the default access arrangements to the site will be retained, i.e., continued and free pedestrian access across the site, however the farmstead area will be fenced with standard 1.1 m rylock fencing (Drawing 0022) to protect Spaceport infrastructure from livestock. Two types of access restrictions will be implemented depending on the nature of launch activities at the site: 'Launch Event Preparations' and 'Launch Event', described in further details below.

Launch Event Preparations (Site Mobilisation to Demobilisation)

Whilst the site is mobilised for a launch event and equipment / materials are on site, some area-specific access restrictions may be enforced, defined by the nature and quantity of materials retained on site and the security preferences of the LO. Should any hazardous materials be stored at the site, temporary areas of restricted access may be defined under a Safety Clear Zone (SCZ), in addition to any requirements under the Dangerous Substances Explosive Atmosphere Regulations (DSEAR) 2002 (Section 4.6.5).

The restrictions, exclusions and warnings that apply to any Safety Clear Zone will differ depending on what activity is being carried out, however a radius of approximately 40 m to 160 m from the point of storage may be implemented for the most hazardous material expected to be stored at the site in significant volume; hydrogen peroxide (H_2O_2)[22]. Due to the degradation rate of some oxidisers, the storage of hazardous substances is likely to be very short term, and the duration of this period will last up to the launch event only. The duration of these access restrictions is not expected to exceed 10 days per launch event. The public will still have access to Scolpaig Bay and the existing core path network. The Spaceport infrastructure area will, however be permanently fenced off (illustrated on Drawing 0022).

Launch Event

During a launch or testing event, an Exclusion Zone will be implemented, this may extend up to 430 m (radius, centred on the launch vehicle on the pad), depending on the nature of the launch or test. The duration of the restrictions will be approximately one day, although occasionally a launch may be delayed, due to technical or weather-related issues, and there may be a requirement for 1-2 'back-up days' where the launch may be reattempted. Notice will be provided to the public (Section 4.6.7) and appropriate markers, including flags, temporary fencing or tape will be erected to indicate restrictions. Security personnel will continuously monitor the site during these periods.

4.7.8 Waste management

The generation of waste will be minimised through implementation of a Site Waste Management Plan (see Chapter 21: Environmental Management and Monitoring) for further information. Waste generated during the construction period that cannot be safely re-used will be either recycled through appropriate recycling providers or disposed of at licensed waste management facilities. The LO will be required to establish waste segregation bins and to separate all waste materials arising from construction activities, launch preparations and demobilisation.

[22] The SCZ is based on the more conservative calculation of 1) peak incident overpressure or 2) hazardous fragment distance - Federal Aviation Administration – Office of Commercial Space Transportation (FAA-AST) guidance.

4.8 PROJECT INFRASTRUCTURE

A detailed description of the project components is provided below. The site location is provided in Drawing 0020, and the site layout is illustrated on Drawing 0021:

4.8.1 Access Tracks, Parking, Turning Area and Laybys

Existing access to the site from the main A865 will be widened to 3 m and resurfaced to allow articulated vehicles to access the site (Figure 0022). The new access falls away from the public road. A short length (15 m) of two-way road will be formed to allow vehicles to pass at the site entrance. A total to ten parking spaces are proposed at the site entrance; seven standard spaces, two extended car parking spaces and one accessible space. A pedestrian gate will replace the existing 'kissing gate' at the site access point. Three laybys (approx. 90 m^2) will be formed between Loch Scolpaig and the farm buildings. A further layby will be formed to the south of the causeway. Laybys will be used to facilitate passing vehicles, in addition to parking for launch control vehicles, and emergency vehicles (143 m^2). Approximately 30 m of new access track will be installed between the proposed turning area and launch platform.

A vehicle turning area with car parking (approximately 855.6 m^2) will be formed between the derelict farmhouse and the farm buildings (Figure 0022). Two standard car parking spaces and one accessible parking space will be provided. The hardstanding will include an area for the temporary installation of two shipping containers (post launch storage) and access to the upgraded byre.

4.8.2 Upgrading of the Existing Causeway and Culvert

The existing causeway is fully submerged some of the time, is of unknown structural integrity, and restricts flow between upper Loch Scolpaig and Lower Loch Scolpaig. The nature of the existing culvert results in hydrological separation of the loch system, and contributes to localised flooding events in the winter months. The existing culvert will be replaced with a concrete box culvert (internal size, 2.1 m wide x 1.2 m high) shown on Drawing 0022 and 0024. The causeway level will be raised and increased in width and the sides of the causeway will be protected with rock armour. The concrete box culvert will allow the north and south parts of Loch Scolpaig to act as one body of water.

4.8.3 Upgrade of Existing Byre

An existing byre ('byre 2') will be upgraded to provide a covered area for a communications area, storage for the pump set to serve the launch pad sprinkler / deluge system, and a covered workshop / storage area for non-hazardous materials. Existing plans of the byre are provided in Figures 0035 and 0036, proposed upgrades are provided in Figures 0037 – 0040. In summary the upgrade to the byre will comprise internal upgrades, repointing and re-rendering of the external walls, with timber cladding, a new 2.5 m VHF radio mast and 2.6 m x 2.93 m garage-type security door. Roof drainage will be directed to a 1 x 2 m soakaway north of the byre (Drawing 0022).

4.8.4 Launch Pad (Primary Fuel Storage), Tether Pads and Pad Loading Area

The concrete launch pad (13.1 m x 10.1 m) provides a stable and secure surface for the erection of LV tower and launch of LVs. The launch pad also functions as the primary storage area for the storage of fuels / oxidisers prior to a launch event (Drawing 0027). The pad contains an integrated pollution management system which comprises of an inset sump system (2 m X 1 m X 0.5 m) with a removable open grid cover. The sump connects to an underground drain, which subsequently discharges - via a drain stop valve - to a soakaway system (Drawing 0027). A 300 mm wide perimeter drainage channel connects to underground pipework, which conveys any material to a containment (liquid storage) tank (Drawing 0027). The drainage channel has removable, bolted covers. A 'socket set' for a water deluge / sprinkler system surrounds the launch pad. An array of twelve tether points (1 m x 1m x 0.75 m) surrounds the launch pad to provide options for securing the temporary launch tower.

A pad loading area (452 m^2) provides a suitable hardstanding surface for supporting vehicles for the installation / erection of a temporary launch tower (Drawing 0027) and has been sized to accommodate standard articulated vehicles.

4.8.5 Containment (Liquid Storage) Tank

The containment (liquid storage) tank provides a liquid storage unit to prepare for unplanned events only (Drawing 0027). The tank is sized (63.5 m^3) to accommodate the potential dilution requirements of a worst-case scenario spillage event (up to 1.5 t) of HTP and potential dilution / degradation requirements. The tank also provides containment of liquids arising from firefighting water in the event of an explosion, or fire. The tank will have a galvanised steel cover with access hatch and vents.

Below ground drainage pipes from the launch pad integrated sump system and launch pad channel drain will convey liquids (under controlled valve operation) to the galvanised steel containment tank. The containment tank will be surrounded by concrete steps, walkway and handrail. A control valve fitted with lock will provide an option to convey liquid material from the containment tank to a soakaway or connect to tanker for alternative disposal options.

4.8.6 Containment (Liquid Storage) Soakaway

The launch pad soakaway drains the clean launch pad when not in use. In addition, launch preparations for LVs that adopt HTP as part of the propellant will require pre-filling of the containment tank with water to prepare for worst case scenario of spillages, and ensure adequate dilution of HTP. Water or highly dilute / degraded solutions (<2% Hydrogen Peroxide) only will be discharged to the soakaway, and appropriate registration or licence secured from SEPA under the Water Environment (Controlled Activities) (Scotland) Regulations 2011. The sizing of the soakaway is yet to be defined but is anticipated to occupy 180 m^2, at a depth of 1 m.

4.8.7 Post Fuelling Materials Storage Area

A materials storage area for the temporary storage of containers / fuelling infrastructure following the fuelling process, will be located adjacent to the turning area within the farmstead. This area which includes space for up to two shipping containers (Figure 0022).

4.8.8 Water Storage Tank

A water storage tank (5.4 m x 5.4 m) will provide a pumped water supply to the sprinkler deluge system surrounding the launch pad and is fed from an existing private supply serving the Scolpaig Farmhouse (Drawing 0022).

4.8.9 Fencing

The Spaceport compound (vehicles turning area, upgraded byre, new access track, launch pad and associated infrastructure) will be surrounded by 1.1 m rylock stockproof fencing (total length 502 m). Galvanised field gates will be installed at the compound entrance, on the eastern corner, and northern flank of the compound.

4.8.10 Services

An application will be made to the district network operator to replace the existing 11 kV overhead supply to the farm entrance. Responsibility for the overhead supply lies with SSEN who will apply for the required consents. Underground ducts will be installed to provide electricity to the launch pad and byre. Fibre optic cabling will extend from the site entrance via the laybys to the byre and launch pad.

4.8.11 Drainage

Access Track

Surface water from access road will be routed toward natural overland drainage via roadside ditches/swales. The proposed road drainage system will comprise a Type 1 verge allowing sheet flow of surface water from the road. This system will allow initial separation of particulates within the verge. Ditching/swales are proposed to follow the access road gradient. Check dams may be used to control the flow rate within the drainage channel as well as providing some attenuation capacity. The natural topography either side of the access will be used to identify appropriate outfall points along the route for roadside drainage to allow overland flow and filtration of surface water between outfall points and Loch Scolpaig.

Launch Pad

Following every launch event, the launch pad will be cleaned and the effluent contained within the sump system (valves to soakaway closed). Cleaning effluent will be disposed of via inert materials or tanker disposal. When not in use the launch pad will drain, via the integrated sump system to the soakaway (Drawing 0027), described in Section 4.8.6.

Upgraded Byre

The upgraded byre has a soakaway (1 m x 2 m X 0.3 m) to convey and disperse roof drainage.

4.9 CONSTRUCTION AND INSTALLATION

The construction period for the Project is anticipated to last approximately 20-24 months. Table 4-4 provides an indicative timescale of the key activities included within the construction phase.

Table 4-4 Indicative construction timetable

	Week Number																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Access road 1 widen (to formation)																				
Causeway cofferdam set up																				
Causeway work area dewatering/silt management																				
Causeway widen for site access during culvert construction																				
Access road 2 widen (to formation)																				
Hard standing/parking area (to formation)																				
Access Road 3 build (to formation)																				
Building works																				
Launch pad and storage areas (to formation)																				
Box culvert installation																				
Causeway construction																				
Remove over pumping/cofferdam																				
Launchpad and containment infrastructure																				
Fencing																				
Utilities/ducting/chambers																				
Final running surface (Type 1/Surfacing)																				

4.9.1 Construction Personnel

Approximately 15 people will be contracted on-site over the duration of the construction. The actual number will depend on the activities being undertaken and will vary throughout the course of the construction programme.

4.9.2 Upgrade of access from A865, associated laybys and car parking.

The existing entrance will be increased in size to allow articulated vehicles to access the site form the single width A865. The entrance radius will be increased to 9 m and a 15 m length of 2-way road to allow vehicles to pass. Up to three cars or one articulated vehicle can be stationary waiting to access the A865 while allowing vehicles to enter the Scolpaig access track. The first 5 m of the access track, measured from the A865, will be finished with a hard-wearing surface such as Bitmac or concrete. The new access will be graded away from the A865 ensuring that there is no water run-off onto the public road. The remainder of the access will be formed to the same standard as the upgraded access track. The small rock outcrop on the east side of the current farm access track will be removed.

Ten car parking spaces will be formed off the new access. These spaces are primarily for use of the public visiting Scolpaig for recreational purposes. One of these parking spaces will be accessible and will be finished with a plastic grid paving system. Two of the spaces will be extended to accommodate larger vehicles. The remaining parking spaces will be finished to the same specification as the access track. Beyond the entrance and car parking there will be a gate forming a stock proof barrier to Scolpaig Farm. Adjacent to the gate on the track the existing "kissing gate" will be replaces by a standard access pedestrian gate to facilitate access to users of limited mobility.

4.9.3 Upgrade of existing access track.

The existing access track currently varies in width from 2.0 m to 2.5 m, this will be increased in width to 3.0 m with local widening at corners (Drawing 0021 and 0024). Topsoil from the verges of the existing track will be laid aside and used for finishing the edges of the widened track. Any areas of soft verge will be excavated and filled with small rockfill. Soft excavated material will be used for finishing the edges of the upgraded track. It is envisaged that areas of soft verge will be restricted to the area immediately adjacent to the causeway on the west side. The existing track and existing verges will be overlaid with a geotextile membrane and capped with a surface layer of minimum 150 mm deep Type 1 aggregate.

4.9.4 Causeway upgrade including installation of concrete box culvert

The existing culvert, approximate opening size 0.3 m x 0.4 m, will be replaced with a precast concrete box culvert with an opening of 2.1 m wide x 1.2 m high. An outline method statement for the construction is provided in Appendix 17.2: Water Management. Prior to construction works a temporary dam structure will be installed to enable the culvert to be replaced under dry conditions. Dewatering of the working area will require the deployment of sump pumps to discharge water to a proposed temporary construction area adjacent to lower Scolpaig Loch (Drawing 0021). A zone within the temporary construction area will be contained with silt fencing to ensure suspended sediments are filtered out between existing vegetation and fencing. A second pump will be deployed to the control water level of the upper loch. This water would be discharged directly into the lower loch, or alternatively, should the pump intake be located close to the bed sediment, this water would also be discharged to the silt management area. Following dewatering of the working area, the box culvert will be installed with ongoing pumping to the silt management area and continued as necessary. On completion, the temporary dam and silt management measures will be removed.

The causeway and the existing track will be raised to ensure that the access track is above the estimated 1 in 200-year flood level. Drawing 0024 illustrates details of the culvert design.

4.9.5 Vehicle turning area, car parking, byre access and base for shipping containers

A turning area, approximately 855 m^2 will be constructed between the existing farm outbuildings and the farmhouse. Adjoining this area will be an additional hardstanding area for the temporary installation of shipping containers and the byre access. The vehicle turning area, car parking, base for shipping containers and the existing byre access will be set level with the surrounding machair ground. The existing grass vegetation will be carefully removed and laid aside for reuse. The sand will be excavated to a depth of approximately 500 mm. Excavated sand will be used to make up levels for the launch pad access road with the remainder being stored in the low areas within the former walled farmyard. A geotextile membrane will be laid over the sand base. This will be capped with 450 mm of small, crushed rock fill and finished with a wearing surface of 100 mm of Type 1 Road Base.

4.9.6 New access track to launch platform

New access track will follow the shortest route from the vehicle turning area car park to the launch platform. The access track passes between the walls of two former buildings and crosses the farmyard perimeter wall which is currently covered with windblown sand. The land within the former farmyard is uneven. Sand from the excavation of the vehicle turning area will be used to overlay the loose stone which lie between the walls of the two former buildings and level the route of the new track. Detailed sections of the excavations are provided in Drawing 0023. The existing farm wall will be reduced in level in the location of the new access track and the track excavated between the farmyard boundary wall and the launch platform. The sand will be well rolled, overlaid with a geotextile membrane and capped with 450 mm of crushed rock fill and finished with a wearing surface of 100 mm of Type 1 Road Base. Verges will be finished with turf laid aside from the vehicle turning and car parking area. With the exception of the excavation at the former farmyard, the proposal is to overlay the existing ground so as not to disturb any items of potential archaeological interest.

4.9.7 Launch pad, tether pads and pad loading area

A detailed layout of the launch pad is provided in Drawing 0026. The launch pad / tether points and pad loading area will be constructed on land remodelled to the level of the launch pad (9.0 m AOD) of excavated and levelled sand. Prior to cutting and filling, turf will be removed, laid aside and reinstated immediately on completing cut and fill work. Details of the excavation sections for the launch pad, tether pads and loading area is provided in Drawing 0023.

The launch pad loading area will be approximately 452 m^2 with the majority of the hardstanding comprising a Type 1 finish on crushed rock. The launch pad / sump (13.1 m x 10.1m) will be inset within this area. The launch platform will comprise reinforced concrete, 0.8 m deep and laid to falls (1:60) on a blinded hardcore base on geotextile membrane. An array of twelve concrete 1 m x 1 m x 0.75 m tether points with inset tie ring surrounding the launch pad for securing launch tower/ rail (Figure 0027);

4.9.8 Containment Tank and Water Storage Tank

The original ground level will be excavated to a depth of 1.09 m, over an area cross section of 14.5 m^2. After setting out the construction area, grass turf will be carefully removed and laid aside for reuse. Sand will be excavated to formation level. The sand will be used for building up road levels and filling hollows within the application site. A reinforced concrete slab will be constructed over blinded hardcore on a geotextile membrane laid over the sand formation level. Ready mix concrete from a registered production plant will be brought to the site. Tank supports will be constructed from concrete blockwork. The tank will be constructed from galvanised steel panels bolted together over the block work support structure. No specialised machinery is required. Two mass retaining walls will be constructed at the liquid storage tanks (blockwork or poured concrete). On completion of the tank construction, the ground around the tanks will be graded as shown on the design drawings and all exposed sand will be covered with the grass turf laid aside during the excavation work.

4.9.9 Soakaway

Two below ground soakaways will be installed for the launch pad and byre roof drainage. The soakaways comprising clean crushed rock with perforated pipe distribution contained within a filter membrane.

4.9.10 General construction

Construction Hours

Construction hours will be 07.00 to 20.00 Monday to Friday and 07.00 to 18.00 Saturday, with no Sunday working.

Temporary construction requirements

The Contractor will require a temporary compound to provide staff facilities, the storage of materials and a control point for visitors to the works. A temporary construction compound may be designated within the existing farm complex or, alternatively the proposed car parking area at the entrance to the site may be adopted as an alternative option by the contractor. Temporary construction requirements are likely to include a cabin with toilets, a canteen and a meeting room. A further temporary area (approximately 120 m^2) will be established adjacent to Loch Scolpaig exclusively to support the over-pumping works and sediment management requirements for the proposed culvert upgrade (Drawing 0021).

4.9.11 Construction Materials

The estimated quantities of construction materials are outlined in Table 4-5. Sand excavated from the site will be retained on site and used for filling below the launch platform access road and landscaping. Machair turf, laid aside during excavation works, will be used to cover and landscape areas and the road verges within the machair areas. Soil and nominal quantities of peaty soils[23] excavated as part of the road works will be used for landscaping road verges in the areas which are not machair. It is intended to retain all excavated materials on site.

Aggregate

All aggregate material required for construction will be imported to the site, no borrow pits are proposed on site. Approximately 5,074 tonnes of aggregate will be delivered to the site by road. It is expected that aggregate will be sourced from one of the Uist and Benbecula quarries, as identified in the CnES Outer Hebrides Local Development Plan, Development Strategy Maps and subsequently will have similar properties to the site.

Concrete and Steel

Concrete and steel will be required for the launch pad, containment tank and water tank. The concrete culvert will be precast and manufactured off site. The likelihood is that these will be manufactured on the mainland and imported. All geotextile membranes and drainage, including the drainage storage tank will be imported. Concrete will not be batched on site and will be imported.

[23] Trial pits identified two limited and shallow deposits of peat around the causeway not exceeding 50 cm in depth and subsequently not considered to fall within the definition of peat soil (Scottish Government *et al*, 2017).

Table 4-5 Anticipated volumes of construction materials and traffic

Material	Area	Volume	Tonnage	Loads
Rockfill	Access track upgrade (inc. access at main road)	805	1610	107
Rockfill	Passing places	264	528	35
Rockfill	Compound hardstanding	436	872	58
Rockfill	Launch pad access	203	406	27
Rockfill	Launch pad & storage area	339	678	45
Rockfill	Causeway	374	748	50
Rockfill	Containment	116	232	15
Concrete	Launchpad, containment and water tank	103 m^3	257	18
Steel	Launchpad, containment and water tank		1-2	3
Geotextile		7879 m^2	8 Rolls	2
Containment and Water Tank		N/A	N/A	2
Pipes/Ducts/chambers				5
Culvert Units				3
Accommodation & Sundries				10
TOTAL				**380**

4.9.12 Construction traffic

Traffic movements associated with the construction of the infrastructure will primarily be related to the delivery of materials and components to the site together with construction staff travel. Prior to construction, all affected road surfaces will be reviewed and strengthened where any damage may be likely to occur. The Spaceport will contribute, under agreement with CnES, to review and undertake road repairs due to the increased pressure on the surfaces from repeated heavy loads.

Table 4-5 outlines anticipated construction materials and estimated number of loads. It is anticipated that over the construction period there will be approximately 380 deliveries of goods to the site. It is anticipated that the route used will be from Clachan along the west side of the island to the site along the A865. On the basis of a 20–24-week construction timetable, the average weekly heavy vehicle movements during the construction works are approximately 16-19 per week.

4.9.13 Construction Management

Change control

The project will be tendered on the basis of a design, drawings and specification. Only changes instructed by the Contract Administrator will be authorised. All relevant stakeholders would also be consulted at this time.

Smaller changes will be tracked during the detailed design and construction of the project and measures will be taken to ensure that negative impacts are not exacerbated by changes, and where possible opportunities are taken to enhance positive impacts.

Public Access and Communication

During the construction period, public access to the site will be restricted. Specific site management measures will be determined by the appointed contractor during construction and in accordance with the relevant best practice and health and safety requirements.

Notification of construction activities is likely to include:

- Public notification of intended restriction access;
  - Local authority website, community councils, local press;
  - Area of land affected, date and times, alternative access arrangements (if relevant); and
- Signage on site, access road, paths into site, marshalling.

Commissioning

Commissioning will be limited to testing the water and drainage systems at the launch platform. This work will be carried out by the construction contractor prior to the completion of their work.

4.10 ENVIRONMENTAL MANAGEMENT

Construction

A Construction Mitigation Register (CMR) will include monitoring, reporting and communication protocols to manage changes, as detailed in Chapter 21. Environmental Management and Monitoring. The CMR will be based on the Schedule of Mitigation in Annex C. The CMR will set out the commitments in the Mitigation Schedule and any additional planning and licensing conditions. The CMR will form a part of tender documentation for a construction Contractor, who will be required to provide a dedicated 'Construction Environment Manager' to ensure compliance with the CMR during construction. The Construction Environment Manager will ensure all activities with potential to affect the environment are appropriately managed, and commitments made during the EIA process and relevant planning are implemented. All identified environmental risks and necessary protection measures will be integrated into the contractor's method statements for all key construction activities. The contractor will also be required to produce a set of minimum control standards for sub-contractors working at the site.

Operation

As outlined in Section 4.7.1, in addition to the proposed operational staffing of the Spaceport, either CnES or the Spaceport 1 entity will also include one member of staff dedicated to habitat management for the site. This staff member will also be responsible for the coordination of any community grazing opportunities and the management of public access and amenity.

4.11 DECOMMISSIONING

This application seeks planning approval for a permanent project. Should the Spaceport close the containment and water tanks will be removed and the communications room demobilised. Access and parking infrastructure is proposed to remain in place to facilitate access to the site as a common grazing resource and any ongoing habitat management requirements.

4.12 REFERENCES

Department of Transport. 2020. Guidance for spaceport licence applicants and spaceport licensees; The Space Industry; Space Industry; UK Space Agency

LTPA. 2020. MoD Hebrides. Available online: https://www.ltpa.co.uk/SitesAndRanges/Hebrides. Accessed 02/10/2021.

Department for Transport. 2020. Guidance for the Assessment of Environmental Effects.

Scottish Government, Scottish Natural Heritage, SEPA. 2017. Guidance on Developments in Peatland: Peatland Survey.

5 CONSULTATION

CONTENTS

5 CONSULTATION PROCESS

5.1 INTRODUCTION

Consultation with both statutory and non-statutory stakeholders is an integral part of the EIA process throughout the lifetime of the Project. Consultation provides the opportunity for environmental issues to be identified at an early stage, ensuring issues/potential impacts can be adequately addressed as part of the impact assessment.

This chapter summarises the results of the consultation process undertaken to date to inform the EIA process. Key consultation events summarised include the results of the request for a Scoping Opinion[1], the public representations received in response to an earlier planning submission for the development[2], a series of public meeting events informing the planning submission in 2019, ongoing consultation with statutory and non-statutory stakeholders to inform the EIA, and a public information session to update stakeholders, and the community on the revised submission/application of the application in 2021.

Comments raised through consultation in relation to specific EIA topics, and details on how these have been addressed, can be found in each individual chapter within this EIA Report. A full record of stakeholder consultations is detailed in Annex E: Stakeholder Consultation Record.

5.2 CONSULTATION APPROACH

The consultation process was initiated prior to the EIA scoping process, with early discussions with the UK Space Agency (UKSA) and UK Civil Aviation Authority (CAA). Since the scoping process, the project design has been substantially modified and reduced in both the spatial and operational scope. Full details of the design changes, including the reasoning behind the changes, are outlined in Chapter 3: Site Selection and Alternatives. A brief summary of each consultation approach is provided below.

- **Site Selection** - details of the initial site selection process are provided in Chapter 3: Site Selection and Alternatives. The selection process was an independently led, national level evaluation which adopted a highly limited set of locational and technical criteria to identify a site suitable for the development of a rocket launching facility. Further details on this process are also provided in Chapter 3. No public consultation was carried out relating to the national selection process.
- **Pre-scoping –** Pre-scoping activities were limited to discussions with the UK Space Agency (UKSA) and CAA, relating mainly to the legislative framework and requirements for developing the Spaceport. A summary of UKSA and CAA consultations is provided in Chapter 12. Aviation, Defence and Telecommunications. Discussions were also held with the UKSA and Department for Transport, to discuss the subject of site suitability from a safety perspective.
- **Scoping** - a request for a Scoping Opinion was submitted to Comhairle nan Eilean Siar (CnES) in August 2018[1] based on a substantially larger development proposal than the current design and operations presented in the EIA Report. Details of how the design has evolved and reasoning behind the changes is provided in Chapter 3: Site Selection and Alternatives.
- **Planning Submission** - following substantial review of the project design and operations, a planning application[2] was submitted to CnES outlining revised details of the reduced design. The planning application received significant

[1] Submitted 19 June 2018 to Comhairle nan Eilean Siar, Reference 18/00234/SCO_L.

[2] Submitted 26 June 2019 to Comhairle nan Eilean Siar, Planning Application Reference 19/00311/PPD.

public interest and 640 public representations were received, in addition to comments from the statutory consultees. The content of the public representations has been reported in Appendix 5.1: Review of Planning Representations and summarised in Section 5.3.3 below.

- **Community Newsletter –** a community newsletter was distributed to every house in North Uist during the week beginning 4 August 2019 to provide information on the development and details of the first round of public consultation events.
- **Public Consultation Events (2019)** – seven public consultation events were held over two rounds in Lochmaddy Hall and Carinish Hall in August 2019 and September 2019.
- **Statutory and Non-Statutory Consultee Meetings** – meetings were held with key stakeholders to determine the detailed scope and content for the EIA and wider management issues associated with the development of the Spaceport. Summaries of individual stakeholder meetings are provided in Section 5.3.4.
- **Public Information Event (2021)** – an online public information event was held on 17 November 2021 and was attended by 70 members of the public and stakeholders. A recording of the event was made available online (*YouTube*).

5.3 CONSULTATION ACTIVITIES

A detailed summary of the consultation received from statutory and non-statutory consultees and how each comment has been addressed in the EIA is provided in Appendix 5.1: Review of Planning Representations.

5.3.1 Pre-Scoping

A number of discussions were held with UKSA focusing on the regulatory aspects related to the development of the Spaceport and airspace change proposals / management issues, reported in Chapter 12: Aviation, Defence and Telecommunications.

5.3.2 Scoping

A request for a Scoping Opinion was submitted to CnES on 19 June 2018[1]. The feedback from this process related to proposals for a substantially larger development than the current infrastructure. Subsequently many of the stakeholders' feedback received in response to the Scoping Opinion was revisited and revised following the evolution of design proposals. Details of the main changes to infrastructure is provided in Chapter 3: Site Selection and Alternatives. Scoping responses were received from the following bodies:

- SNH (03 August 2018);
- Historic Environment Scotland (01 July 2018);
- SEPA (04 July 2018);
- Scottish Water (04 July 2018);
- Health and Safety Executive – Licensed Explosive Sites (03 July 2018);
- Highlands and Island Airports (28 June 2018);
- Met Office (28 June 2018);
- Building Standards – Balivanich (27 June 2018); and
- National Air Traffic Services (25 June 2018).

The content and responses to each consultee's feedback is set out in the relevant technical chapters.

5.3.3 Planning Submission Representations

Previously, a planning application for the development was submitted on 26 June 2019 (Planning Reference 19/00311/PPD), due to the revised and reduced scale of the development, the planning application was not supported by an EIA Report, nor did the revised development proposals trigger the requirement for Pre-Application Consultation under the Planning (etc) Scotland Act 2006 (as amended). In response to the submission, approximately 640 representations from the public were received, in addition to 13 comments from statutory consultees. The comments from the public have been analysed and reported in Appendix 5.1. Review of Planning Representations, which includes a summary of how each concern has been addressed in the Project. Many responses focused on the original 'scoped' project which set out much larger infrastructure proposals to support an orbital launch facility, however all comments have been collated and integrated into the EIA process. Comments from statutory consultees are reported separately in the relevant technical chapter. Public comments are also considered in each of technical chapters within the EIA Report.

Public Responses

A total of 640 objections were received, with the majority of respondents objecting to the development (98%), 1 respondent (0.1%) expressed a neutral view and 12 respondents (2%) expressed a supportive view. The majority of the representations originated outside the Western Isles (79%), with a global distribution, with 136 (21%) representations originating from the Western Isles. These predominately comprised objections (90%) with the remaining 10% mainly outlining a supportive or, in one case, a neutral view.

The majority of representations referenced numerous issues and topics of concern. Following analysis, the main area of concern related to the impact on the landscape (70%) followed by impacts specifically on birds (72%) and concerns on the potential damage to the natural environment and its wildlife (57%). Impacts on tourism also featured as a substantial concern with 48% of suggesting an adverse effect on tourism, particularly walking, citing impacts on the Hebridean Way.

Individual topics drawn out of the analysis included concerns around specific species or groups of species, for example corncrake, bumblebees, marine wildlife, butterflies and otters. Other significant objections centre around impacts on peat and water pollution. A significant number of representations (24%) objected to the lack of information provided to support the planning application and the level of engagement with the public. A smaller number of representations cited concerns with the potential for accidents and hazards, disruption to traffic, noise, and the fishing sector.

Consultee Responses to 2019 Planning Application

Following the submission of the 2019 planning application[2], a total of 21 bodies were consulted, with 11 respondents listed below:

- SNH (24 September 2019);
- EH Uists & Barra (19 August 2019);
- Roads, Bridges and Streetlighting, Uist & Barra (12 August 2019);
- MoD (08 August 2019);
- Historic Environment Scotland (16 July 2019);
- Highlands and Islands Airports (10 July 2019);
- CNES Archaeologist (09 July 2019);
- SEPA (08 July 2019);
- Scottish Water (01 July 2019);

- National Air Traffic Services Ltd (01 July 2019); and
- Met Office (01 July 2019).

The content and responses to each consultee's response is set out in each of the relevant technical chapters.

5.3.4 Statutory and Non-Statutory Consultee Meetings

A number of individual consultation events and meetings have been held with consultees throughout the EIA process with statutory and non-statutory consultations. These meetings were held to clarify specific information requirements, respond to queries, and agree the scope and content of the EIA. Additional direct correspondence with key stakeholders, including details of any requests for specific information or issues to be addressed in the EIA, are detailed in relevant EIA chapter topics. A summary of key consultations with statutory and non-statutory stakeholders is provided below:

- **CnES Planning** - meeting with planning to outlined current status of development and seek clarification on specific points of the EIA, specific development aspects and submission protocols / timescales.
- **CnES Access Officer:** approaches to access arrangements during construction and operation, including interaction with the Space Industry Act 2018 provisions and the core path network.
- **CnES Archaeologist:** project updates, guidance on baseline information, and agreement of mitigation approaches to cultural heritage features.
- **CnES Environmental Health:** correspondence to agree the methodology and scope of the noise assessment and approaches to air quality.
- **Marine Scotland Licensing Operations Team (MS-LOT)** - correspondence to determine scope and content of EIA and potential licensing requirements for each launch. In addition to joint meetings with other marine stakeholders for marine licensing requirements.
- **Maritime Coastguard Agency (MCA)** – several meetings to outline the development, interface with existing QinetiQ operations and existing management of maritime safety. MCA provided recommendations for assessment within EIA, commented on marine management procedures and supported discussions on terminology / charting with UKHO.
- **Ministry of Defence (MOD)**: agreement of mechanisms to develop a formal relationship with the MOD to manage interfaces and mitigate any potential risks associated with the Spaceport operation.
- **NatureScot** - Correspondence to agree bird surveying methodology followed by updates to provide NatureScot with an update of Project: year 2 bird survey, outputs of HRA and agree actions in terms of LVIA. Specific advice provided on marine ecological impacts, otter and corncrake.
- **Northern Lighthouse Board:** meetings to outline the development, interface with existing QinetiQ operations and existing management of maritime safety. NLB provided information about their activities within the Space Launch Hazard Area. In addition to joint meetings with other marine stakeholders for marine licensing requirements.
- **Royal Society for the Protection of Birds (RSPB)** - Meeting to outline project design, update on bird surveys and agree the key issues in relation to birds, including wider habitat management.
- **Scottish Environment Protection Agency (SEPA) -** communications between SEPA and HIE (via telephone, email and letter) to provide further details of the proposal, discussion of these details and outstanding areas needing further clarification. Further advice provided on management of hazardous materials, Control of Major Accidents and Hazards, flood risk, mammal passages and soakaways.
- **UK Civil Aviation Authority (CAA)** – ongoing consultation around general licensing requirements for the Spaceport.

- **UK Hydrographic Office (UKHO)** – joint meetings with other marine stakeholders to agree terminology, charting and notification requirements.
- **Western Isles Emergency Planning and Coordinating Group**[3] - meetings with the Western Isles Emergency Planning and Co-ordinating Group (WIEPCG) to gain feedback regarding the safety of the proposal and identify any issues specific to the site, the Western Isles and the availability of resources.
- **Western Isles Fisheries Association (WIFA)** – briefing note issued and key concerns / issues raised via meeting, ongoing consultation around impacts on fisheries resource.

5.3.5 Public Meetings

Round 1

Five 'town hall' style public consultation meetings were held in Carinish and Lochmaddy in North Uist on the 15 and 16 August 2019. The meetings were publicised via a community newsletter distributed to every household in North Uist and held over the course of two days. Events were also publicised through posters in local shops, CnES social media pages and there were announcements on local radio. A total of 278 attendees were recorded over the five events. The purpose of the consultations was to provide the local community with information about the proposals, provide an opportunity for the public to highlight issues and for a panel of the developers to address any queries.

Information provided to the public included the rationale for the rocket launching facility, a description of the Project's phased approach[4], the visual appearance of the facility and aspects relating to public safety and site operations. Information also included the likely disturbance generated by the development and potential impacts on the environment.

Table 5.3 Public consultation events

Date	Venue	Number of attendees
Round 1		
15 August 2019	Carinish Hall	51
15 August 2019	Carinish Hall	36
15 August 2019	Carinish Hall	95
16 August 2019	Lochmaddy Hall	34
16 August 2019	Lochmaddy Hall	62
Round 2		
18 September 2019	Carinish Hall	45
18 September 2019	Carinish Hall	98

A number of residents present at the meetings expressed their support for the development, explaining the need for employment opportunities and the importance of employment in sustaining the rural population of North Uist. However, a number of concerns were also raised, covering a range of topics, which are summarised below in Table 5-1.

[3] HM Coastguard, NHS Western Isles, Police Scotland, Scottish Ambulance Service and SEPA

[4] Note aspects of the project have been modified since the public consultation events, the project is no longer part of a phased development. A full description of the site development rational is provided in Chapter 3: Site Selection and Alternatives.

Round 2

A second round of public consultations was undertaken in September 2019, to provide an update on the Project's progress and address any additional queries (Table 5-1). Presentations were delivered by the development team, followed by a similar question-and-answer format. The information provided during the presentations included details on the revised planning application and an update on planning process, responses to previously unanswered questions on sounding rockets, purpose of satellites, ethical use of space, governance of the spaceport, description of the organisations that make up the development team, employment and financial information. Queries raised at the second round of events are also provided in Table 5-1.

Table 5-1 Topics raised at public consultation events

General topic	Sub-topic	Description of concern	Response
General Planning	Change of land use	Change of land use at Scolpaig Farm from agricultural to industrial.	A planning application, supported by an EIA.
	Nature of temporal development	Concern was raised regarding the duration of a 3-year testing programme.	Smaller sub-orbital project represents a permanent development.
	Future development	Concern regarding the consent for all types of rockets in the planning permission process, and the potential for larger rockets to be used in future.	Proposed project infrastructure and location inherently limits the nature of launch vehicles to sub-orbital specifications.
	EIA	Concern as to why an EIA wasn't being carried out.	An EIA Report accompanies the 2021 planning application.
	Perception of lack of impartiality	Conflict of interest if the project developer, i.e., the Comhairle, is also acting as Planning Authority. Conflict of interest where Comhairle councillors are sitting on community councils.	Concerns not specific to EIA process.
Public consultation	Keeping the community informed	Request for information about the Project to be made more readily available, e.g., type of propellant to be used in launches. Perception that the public consultation had come very late in the process, i.e., after land purchase and application process. Query as to whether there will be public consultation following the amended application.	An EIA Report accompanies the 2021 planning application containing proposed project infrastructure based on review of representative launch vehicles and worst-case scenario impacts. Project does not trigger the pre application process under the Planning etc (Scotland) Act 2006. Public information event held on 21 November 2021, in addition to seven 'town hall' events in 2019 and community newsletter distribution.
Socio-economic	Project financing	Concern as to whether the Comhairle is using public funds to promote a development that is not guaranteed to go ahead.	Concerns not specific to EIA process.

General topic	Sub-topic	Description of concern	Response
	Impact on tourism	Concern as to the potential impact on tourism of an industrial development, such as a spaceport, in a rural setting.	Impact on tourism assessed in Chapter 7: Community, Recreation and Tourism. Access restrictions along path network to Scolpaig Bay will be minimised to ensure that regular access is maintained and limited only during launch days. Landscape and visual impacts scoped out of the EIA in Chapter 8: Landscape and Visual Amenity.
	Employment opportunities	There was considerable interest as to whether the facility will provide valuable employment for the local community, particularly with rockets only being launched periodically through the year. Queries as to whether local contractors would gain employment for the site construction phase.	Socio-economic benefits assessed in Appendix 7-1: Socio-Economic Analysis. Estimated that approximately 26 jobs (full-time equivalent (FTE)) full and part-time jobs created during operation.
Environmental impact	Redundant rockets	Potential for environmental impact of launched rockets when no longer required, concern that there could be damage to the marine environment.	Jettisoned stages of LVs will be designed for recovery or to sink to the seabed. Each launch will be individually regulated by MSLOT under the Marine (Scotland) Act 2010 to ensure that deposits are licensed in accordance with the National Marine Plan and that impacts on the environment (human and natural), including other legitimate uses of the sea, are minimised or avoided. Impacts are assessed in Chapter 13: Marine Users, Chapter 14: Ornithology and Chapter 16: Marine Ecology.
	Public access	A number of individuals raised concerns regarding fencing and restrictions across the area/site.	Fencing will be in place around launch infrastructure only. The local path, contributing to the Wider Path network (in the Outer Hebrides Core Paths Plan) will be maintained through to Scolpaig Bay. Temporary restrictions will be in place for a short period during construction works and during launch events only (up to 10 times a year) when the Spaceport is operational.

General topic	Sub-topic	Description of concern	Response
	Noise	Numerous individuals raised concerns over sound pollution created by the launches.	Noise modelling undertaken for launch noise generation and sonic boom. Launch noise generation is below the 110 dB criteria at all identified receptors, and would only be experienced during the launch event, which is limited to 120 seconds at any one time, up to 10 times per year (worst case scenario). Sonic boom generation relevant to specific LV specifications only and will have a duration of <1 second.
Health and safety	Keeping the community safe	A number of individuals had queries as to how public safety would be maintained in the area during launch days.	Access restrictions will be in place during launch events. Safety procedures developed in conjunction with WIEPCG. Spaceport and each launch event regulated by the UK CAA on the basis of safety compliance.
		Queries raised as to how launching fuel would be transported to site and whether it would be transported via Calmac Ferries.	Non hazardous substances would be transported by standard means. Specific hazardous substances (e.g., concentrated hydrogen peroxide) would be transported privately.
Site infrastructure and operation	Site infrastructure	Information requested regarding radars, pads and heights of proposed buildings.	Site infrastructure plans provided in the Drawing Pack and Figure 4.3 and detailed in Chapter 5: Project Description.
	Site operation	Information requested as to the regularity of launching through the year and also what a launch day would comprise.	Launch events restricted to 10 events per year. Details of launch events provided in Chapter 4: Project Description.
Ethics	Benefit to humanity	It was queried as to how these satellite launches would benefit humanity.	Chapter 3: Site Selection and Alternatives provides details on the project rationale.

5.3.6 Public Consultation Events (2021)

A public information event was held across an online Microsoft Teams forum at 7 pm on 17 November 2021. The event was managed by CnES Media and publicised via press releases to welovestornoway.com and Am Papier. Participants were able to register to attend through 'Eventbrite' and a recording of the event was subsequently published on '*YouTube*'[5]. The meeting provided information on design evolution, the regulatory framework for the spaceport and associated operations, permanent / temporary infrastructure proposals, the EIA process and key mitigations. An opportunity was provided for members of the public to submit online questions to the panel comprising the project manager, the environmental consultants and technical consultants. A list of published answers to the questions

[5] https://www.youtube.com/watch?v=Zs8MXKKE3Lg

submitted during the session will be published on the CnES website following submission of the planning application. Key themes are outlined and responses are summarised in Table 5-2.

Table 5-2 Summary of main questions and responses generated during the online public information event on 17 November 2021

Question Theme	Response	Reference
Ecology: Surveys undertaken for Scottish Biodiversity List (SBL) species.	A number of the surveys include SBL species and habitats, which are often protected under other legislation e.g., numerous species of bird. Other species e.g., invertebrates are assessed in terms of impact based on habitat removal as a proxy.	Chapter 15: Terrestrial Ecology
Should bat surveys have been carried out.	No, the scope and content of the EIA is initially guided by responses from statutory and non-statutory stakeholders, however additional surveys may be undertaken if particular proposals suggest the potential for significant effects. No potentially significant effects were identified relating to bats, due to the quality of the surrounding habitat.	Chapter 15: Terrestrial Ecology
If launches will be undertaken during the breeding season	Yes, it is possible that launches may occur within the bird breeding season. Mitigation has been suggested for specific species at risk of significant impacts (corncrake).	Chapter 14: Ornithology
Desmid Survey	No, impacts on the Scolpaig Loch are limited to the construction period and mitigations are in place to manage sedimentation. Specialist surveys of this nature would be carried out on the advice of statutory consultees, or should a specific impact be identified.	Chapter 15: Terrestrial Ecology
Socio-economic: What kind of jobs will be created, and will they be well paid?	Permanent staff range include a director post, managerial roles, business development, environment, safety compliance, operations, and training management, with the potential to expand into further specialist roles. Other appointments are likely to include administrative and security.	Appendix 7-1: Socio-Economic Analysis
Noise: Level of noise on residential receptors.	Sonic boom and launch noise have been modelled; all residential receptors fall below significant threshold criteria in context of EIA. Therefore, no likely significant effects anticipated.	Chapter 19: Noise
Impact of noise on nesting bird colonies and marine life.	Launch noise was identified to have potentially significant effects for one species of bird, and otter. Mitigation has been developed to reduce impacts on these species to ensure that these will not be significant. Monitoring will be undertaken to ensure effects are understood and appropriate management measures will be undertaken.	Chapter 14: Ornithology Chapter 16: Marine Ecology
Pollution Control: How will pollution control measures work	Several tiers of pollution control are in place, from the design of the LV / fuelling infrastructure, containment of small spillages and management of catastrophic events.	Appendix 17.1 Outline Hazardous Materials Management Plan

Question Theme	Response	Reference
Infrastructure: How will temporary buildings be transported to site.	Temporary infrastructure will be transported to site via standard road haulage infrastructure. Specific arrangements will be made for containers with hazardous substances.	Appendix 17.1 Outline Hazardous Materials Management Plan
Plans for upgrading the roads.	There is no requirement to upgrade public roads, however a commitment has been made by the Project to reinstate road repairs, where necessary, following construction works. No abnormal loads will be required during construction or operational phases of the Project.	Chapter 4: Project Description, Chapter 11: Traffic and Transport
Query on plans to restore the farmhouse.	There are no current plans to restore the farmhouse, however the Habitat and Amenity Management Plan has provision to develop the archaeological heritage of the wider farm area.	Appendix 7.1: Outline Habitat and Amenity Management Plan
Query the maximum size of rocket.	The parameters of the EIA have been based on a review of representative launch vehicles; the largest specification known at this time is 10.8 m in length.	Chapter 4: Project Description
Impacts of windblown sand.	Outline maintenance requirements have been identified incorporating the impacts of windblown sand on infrastructure.	
Climate Change: Queries around greenhouse gas generation from the site and propellants.	Due to the high level of combustion efficiency required for launches, a number of propellant mixtures do not include fossil fuels, although kerosene-based fuels can be adopted. A small proportion of rocket fuels adopt hydrocarbon-based fuels as a propellant (kerosene). Due to the high levels of efficiency required for rocket fuels, non-fossil fuels are more frequently adopted as an alternative (hydrogen peroxide, liquid O_2). Due to the diverse nature of propellants, it is not possible to accurately quantify general greenhouse gas generation from the site, however a maximum materials inventory has been collated outlining the maximum quantities of materials that will be accepted at the site and emissions from individual propellant mixed (based on actual launch vehicles) is provided in the assessment.	Chapter 4: Project Description, Chapter 18: Air Quality and Heat, Chapter 20: Climate Change
Green credential of projects.	Sub-orbital launches are frequently used for climate and atmospheric research, in addition to testing orbital experimentation equipment and processes prior to launch. Measures to enhance the site focus on habitat enhancement initiates created in conjunction with the RSPB following a period of intensive grazing under private ownership, and in conjunction with a community grazing opportunity.	Chapter 3: Site Selection and Alternatives, Appendix 7.1: Outline Habitat and Amenity Management Plan

Question Theme	Response	Reference
Access: Current access arrangements do not support disabled users, can disabled access be mitigated.	Vehicle access to the site has, to date, been avoided due to the potential impact of unauthorised campervan use and potential disturbance by recreational users on wildlife. Pedestrian access to the area will be enhanced through the upgrading and widening of the existing access road from the A865 to Scolpaig Farm. An additional 10 parking spaces will be installed (including a disabled space), which will be available to the public when there are no launch restrictions. The 'kissing gate' will be replaced by a pedestrianised gate to enable access for recreational users of limited mobility.	Chapter 7: Community, Recreation and Tourism, Appendix 7.2: Outline Habitat and Amenity Plan
Closure of roads during launch events.	Traffic management measures are not required in terms of the operations of the Spaceport site from a launch safety perspective. However, Western Isles Emergency Planning Coordinating Group (WIEPCG) has stipulated that precautionary measures be put in place to manage against the risk of potential congestion arising from incidental spectators or vehicles stopping or parking in laybys causing obstruction on single track roads. Roads are not intended to be closed during a launch event, a clearway system (no stopping) will be implemented and managed by Police Scotland during any launch days. This is to ensure traffic flow is maintained along this route for the benefit of all road users and will promote the existing Highway Code responsibilities for vehicles on single track roads - i.e. no stopping on the single track road, the verge or in passing places and will be strictly enforced with the police having power to move/remove vehicles. As an emergency planning measure only, a Temporary Traffic Regulation Order (TTRO) will be applied for, which will include powers for the police to invoke a localised road closure, in the unlikely event that traffic congestion could lead to potential obstruction or danger for road users.	Chapter 11: Traffic and Transport
General: Potential for the site to expand into orbital. Rationale for the site not be at Scolpaig?	Infrastructure is specified and designed for sub-orbital launches only. The proposed application is for a permanent development based on market differentiation into the sub-orbital market and the presence of two other sites in Scotland serving the orbital market (Shetland and Sutherland). The rationale for the site is provided in relevant chapter.	Chapter 3: Site Selection and Alternatives
Does the EIA cover everything in the Atkins report?	The scoping report covered a substantially larger development than the current proposal. All consultees have been revisited and scope amended where necessary. The EIA Report extends the scope of the scoping report across specific areas and topics e.g., the marine environment.	
Will this application represent an amended or new application?	The previous application will be withdrawn.	

5.4 POST-SUBMISSION CONSULTATION

Consultation and engagement with regulators and wider stakeholders will continue, as appropriate, throughout the determination period. The Spaceport and each proposed launch activity will fall under the Space Industry Regulations 2021, subsequently further consultation will be required to secure a licence for the Spaceport and each launch will require specific launch licences from the CAA and MS-LOT.

The project design will continue to respond to stakeholder consultation for key topics, including the following:

- **MCA and UKHO** – definition of a relevant agreement as defined under the Space Industry Regulations 2021 outlining protocols for notifications and working;
- **MOD** – a dedicated agreement to determine a mechanism for managing interfaces with MoD activities and managing risk;
- **RSPB, SNH, CnES** – the ongoing development and management of a Habitat and Amenity Management Plan;
- **CnES** - ongoing management and reporting of post consent planning conditions, including monitoring;
- **WIEPCG** – consultation on an individual launch basis to plan for emergencies and unplanned events;
- **Marine Stakeholders** – a protocol has been developed for notification and communication for each launch. The procedures for this notification process are described in Appendix 13.1: Maritime Management Procedures and are likely to form part of future marine licence requirements; and
- **Local Community** – notifications of launch dates and procedures for accessing the site will be disseminated as outlined in the procedures within Chapter 4: Project Description.

6 APPROACH TO EIA

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6 APPROACH TO EIA

6.1 INTRODUCTION

The EIA Report has been undertaken in accordance with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (the 'EIA Regulations') to support the accompanying planning application for the Project. An EIA is required where a development is likely to have significant effects on the environment by virtue of factors such as its nature, size or location. The Project does not fall directly under either Schedule 1 (mandatory EIA) or Schedule 2 (thresholds and criteria for classifying development as Schedule 2 development) of the EIA Regulations. However, the proposals have undergone the process of EIA due to the nature of the proposals, proximity to sensitive areas (as defined by the EIA Regulations) and to address issues raised by statutory consultees and local stakeholders.

This EIA Report presents the results from the EIA of the Project; a process which draws together, in a systematic way, an assessment of a development's likely significant environmental effects. This ensures that the importance of the predicted effects, and the scope for reducing any adverse effects through avoidance or mitigation, are fully understood by stakeholders and the planning authority before it makes its decision. Information and conclusions on likely significant effects presented in the EIA Report will be taken into consideration by the planning authority and their advisors as part of the determination of the planning application.

The EIA Report is based on the Scoping Opinion provided by the planning authority and includes the information that may reasonably be required for reaching a reasoned conclusion on the likely significant effects of the Project on the environment, taking into account current knowledge and methods of assessment. It should be noted that the original Scoping Report was for a larger orbital development, which has since reduced in scope and footprint to a smaller sub-orbital development. A full summary of the project background and rationale for the Project is presented in Chapter 3: Site Selection and Alternatives.

This chapter summarises the overarching principles and approach taken for the EIA process for the Project, in accordance with the relevant legislative framework and guidance (detailed in Chapter 2: Legislation and Policy). The specific approach adopted for each EIA topic is covered separately in individual chapters under the section 'Assessment Methodology'.

6.2 EIA PROCESS

The EIA process for the Project complies with the requirements of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 ('the EIA Regulations') and ensures that a proportionate and transparent EIA Report is delivered focussing on likely significant effects with mitigation clearly set out. The legislative context is outlined in Chapter 2: Legislation and Policy.

6.2.1 Best practice and guidance

The approach to the EIA has been informed by the following:

- Planning Advice Note (PAN) 1/2013 Environmental Impact Assessment;
- Planning Circular 1/2017: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017; and

- Chartered Institute of Ecology and Environmental Management's (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. September 2018. V1.1 - updated September 2019.
- Scottish Natural Heritage (SNH) and Historic Environment Scotland (HES). Environmental Impact Assessment Handbook. Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland. Version 5, April 2018.

Figure 6.1 identifies the key stages of the EIA process in relation to the Project.

STAGE		ACTIVITY	AIM/OBJECTIVE	OUTPUT
	Screening	Legislative review	Determine if EIA is required for proposed project	Confirmation from statutory authority on whether or not EIA is required
	Scoping	Scoping study	Identification of key issues for consideration in EIA. Confirmation of approach to EIA and data requirements	Scoping Report for submission for consultation Scoping Opinion from statutory authority and their consultees
	EIA	Baseline description	To characterise the existing environment	Detailed description of existing environmental conditions against which impacts are assessed
		Specialist studies	To further investigate those environmental parameters that may be subject to likely significant effects	Specialist reports (Appendices to EIA Report)
		Mitigation and optimisation measures	Identify appropriate and practical mitigation/ enhancement measures that minimise impacts on a receptor when implemented	Suite of general and receptor-specific mitigation measures that minimise adverse and maximise beneficial effects and which can be fed back into the design process, as applicable
		Impact assessment	Classify sensitivity of a receptor Evaluate and predict the magnitude of impact Assess the likely significance of effects Assess the likely significance of cumulative effects	Identification of likely significant adverse and beneficial effects Identification of those impacts assessed to have no likely significant effects
		EIA report	Production of the EIA Report in accordance with relevant guidance, including a Non-Technical Summary (NTS)	EIA Report; NTS; Appendices; Figures and Attachments
		Consultation	Give members of the public and third parties the opportunity to review and comment upon the application both in pre and post submission stage	Public engagement events during site selection stage Public access to copies of the application Means to provide feedback
		Post submission	Liaison and consultation to resolve matters or representations/objections	Addendum to EIA Report (if required)
EIA CONSENT DECISION				

Figure 6.1 Key stages of the EIA process in relation to the Project

6.2.2 Baseline description and specialist studies

Baseline information was gathered to inform the EIA from both desk-based and field studies. Impacts are assessed in the context of the predicted baseline conditions and potential changes arising during the lifetime of and in response to or as a result of the Project.

6.2.3 Impact assessment

The general approach to EIA as described in this chapter has been adopted across all topics so far as possible. Where a deviation from this high-level methodology has been necessary, in accordance with specific technical guidance, this is described in the relevant technical chapter.

To assess the likely significant effects of the Project, the magnitude of the impact being assessed has been evaluated against the importance of the receptor in question. The value or importance of a receptor may depend upon its frequency or extent of occurrence at a geographical scale (international, national, regional or local level), in legislation, by conservation status, or by societal value.

The impact assessment involves the evaluation and prediction of the magnitude of impact of the Project on the existing environment. Spatial extent, scale (size, amount, volume and intensity), duration, frequency and timing, reversibility and sensitivity of receptors, are all factors for consideration of the magnitude of impact.

Assessment of likely significant effects

Significance is not defined in the EIA Regulations. The definition of a significant effect which has been adopted in this assessment is one which, in isolation or in combination with others, is material to the environment and should be taken into account in the decision-making process. The significance of an effect results from the interaction between the magnitude of impact and importance of those receptors that might be affected. Professional expert judgement is used to determine the likely significance of effects. The approach taken in many cases is topic-specific, in line with industry guidelines or other established approaches, and is presented in respective chapter assessments.

The significance of effects is assigned based on a matrix that combines the importance of a receptor and the magnitude of impact (see Table 6.1). This matrix approach is used to provide consistency across all the topics in the EIA and ensures that the process is transparent. The table provides a guide for the assessor and is not intended to be prescriptive. An impact assessed as having a 'moderate' or 'major' effect on a receptor is considered to be a 'likely significant effect' under the EIA regulations. CIEEM guidance (CIEEM, 2019) suggests avoiding reliance on a matrix approach for determining the significance of effects on ecological receptors, therefore a matrix approach is not used for ecological receptors instead the assessments are based on professional judgement.

The approach taken in each chapter is to assess the effects of residual impacts once any mitigation has been taken into account.

Table 6.1 Determining significance of effect

	Magnitude			
Importance	**High**	**Medium**	**Low**	**Very Low**
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible
Very Low	Negligible	Negligible	Negligible	Negligible

Where there are not anticipated to be likely significant effects for particular receptors, those topics will be addressed at an appropriate level of detail. Under the EIA regulations, such impacts may be of little or no significance for the particular development in question and, where included in the EIA report, the specific text will demonstrate that their possible relevance has been considered and to ensure there has been no change to the baseline situation since Scoping.

6.2.4 Mitigation

Mitigation measures have been identified during the EIA process and have been informed through stakeholder consultation and specific surveys and studies, along with best practice industry guidance. Mitigation measures are

intended to avoid or reduce potential impacts of the Project and include project design mitigation, general mitigation through best practice, and receptor-specific mitigation.

6.3 CUMULATIVE IMPACTS

Approach

The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 requires the likely significant effects of the development on the environment to be considered in relation to the characteristics and location of the development (criteria set out in paragraphs 1 and 2 of the regulations), with regard to the impact of the development, taking into account:

> *the cumulation of the impact with the **impact** of other existing and/or approved development.*

The approach to Cumulative Impact Assessment (CIA) also takes account of relevant guidance including CIEEM 'Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, freshwater and Coastal' (2019), Planning Circular 1/2017: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 and relevant principles within SNH's 'Guidance Assessing the Cumulative Impact of Onshore Wind Energy Developments' (2012).

SNH (2012) '*only seek cumulative impact assessments where it is considered that a proposal could result in significant cumulative impacts which could affect the eventual planning decision*', and therefore, all cumulative impact assessments should '*focus on the likely significant effects and in particular those which are likely to influence the outcome of the consenting process*'.

Projects within the same zone of influence that have been considered for inclusion in the CIA are as follows:

- Proposals for which consent has been applied which are awaiting determination in any regulatory process (not necessarily limited to planning permission);
- Projects which have been granted consent (not limited to planning permissions) but which have not yet been started or which have been started but are not yet completed (i.e. under construction);
- Proposals which have been refused permission, but which are subject to appeal and the appeal is undetermined to the extent that their details are in the public domain, proposed projects that will be implemented by a public body but for which no consent is needed from a competent authority;
- Projects that have submitted a Scoping Report are defined as being "reasonably foreseeable" and therefore may need to be included in the CIA; however, it is recognised that due to lack of information available only a qualitative assessment may be possible; and,
- In some situations, it may be necessary to also consider constructed developments whose full environmental effects are not yet felt and therefore cannot be accounted for in the baseline.

Existing activities will be considered in the main EIA Report as part of the existing baseline and therefore not in the CIA.

The potential for cumulative impacts with other developments is assessed within each chapter topic. Developments are screened against the Project to identify whether there is any potential pathway and mechanism for cumulative impacts to arise between multiple proposals.

If there is potential connectivity between impacts arising from the source project and pathway for cumulative impacts with other developments, those developments and relevant impacts are taken forward for further assessment. Where there is no potential pathway for cumulative impacts i.e. there is no physical overlap of any project elements from the

proposals or within the zone of influence between proposals, they are screened out and no further assessment is undertaken. In some cases where there may be no significant effects from the Project, cumulatively with other developments, they may give rise to potentially significant effects; therefore, these impacts may be screened in for further assessment.

Cumulative developments to be included

At the time of EIA preparation for the Project, there were no other EIA developments, recently consented or proposed with any adverse impacts of which would overlap with or have connectivity with the proposed Project, therefore there is no potential pathway for cumulative impacts with another EIA development.

Further, at the time of EIA preparation for the Project, there were no other non-EIA developments recently consented or proposed that had identified potential adverse environmental impacts or likely significant effects, the impacts of which would overlap with or have connectivity with the proposed Project, that required environmental assessment of such impacts.

Consideration was given to the impacts of the one non-EIA development identified within the vicinity of the Project: the recently consented 21/00184/PPD St Kilda Viewpoint Visitor Centre, for which a developer has previously submitted two related applications (19/00303/PPP – permitted with conditions in September 2019 and 17/00388/PPP – permitted with conditions in October 2017).

The 2017 Screening Opinion by Comhairle nan Eilean Siar concluded that the development was '*unlikely to have a significant effect on the environment'* and '*therefore an Environmental Statement is not required*'. No potential adverse impacts or likely significant effects were identified for the project, or required to be assessed.

As no likely significant effects have been identified for the St Kilda Viewpoint Visitor Centre development and consequently no assessment of impacts of significance have been undertaken, there is unlikely to be any potential pathways for significant cumulative effects and therefore is screened out of the cumulative impact assessment.

7 COMMUNITY, RECREATION AND TOURISM

CONTENTS

7 COMMUNITY, RECREATION AND TOURISM

7.1 INTRODUCTION

This chapter of the EIA Report describes the potential impacts of the Project on the local community together with recreation and tourism. The characteristics of the North Uist community and local tourist amenity and recreational activity receptors identified at Scolpaig and its surrounds are defined and described within the baseline. Potential impacts on receptors are identified for all phases of the Project and where relevant, mitigation measures are proposed to avoid, reduce, or offset any likely significant effects. In addition to the assessment of potential impacts, this chapter presents a high-level summary of wider Project aspirations and benefits that are anticipated to have a positive impact on the local community, recreation and tourism amenity.

Economic impacts of the Project are separately contained within Appendix 7-1: Socio-Economic Analysis, which presents the outcomes of an economic assessment commissioned by Comhairle nan Eilean Siar (CnES) and undertaken by MKA Economics in support of the planning application. The regional and local economic climate are defined and characterised within the baseline conditions with reference to important economic indicators, including Gross Value Added (GVA) of goods and services, as well as levels of income and employment. The economic impact of increased business tourism associated with the Project is additionally addressed within Appendix 7-1.

An Outline Habitat and Amenity Management Plan (HAMP), which sets out the key principals in the future management of the Scolpaig Farm site including habitat enhancement, grazing activities and public access and recreation, is provided in Appendix 7-2: Outline Habitat and Amenity Management Plan.

This Chapter should, where applicable, be considered in conjunction with Chapter 8: Landscape and Visual Amenity, Chapter 9: Land Use and Utilities, and Chapter 11: Traffic and Transport. It should be noted that potential impacts for these receptor topics have been scoped out of the EIA, however, a high-level overview for each is provided to summarise the information gathered and initial assessment undertaken to provide the basis for scoping out potential impacts.

Reference should be made to Chapter 13: Marine Users and Assets for the assessment of navigational impacts on recreational vessels.

7.2 STUDY AREA

The study area for the community, recreation and tourism assessment encompasses the island of North Uist. In addition to the island's scenic landscape, there are key amenities on the island such as the Hebridean Way cycling route which encircles the island, as well as archaeological interests and an extensive coastline which offers various recreational opportunities for locals and visitors. In particular, the baseline and impact assessment focus on amenities around Scolpaig and its surrounds, where it is considered potential impacts will most likely be felt at this scale with regard to community access through and around the Project site.

Data for the Western Isles region is also used to describe general population trends and provide a snapshot of the wider tourism sector.

7.3 LEGISLATIVE FRAMEWORK AND POLICY CONTEXT

The following legislation and policies are considered relevant to the community, recreation and tourism assessment:

Legislation

- The Land Reform (Scotland) Act 2003 establishes statutory public rights of access to land and inland water for recreational and other purposes and for crossing land and extends some of the provisions for these purposes to rights of way. As part of this Act, every local authority in Scotland is required to draw up a plan for a system of Core Paths sufficient for the purpose of giving the public reasonable access throughout their area. Although there are no core paths within the Project boundary, there are footpaths crossing the site which form part of the wider path network of the Outer Hebrides Core Paths Plan.
- The Space Industry Act 2018 includes powers to obtain rights over land and powers to temporarily restrict the use of land to protect safety in relation to a space launch (Sections 39-45). The Act grants the Secretary of State power to temporarily restrict the use of land during launch or landing so as to ensure safety both to the launch and to persons and property. This Act supersedes the Land Reform Act with respect to access.

Planning policy and advice

- The Outer Hebrides Local Development Plan (OHLDP) (Comhairle nan Eilean Siar, 2018) sets out CnES' planning framework for the Outer Hebrides and contains policies relating to economic development, countryside and coastal access, neighbouring land-use and heritage planning policies which the Comhairle will use for determining planning applications. An assessment of Project compliance with relevant OHLDP policies is presented in Chapter 2: Legislation and Policy.
- Outer Hebrides Core Paths Plan (CnES, 2010): The adopted Outer Hebrides Core Paths Plan provides the public with a system of core and wider path network routes which are sufficient for the purpose of giving reasonable access throughout the Outer Hebrides. The Plan has been developed in accordance with the Land Reform (Scotland) Act 2003.
- Scotland's Third Land Use Strategy 2021 – 2026 seeks to provide a planning and engagement model that ensures a smooth transition through the rural development process and which encourages outdoor recreation opportunities and public access.
- The National Space Strategy – sets out future growth opportunities in this area and recognises locations which will help realise this strategy.
- A Strategy for Space in Scotland details the scale of opportunity in Scotland and how the development of launch facilities in Scotland are important to achieve growth in this sector.
- Scotland Outlook 2030 Responsible Tourism for a Sustainable Future: sets out the vision and strategy for Scotland to become a world leader in 21st century tourism, including the supporting of remote, rural and island communities and economies.
- Scotland's National Marine Plan details a number of relevant policies that should be taken into account when deciding on uses of the marine environment, including the potential effects of a development on economic benefit and sustainable development, cultural and economic importance of fishing, the qualities important to recreational users, and access to coastal areas and resource for recreation or tourism purposes. The Project's compliance with these policies is presented in Chapter 2: Legislation and Policy.

7.4 DATA GAPS AND UNCERTAINTIES

There are no specific gaps or uncertainties of note identified from the baseline information gathered from the desk-based review (see Section 7.5.1). Where necessary, and appropriate, highest case estimates or range values of uncertain parameters have been applied to ensure a conservative and robust assessment of impacts.

7.5 METHODOLOGIES FOR SUPPORTING SURVEYS AND STUDIES

7.5.1 Desk Study

A desk-based review of published and other available data sources was undertaken to summarise the community, recreation and tourism baseline and inform the assessment of impacts within the defined study area, utilising relevant legislation and policies outlined in Section 7.3.

7.6 CONSULTATIONS

The key points raised by stakeholders during Scoping and pre-application consultation regarding community, recreation and tourism are presented in Table 7-1.

Table 7-1 Key issues raised by stakeholders during consultation

Stakeholder	Comment	Response/Action taken	Section cross-reference
CnES Environment Officer Scoping Opinion (2018)	While there are no Core Paths, footpaths forming part of the Wider Footpath Network cross the site.	Reference to the wider path network is made in the baseline description. Potential impacts surrounding the temporary disruption of access to tourist and recreational amenities is addressed within the impact assessment.	Section 7.8 – Section 0
Public consultation events (15/08/2019, 18/09/2019)	There was considerable interest as to whether the facility will provide valuable employment for the local community, particularly with rockets only being launched periodically through the year. Queries as to whether local contractors would gain employment for the site construction phase.	A detailed assessment of the Project's economic impact is provided in Appendix 7-1, where it is estimated that the operational facility will create 26 full-time and part-time jobs. A range of roles will be created including a director post, managerial roles, business development, environment, safety compliance, operations, and training management. Local contractors will be invited to tender for the construction works on the site.	Appendix 7-1: Socio-Economic Analysis
Public consultation events (15/08/2019, 18/09/2019)	A number of individuals raised concerns regarding fencing and restrictions across the area/site.	The project site is part of the former Scolpaig Farm, which was purchased by CnES on 6th June 2019 having formerly been under private ownership. CnES plan to allow controlled grazing throughout the site as well as enhancing access and infrastructure for walkers. Fencing will be in place around launch infrastructure only. Access will be maintained through Scolpaig Farm to Scolpaig Bay and the wider path network (in the Outer Hebrides Core Paths Plan). Temporary access restrictions will be in place for a short period during construction works and during launch events only (up to 10 times a year) during the Project's operational phase.	Section 7.9 – Section 0.

Stakeholder	Comment	Response/Action taken	Section cross-reference
Public consultation events (15/08/2019, 18/09/2019)	Concern regarding the potential impact on tourism of an industrial development, such as a spaceport, in a rural setting.	The majority of project infrastructure is based on existing infrastructure. Due to the limited scale of the Project, it does not fall directly under either Schedule 1 (mandatory EIA) or Schedule 2 (thresholds and criteria for classifying development as Schedule 2 development) of the EIA Regulations. However, proposals have undergone the process of EIA due to the nature of the proposals, proximity to sensitive areas (as defined by the EIA Regulations) and to address issues raised by statutory consultees and local stakeholders. The impact assessment concludes that the Project has no likely significant effects on tourism. Access along the wider path network will be maintained throughout the year, except on launch days when there will be temporary safety restrictions in place. There will be a maximum of 10 launch days per year. Access along the A865 will be maintained using traffic management measures, for a limited duration on day of launch only. This will comprise a clearway for vehicles (no stopping) to avoid potential congestion from incidental spectators and ensure continual flow of traffic. This reinforces an existing requirement for vehicles not to park on single track roads or passing places under the Highway Code. Due to the relatively small scale of the permanent infrastructure and the temporary nature and nominal scale of operational infrastructure associated with the Project, no likely significant effects on landscape and visual amenity are anticipated and has therefore been scoped out of the assessment.	Section 0 Chapter 1: Introduction Chapter 8: Landscape and Visual Amenity

Stakeholder	Comment	Response/Action taken	Section cross-reference
CnES Environment Officer Correspondence (12/04/2021)	The Land Reform Act 2003 has been superseded in this case by The Space Industry Bill 2017-2019. Space Industry Act 2018 section 41: Powers to obtain rights over land. Clauses 38–49 would grant powers to the Secretary of State to make orders in relation to land for the purposes of spaceflight activity. These include powers to obtain rights over land and powers to temporarily restrict the use of land to protect safety in relation to a space launch. The Government intends that these clauses should only be used as a 'last resort' should negotiations with landowners regarding access fail. Clause 40 allows the Secretary of State power to temporarily restrict the use of land during launch or landing so as to ensure safety both to the launch and to persons and property. As far as possible it would be advisable to provide alternative routes to allow access during construction and where it is safe during operation of the site. The idea of temporarily fencing off work areas would allow access around them to the coast and as much community engagement as possible would also be beneficial.	**Construction phase:** Access through the Project site will be restricted during construction works; however restrictions will be temporary over the relatively short construction timescale of five months. **Operational phase:** During the operational phase, access along the wider path network will be maintained throughout the year, except on launch days when there will be temporary safety restrictions in place. There will be a maximum of 10 launch days per year. Access along the Hebridean Way Cycling Route will be maintained using traffic management measures along a small section of the route, for a limited duration on day of launch only. This will comprise a clearway for vehicles (no stopping) to avoid congestion and ensure continual flow of traffic. This reinforces an existing requirement for vehicles not to park on single track roads or passing places under the Highway Code.	Section 7.10 Section 0

Stakeholder	Comment	Response/Action taken	Section cross-reference
CnES Environment Officer Correspondence (16/08/2021)	Requested that the local community is notified of launches as early as possible. Asked whether access restrictions to beach could be minimised as far as possible during construction phase. Suggested waymarkings or signage be installed to notify walkers and identify alternative routes to Scolpaig beach during construction activities.	An Advance Alert sign-up service with a dedicated email address and website will be made available for notification of activities relevant to key stakeholders including emergency services, hauliers and closest residential receptors. Additional measures will be implemented to ensure the wider community is notified in advance of launch operations. The Spaceport Operator will publish planned activities in local/social media, as well as the schedule of planned activity on their website. Regular updates will be emailed to local community groups. Temporary site access restrictions during the construction phase will be limited as far as practicable to enable access to safely resume from the Scolpaig Farm entrance off the A865. Alternative access to Scolpaig Bay and the wider path network will continue to be available, where appropriate signage and notices will be provided during construction as part of measures to reduce disruption to public road users.	Section 7.10 Section 0 Chapter 11: Traffic and Transport
Online public consultation event (17/11/2021)	Question raised on what kind of jobs will be created, and will they be well paid.	Permanent staff include a director post, managerial roles, business development, environment, safety compliance, operations, and training management, with the potential to expand into further specialist roles.	Appendix 7-1: Socio-Economic Analysis
Online public consultation event (17/11/2021)	Infrastructure query raised on plans to restore the farmhouse.	There are no current plans to restore the farmhouse, however the Outline HAMP has included provision to investigate opportunities to develop the cultural heritage of the Scolpaig Farmhouse in the future.	Appendix 7-2: Outline Habitat and Amenity Management Plan

Stakeholder	Comment	Response/Action taken	Section cross-reference
Online public consultation event (17/11/2021)	Access queries raised: Current access arrangements do not support disabled users, can disabled access be mitigated. Closure of roads during launch events.	Vehicle access to the site has to date been avoided due to the potential impact of unauthorised campervan use and potential disturbance by recreational users on wildlife. The upgraded road access track will improve access for walkers, cyclists and those with mobility issues, with safer road access through implementation of road widening for visibility splay at the site entrance. Following discussion with community representatives, it has been agreed that the kissing gate will be replaced with a pedestrian gate to allow disabled users to enter the site more easily. During a launch event a clearway system will be implemented on the A865, allowing free flow of traffic.	Appendix 7-2: Outline Habitat and Amenity Management Plan Chapter 11: Traffic and Transport

7.6.1 Planning Application Representations

A planning application to develop a proposed Spaceport at Scolpaig Farm in North Uist was submitted to CnES on 26 June 2019 (Planning Reference 19/00311/PPD). The planning application attracted significant public attention and consequently, approximately 640 representations from the public were received. Comments raised from both the public and consultees highlight key issues and concerns of relevance to the EIA process. Given the relationship to the EIA process, an analysis was undertaken of the representations submitted. The complete analysis is provided in Appendix 5-1: Review of Planning Representations.

In terms of community, recreation and tourism, approximately half of the received representations (309 / 48 %) expressed a predicted adverse effect on tourism as a key reason for their objection to the Project. Respondents advocated that the Project would cause a decline in tourism in the area which would have a knock-on effect on the local economy through loss of business. Furthermore, it was perceived that the Project would have a negative impact on walking and cycling, particularly the Hebridean Way cycle route. 105 representations / 16 % attracted concerns that the scenery and views enjoyed and photographed by cyclists would be impacted. Eight objections (1 %) were received indicating concerns over the perceived loss of access for both tourists and locals to the launch area and proposed radar tracking zones.

7.7 ASSESSMENT METHODOLOGY

7.7.1 Approach to assessment

Recreation and tourism

The general EIA process and methodology is detailed in Chapter 6: Approach to EIA. There is currently no prescribed methodology or standard guidance on the assessment of impacts on recreation and tourism within an EIA. The method adopted therefore focuses on the determination of baseline conditions through desk-based analysis, professional judgement, previous project experience and the general assessment approach as outlined in guidelines produced by the Chartered Institute of Ecology and Environmental Management (CIEEM) (CIEEM, 2018) and the Environmental Impact

Assessment Handbook (NatureScot, 2018), in which Appendix 6 Outdoor Access Impact Assessment presents a high-level description of potential impacts on outdoor access resources and possible mitigation strategies.

Wider social benefits

Wider aspirations for the Project are anticipated to bring several beneficial effects for the local community, recreation, and tourism amenity. This chapter provides a high-level overview of wider Project aspirations and benefits separately within Section 7.12. The assessment does not attempt to quantify these benefits. Direct economic benefits, such as GVA and employment, are quantified and assessed in Appendix 7-1: Socio-Economic Analysis.

7.7.2 Assessment criteria

The following qualitative criteria have been utilised to inform the assessment of significant effects (positive and negative), based upon consideration of the importance of community, recreation and tourism receptors (Table 7-2) and magnitude of impact (Table 7-3).

Importance

For the purposes of this assessment, the local community (i.e. people) receptor is considered to be of **high** importance. The importance of recreation and tourism receptors in relation to their status, or level of use, are defined in Table 7-2.

Table 7-2 Importance of recreation and tourism receptors

Importance	Criteria
High	Recreational activity / resource with high use or where there are no available alternatives regionally. Tourist site of national or international status or high visitor numbers (10,000s / year).
Medium	Recreational activity / resource with moderate use or where there are no available alternatives within North Uist. Tourist site of regional status or moderate visitor numbers (1000s / year).
Low	Recreational activity/resource with low use or where there are some alternatives within the region. Tourist site of local status or low visitor numbers (100s / year).
Very Low	Recreational activity / resource with little or no use or where there is access to many alternatives within the study area. Tourist site with few visitor numbers (10s / year).

Magnitude of impact

Sensitivity of receptors is an important consideration when determining the magnitude of impact. The sensitivity of important community, recreation and tourism receptors to potential impacts of the Project is based on their capacity to avoid, tolerate, recover from, or adapt to a particular impact.

The following factors are also considered when characterising the potential magnitude of a particular impact:

- **Extent**: the geographical area or size of population likely to be affected;
- **Scale**: the size, volume, amount and / or intensity;
- **Duration**: whether the impact is short, medium or long-term, permanent or temporary;

- **Frequency and timing**: the characterisation of when the impact will occur; and
- **Reversibility**: the characterisation of how easily / quickly the impact will be reversed if applicable.

The magnitude of a community, recreation and tourism impact is defined by the following criteria presented in Table 7-3. The table is not intended to be prescriptive and provides a guide only.

Table 7-3 Magnitude of impact (community, recreation and tourism)

Magnitude	Criteria
High	Long term and permanent change to amenity. Long term or permanent obstruction to recreational use. Long term or permanent obstruction to tourist site. Results in a dramatic change in tourist visits or recreational uses (positive or negative).
Medium	Long term but non-permanent change to amenity. An obstacle that creates a nuisance to recreational uses that must be avoided. Results in a moderate change in tourist visits or recreational uses (positive or negative).
Low	Medium term and non-permanent change to amenity. Short term, temporary obstacle to recreational use that can easily be avoided. Results in a minor change in tourism visits or recreational users (positive or negative).
Very Low	Short term and non-permanent change to amenity. A noticeable activity that does not create any obstacle or obstruction to recreational users. No noticeable change in tourist visits or recreational uses (positive or negative).

Significance of effects

The significance of an effect results from the interaction between an impact's magnitude and the importance of those community, recreation and tourism receptors that might be affected.

Table 7-4 and Table 7-5 are used to support the identification of significant effects to ensure that the process is consistent and transparent. However, the matrix tables provide a guide for the assessor and are not intended to be prescriptive. Professional judgement is used to determine the likely significance of effects. An impact assessed as having a *moderate* or *major* effect on a receptor is considered to be significant in the context of the EIA Regulations and is examined in more detail in this chapter.

The approach taken in the assessment is to assess the effects of residual impacts once any mitigation has been taken into account.

Table 7-4 Significance of effect (adverse)

	Magnitude			
Importance	**High**	**Medium**	**Low**	**Very Low**
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible
Very Low	Negligible	Negligible	Negligible	Negligible

Table 7-5 Significance of effect (beneficial)

	Magnitude			
Importance	**High**	**Medium**	**Low**	**Very Low**
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible
Very Low	Negligible	Negligible	Negligible	Negligible

7.8 BASELINE DESCRIPTION

7.8.1 Introduction

North Uist lies in the centre of a major island chain in Scotland, known as the Outer Hebrides or the Western Isles (Na h-Eileanan Siar), with neighbouring islands in the chain including Lewis, Harris, Benbecula and South Uist. North Uist encompasses an area comprised of the island of North Uist with inhabited islands Grimsay, Baleshare and Berneray, all of which are linked by causeway. A ferry link connects the island's principal village and ferry terminus of Lochmaddy to Uig on Skye, and from Leverburgh in Harris to Berneray. Scolpaig is situated on the north-west coast of North Uist and is known for its beautiful coastline and scenic landscape. The area is surrounded by a number of small settlements including Griminish, Tigh a' Gearraidh, Middlequarter, and Ceann a' Bhàigh.

7.8.2 Social and community context

Geographically, the majority of the Western Isles are classified as "very remote rural" under the Scottish Government Urban Rural Classification (2016). This extreme rurality poses a unique set of socio-economic challenges for the region and local community.

The mid-year population estimate for the Western Isles overall in 2020 was 26,500, which was a decrease of 0.8 % from mid-2019 to mid-2020 (CnES, 2021b). Demographically, the population of the Western Isles is ageing with a continuing trend of young adults leaving the islands for further education or employment purposes. In 2020, over 1 in 4 individuals (26 %) was aged 65 and over (CnES, 2021b). Due to a falling birth rate and ageing population, there is an uneven age profile compared to the rest of Scotland, with a higher percentage of the population being of pensionable age (Western Isles 25 %, Scotland 19 %), and a lower percentage of those who are working age (Western Isles 59 %, Scotland 64 %).

Over the period of 2018 – 2043 it is predicted that the Western Isles will have the largest decrease in households across Scotland's Local Authorities of 11 %. In 2018, one-adult households were predicted to be the most common throughout the Western Isles (41.8 % of total households), and this is projected to continue with the number of family households declining (CnES 2021a).

The population of North Uist (together with Berneray and Grimsay) was 2,905 in 2018, of which there are around 300 residents in the main village of Lochmaddy. The population has fallen by 2 % since 2011 (Outer Hebrides Community Planning Partnership; OHCPP 2018). According to the Scottish Index of Multiple Deprivation (SIMD) 2020, the population of the west of North Uist (data zone S01009021) is 700, of which 56 % are of working age which reflects the trend observed for the wider Western Isles (Scottish Government, 2020). Within this data zone there are 29 % of premises that do not have access to superfast broadband (defined as a minimum of 30 Mbit/s download speed) (SIMD; Scottish Government 2020).

The traditional mainstays of the local economy on North Uist have been crofting and fishing. Today the largest sources of employment on North Uist include the following (OHCPP, 2018):

- Health and social work activities;
- Construction;
- Agricultural and fishing activities;
- Wholesale, retail, repair of motor cars;
- Education; and
- The biggest employer outside of the public sector is QinetiQ, the Ministry of Defence Hebrides Range operator.

In 2017, the OHCPP surveyed communities across the Western Isles to identify their priorities for local improvement, as part of the North Uist & Benbecula Locality Plan. The main priorities for improvement as emphasised by North Uist and Benbecula communities were as follows: work and local economy (17 % of survey respondents), facilities and amenities (13 %), public transport (11 %) and play and recreation (10 %) (OHCPP, 2018).

For a detailed examination of the economic baseline of North Uist and the wider Western Isles, see Appendix 7-1: Socio-Economic Analysis.

7.8.3 Recreation

The Western Isles landscape offers opportunities for a wide range of recreational activities to be undertaken by both residents and visitors. The scenery, coastline, history and wildlife of the Western Isles provide a major focus for much of the outdoor recreational activities. The Project site is directly adjacent to the South Lewis, Harris and North Uist National Scenic Area (NSA; see Chapter 8: Landscape and Visual Amenity and associated visuals for reference to the Project's Zone of Theoretical Visibility in relation to the NSA). The Outer Hebrides Visitor Survey 2017 reported a respective 15 % and 7 % of respondents identified a specific sport or activity and interest in archaeology as their motivation to visit the Western Isles (CnES and Visit Scotland, 2018).

Recreation and tourism amenities in the vicinity of the Project site is presented in Figure 7.1. Under private ownership, public access through Scolpaig Farm was not facilitated despite the presence of existing footpaths in the area as part of the wider path network.[1] There is anecdotal evidence from survey visits that since spring 2019, following the purchase of the farm by CnES, there has been a marked increase in recreational activity (see further details in Chapter 14: Ornithology and Chapter 15: Terrestrial Ecology). Pedestrian access is currently maintained on site in accordance with the Land Reform (Scotland) Act 2003. A "kissing gate" was installed at the end of the Scolpaig track which facilitated pedestrian access through the site, while the main gate is locked to discourage vehicular access. Limitation of vehicular access serves to avoid disturbance to ground-nesting birds (including corncrake) throughout the machair habitat, and to ensure recreational access is compatible with any agricultural lease for the site. Furthermore, the existing track is in poor condition and parts of the road are liable to flooding.

Walking and cycling

Walking was reported as the most popular leisure activity by 83 % of respondents in the Outer Hebrides Visitor Survey 2017 (CnES and Visit Scotland, 2018). There are several walking trails available across North Uist with trails

[1] It should be noted that the existing wider path network is currently not marked out on site and is indicative only.

encompassing peak of Beinn Lee above Lochmaddy, North Lee and Udal to the Langass woodland. To the west of North Uist there is an uphill trail climb to Clettraval where the St Kilda viewpoint is located.

Scolpaig Farm is used by islanders and tourists for walking, birdwatching and photography. The sandy beach at Scolpaig Bay and routes from the farmhouse along the coast, out to Griminish Point and to the summit of Beinn Scolpaig (each just less than 1 km north and north-west of Scolpaig Farm) appear to be especially popular, as well as an unusual "geo" or inlet feature north of the site. There are no Core Paths within the site, however, the wider path network follows the coastal perimeter of the site with connections south to the A865 via Scolpaig Farm (following the farm access track) and Griminish to the east (following the wider path network track which traverses Beinn Scolpaig). Figure 7.2 presents the wider path network and its indicative route through the Project site boundary, as well as the proposed minor rerouting of the path between the Scolpaig farmhouse and planned vehicle turning area.

The Hebridean Way is a major cycling route through the Western Isles, with both routes beginning on Vatersay and the cycling route ending at the Butt of Lewis, and the walking route terminating in Stornoway. The A865 road to the west of North Uist forms part of the Hebridean Way cycling route (National Cycle Network Route 780), while the walking route progresses from south to north along off-road tracks from Clachan in North Uist over to Locheport and Langass, then onward to Lochmaddy. Walkers then continue north to Berneray where they catch the ferry to Leverburgh to pick up the route. The Hebridean Way is renowned for spectacular landscapes and rich wildlife, and is popular with wildlife/outdoor enthusiasts, birdwatchers, cyclists following the route and other travellers journeying through the Western Isles. At its closest point the Hebridean Way cycling route is situated approximately 0.7 km from the Project site, where the farm access track meets the A865.

Angling and water sports

North Uist is a key destination for recreational and sporting anglers with brown trout, sea trout and salmon season open from mid-March to end of October. Fishing at Loch Scolpaig, adjacent to the Project site, is controlled by North Uist Angling Club who also have the rights to fish Balranald Estate (over 4.8 km from the site) and Newton Estate to the further north-east of the island. North Uist Estate controls the larger part of the available fishing across the island including Loch Hosta and Loch nan Clachan, situated approximately 3 km south and 4.5 km east of the Project site.

The marine environment around the Western Isles is a significant recreational resource and is important to the visitor experience of the environment. The Scottish Marine Recreation and Tourism Survey (SMRTS) indicates that activities such as sea angling, power boating, motor cruising and sailing are likely to occur in the vicinity of and within the study area (Marine Scotland, 2016). Prime beach locations offer enjoyment by locals and visitors to undertake additional recreational activities such as sea swimming, scuba diving and surfing (CnES, 2018). Wild swimmers have been observed at Scolpaig Bay adjacent to the Project site (Appendix 14-1: Ornithology Technical Report). Hosta beach (Tràigh Stir), situated approximately 2.6 km south of the Scolpaig Project site, is recognised as a popular surfing beach accessible off the A865 (CnES, 2018). Due to the sensitivity of Hosta beach as a surfing location, the area is considered as a potential constraint to marine fish farm development as outlined in the Outer Hebrides Local Development Plan (OHLDP; CnES, 2018).

The St. Kilda Challenge[2] is an international sailing event which typically occurs biannually and involves a yacht race with options of a passage race between Rathlin Island and St. Kilda, as well as a sprint race around St. Kilda, which starts and finishes in Lochmaddy (via the sound of Harris). Shore-based festivities would normally occur in and around

[2] https://www.thestkildachallenge.co.uk/

Lochmaddy. No impacts are expected for the international St Kilda sailing challenge, and therefore this activity will not be considered further in the impact assessment.

7.8.4 Tourism

Western Isles

Sustainable tourism is identified in the Scottish Government's Economic Strategy as one of six Growth Sectors where Scotland is recognised to have a distinct comparative advantage (Scottish Government, 2015). The Western Isles is a well-known tourism destination, where in 2015 it was the Local Authority with the highest share of local Gross Value Added (GVA) contributed by the tourism sector, at 10.9 % (Tourism Leadership Group, 2018). The Outer Hebrides Visitor Survey 2017 indicated that since the previous survey in 2013, there was an increase in tourism volume and value to the Western Isles, with 218,590 visitors contributing a total economic value of £65 million in 2017 (CnES and Visit Scotland, 2018). In 2019, tourism directly supported the equivalent of 1,500 full-time jobs in the Western Isles (Scottish Government, 2021).

In terms of general trends, the Outer Hebrides Visitor Survey 2017 (CnES and Visit Scotland, 2018) identified that the total average spend per person while on the Western Isles was approximately £309, excluding travel expenditure and full package costs (including these factors raised this value to approximately £430). Accommodation (including food and drink) was the category with the highest average spend per person at £125. The primary influences for those visiting the islands were for leisure (68 % of survey respondents), business (19 %), or visiting friends and relatives (VFR; 12 %), of which leisure visitors had the highest average spend per person per trip (£343.77) compared to business or VFR visitors (respectively £212.06 and £177.60). The peak season for tourism in the Western Isles is June – August.

From 2020 the COVID-19 pandemic has had a detrimental impact on the tourism industry in Scotland and worldwide. The estimated Gross Value Added (GVA) decline in the Highlands and Islands in 2020 for accommodation and food services is -39 % (£259 m) and -21 % (£35 m) for the arts, entertainment and recreation sector. The estimated decline in visitor spend in the Highlands and Islands in 2020 is £370 – 584 m (Highlands and Islands Enterprise, 2020).

Post-pandemic recovery of the tourism sector in the Western Isles follows Outer Hebrides Tourism's (OHT) Destination Strategy 2030, which sets out the strategic framework for growing tourism in the region, and the means to achieve the Strategy's vision and mission (Outer Hebrides Tourism, 2021). The Destination Strategy was developed as the local response to Scotland's Outlook 2030 and to reflect the impact of COVID-19.

North Uist

North Uist's varied landscape is characterised by its numerous peat bogs, lochans, and beaches and is a popular destination for its archaeological interests, wildlife watching and recreation with visitors arriving primarily via ferry at Lochmaddy. The Outer Hebrides Visitor Survey 2017 reported just under a just under a third of visitors to the Western Isles visited North Uist (29 % of survey respondents), staying on an average of three nights (CnES and Visit Scotland, 2018).

Local transport and accommodation

The Outer Hebrides Visitor Survey 2017 indicated that 82 % of leisure visitors used cars while visiting the Western Isles (CnES and Visit Scotland, 2018). The proposed Project site adjacent to Scolpaig Farm is situated along a farm access track off the A865, a single-track road with passing places and which forms the main route out to the west of North Uist.

There are a small number of accommodation providers (lodges, cottages, self-catering properties) scattered to the west of North Uist, of which the closest to the Project site is Eagle's Rest Self-Catering off the A865, at approximately 1.78 km

south. There is a campsite on the coastline at the Balranald Nature Reserve, approximately 5.45 km south-west of the Project site.

Main tourist attractions

The Outer Hebrides Visitor Survey 2017 (CnES and Visit Scotland, 2018) reported the following tourist attractions as the most popular for visitors to North Uist and the neighbouring island of Berneray:

- Balranald Nature Reserve (29 % of survey respondents): managed by the Royal Society for the Protection of Birds (RSPB). The reserve is composed mainly of sand dunes, coast, and ocean habitats and is a particular draw for bird enthusiasts to experience the rare corncrake. Access to the nature reserve is off the A865, where car parking is available by the RSPB information centre just outside the village of Hougharry/ Hoga Gearraidh (approximately 5 km from the proposed development at Scolpaig). On the reserve there is a waymarked trail which takes the visitor around 4.5 km of coastline. The Balranald RSPB Reserve Route forms Core Path no. 18 in the Outer Hebrides Core Paths Plan (CnES, 2010).
- St Kilda viewpoint (24 %): located at Clettreval Hill approximately 4.33 km south-west from the Project site, this viewpoint looks out to the World Heritage site of St Kilda archipelago.
- The Hebridean Smokehouse (24 %): a smokehouse and gift shop located in Clachan, approximately 13.64 km south-east of the Project site.

Boat tours throughout the Western Isles are popular with tourists with trips available out to St Kilda, Mingulay, as well as the Shiant, Flannan and Monach isles (departing from various locations). Navigational impacts associated with launch operations are assessed in Chapter 13: Marine Users and Assets.

There are many archaeological interests throughout North Uist with Scolpaig Tower ("Dun Scolpaig") situated closest to the Project site, near Scolpaig Farm in Loch Scolpaig (approximately 420 metres south-east). Dun Scolpaig is a nationally important Scheduled Monument designated by Historic Environment Scotland, represented by a Georgian Folly built in 1830 on a circular island in Loch Scolpaig. Within a 5 km radius of the Project site there are further 12 Scheduled Monuments of cultural heritage importance (refer to Chapter 10: Archaeology and Cultural Heritage for a more detailed baseline description and assessment of potential impacts on archaeological and cultural heritage assets).

The location of key tourist amenities (including visitor accommodation) is presented in Figure 7.1.

7.8.5 Summary

The baseline conditions within the study area are summarised as follows:

Social and community context

- The Western Isles is classified as a "very remote rural" location which faces socio-economic challenges caused by long-term population decline as a result of an ageing population, low birth rates, and out-migration amongst primarily young demographics.
- The trend of depopulation is reflected on North Uist where there has been a 2 % decline in the population since 2011, and approximately just over half of the population are of working age.
- Traditional industries across North Uist have been crofting and fishing, however there has been growth into other sectors such as health and social work, construction, and education. The MOD Hebrides Range is a significant employer outside of the public sector.

- A set of priorities for local improvements has been identified by the North Uist and Benbecula community in which work and local economy, facilities and amenities, public transport, and play and recreation were the most commonly reported by survey respondents (North Uist & Benbecula Locality Plan; OHCPP, 2018).
- The baseline summary concludes that the local community (i.e. people) is a receptor of **high** importance.

Recreation and tourism

- The Project site is used by locals and visitors for walking, swimming, birdwatching and photography, with access to the beach and coastline through Scolpaig Farm. Access tracks around the Project site are part of the wider path network, with the nearest Core Path situated approximately 5 km south at Balranald Nature Reserve (Core Path no. 18). Due to the existing pedestrian access through Scolpaig Farm, as well as proximity of the site to the A865/Hebridean Way national cycle route, swimming, walking and cycling are considered to be activities of **medium** importance to the Project site.
- Recreational angling is popular throughout North Uist and at its closest location, occurs adjacent to the Project site at Loch Scolpaig under management of the North Uist Angling Club. Taking into account the presence of other angling destinations accessible southbound of the Project site along the A865, as well as a popular surfing location at Hosta beach, angling and other water sports are considered to be of **medium** importance to the Project site.
- Tourism is central to the Western Isles economy. Following the impacts of the COVID-19 pandemic, the recovery of tourism is highlighted as a crucial strategy to strengthen economic resilience throughout the Western Isles. Therefore, the tourism sector is considered to be **high** importance to the Western Isles.
- North Uist is a tourist draw for its archaeological interests, wildlife watching and recreation. There are number of archaeological interests within the vicinity of the Project site, with Dun Scolpaig located closest to Scolpaig Farm. However popular tourist attractions in North Uist such as Balranald Nature Reserve, St Kilda viewpoint are each situated several kilometres from the Project site. There is a low number of tourist accommodation scattered to the west of North Uist. Therefore, tourism amenity is considered to be of **low** importance to the Project site.

7.9 POTENTIAL IMPACTS

The following potential impacts, including any with potential positive or negative and direct, indirect or secondary effects have been established through scoping (see Annex D: Scoping Opinion (2018)) and consultation with key stakeholders (see Section 7.6).

The potential impacts on community, recreation and tourism, without mitigation, which have been identified as relevant for the Project are:

Construction Phase

- Disruption or severance to community, recreational and tourism amenities during construction works.

Operation Phase

- Disruption or severance to community, recreational and tourism amenities during launch operations; and
- Access enhancement and enjoyment for recreational users of Scolpaig Farm.

Decommissioning Phase

- Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase.

There is the potential for the facility to act as a business tourism attraction for the Western Isles, as additional business-related travel will be generated by those who would come to the islands for the planning and preparation of their activities, as well as for subsequent test or launch campaigns. The economic impact associated with increased business tourism is separately addressed within Appendix 7-1: Socio-Economic Analysis.

It should be noted that potential effects on landscape and visual amenity and traffic and transport have been scoped out due to the relatively small scale of the permanent infrastructure and the temporary nature and nominal scale of operational infrastructure associated with the Project (Chapter 8: Landscape and Visual Amenity; Chapter 11: Traffic and Transport). Therefore, indirect effects on community, recreation and tourism receptors are scoped out.

Wider project aspirations and benefits

Wider Project aspirations and benefits are anticipated to have a positive impact on the local community, recreational and tourism amenity. High-level descriptions of each benefit are presented in Section 7.12, however they have not been assessed as part of the EIA. Benefits include the following:

- Economic development through public participation and community benefit;
- Environmental stewardship and community use of the Scolpaig Farm site;
- Beneficial effects for the Western Isles community through Science, Technology, Engineering and Mathematics (STEM) education and training programme;
- Enabling research and development;
- Enhancement and improved sustainability of MOD Hebrides Range; and
- Beneficial effects from extension of broadband fibre connection to the Project site.

7.10 MITIGATION AND MANAGEMENT MEASURES

The following mitigation and management measures are proposed to remove, avoid, reduce and, where possible, offset any impacts which could, either by themselves or in combination with others, have a significant adverse effect. These measures are considered in the assessment of residual effects in Section 0.

Table 7-6 Mitigation measures

Ref.	Title	Description
GM03	Site Access Management and Safety (Operation)	Where access restrictions are required for public safety during the operational phases of the Project, the public will be notified through appropriate signage and markers. These physical demarcations may include: • Operational launch site mobilisation and demobilisation: signage will be provided for the public while temporary fencing or marking of areas will be required for security purposes. • Launch events: flags, temporary fencing or tape, and signage will be provided to the public and monitored or enforced by security personnel for safety purposes.
GM04	Site Access Management and Safety (Construction)	• Provision of appropriate signage, notices during construction period and information on operational launch activities. • Best practice construction traffic measures to minimise material/dust on public roads i.e. All HGVs to be sheeted to reduce dust and stop spillage on public roads; and wheel cleaning arrangements in place, where necessary.

Ref.	Title	Description
GM05	Pre-Launch Communications: Advance Alert and Community Notifications	An Advance Alert / Pre-Launch Contact Service will provide advance notice of activities relevant to key stakeholders including emergency services, fishermen, hauliers and closest residential receptors. Stakeholders can register for the alert service on a dedicated email address and can view the range activity programme on a dedicated website. The Spaceport Operator will additionally publish notifications in local/social media, their website and at key information points in the surrounding locality to the wider community and stakeholders informed of key project activities and any associated restrictions. Measures are likely to include: • Regular updates via e-mail to local community groups. • Website – showing schedule of planned activity. • Social Media – posts about planned activity.
GM07	Construction Hours	Movement of HGVs will be restricted to 0700-2000 Monday to Friday and 0700 – 1800 on Saturdays. There will be no Sunday working.
GM08	Launch day traffic management measures	Traffic management measures are not required in terms of the management / operations of the Spaceport site from a launch safety perspective. However, Western Isles Emergency Planning Coordinating Group (WIEPCG) has stipulated that precautionary measures be put in place to manage against the risk of potential congestion arising from incidental spectators or vehicles (more generally) stopping or parking in laybys causing obstruction on single track roads. Police Scotland will be responsible for monitoring the route and have stated that for each launch event management measures will include: • A dedicated police patrol to monitor traffic during a launch event. • A temporary clearway (no stopping) along the A865 (from Clachan to Lochmaddy via the west-side of North Uist) during each launch day. This is to ensure traffic flow is maintained along this route for the benefit of all road users and will promote the existing Highway Code responsibilities for vehicles on single track roads - i.e. no stopping on the single track road, the verge or in passing places and will be strictly enforced with the police having power to move/remove vehicles. • Proactive media releases to notify local community of planned launch days and discourage motorists from causing congestion along the route. • As an emergency planning measure only, a Temporary Traffic Regulation Order (TTRO) will be applied for, which will include powers for the police to invoke a road closure, in the unlikely event that traffic congestion could lead to potential obstruction or danger for road users. The efficacy of these measures will be reviewed following initial launches with the WIEPCG, with the opportunity to step-down measures, if appropriate for future launches.

Ref.	Title	Description
COM01	Habitat and Amenity Management Plan (HAMP) & Environment Officer	A Habitat and Amenity Management plan will be developed post-consent to expand the current habitat enhancement proposals and integrate these with commitments arising from the EIA / planning process as part of a wider HAMP. Under CnES ownership, the site is currently being managed to allow access for recreational use, community grazing opportunities, and enhancement of habitats in consultation with the RSPB. An outline HAMP outlining key commitments and principals is provided in Appendix 7-2 and will be developed post consent in conjunction with a consultative Advisory Group. Coordination and management of the HAMP will be delivered by an Environmental Officer contracted by Spaceport 1. Commitments and development principals centre around the following: • Habitat enhancement for specific species and habitats; • Public (including users of limited mobility) access; • Community grazing opportunities; • Cultural heritage; and • Fisheries.
COM02	Public access and users of limited mobility	Pedestrian access to the area will be enhanced through the upgrading and widening of the existing access road from the A865 to Scolpaig Farm and additional layby adjacent to Loch Scolpaig. An additional 10 parking spaces will be installed which will be available to the public, including one accessible space and two extended spaces for larger vehicles. The existing 'kissing gate' will be replaced by standard pedestrian access to facilitate access for users of limited mobility.

7.11 IMPACT ASSESSMENT

Construction Phase

7.11.1 Disruption or severance to community, recreational and tourism amenities during construction works

Impact overview (without mitigation)

Tourism is an essential sector of the Western Isles economy, and its recovery key to post-pandemic economic resilience. Visitors will travel to the North Uist to visit destinations such as Balranald Nature Reserve and other local tourism amenities. Cyclists will use the A865 as part of the Hebridean Way, while walkers will use the wider path network through the Project site to access Scolpaig Bay and surrounding hills and coastline. Other visitors will avail of the various recreational activities on offer such as angling and other water sports. The main impact to community, recreational and tourism amenity during the construction phase is likely to be temporary disruption, both in terms of time and access. This is likely to be due to busier roads caused by construction traffic associated with the Project. In particular, locals and visitors using the A865 may be temporarily inconvenienced as this is the main delivery route for materials and components to the site and access route for staff. Access through Scolpaig Farm to specific parts of the wider path network and Scolpaig Bay may also be temporarily limited for public safety during upgrade works on the farm road access track and causeway culvert. This may also disrupt potential angling activity in Loch Scolpaig.

Mitigation

The Developer will implement standard best practice mitigation measures to minimise the temporary effects relating to traffic associated with the construction phase of the project, which will include restriction of construction hours (GM07) and provision of appropriate signage and notices during construction periods (GM04), as well as liaison with the local

community and key stakeholders for prior notification of construction activities (GM05). Full traffic mitigation measures are detailed in Chapter 11: Traffic and Transport.

Assessment of residual effects

Magnitude of impact

Potential impacts on traffic and transport have been scoped out of the assessment due to the relatively small scale of the Project and limited infrastructure requirements (see Chapter 11: Traffic and Transport). Standard best practice and construction management measures will be implemented to ensure any disturbance to the local community and visitors is minimised. Potential journey delay on the A865 would be limited and unlikely to impact tourist or local amenity to the extent of delay beyond normal busy periods experienced on the A865. Potential journey delays will also be localised to a small section of the A865 and may occur occasionally throughout the duration of the construction programme of approximately five months. On the basis of this construction timetable, it is anticipated there will be approximately 380 deliveries of materials to the site with up to 19 HGV movements per week on average. It is anticipated that construction traffic will use the route from Clachan along the west side of the island to the site along the A865.

Access to the wider path network and to Loch Scolpaig for fishing may be limited through the farm road access from the A865 for a temporary period during construction works for public safety, such as the road and causeway culvert upgrade works. This is likely to be for a limited period within the five-month construction phase, during which the majority of works will be focused around the launch pad area. Where it is possible to open pedestrian access on this section of the farm road during the construction phase, such as following completion of the access upgrades, appropriate fencing and signage will be erected for public safety. Specific site management measures will be determined by the appointed contractor during construction and in accordance with the relevant health and safety requirements.

While access will be limited through Scolpaig Farm during construction activities, the overall wider path network will still be accessible via Griminish, for which the turn-off the A865 is situated approximately 1.78 km east of the end of the farm access track to the Project site (see Figure 7.2). Loch Scolpaig will still be able to be used by recreational anglers during the construction phase, however, while there are temporary farm access track restrictions anglers may be required to fish from an alternative section of the Loch for a limited period.

In summary, the disruption to access and potential journey delay is likely to be temporary in duration and limited in extent to within the planning boundary. Alternative access to Scolpaig Bay and the wider path network will continue to be available, while any site access restrictions required during the five-month construction phase will be limited as far as practicable to enable access to safely resume from the Scolpaig Farm entrance off the A865. Therefore, the magnitude of this impact is assessed as **low**.

Furthermore, it is considered unlikely that this impact will indirectly affect the wider tourism sector through changing visitor numbers and expenditure, due to the small scale and temporary nature of disruption to access to tourism amenity and recreation. Therefore, the magnitude of indirect impacts on the tourism sector is considered as **very low**.

Significance of residual effects

The local community is a receptor of **high** importance. The magnitude of this impact is assessed as **low**. Therefore, it is anticipated that there will be **minor** residual effects which are **not significant**.

Recreation is considered of **medium** importance to the Project site. The magnitude of this impact is assessed as **low**. Therefore, it is anticipated that there will be **negligible** residual effects which are **not significant**.

Tourism amenity (including accommodation) is considered of **low** importance to the Project site. The magnitude of this impact is assessed as **low**. Therefore, it is anticipated that there will be **negligible** residual effects which are **not significant**.

The tourism sector is of **high** importance to the Western Isles. The magnitude of this impact on the wider tourism sector is assessed as **very low**. Therefore, it is anticipated that there will be **negligible** residual effects which are **not significant**.

Operational Phase

7.11.2 Disruption or severance to community, recreational and tourism amenities during launch operations

Impact overview (without mitigation)

Following construction and throughout the Project's operational phase, the farm building compound and launch pad will be fenced off to secure the draining and containment systems for health and safety, and to prevent livestock from contaminating the system. However, pedestrian access will be maintained between Scolpaig Farmhouse and the farm byres to Scolpaig Bay. During launch preparation, launch events and demobilisation, two levels of access restrictions will be implemented depending on the nature of launch activities at the site (refer to Chapter 4: Project Description for full operational details). These restrictions will result in a temporary disruption of access and in particular, to marine recreational activities during launch events where safety exclusion areas may include the coastal area around Scolpaig Farm and the area of sea overlapping with a launch trajectory. Users of the A865/Hebridean Way cycle route may be temporarily inconvenienced due to traffic management measures during launch events.

Mitigation

Advance community notifications will be provided through an Advance Alert / Pre-Launch Contact Service, social media and the Spaceport Operator website to ensure that all relevant community, recreation and tourism stakeholders are informed of key operational activities and associated restrictions (GM05). Where access restrictions are required for public safety throughout the launch preparations, launch events and demobilisation stages of the operational phase, appropriate signage and physical markers will be provided to further notify the public (GM03).

Specific traffic management measures to ensure the continued flow of traffic for road users will be confirmed in advance of any launch in consultation with the WIEPCG and prior notification will be given to the local community and key stakeholders. No road closures will be required with a clearway traffic system put into place during each launch event to ensure traffic flow is maintained for all users (GM08). This enforces existing Highway Code responsibilities for vehicles on single track roads i.e. no stopping on the single track road, the verge or in passing places. The police will have powers to move/remove vehicles obstructing safe passage.

An Outline HAMP is provided in Appendix 7-2 which sets out the principles for future management of the Scolpaig Farm site including public access and recreation. The Plan will be fully developed by CnES post-consent in consultation with stakeholders (COM01).

Assessment of residual effects

Magnitude of impact

Public access will be restricted during launch site preparation, launch events, and demobilisation for site security purposes and public safety, which is a legal obligation of the Spaceport Operator. Site management, safety measures

and traffic management measures will comply with relevant regulations and will be consulted upon and confirmed in agreement with Western Isles Emergency Planning & Co-ordinating Group (WIEPCG)[3], where appropriate.

Launch Event Preparations (Site Mobilisation to Demobilisation)

Whilst the site is mobilised for a launch event and equipment / materials are on site, some area-specific access restrictions may be enforced, defined by the nature and quantity of materials retained on site and the security preferences of the LO. Should any hazardous materials be stored at the site, temporary areas of restricted access may be defined under a Safety Clear Zone (SCZ)[4], in addition to any requirements under the Dangerous Substances Explosive Atmosphere Regulations (DSEAR) 2002.

The restrictions, exclusions and warnings that apply to a SCZ will differ depending on what activity is being carried out, however a radius of approximately 40 m to 160 m from the point of storage may be implemented for the most hazardous material expected to be stored at the site in significant volume; hydrogen peroxide (H_2O_2). Due to the degradation rate of some oxidisers, the storage of hazardous substances is likely to be very short term, and the duration of this period will last up to the launch event only. The duration of these access restrictions is not expected to exceed 10 days per launch event. The public will still have access to the site (with exception of the fenced off Spaceport infrastructure area illustrated on Drawing 0022).

Launch Event

During a launch or testing event, a SCZ will be implemented which may extend up to 430 m, depending on the nature of the launch or test. The duration of the restrictions will be one day, although occasionally a launch may be delayed, due to technical or weather-related issues, and there may be a requirement for 1-2 'back-up days' where the launch may be reattempted. Notice will be provided to the public and appropriate markers, including flags, temporary fencing or tape will be erected to indicate restrictions. Security personnel will continuously monitor the site during these periods.

On the day of the planned launch, access will be prohibited through the site to the wider path network and Scolpaig Bay, situated within the 430 m radius of the SCZ. However, the overall wider path network will still be accessible via Griminish, for which the turn-off the A865 is situated approximately 1.78 km east of the end of the farm access track to the Project site (see Figure 7.2).

Should a road users' journey coincide with the day of a launch, they will be required to follow the proposed traffic management measures along the A865 (GM08). The traffic management measures are proposed to ensure a continued flow of traffic along the A865 (see Figure 11.1) to manage against the risk of potential congestion arising from incidental spectators or vehicles (more generally) stopping or parking in laybys causing obstruction on single track roads. Traffic management measures have been stipulated following consultation with WIEPCG, including Police Scotland and CnES Roads, to ensure traffic flow is maintained on the A865 in the vicinity of Scolpaig for all users. Traffic management measures are not required in terms of the operations associated with the Spaceport activities, but as a precautionary measure to avoid any potential congestion caused by incidental spectators or vehicles obstructing access along the route for all road users, including the local community and emergency services.

[3] The WIEPCG meets statutory obligations to be prepared, to respond to, and mitigate the effects of any potential emergencies in the Western Isles. This planning process brings together all emergency first responders as well as the health board, local authorities, public utilities, government departments, industry and the voluntary agencies.

[4] The calculation of the SCZ is based on the more conservative calculation of 1) peak incident overpressure and hazardous fragment distance and 2) the Federal Aviation Administration – Office of Commercial Space Transportation (FAA-AST) guidance.

Up to 10 launches per year are proposed for the Spaceport, there may be instances where a launch cannot proceed on the day as planned and is rescheduled to a subsequent back-up day, in the worst case resulting in a further 1-2 days where a launch may be reattempted. It is anticipated that clearway measures would be in place for only part of a single day in most cases. Proactive media releases will ensure advanced notification to the local community of planned launch days and discourage motorists from causing congestion along the route. These measures promote the existing Highway Code responsibilities for vehicles on single track roads - i.e. no stopping on the single track road, the verge or in passing places. The benefit of these measures is to ensure continued traffic flow for all road users.

As an emergency planning measure only, a Temporary Traffic Regulation Order (TTRO) will be applied for, which will include powers for the police to invoke a road closure for a short period until the launch is complete, in the unlikely event that traffic congestion could lead to potential obstruction or danger for road users. With the provision of the proposed clearway measures, it is not anticipated that any road closures would be required. These measures will be reviewed following initial launches with the WIEPCG to ensure they are effective, and disruption is minimised as far as practicable, with the opportunity to step-down measures, if appropriate for future launches (refer also to Chapter 11: Traffic and Transport).

Marine recreational users along the Scolpaig coast may be temporarily inconvenienced during the day of a launch and will be restricted within the Exclusion Zone for the duration it is active, in the worst-case over four hours during the day of a launch, following which access can resume. Disruption to recreational users is likely to be infrequent, with no more than 10 launches in a year, for a short and temporary duration over a limited area. Notification and management measures will ensure advanced warning to enable recreational users to make alternative arrangements, where possible, and timely updates to mariners on completed launches to allow transits to resume at the earliest opportunity (further information around navigation for marine recreation users is detailed in Chapter 13: Marine Users and Assets).

In summary, any disruption to access is likely to be for a temporary and limited duration for each launch event (up to 10 launches proposed each year), with prior notifications of launch activities which will ensure the local community and recreational users are notified in advance. Therefore, the magnitude of this impact is considered to be **low**.

Furthermore, it is considered unlikely that this impact will indirectly affect the wider tourism sector through changing visitor numbers and expenditure, due to the small scale and limited duration disruption to access to tourism amenity and recreation around launch events. Therefore, the magnitude of indirect impacts on the tourism sector is considered as **very low**.

Significance of residual effects

The local community is a receptor of **high** importance. The magnitude of this impact is assessed as **low**. Therefore, it is anticipated that there will be **minor** residual effects which are **not significant**.

Recreation is considered of **medium** importance to the Project site. The magnitude of this impact is assessed as **low**. Therefore, it is anticipated that there will be **negligible** residual effects which are **not significant**.

Tourism amenity (including accommodation) is considered of **low** importance to the Project site. The magnitude of this impact is assessed as **low**. Therefore, it is anticipated that there will be **negligible** residual effects which are **not significant**.

The tourism sector is of **high** importance to the Western Isles. The magnitude of this impact on the wider tourism sector is assessed as **very low**. Therefore, it is anticipated that there will be **negligible** residual effects which are **not significant**.

7.11.3 Access enhancement and enjoyment for recreational users of Scolpaig Farm

Impact overview (without enhancement)

Under private ownership, pedestrian access through Scolpaig Farm was not facilitated despite the presence of footpaths as part of the wider path network. Following the transition of ownership of Scolpaig Farm to CnES, new access arrangements (installation of a "kissing gate") and the change of perception of the site as being under 'public ownership' is thought to have led to a marked increase in the number of islanders and tourists visiting the site for recreation (based on anecdotal reports from surveyors and local reports). Scolpaig Farm is currently used regularly for recreation for walking, birdwatching, dog-walking. The wider path network leads to the coastline for other activities such as sea swimming, as well as being adjacent Loch Scolpaig which is regularly used for angling.

Construction works to upgrade the farm access road off the A865 and provide permanent on-site parking infrastructure is anticipated to further enhance community access throughout the operational phase of the Project, where access through the farm will be maintained and managed during launch events to minimise disruption to recreational activities.

Enhancement

The following access upgrades (COM02) will be implemented during the construction phase to develop Project infrastructure (see Chapter 4: Project Description for further details on planned Project infrastructure):

- The existing farm access road off the A865 will be widened and resurfaced to allow articulated vehicles to access the site, with visibility splay to increase safe access to and from the A865 (refer to Figure 7.2);
- Nine standard car spaces and once accessible car space will be provided at the site entrance, which will be available to the public when there are no launch operations;
- The kissing gate will be replaced by a pedestrian gate at the site entrance next to the parking area and the farm access track to facilitate users of limited mobility.

An Outline HAMP is provided in Appendix 7-2 which sets out the principles for future management of Scolpaig Farm with regard to enhancing public access to the site. The Plan will be fully developed by CnES post-consent in consultation stakeholders (COM01) and will continue to develop measures to manage public use of Scolpaig Farm that promotes responsible access as set out in the Scottish Outdoor Access Code for the continued enjoyment by all users. Further details around future enhancements are provided in Section 7.12.2 Environmental stewardship and community use of the Scolpaig Farm site.

Assessment of residual effects

Magnitude of impact

The extent of permanent access and infrastructure improvements will be localised to within the Project site boundary, where there will be an increase in available parking spaces for use outside of launch events by those accessing the bay, wider path network and for angling at Loch Scolpaig. The upgraded road access track will improve access for walkers, cyclists and those with mobility issues, with safer road access through implementation of road widening for visibility splay at the site entrance. There will be a minor rerouting of the footpath through the Project site to between the Scolpaig farmhouse and planned vehicle turning area (Figure 7.2).

Part of the Project site will be leased under an agricultural tenancy for controlled grazing of livestock to enhance habitats for birds and other sensitive species. It is recognised that while public access enhancements will encourage recreational use of the site, it is acknowledged that some activities have the potential to negatively impact habitat (e.g., trampling and erosion) and wildlife (e.g., disturbance and trampling, and dog induced disturbance, or predation of bird eggs and

chicks). Therefore, the full HAMP will detail the client's commitments to enhance habitat conservation and wildlife on site (including species-specific measures and habitats) in line with grazing and recreational activities. Long-term measures to be explored in the Plan will build on the experience of managing public access to other sites of high wildlife value in the Western Isles, such as Balranald Nature Reserve under management of RSPB.

While the project is expected to result in long-term improvements to access and amenity, the HAMP will ensure responsible access to protect habitats for sensitive species and agricultural tenancy. Responsible use of the site will allow for continued future enjoyment of the site by islanders and tourist visitors. It is anticipated there will be a minor to moderate positive change in recreational and tourist use of the site and therefore, the magnitude of this impact is considered to be **low**.

Significance of residual effects

Recreation is considered of **medium** importance to the Project site. The magnitude of this impact is assessed as **low**. Therefore, it is anticipated that there will be **minor beneficial** residual effects which are **not significant**.

7.12 WIDER PROJECT ASPIRATIONS AND BENEFITS

7.12.1 Economic development through public participation and community benefit

The Project presents an opportunity to bring the public, private and community sectors together. A Community Interest Company (CIC) was set up in 2017 as the operating entity for the Spaceport 1 initiative, founded on the principles of public participation and community benefit, with both the local authority (CnES) and the community receiving a share of profits each year to support future growth and development.

7.12.2 Environmental stewardship and community use of the Scolpaig Farm site

With input from RSPB, CnES has developed a programme of seasonal livestock grazing at Scolpaig Farm under a short-duration tenancy agreement, to be initiated in 2022. A process for awarding a Short-Limited Duration Tenancy of Scolpaig Farm was developed in consultation with the Scottish Agricultural College (SAC), Scottish Crofting Federation (SCF) and RSPB during 2021. The selection criteria favoured new entrants, people under 40 years and those who have limited or no access to other croft land. The process was initiated in mid-2021 and the tenancy was awarded (subject to mutual agreement on the terms of the lease) in October 2021. At the time of writing, the lease had yet to be agreed but is anticipated to be agreed by the end of January 2022. This tenancy agreement will be based on traditional agricultural practices and aims to enhance habitats around Scolpaig Farm for wildlife including corncrake, wetland birds, and species rich grasslands.

The Project site is popular with locals and visitors and is used regularly for walking, angling, and other coastal activities such as sea swimming. Given the site will be used for operations a maximum of 10 launch days per year, it is recognised as important to maintain community access through Scolpaig Farm between launch events. As part of the project programme, a detailed HAMP will be developed post-consent, building on the principles provided in the Outline HAMP (Appendix 7-2), which identifies commitments around managing and enhancing nature conservation, grazing activities, cultural heritage, public access and recreation around Scolpaig Farm. A dedicated Environment Officer will be permanently employed to develop and implement the Plan in consultation with an Advisory Group comprising key stakeholders and community representatives.

7.12.3 Beneficial effects on the Western Isles community through Science, Technology, Engineering and Mathematics (STEM) education and training programme

There is growing interest amongst the space sector in engaging with schools, colleges and families on space-related activities to inspire future generations into engineering and scientific studies and careers.

The 'CANSAT' competition, which started in 1998 in the United States and Japan, was conceived to teach students the basic principles of spacecraft design and launch. Students were tasked with designing their own soda-can sized 'spacecraft' to be launched on sub-orbital rockets and winners were chosen based on the design and performance of their systems. The initiative has spread rapidly worldwide and there are now regular CANSAT competition in the UK. Many other initiatives are developing with a similar goal of inspiring, engaging and attracting younger generations into high-tech activities.

Supporting education and outreach activities is an important aspect in the development and futureproofing of the Project. The facilities and infrastructure at the site are well suited to deliver initiatives such as CANSAT. There will be occasional payload capacity on upcoming test and qualification launch vehicle flights, which may not be suitable for commercial payload customers, and research activities but could be leveraged to support educational activities.

As part of the Project, an education outreach programme will be developed with the commitment to build the following clause into Memorandums of Understanding with launch operators:

- *Develop and deliver a STEM (or other youth focused) education project for the community of the Western Isles.*

Part of the licencing regime for spaceports is the obligation to develop and implement a training programme. A training programme is currently in development on the premise that the stated aim is to offer local jobs for local people. Where skills gaps are identified, the Consortium has committed to working with Highlands and Islands Enterprise (HIE) and other partners to ensure that training and education programmes are provided to address these gaps locally.

The benefits of such training programmes have been demonstrated at Hebrides Range, with several people who were initially taken on as apprentices now in prominent, highly paid professional roles.

Similar principals apply to the local supply chain. Although there are a range of local micro businesses offering expertise in areas such as welding and electronics, the Consortium will work with potential customers to identify the range of skills required on-island and develop appropriate skills development and diversification opportunities in collaboration with HIE. During discussions with potential operators to date, rather than relying on bringing in spare components and experts in particular fields with them to Uist, it has been stated that they would far prefer to utilise local tradesmen, businesses and services should the need arise. From a launch operator's perspective, this is a far more prudent business decision and will be an important strand to develop from the outset of the Project's operations.

7.12.4 Enabling Research and Development

The Project is anticipated to provide a focal point for Research and Development (R&D) activities, in terms of the spaceport design and operations, the activities conducted from the site and the activities of the supporting ecosystem including local engineering companies.

From a spaceport perspective, there are R&D activities associated with moving from an initial operating capability to full operating capability, as the concept of operations is developed and further refined.

Launch system operators will be supported at the site, many of whom will be conducting test and qualification activities and by their very nature are conducting R&D. Whilst some of the parties may conclude their development and focus on the provision of commercial services, others will enter operation and then continue their developments in parallel, further enhancing the performance and capability of their designs or improving the environmental impact and efficiency of their systems.

With the launch site established, and launch systems developed and entering commercial operations, the Project will be able to address the sub-orbital and microgravity research market providing flight opportunities for payload customers who wish to launch their payloads, instrument and experiments to an altitude and then recover them. This provides opportunities for local engineering companies to become part of the ecosystem and expand their capabilities to address sub-orbital mission requirements.

7.12.5 Enhancement and improved sustainability of MOD Hebrides Range

The Project plans to utilise the MOD Hebrides Range to support sub-orbital launch activities, utilising the current controlled air and sea space management capabilities, and leveraging the existing range tracking, telemetry and flight termination systems.

The Hebrides Range is a significant employer within the area, however, faced an uncertain future in 2009 following the announcement that the site would be closed. This decision was subsequently retracted, although there were staff reductions to reduce operating costs. In 2016, commitment was given to maintain operations until at least 2028 and whilst it is unlikely the site would be closed, mitigating the risk would be beneficial.

The procurement of services from the Hebrides Range to support commercial operations will increase the utilisation of the site, reducing operating costs through shared infrastructure, generate revenues for the MOD and the site operator QinetiQ and reduce the overhead and operating expense. The capabilities of Hebrides Range will be enhanced with the Project's infrastructure at Scolpaig Farm, through the provision of an additional launch site and enabling more sophisticated system testing to be undertaken. The key benefit of QinetiQ diversifying Hebrides Range into a wider commercial opportunity, with the associated income and potential for additional use for enhanced defence systems testing resulting from enhanced capabilities, is anticipated to enhance resilience and workforce security.

Refer to Chapter 12: Aviation, Radar and Telecommunications for a more detailed assessment of potential impacts of the Project on MOD technical assets.

7.12.6 Beneficial effects from extension of broadband fibre connection to the Project site

A BT broadband fibre extension will be extended from the Cleatraval-Hougharry junction, where it currently terminates, to the Project site. The purpose of this cable installation is to ensure security and reliability of communications undertaken at the Project site. It is recognised that, at present, there are no plans by HIE or other parties to install fibre connections near the site, therefore, local residents will receive the benefit of access to improved connectivity within the area. Within the west of North Uist area (data zone S01009021), there are 29% of premises that do not have access to superfast broadband (defined as a minimum of 30Mbit/s download speed) (SIMD; Scottish Government 2020).

7.13 CUMULATIVE EFFECTS

No other proposed or recently consented projects where there is potential for cumulative effects to arise have been identified within the study area. Cumulative effects have been scoped out of the assessment for this topic.

7.14 ASSESSMENT SUMMARY AND CONCLUSIONS

The study area for the community, recreation and tourism assessment encompasses the island of North Uist, with a particular emphasis on Scolpaig and its surrounds, as potential impacts are most likely to apply at this scale with regard to community access through and around the Project site.

A detailed desk-based assessment was undertaken to inform the baseline characterisation of the study area, with additional consideration given to general social conditions and the tourism sector in the context of the wider Western

Isles. The economic baseline of the study area (and subsequent economic impact of the Project) is contained within Appendix 7-1: Socio-Economic Analysis, which should be considered in close conjunction with the assessment provided for community, recreation and tourism.

The island of North Uist is a very remote rural area, well-known for its beautiful coastline, scenic landscape and numerous archaeological interests that make the area a popular tourism destination. The area of Scolpaig and its surrounds offer opportunities for various recreational activities. Following the transition of ownership of Scolpaig Farm to CnES and the restoration of access, there has been a reported increase in pedestrian access through the site to the wider path network for walking, birdwatching, as well as to access Scolpaig Bay for sea swimming and other coastal activities. Recreational anglers currently fish at Loch Scolpaig, while cyclists bypass the Project site along the A865 which forms part of the Hebridean Way cycling route.

The main impact to community, recreation and tourism receptors during the construction and operational phases is disruption to community, recreational and tourism amenities. Local and visiting road users may become inconvenienced due to minor journey delay associated with construction traffic, while access restrictions through the Project site will be required during works to upgrade the farm road access track and causeway culvert, requiring a temporary alternative route to the wider path network.

Due to the relatively small scale of the Project and limited infrastructure requirements, traffic and transport impacts have been scoped out of the assessment and standard best practice will ensure potential delays on the A865 are limited and unlikely to impact tourist or local amenity to the extent of delay beyond normal busy periods experienced on the A865. Alternative access to Scolpaig Bay and the wider path network will continue to be available, while any site access restrictions required during the five-month construction phase will be limited as far as practicable to enable access to safely resume from the Scolpaig Farm entrance off the A865. Therefore, the assessment concludes that during the construction phase, adverse residual effects to the local community, tourism amenity and recreational activity is **negligible** and **not significant**.

During the operational phase of the Project, public access through Scolpaig Farm will be maintained except during launch events, where temporary restrictions will be implemented for site security purposes and public safety. However, with up to 10 launches per year, these restrictions will be of very limited frequency and duration. Prior notification of launch activities will be issued to ensure the local community and recreational users are notified in advance to be able to make alternative arrangements to access the wider path network, where possible. Marine and coastal recreational users in the vicinity of Scolpaig Bay will also to subject to temporary restrictions during the day of a launch only, with prior notification to minimise disruption and access quickly able to resume following completion of a launch. Should a road users' journey coincide with the timing of a launch operation, traffic management measures will be in place to ensure continued flow of traffic on the A865 and congestion is avoided from incidental spectators or vehicles otherwise blocking the road. Therefore, the assessment concludes that during the operational phase, adverse residual effects to locals, tourism amenity and recreational activity is **negligible** and **not significant**.

It is considered unlikely that any disruption to visitors caused by the Project will indirectly affect the wider tourism sector through changing visitor numbers and expenditure, due to the small scale and temporary nature of disruption to access to tourism amenity and recreation. Therefore, the assessment further concludes any effects on the wider tourism sector is negligible and **not significant**.

Community access through the Project site will be enhanced through permanent access and infrastructure improvements including farm road upgrades, additional parking spaces and an adjacent pedestrian gate. Existing access through the site to the wider path network, which is currently indicative only, will receive a minor rerouting between the Scolpaig

farmhouse and planned vehicle turning area. While the Project will improve long-term improvements to access and amenity, implementation of a full Habitat and Amenity Management Plan will ensure responsible access to protect habitats for sensitive species and agricultural tenancy at Scolpaig Farm. It is expected these measures will encourage a minor to moderate positive change in islanders and visitors' enjoyment and use of the site. The assessment therefore concludes that the beneficial effects of access enhancements will be **minor** which are **not significant**.

Wider aspirations for the Project are anticipated to bring several additional community benefits. The implementation of a full Habitat Amenity Management Plan will enhance environmental stewardship and community use of the Scolpaig Farm site in line with nature conservation objectives, in addition to other interests associated with the site (e.g. cultural heritage and fishing). The Project will support STEM education and outreach and implement a training programme that addresses local skills gaps, in addition to operating as a focal point for Research and Development activities that provides the opportunity to include local engineering companies. Procurement of services from MOD Hebrides Range to support commercial operations will increase support diversification of the range and generate revenue for site operator QinetiQ. Finally, the extension of broadband fibre to the Project site to improve connectivity is anticipated to benefit local residents in the vicinity who may not have access to superfast broadband connection.

No other proposed or recently consented projects subject to EIA have been identified within the study area and therefore, cumulative effects have been scoped out of the assessment for this topic.

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8 LANDSCAPE AND VISUAL AMENITY

CONTENTS

8 LANDSCAPE AND VISUAL AMENITY

8.1 INTRODUCTION

Potential impacts on landscape and visual amenity have been scoped out of the EIA, in consultation with NatureScot and the planning authority, and therefore no Landscape and Visual Impact Assessment (LVIA) has been undertaken for the Project. This chapter summarises the information gathered and initial assessment undertaken to provide the basis for scoping out potential impacts on landscape and visual amenity.

Potential impacts on the setting of features of archaeological and cultural heritage importance are assessed in Chapter 10: Archaeology and Cultural Heritage.

Reference should also be made to the Visualisations Pack, which presents a number of representative visualisations (photomontages) of the proposed Project (viewpoints 1-4).

8.2 CONSULTATION

The key points raised by stakeholders during Scoping and pre-application consultation regarding landscape and visual amenity are presented in Table 8-1.

Table 8-1 Key issues raised by stakeholders during consultation

Stakeholder	Comment/Discussion	Response/Action taken	Section cross-reference
Sealladh Hiort Correspondence 17/09/2019	Requested additional viewpoint visualisation from proposed St Kilda Viewpoint Centre.	Viewpoint visualisation prepared (VP2) and no issues raised with regard to visibility of any infrastructure associated with the Project.	Visualisation Pack
NatureScot Correspondence 25/09/2020	NatureScot (SNH) confirmed no additional viewpoint visualisations required following a review of four provided.	No further action.	N/A
CnES Planning Meeting 01/10/2020	Confirmation that a Landscape and Visual Impact Assessment is not required following a review of four viewpoint visualisations (photomontages) and amended project design. The visualisations provided were confirmed to be in a suitable format. An additional viewpoint visualisation recommended for one of two possible locations along the A865.	A zone of theoretical visibility (ZTV) model was run using Terrain 5 data to identify potential visibility of the temporary launch tower and wireframe presented. The wireframe illustrating access entrance to Callernish House (VP5) shows no visibility of the temporary launch tower.	Figure 8-2
CnES Planning Correspondence 16/12/2020	Advised to consult with archaeologist for the project on requirement for an additional visualisation to assess potential setting impact on Dun Scolpaig scheduled monument.	Potential impacts on setting of archaeological features assessed in dedicated chapter.	Chapter 10: Archaeology and Cultural Heritage

Stakeholder	Comment/Discussion	Response/Action taken	Section cross-reference
CnES Planning Teleconference 05/03/2021	Confirmation that no further visualisations required following review of the ZTV and additional wireframes.	No further action.	N/A
CnES Planning Correspondence 18/05/2021	An additional design option for a larger launch vehicle tower height of 20 m was included in the project envelope. The ZTV and wireframes were revised and issued to CnES Planning for review, with confirmation that no further visualisations required.	No further action. The largest tower option and mobile tower option have been presented in the visualisations.	Visualisation Pack
Public responses to previous application in 2019 (19/00311/PPD)	The majority (70%) of respondents objected to the proposed development on the grounds of the anticipated and irreparable visual damage to the landscape and coastline. Objections also referenced the proposed presence of concrete surfaces and storage facilities, which were expected to spoil uninterrupted views to distant islands. Respondents are concerned the potential loss of the island's wildness and beauty will adversely affect tourism, one of the key contributors to the local economy.	Concrete surfaces will be limited to the launch pad, pollution control infrastructure and tether points. Approximately 140 m of new access track will be constructed using materials similar to existing geological character. Storage facilities will be temporary and limited to mobile units on the launch pad for propellants / oxidisers. A temporary launch tower will have a maximum height of 20 m. Vehicular parking and control will be located in laybys along the road. A zone of theoretical visibility and series of accompanying visualisations have been produced and following consultation with NatureScot and CnES, landscape impacts have been scoped out.	Chapter 5: Consultation Process, Appendix 5-1: Review of Planning Representations

8.3 APPROACH

Permanent visible infrastructure is limited to minor upgrades of existing access tracks, a small length of additional access track (140 m), hardstanding, a concrete launch pad and water storage tank. The proposals for permanent infrastructure are not considered to have potential for significant effects and are not assessed in terms of impacts on landscape and visual amenity.

A zone of theoretical visibility (ZTV) analysis was modelled using a Terrain 5 model (with 5 m contours) to establish potential visibility of the temporary launch tower across a 5 km study area (Figure 8-1). Four representative viewpoints, assessed to have theoretical visibility of the temporary launch tower, were selected in consultation with NatureScot and the planning authority. Photomontages were prepared to provide a visual representation of the Project when the launch tower is on site (VP1 – VP4 in the Visualisation Pack), these include the water tank and temporary infrastructure including storage containers. Visualisations are also provided with an alternative mobile LV transport system that may be utilised for some launches, and a representation of the site when the Spaceport is not being mobilised for a launch. These visual representations include views from: Scolpaig Bay (VP1); the proposed St Kilda Viewpoint Centre (VP2); north of the

launch pad (VP3); and the main road (A865) approaching the Project from the south-west (VP4). A wireframe was prepared for an additional viewpoint towards the eastern extent of the ZTV (VP5), near the access point to Callernish House, confirming that the tower will not be visible from this view (Figure 8-2).

8.4 SUMMARY DESCRIPTION

The Project boundary is outwith but adjacent to the South Lewis, Harris and North Uist National Scenic Area (NSA) (Figure 8-1)[1]. There is no permanent infrastructure proposed for the Project that would trigger the requirement for LVIA. The launch tower will be a temporary structure of up to 20 m height (likely to be a steel lattice structure, either fixed to the launch pad or vehicle mounted), although most towers required are likely to be under 12 m, erected prior to and removed from site following each launch event. Up to 10 launches per year are proposed, with each launch campaign expected to last for up to two weeks (from launch preparations to demobilisation of site). The launch tower is anticipated to be erected for up to two days for vehicle mounted or up to four days for fixed structures during each launch campaign (further details are presented in Chapter 4: Project Description). The type of launch tower erected will vary depending on the type of launch vehicle being deployed and preference of the Launch Operator.

Other temporary infrastructure that may be visible on site include a range of storage containers and mobile units which will be brought on site temporarily and removed from site following the completion of each launch campaign. Permanent infrastructure is limited to road and parking upgrades, launch pad with hardstanding, a water storage tank and utilisation of one existing farm building. Construction works for this infrastructure will last for a short period, estimated to be up to five months.

8.5 CONCLUSION

Due to the relatively small scale of the permanent infrastructure and the temporary nature and nominal scale of operational infrastructure associated with the Project, **no significant effects** on landscape and visual amenity are anticipated. This topic has been scoped out of the assessment.

[1] NSA boundary taken from NatureScot SiteLink database (https://sitelink.nature.scot/home) and confirmed with NatureScot (SNH) 16/09/2019.

9 LAND USE AND UTILITIES

CONTENTS

9 LAND USE AND UTILITIES

9.1 INTRODUCTION

This Chapter of the EIA Report describes the potential impacts of the Project on land use and utilities. The characteristics of land ownership, local infrastructure assets and neighbouring land uses are defined and described within the assessment of baseline conditions.

This Chapter should be read in conjunction with Chapter 7: Community, Recreation and Tourism and Chapter 17: Hydrology, Hydrogeology and Geology (regarding water use and discharge).

No likely significant effects on land use and utility receptors were identified in the Scoping exercise of 2018 for the larger orbital proposal (18/00234/SCO_L). The proposed Project has subsequently been revised with a reduced scope in terms of on-site infrastructure required, and the scale of launch operations (refer to Chapter 3: Site Selection and Alternatives for further information). Therefore, only a high-level scoping assessment has been undertaken for land use and utilities to demonstrate that their possible relevance has been considered and to ensure there has been no change to the baseline situation since submission of the Request for a Scoping Opinion in June 2018.

9.2 CONSULTATIONS

The key points raised by stakeholders during Scoping and pre-application consultation regarding land use and utilities are presented in Table 9-1.

Table 9-1 Key issues raised by stakeholders during consultation

Stakeholder	Comment	Action to address	Section cross-reference
Scottish Water Scoping (2018) and Application (2019) responses	Scottish Water has no objection to this planning application; however, the applicant should be aware that this does not confirm that the proposed development can currently be serviced and would advise the following: • According to our records there is no public Scottish Water, water infrastructure within the vicinity of this proposed development therefore we would advise applicant to investigate private options. • According to our records there is no public Scottish Water, wastewater infrastructure within the vicinity of this proposed development therefore we would advise applicant to investigate private treatment options.	No public water infrastructure run through the site, therefore no likely significant effects on public water supplies or wastewater networks, arising from Project activities, concluded.	Section 9.3.2, Section 9.5.

Stakeholder	Comment	Action to address	Section cross-reference
Scottish Water Scoping (2018) and Application (2019) responses	A review of our records indicates that there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed activity.	No drinking water catchments run through the site, therefore no likely significant effects arising from Project activities concluded.	N/A
Public responses to previous application in 2019 (19/00311/PPD)	Concerns raised during public stakeholder events (refer to Chapter 5: Consultations Process and Appendix 5-1. Review of Planning Representations), included the potential impact of the Project from a change in land use from agricultural to industrial.	Project aims to enhance land use with a Short-Limited Duration Tenancy for Scolpaig Farm and a Habitat and Amenity Management Plan (HAMP).	Section 9.5; Appendix 7-2: Outline HAMP; Chapter 5: Consultation Process; Appendix 5-1: Review of Planning Representations.

9.3 BASELINE DESCRIPTION

The Project site is part of the former Scolpaig Farm, which was purchased by CnES on 6 June 2019 having formerly been under private ownership. CnES plans to allow controlled grazing throughout the site under a Short-Limited Duration Tenancy, as well as maintaining access to Scolpaig Bay for walkers and other recreational users (see Appendix 7-2: Outline Habitat and Amenity Management Plan). The total land area of Scolpaig Farm is approximately 276 ha and the total application site area is 1.7 ha. No change in the baseline conditions of the land use and utilities conditions is known by the Developer to have occurred since the request for a Scoping opinion.

9.3.1 Land use

The proposed Project is situated in the north-west corner of North Uist and is bounded to the north and west by the Atlantic Ocean and to the south by the A865 road. The site is located approximately 16 miles from the ferry port of Lochmaddy and 21 miles from Benbecula Airport.

The north-west corner of North Uist consists of rugged coastline with steep cliffs and occasional white sandy bays. The land is dominated by three small hills; Beinn Scolpaig (88 m), to the north of the A865, and Beinn Riabhach (117 m) and Carra-crom (120 m), to the south. The area consists of a mix of rough grazing land, mainly used in the past for open grazing of sheep and cattle, machair, peat bog, and sandy shoreline. The area is popular with walkers, both visitors and locals, throughout the year. There are three lochs extending to approximately 67 acres.

The existing access track on the site runs over rough moorland from the A865 in a north-west direction until it reaches a short causeway, which incorporates a stone culvert, over Loch Scolpaig. The track then runs north-west over farmland to the existing Scolpaig Farm buildings which - with the exception of one byre - are largely derelict.

The farmhouse comprises a one and a half storey stone and rendered building and is unoccupied. One of four unused outbuildings adjoins the rear of the farmhouse. Scolpaig Tower (Dun Scolpaig) is a scheduled monument located on a small island within Loch Scolpaig to the south-west of the site.

The area surrounding the site is largely open, comprising of grassland, wetland and coastal habitats, with a small number of residential properties and minor roads. The closest residential property is An Ataireachd Ard approximately 670 m south of the Project site boundary. There are no commercial properties in close proximity to the site.

Outdoor access and recreation

The track to Scolpaig Farm is used by walkers and other recreational users to access Scolpaig Bay. There are no Core Paths within the site, however, the Wider Path network (contributing to the Core Path network) follows the coastal perimeter of the site with connections south to the A865 via Scolpaig Farm (following the farm access track) and also Griminis to the east (following the access track). The latter routes are also connected via a path which traverses Beinn Scolpaig (Figure 7.1). The A865 forms part of National Cycle Network (NCN) Route 780 (The Hebridean Way) which is a 150 mile on-road route through the Outer Hebrides, beginning on Vatersay and ending at the Butt of Lewis.

Recreational access within the planning boundary and potential impacts arising from the Project are covered in Chapter 7: Community, Recreation and Tourism.

9.3.2 Utilities

Water (private and public extractions)

Scottish Water confirmed during Scoping that there is no public water infrastructure within the Project site. It was also confirmed that there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the Project.

CnES has no records of any private water supply at the property, despite existence of a disused well (detailed in Chapter 17: Hydrology, Hydrogeology and Geology). There are reports of a private water supply 'up the hill', (R. Fraser, *pers. comm.*), however the location of this supply is currently unverified and there are no records of this as a private water supply[1]. Consultation with a local historian also suggested the presence of another potential well in the same location (Local Historian, 08 November 2021) however no records of this, or any other abstraction features have been identified. The current water supply arrangements to the property are thought to comprise a private pipe from a connection point in Balmartin. However, this infrastructure is currently not recognised/adopted by Scottish Water.

There are no registrations or licences issued under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) within the study area (SEPA, 2014)[2]. The closest licensed site relates to a CAR licence held by An Ataireachd Ard approximately 670 m from the Project site boundary.

Wastewater

Scottish Water confirmed at Scoping that there is no public Scottish Water wastewater infrastructure within the vicinity of the Project.

[1] The farmhouse is reported to have been served by a private pipe, installed approximately 20 years previously (R. Fraser, Fraser Architects, *pers. comm.*)

[2] SEPA. 2014. Licensed Sites. Downloaded: https://www.sepa.org.uk/environment/environmental-data/

Electrical infrastructure

An existing 11Kv overhead supply connects the farm buildings via the access track via a point close to the access of the A865 (Drawing 0021).

Telecommunications infrastructure

A British Telecom cable supplies Scolpaig Farm via the access track but does not supply any other dwellings via the Project boundary.

Defence, aviation and other radar and communications assets are assessed in Chapter 12: Aviation, Radar and Telecommunications.

9.3.3 Future baseline

A planning application has been submitted for the proposed St Kilda Viewpoint Visitor Centre (21/00184/PPD) at Beinn Riabhach, south-east of the Project[3]. The development is to comprise a visitor centre, access road, vehicle parking and turning area, waste treatment plant, and fire-fighting pond. Access to the development is proposed approximately 0.5 km east of the development site access, heading towards Sollas.

9.4 POTENTIAL IMPACT PATHWAYS

Potential impact pathways associated with land use and utilities include:

- Construction works and site operations associated with the Project may result in the loss of agricultural land for grazing;
- Construction works and site operations associated with the Project may lead to the disruption of utility infrastructure and services;
- Site operations associated with the Project may disrupt access to neighbouring land use; and
- Construction works and site operations associated with the Project may disrupt or severe access through the site for recreational activities. This impact is addressed in Chapter 7: Community, Recreation and Tourism.

9.5 IMPACT ASSESSMENT

9.5.1 Construction works and site operations associated with the Project may result in the loss of agricultural land for grazing

Potential impacts associated with the loss of agricultural land use are likely to be limited due to the minimal area of land required for the proposed project, with an additional footprint of 0.46 ha of rough grazing land (over dune grassland) required for the new launch infrastructure.

A process for awarding a Short-Limited Duration Tenancy of Scolpaig Farm was developed in consultation with Scottish Agricultural College (SAC), Scottish Crofting Federation (SCF) and Royal Society for the Protection of Birds (RSPB) during 2021. The selection criteria favoured new entrants, people under 40 years and those who have limited or no access to other croft land. The process was initiated in mid-2021 and the tenancy was awarded – subject to mutual agreement

[3] Application permitted with conditions on 21/01/2022.

on the terms of the lease – in October 2021. At the time of writing, the lease had yet to be agreed but is anticipated to be completed by the end of December 2021.

In parallel with the agricultural tenancy, a range of habitat enhancement measures are proposed through the commitment to develop a Habitat and Amenity Management Plan (an outline Habitat and Amenity Management Plan is provided in Appendix 7-2). Livestock grazing in the area may be temporarily restricted during construction works, however this will be able to resume upon completion. The land was previously under private ownership and grazing was not open to the community. The Project footprint will result in a negligible loss of grazings within the wider grounds of Scolpaig Farm and together with the grazing management measures proposed, which will enhance the agricultural use of the farm, **no significant effects** are concluded.

9.5.2 Construction works and site operations associated with the Project may lead to the disruption of utility infrastructure and services

No disruption to utility infrastructure and services is anticipated as there are no public supplies on site. Any discharges from the launch platform, during launch operations, will be contained within a drainage channel, directly to an underground storage tank and disposed under a consented trade effluent discharge licence with Scottish Water at an agreed discharge location. When the launch site is not in use, rainwater collected in the drainage channels will be diverted to an infiltration field. Therefore, no pressure on the existing wastewater treatment network is anticipated. Details on the design and measures for the control of effluent is provided in Chapter 17: Hydrology, Hydrogeology and Geology. Therefore, **no significant effects** on utilities and services are anticipated.

Electricity cables and BT telecom links that serviced the Scolpaig Farmhouse, which will not be occupied throughout the lifetime of the Project, will be protected during construction works /any temporary disconnection will be agreed with relevant stakeholders such that **no significant effects** are anticipated. The consortium intends to install a BT fibre connection to the farm, which will improve local internet access and is likely to result in a beneficial impact for the local community in the area (refer to Chapter 7: Community, Recreation and Tourism).

9.5.3 Site operations associated with the Project may disrupt access to neighbouring land use

The A865 is a minor road, with single track and passing places and is at risk of becoming congested in the vicinity of the Spaceport at Scolpaig on a launch day, should there be a substantial increase in traffic associated with incidental spectators or other road users stopping or parking along the road, the verges or in passing places. This could lead to disruption to local road users, and particularly obstruction of access to neighbouring land uses. Neighbouring land use includes agricultural land, local access to dwellings and the recently consented St Kilda Viewpoint Visitor Centre, access to which is proposed approximately 0.5 km east of the entrance to the Spaceport.

Traffic management measures have been stipulated following consultation with Western Isles Emergency Planning Coordinating Group (WIEPCG), including Police Scotland and CnES Roads, to ensure traffic flow is maintained on the A865 in the vicinity of Scolpaig for all users. Traffic management measures are not required in terms of the operations associated with the Spaceport activities, but as a precautionary measure to avoid any possibility of congestion caused indirectly by incidental spectators or vehicles obstructing access along the route for all road users, including the local community and emergency services (further details provided in Chapter 11: Traffic and Transport).

On the day of a launch event, traffic management measures comprising a temporary clearway (no stopping) on the A865 (from Clachan, via the west-side of North Uist to Lochmaddy) will be in place and managed by a dedicated police patrol. The existing Highway Code responsibilities for vehicles on single track roads - i.e. no stopping on the single track road, the verge or in passing places - will be strictly enforced and the police will have power to move/remove vehicles. This is a precautionary measure to avoid congestion caused by incidental spectators or vehicles obstructing access along the

route. The benefit of this measure is that it will ensure traffic flow is maintained along this section of the A865 for all road users. This measure will be required up to 10 times per year, for the day of a launch only. There may be instances where a launch cannot proceed on the day as planned and is rescheduled to a subsequent back-up day, in the worst case resulting in a further 1-2 days where a launch may be reattempted.

Proactive media releases will ensure advanced notification to the local community of planned launch days and discourage motorists from causing congestion along the route. As an emergency measure only, a Temporary Traffic Regulation Order (TTRO) will be applied for, which will include powers for the police to invoke a road closure, in the unlikely event traffic congestion could lead to potential obstruction or danger for road user, for a short period until the launch is complete and congestion is cleared. With the provision of the proposed clearway measures, it is not anticipated that any road closures would be required.

These measures will be reviewed following initial launches with the WIEPCG to ensure they are effective, and disruption is minimised as far as practicable, with the opportunity to step-down measures, if appropriate for future launches. Therefore, **no significant effects** on any existing neighbouring land uses, including potential future neighbouring land uses such as the St Kilda Viewpoint Visitor Centre are anticipated. Further details on traffic management measures are detailed in Chapter 11: Traffic and Transport.

9.6 CUMULATIVE IMPACTS

No other developments, recently consented or proposed, that have been required to undertake an assessment of potential environmental impacts (either under the EIA Regulations or through provision of further environmental information in a planning application), are within proximity to the Project that could impact present land uses, therefore no cumulative impacts with respect to land use and utilities are predicted.

9.7 ASSESSMENT SUMMARY AND CONCLUSIONS

The Project site is part of the former Scolpaig Farm, which was purchased by CnES on 6th June 2019 having formerly been under private ownership.

The area is currently a mix of rough grazing land, mainly used in the past for open grazing of sheep, machair, peat bog, and sandy shoreline. The area is popular with walkers, both visitors and locals, throughout the year.

The assessment confirmed that:

- No public water supply or wastewater infrastructure are located within the Project site boundary.
- No registered abstractions for a private water supply were identified on site, although evidence of historic systems was identified. Scolpaig Farmhouse is currently served by an existing private pipe from Balmartin.
- An existing 11Kv overhead supply connects the farm buildings to a point close to the access of the A865, however no public supplies transit the site.
- A British Telecom cable supplies the farm via the access track but does not supply any other dwellings via the Project boundary. The consortium intends to upgrade the connection to provide a fibre optic link, which will be available to local residents within the vicinity.
- As part of the proposed Habitat and Amenity Management Plan for the wider Scolpaig Farm, a Short-Limited Duration Tenancy was awarded to local crofters meeting the relevant selection criteria, which will incorporate

habitat enhancement measures for specific habitats and species, as well as continuing and enhancing recreational access.

- A potential neighbouring land use development is proposed south-east of the Project – St Kilda Viewpoint Centre, where access will be maintained during Spaceport launch activities, should the development be constructed during the lifetime of the Project.

The impact assessment therefore concludes that **no significant effects** on agricultural land use, neighbouring land use or utility infrastructure or services are anticipated.

10 ARCHAEOLOGY AND CULTURAL HERITAGE

CONTENTS

10 ARCHAEOLOGY AND CULTURAL HERITAGE

10.1 INTRODUCTION

This chapter has been prepared by GUARD Archaeology Limited and assesses the likely significant effects of the Project on archaeological and cultural heritage assets within the Project site and surrounding area. The chapter sets out the methods used to assess the impacts of the Project and describes the baseline conditions currently existing within the Project site, and within its immediate vicinity. It details the potential impacts of the Project, the mitigation measures required to prevent, reduce, or offset those impacts, and any likely residual effects, in the context of current planning policy.

This Chapter is supported by a Gazetteer of Cultural Heritage Sites (Appendix 10-1: Archaeology Gazetteer). Reference has been made to Chapter 8: Landscape and Visual Amenity, in relation to indirect impacts (setting) on cultural heritage assets and Chapter 19: Noise and Vibration.

The assessment was carried out in accordance with the following regulations, standards, and guidance of the Chartered Institute for Archaeologists (CIfA), of which GUARD Archaeology Ltd is a Registered Organisation:

- Code of Conduct (2021);
- Standard and guidance for archaeological advice by historic environment services (2020);
- Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment (2020); and
- Standard and guidance for historic environment desk-based assessment (2020).

10.2 STUDY AREA

The study area for direct impacts includes the Project boundary and a buffer of 200 m surrounding the boundary. A further buffer of 5 km has been used to assess potential indirect effects (setting) upon designated cultural heritage sites (Figures 10.1 and 10.2).

10.3 LEGISLATIVE FRAMEWORK AND POLICY CONTEXT

10.3.1 National Planning Legislation

The statutory framework for heritage in Scotland is outlined in the Town and Country Planning (Scotland) Act 1997, as amended by the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997, and The Ancient Monuments and Archaeological Areas Act 1979, both of which are modified by the Historic Environment (Amendment) (Scotland) Act (2011).

Cultural heritage resources consist of designated and non-designated sites, including individual monuments, related settings, and the wider cultural landscape. Sites with statutory designations are defined in Historic Environment Scotland's *Designation Policy and Selection Guidance* (2019a) and comprise:

- World Heritage Sites;
- Scheduled Monuments;
- Listed Buildings;
- Conservation Areas;
- Historic Marine Protected Areas;

- Inventory Gardens and Designed Landscapes; and
- Inventory Battlefields.

10.3.2 National Planning Policy and Guidelines

The implications of the acts noted above with regard to local government planning policy are described within *Scottish Planning Policy* (SPP) (2014), the *Historic Environment Policy for Scotland* (HEPS) (2019b) and its supporting guidance, and *Planning Advice Note 2/2011* (2011). SPP and HEPS deal specifically with planning policy in relation to heritage.

Additional guidance regarding the consideration of cultural heritage in development planning is provided by HES's guidance notes *Our Place in Time: The Historic Environment Strategy for Scotland* and HES's *Managing Change* series of guidance notes.

Four paragraphs of Scottish Planning Policy (SPP) 2014: Valuing the Historic Environment are pertinent to this assessment of the Project.

Listed Buildings

SPP paragraph 141 states:" Change to a listed building should be managed to protect its special interest while enabling it to remain in active use. Where planning permission and listed building consent are sought for development to, or affecting, a listed building, special regard must be given to the importance of preserving and enhancing the building, its setting and any features of special architectural or historic interest. The layout, design, materials, scale, siting and use of any development which will affect a listed building or its setting should be appropriate to the character and appearance of the building and setting. Listed buildings should be protected from demolition or other work that would adversely affect it or its setting."

Scheduled Monuments

SPP paragraph 145 states: "Where there is potential for a proposed development to have an adverse effect on a Scheduled Monument or on the integrity of its setting, permission should only be granted where there are exceptional circumstances. Where a proposal would have a direct impact on a Scheduled Monument, the written consent of Scottish Ministers via a separate process is required in addition to any other consents required for the development."

Archaeology and Other Historic Environment Assets

SPP paragraph 150 states: "Planning authorities should protect archaeological sites and monuments as an important, finite and non-renewable resource and preserve them *in situ* wherever possible. Where *in situ* preservation is not possible, planning authorities should, through the use of conditions or a legal obligation, ensure that developers undertake appropriate excavation, recording, analysis, publication and archiving before and/or during development. If archaeological discoveries are made, they should be reported to the planning authority to enable discussion on appropriate measures, such as inspection and recording."

SPP paragraph 151 states: "There is also a range of non-designated historic assets and areas of historical interest, including historic landscapes, other gardens and designed landscapes, woodlands and routes such as drove roads which do not have statutory protection. These resources are; however, an important part of Scotland's heritage and planning authorities should protect and preserve significant resources as far as possible, *in situ* wherever feasible."

National Record of the Historic Environment (NRHE) and the local Historic Environment Record (HER)

Other cultural heritage and archaeological sites, not subject to other designations, are recorded within the National Record of the Historic Environment (NRHE) and the local Historic Environment Record (HER), and many such sites have not yet been identified or recorded. Such undesignated sites are frequently assigned to regional, local or lesser categories of significance.

The regional or local importance of such a site is established on the basis of professional judgement, although the criteria for identifying nationally important sites, as outlined in Annex 1 to Historic Environment Scotland's Designation Policy and Selection Guidance (2019b), will often be referred to in making such judgements. Some sites are also, variously, classed as of lesser importance, unknown importance or other importance. Unknown or other importance usually refers to examples where insufficient information exists to assign importance.

10.3.3 Local Planning Policy and Guidelines

Local planning policy is defined in the Outer Hebrides Local Development Plan (2018). The LDP includes one policy that is pertinent to this assessment.

Policy NBH4: Built Heritage (excerpt)

"*All Development*
Development which preserves or enhances the architectural, artistic, commemorative or historic significance of built heritage assets will be supported.

Where there is clear evidence of historic significance, development which would have a substantial adverse impact on this significance will only be permitted where it can be demonstrated that:

a) all reasonable measures will be taken to mitigate any loss of this significance; and
b) any lost significance which cannot be mitigated is outweighed by the social, economic, environmental or safety benefits of the development.

Listed Buildings
The Comhairle will seek to manage the special architectural and historical interest of listed buildings and their settings and will support sympathetic conversions and extensions to secure their future use. Every effort will be made to retain listed buildings and bring them back into use."

10.4 SUPPORTING SURVEYS AND STUDIES

The following supporting surveys and studies have been used to inform the assessment:

10.4.1 Desk-based Assessment

The desk-based assessment is based upon data obtained from publicly accessible archives. Designation data from HES and data from NRHE was downloaded on 17 May 2021. The assessment does not account for any records which may have been amended or added after this date. The archaeological time periods referred to in the text are taken from the standard date-ranges utilised by the Scottish Archaeological Framework (ScARF).

10.4.2 Walkover Survey

A walkover survey of the accessible areas of the project site (planning application boundary) was undertaken on 27th May 2021 in dry, overcast weather conditions. A Global Positioning System (GPS) was available to record the locations

of any features identified; any such features were also to be recorded by written description and, if appropriate, measured sketches and photographs. Previously recorded sites collated during desk-based research were visited to assess their current condition.

10.4.3 Setting

Photomontages and wireframes were generated as part of the landscape assessment (LVIA), presented in Chapter 8: Landscape and Visual Amenity, which also provides a full discussion of the methodology used to generate a zone of theoretical visibility (ZTV) based on a temporary tower structure proposed as part of the Project. Existing photomontages and additional wireframes were generated to complete the assessment of indirect impacts on setting.

10.4.4 Noise

An assessment of noise and vibration was undertaken based on worst-case scenarios of noise generation from the launch event and sonic boom. The analysis is presented in Appendix 19-1: Noise Technical Report and interpreted in Chapter 19: Noise and Vibration.

10.5 DATA GAPS AND UNCERTAINTIES

Due to its location on an islet in the middle of a loch, it was not possible to visit the small islet where Dun Scolpaig, dun (site of) and tower (SM 7640), is located as part of the setting assessment. Views from the lochside towards the dun and encompassing the Project have been rendered as a photomontage (Figure 10.6), and a wireframe was used to assess potential indirect effects upon the setting of Dun Scolpaig (Figure 10.4). Visualisations are provided in the Visualisation Pack.

No published work that details the potential effects upon cultural heritage sites of vibration from rocket launching could be located. Comparable activities generating similar vibration impacts could include the effects of blasting at quarry sites. However, the force of the vibrations from quarry blasting are intended to spread out from the epicentre through the rock, exploiting weaknesses in the structure of the rock to cause it to break apart. The force of the vibration from a rocket launch would be primarily directly downward before any spreading out would occur. These differences in the nature of the vibrations means that direct comparison is unlikely to contribute to the assessment of direct effects of vibration upon the cultural heritage resource. A precautionary approach has been adopted in considering the impacts of vibration by establishing an ongoing monitoring programme via Historic Building Record (HBR) surveys (Section 10.10) to assess building integrity.

This assessment is based upon data obtained from publicly accessible archives. Designation data from HES was downloaded on 25 October 2021, and data from NRHE was accessed on the same day. The assessment does not account for any records which may have been amended or added after this date.

10.6 CONSULTATIONS

The statutory consultees for archaeology and cultural heritage are Historic Environment Scotland (HES) and Western Isles Council Archaeology Service (WICAS). The key points raised by the consultees during Scoping and pre-application consultation regarding Archaeology and Cultural Heritage are presented in Table 10-1.

Table 10-1 Key issues raised by stakeholders during consultation

Stakeholder / Date	Consultee's Comment	Response / Action	Section cross - reference
Historic Environment Scotland (HES) 10 July 2018	Content to adopt the approach in the Design Manual for Roads and Bridges to aid in this assessment. Suggested including the Managing Change Guidance Note on Setting as well as the newly published Environmental Assessment Handbook. In terms of the proposed study area of 5 km we can confirm that we consider this of an appropriate scale for the assessment.	*The Environmental Impact Assessment Handbook* (2018) published by Historic Scotland and Scottish Natural Heritage has been referenced as a basis for the assessment. 5 km buffer adopted for setting assessment.	Section 10.7.2 Figures 10.2 and 10.3
Historic Environment Scotland (HES) 10 July 2018	The proposed spaceport infrastructure has the potential to have an adverse impact on the settings of a number of scheduled monuments: Dun Scolpaig and Caisteal Odair, and welcome opportunity to review photomontages.	A photomontage was rendered at and the main road (A865) approaching the Project from the south-west. A further wireframe has been generated from the actual location of the feature. The ZTV has established that there will be no inter-visibility between the project site and Caistel Odair Scheduled Monument.	Figure 10.6 Figure 10.4 Figure 10.3
Historic Environment Scotland (HES) 10 July 2018	Would also ask that the assessment considers potential noise and vibration impacts on the monuments, and on the potential for impact damage if a launch were to fail and debris fall.	Potential effects arising from vibration has been assessed.	Sections 10.11.2 and 10.11.3
Historic Environment Scotland (HES) 10 July 2018	Suggest that the first consideration following assessment should be related to whether changes to the design, layout, proximity etc. of the proposals could mitigate the identified effects.	Project has been substantially reduced since the scoping layout.	Chapter 3: Site Selection and Alternatives. Figure 3.1

Stakeholder / Date	Consultee's Comment	Response / Action	Section cross - reference
Historic Environment Scotland (HES) 10 July 2018	The setting of the Dun Scolpaig includes a distinct relationship to Loch Scolpaig and the surrounding landform, and the nature of the monument means that it is locally prominent. The Environmental Report should assess the impact of the proposed development on the setting of the monument, in particular the relationship of the dun to the loch and the impact on its local prominence, supported by a visualisation (wireframe or photomontage).	A photomontage was rendered at and the main road (A865) approaching the Project from the south-west. A further wireframe has been generated from the actual location of Dun Scolpaig. An assessment of the impacts of setting has been provided.	Figure 10.6 Figure 10.4 Section 10.9.2
Historic Environment Scotland (HES) 10 July 2018	Caisteal Odair setting includes a relationship to the topography and to the wider contemporary landscape. The site has clearly been chosen for its defensive capability, so clear outward views from the monument are likely to be important to understanding and appreciating its setting. There is potential for an adverse impact on the setting of the monument, therefore the Environmental Report should assess the impact of the proposed development on the setting of the monument,	ZTV has established that there will be no inter-visibility between the project site and Caistel Odair Scheduled Monument.	Figure 10.3
Response to 2019 Planning Application (WICAS) 9 July 2019	Response to the planning application outlined the historic context of the site, referencing R.Reids map of North Uist (1799) indicates the pre- crofting settlement at Scolpaig. The Historic Environment Record (HER) for the Western Isles shows 14 recorded archaeological sites located close to the application areas and a number of other features including a Scheduled Monument. Recommends that all areas of development in machair are subject to a programme of archaeological works (evaluation trenches) prior to groundworks to inform further mitigation.	The archaeological sites within the project site boundary and within 200 m of it have been included in the assessment. The methodology for the trial trench evaluation will be included in a Written Scheme of Investigation (WSI) which will be agreed with WICAS prior to the commencement of any development. If within the project footprint, the machair will be included in the 10 % trial trench evaluation.	Section 10.8, Figure 10.1 Section 10.10
Response to 2019 Planning Application (WICAS) 9 July 2019	Recommends that Historic Environment Scotland should be consulted with regard to the Scheduled Monument Dun Scolpaig, (MWE.10072)	HES is a statutory consultee and have been consulted on the project as outlined in this table.	N/A

Stakeholder / Date	Consultee's Comment	Response / Action	Section cross - reference
Response to 2019 Planning Application (WICAS) 9 July 2019	Recommended a series of conditions: a) the extent, character and significance of any archaeological remains within the site will be identified and evaluated; b) any archaeological remains would be preserved in situ or, where their preservation in situ cannot be achieved, how they would be investigated, recorded and recovered and the findings published; c) access to the development site to enable archaeological works and investigation recording and recovery of finds would be achieved; and d) notification of the commencement of development and access by an archaeologist to the site would be given.	Conditions to be integrated into a WSI, should planning permission be issued for the development.	Section 10.10
WICAS Meeting 7 May 2021	WICAS suggested that Historic Building Recording (HBR) surveys of the former steading buildings be carried out prior to development.	Proposed mitigation commits to HBR surveys of former steading buildings and structures within the project site boundary.	Section 10.10
HES Planning Response 16/07/19	HES do not object to the development proposal. However, reiterated that the EIA Scoping Response highlighted that there could be an adverse impact on the setting of two scheduled monuments in the vicinity: Dun Scolpaig, dun (site of) and tower (SM 7640) and Caisteal Odair, promontory fort (SM 5248). In light of this, we requested visualisations were requested.	A photomontage was rendered at a location close to the Dun Scolpaig (due to access restrictions). A further wireframe has been generated from the actual location of Dun Scolpaig. An assessment of the impacts of setting has been provided. ZTV indicates that there would be no intervisibility between the project site and Caisteal Odair, promontory fort (SM 5248).	Figure 10.6 Figure 10.4 Section 10.9.2 Section 10.11.4.

Stakeholder / Date	Consultee's Comment	Response / Action	Section cross - reference
HES responses in relation to SMs 17/02/21	Confirmation that visualisations issued 5 February 2021 provide a useful representation of the development. Suggested that a visualisation produced on the basis of the SM.	Subsequently indicated (19/02/21) that the islet (on which the SM is located) is inaccessible. Wireframe has been generated from the actual location of Dun Scolpaig.	Figure 10.4
WI Council Archaeology Service 25/8/2021	Consultation with WICAS covered the following topics: WICAS and/or Museum Tasglann nan Eilean (MnE) visits to the site and farmhouse. An application to designate the farmhouse as a Listed Building was submitted to HES by a member(s) of the local community. The farmhouse meets the criteria for Listing. Although WICAS and MnE had visited and assessed the interior of the farmhouse, these visits did not constitute a formal site visit, assessment or survey associated with the proposed development. Mitigation of potential direct effects upon the cultural heritage resource.	Baseline information relating the importance of Scolpaig Farmhouse has been reported. The mitigation discussed with WICAS has been included in Section 10.10 of this chapter. This can be summarised as: • Pre-project, subsequent and post-project HBR surveys of all historical structures within the project site boundary; • Trial trench evaluation of 10% of the project site; • Watching brief during groundworks on the access road.	Section 10.8 Section 10.10

Stakeholder / Date	Consultee's Comment	Response / Action	Section cross - reference
WI Council Archaeology Service 30/09/21 2021	Subsequent correspondence reiterated the local importance of the farm complex. The artefacts within the farmhouse and other characteristics suggested that the farmhouse had a higher than anticipated heritage value, and a proposal to designated the farmhouse as a listed property, and the decision of HES that the building met the criteria for listing WICAS recommended that the developer collate a policy or position on the farmhouse. WICAS reiterated that any works which impact standing buildings or ground disturbance should be subject to consultation with CnES Archaeology Services.	The cultural heritage importance of the farmhouse has been integrated into the baseline assessment. The cultural heritage resource has been included as part of the outline Habitat and Amenity Management Plan proposals for the site. Agreement to include an objective around Historic Building Recording Survey commitments to submit information to CnES Archaeology Service, and agree further actions if necessary.	Section 10.8.3 and Appendix 10-1: Archaeology Gazetteer. Appendix 7-2 Outline Habitat and Amenity Management Plan Section 10.10
Local Historian 8/11/21	A summary of the history of the area / building was provided (captured in the HES Decision Document), starting with the Reid map of 1799 which shows a small settlement on the east end of Scolpaig Bay. Described a number of features of importance e.g., the outbuilding, and potentially heated greenhouse. A summary of the decision document published by HES with respect to the proposed listing of the building was provided (building was considered to meet the criteria for listing but was not progressed due to the status of the planning application).	Further details relating to the background of Scolpaig Farmhouse provided, and considered in the assessment of the sensitivity / importance of this feature.	Section 10.8

10.7 ASSESSMENT METHODOLOGY

10.7.1 Approach to assessment

The methodology/approach used to assess the likely significant effects on archaeology and cultural heritage considered the following guidelines produced by Historic Environment Scotland and The Chartered Institute for Archaeologists (CIfA):

- Historic Environment Scotland 2016 *Managing Change in the Historic Environment: Setting*;
- Historic Environment Scotland 2019 *Historic Environment Policy for Scotland*;
- CIfA 2021 Code of Conduct;

- CIfA 2020 Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment; and
- CIFA 2020 Standard and guidance for desk-based assessment.

The assessment of the study area adopted the following information sources:

- GIS Information on Listed Buildings, Conservation Areas and Inventory Gardens and Designed Landscapes was obtained from Historic Environment Scotland (HES);
- GIS Information from the National Record of the Historic Environment (NRHE) was obtained from HES;
- Relevant aerial photographs were viewed at The National Collection of Aerial Photographs online search resource. Three series of photographs ranging in date from 1946 to 1988 were inspected. These were supplemented by satellite images from the twenty-first century;
- Digital versions of the Pre-Ordnance Survey maps and the first, second and later editions of the Ordnance Survey (OS) maps of the area of interest, held by the National Library of Scotland, were identified online, and examined. Relevant maps range in date from the seventeenth to the mid-nineteenth century;
- Relevant Local and Strategic Development Plans were obtained from the Comhairle nan Eilean Siar website.

10.7.2 Assessment Methodology

Direct Effects

The significance of a potential impact resulting from a direct effect related to the Project site is assessed by considering the sensitivity and importance of the feature, and the magnitude of the impact.

The sensitivity and importance of the feature is determined with reference to any designation and, especially for non-designated archaeological remains, by professional judgement made with reference to criteria such as those set out in Annex 1 to Historic Environment Scotland's *Designation Policy and Selection Guidance* (2019), the HES guidance *Managing change in the Historic Environment - Setting* (2016) and *The Environmental Impact Assessment Handbook* (2018) published by Historic Scotland and Scottish Natural Heritage. Other forms of non-designated cultural heritage features can be assigned equivalent levels of importance, with reference, for example, to the criteria for designating Listed Buildings, as outlined in Annex 2 to Historic Environment Scotland's *Designation Policy and Selection Guidance* (2019). Table 10-2 represents a guide used in assigning levels of sensitivity and importance to cultural heritage features.

Table 10-2 Sensitivity/Importance of Cultural Heritage and Archaeology

Sensitivity	Importance	Feature Examples
High	National	World Heritage Sites; Scheduled Monuments or sites of schedulable quality; A-Listed Buildings; some Conservation Areas; Historic Marine Protected Areas; Inventory Gardens and Designed Landscapes and Inventory Battlefields.
Medium	Regional	B-Listed Buildings or buildings of equivalent quality; archaeological remains of regional importance.
Low	Local	C-Listed Buildings or buildings of equivalent quality; archaeological remains of local importance.
Lesser	Lesser	Archaeological remains of lesser importance.
Unknown	Unknown	Archaeological remains of unknown character and importance.

The magnitude of the effect is determined with reference to the scale and type of the potential change to the feature. Definitions of magnitude for direct impacts are provided in Table 10-3.

Table 10-3 Definitions of Magnitude of Effect

Magnitude	Definition
Substantial	Total loss of or major alteration to key elements or features of the pre-project conditions, such that the post-project character or composition of the feature would be fundamentally changed.
Moderate	Loss of or alteration to key elements or features of the pre-project conditions, such that the post-project character of the feature would be partially changed.
Slight	Minor alteration from pre-project conditions.
Negligible/ No change	No or slight change to pre-project conditions.

The significance of any potential effect on a feature has been assessed as *major*, *moderate*, *minor*, *negligible* or *none*. Judgement of the significance of an effect was made with reference to Table 10-4.

Table 10-4 Matrix for the Assessment of Significance of Effect

	Magnitude o			
Sensitivity	**Substantial**	**Moderate**	**Slight**	**Negligible**
High	Major	Moderate to major	Minor to moderate	None
Medium	Moderate to major	Moderate	Minor	None
Low	Minor to Moderate	Minor	Negligible	None
Lesser / Unknown	Minor	Negligible	None	None

Where the effect on a feature is classified as major or moderate, this is considered to be equivalent to likely significant effects referred to in the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.

Indirect Impacts (Setting)

Identification of Cultural Heritage Receptors

A zone of theoretical visibility (ZTV) analysis was modelled using a Terrain 5 model (with 5 m contours) to establish potential visibility of the temporary launch tower across a 5 km study area (Figure 10.3). All designated cultural heritage sites falling within the 5 km buffer were recorded, researched and the impact of the project assessed. Undesignated designated cultural heritage sites were excluded from the indirect effect (setting) assessment.

Photomontages were prepared to provide a visual representation of the Project when the launch tower is on site. Due to the location of Dun Scolpaig on an inaccessible islet within a loch, photomontages were not possible from this location, however a wireframe from the actual location was rendered (Figure 10.4). A wireframe was also rendered to support the assessment of Cille Pheadair Cross (Figure 10.5).

Study of this surrounding landscape provides the local archaeological and historical context of the area giving a broader understanding of the historical development of the area and the potential for as-yet-unidentified archaeological remains within that area.

Assessment

In the context of the current assessment, potential effects on the settings of cultural heritage features are primarily visual in nature although less tangible elements such as function, sensory perceptions or the historical, artistic, literary and scenic associations of places or landscapes can also contribute to the setting of a cultural heritage feature (HES 2020).

The assessment of effects is based on the sensitivity and importance of a cultural heritage site, as defined in Table 10-2, an analysis of its current surroundings, and an assessment of the extent to which change can be accommodated without detriment to the cultural heritage site. The assessment takes account of a wide variety of elements of setting, including inter-visibility with other sites, buildings or landscape features, key viewpoints to, from and across the cultural heritage site, and potential effects from noise, dust and vibration that may be associated with a development proposal. The HES guidance *Managing change in the Historic Environment - Setting* is used to further define the current setting and to evaluate the potential effect resulting from the Project.

The sensitivity of a feature in this context relates to the degree to which change can be accommodated without detrimental effects on the relationship between the feature and its setting. The sensitivity of each feature subject to assessment is defined as high, medium, low, or not sensitive. Unless otherwise justified by specific factors in an individual case, the sensitivity of each feature was determined as shown on Table 10-5.

Table 10-5 Sensitivity of Cultural Heritage Features to Setting Effects

Sensitivity	Feature Designation Categories
High	World Heritage Sites; Scheduled Monuments; A-listed buildings; Historic Gardens and Designed Landscapes; some Conservation Areas
Medium	B-listed buildings; some Conservation Areas
Low	C-listed buildings

The magnitude of effect arising from the Project in relation to a given feature and its setting is described as substantial, moderate, slight, or negligible/no change based on the definitions and descriptions in Table 10-3.

Having defined the current setting and quantified both the sensitivity of the cultural heritage receptor and the potential magnitude of the Project upon the cultural heritage site, the sensitivity and magnitude are, in each case, combined to determine the significance of the potential effect. The assessment of potential effects on setting is based on professional judgements concerning the sensitivity, magnitude, and significance of the effect in each case. These professional judgements were made in the context of the following structure.

The significance of any potential effect on the setting of a feature is assessed as major, moderate, minor, negligible or none. The professional judgement of the significance of an effect was made with reference to the matrix below (Table 10-6).

Table 10-6 Matrix for the Assessment of the Significance of Potential Setting Effects

	Magnitude			
Sensitivity	**Substantial**	**Moderate**	**Slight**	**Negligible**
High	Major	Moderate to major	Minor to moderate	None
Medium	Moderate to major	Moderate	Minor	None
Low	Minor to Moderate	Minor	Negligible	None
Lesser / Unknown	None	None	None	None

Where the effect on the relationship of a feature to its setting is classified as major or moderate, this is considered to be equivalent to likely significant effects referred to in the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. Minor and Negligible effects are not considered significant.

10.8 BASELINE DESCRIPTION

There are 32 known cultural heritage sites (designated and undesignated features) within the 5 km study area. A full description of each feature is provided in Appendix 10-1: Archaeology Gazetteer and illustrated on Figure 10.1 and Figure 10.2.

A total of seven cultural heritage sites are recorded within the Project site boundary. These comprise one structure listed on the HER database, and a site walkover of the Project site identified a further six structures. All seven cultural heritage sites within the Project site are undesignated.

A total of nine cultural heritage sites were recorded between the 200 m buffer and Project site boundary. These comprise one Scheduled Monument, seven sites listed on NRHE and one site listed on the HER data base.

In the 5 km study area a further 15 designated cultural heritage sites were identified, consisting of 12 Scheduled Monuments, two category B Listed Buildings and one category C Listed Building. The Scheduled Monuments are of national cultural heritage importance and high archaeological sensitivity, the category B Listed Buildings are of regional cultural heritage importance and medium archaeological sensitivity, and the category C Listed Building is of local cultural heritage importance and low archaeological sensitivity.

The archaeological time periods referred to in the text are taken from the standard date-ranges utilised by the Scottish Archaeological Framework (ScARF). ScARF is managed by the Society of Antiquaries of Scotland and grant funded by Historic Environment Scotland as a key part of its commitment to Scotland's Archaeology Strategy.

In the following assessment, the reference in parenthesis (**CHS and number**) refers to the cultural heritage sites noted in Appendix 10-1: Archaeology Gazetteer.

10.8.1 Prehistoric and Early Medieval Sites (8000 BC – AD 600)

The Project Site

There are no known prehistoric or early medieval remains within the Project site.

200 m Buffer

Prehistoric remains in the form of a dun, a cup-marked stone, a possible souterrain and a midden are known within the 200 m buffer. These represent both settlement and ritual activity and, aside from Dun Scolpaig Scheduled Monument, are not designated.

- The settlement site of Dun Scolpaig Scheduled Monument (**CHS 1**) is a later prehistoric/early Medieval dun located on an island in Loch Scolpaig. The island is now occupied by a nineteenth century folly, but remains of the earlier structure are likely to survive below the folly. Dun Scolpaig Scheduled Monument is of national cultural heritage importance and **high** archaeological sensitivity.
- A souterrain (**CHS 5**) is said to be located at Scolpaig, although its presence has not been ascertained through excavation and there is no trace of an underground chamber on Cnoc an Litick knoll. This possible souterrain is of potential regional cultural heritage importance and **medium** archaeological sensitivity.
- A Beaker sherd (**CHS 7**) found in a midden to the west of the Site is also an indication of prehistoric settlement in the vicinity. The artefact is of lesser cultural heritage importance and **lesser** archaeological sensitivity
- The cup-marked stone (**CHS 3**) represents ritual activity although not at Scolpaig itself, as the stone was originally found at Ard a'Bhorain approximately 11 km north-east of the Project site and was brought to Scolpaig. Its current location is not known. The stone is of lesser cultural heritage importance and **lesse**r archaeological sensitivity.

5 km Study Area

Within 5 km of the Project site are the remains of 11 prehistoric settlements and ritual sites. Each of these is a Scheduled Monument which means they are all of national cultural heritage importance and **high** archaeological sensitivity.

- Eilean Domhnuill Settlement Scheduled Monument (**CHS 15**) is a late Neolithic settlement that consists of a series of dwellings, indicating prolonged use of the site. Its period of use was c. 3000 BC to c. 2500 BC.
- Geirisclett Chambered Cairn Scheduled Monument (**CHS 17**) dates from the late Neolithic or Early Bronze Age (c.4000 BC to c.1800 BC). It is one of only two Clyde-type cairns in the Western Isles.
- South Clettraval Chambered Cairns, Standing Stone and Aisled House Scheduled Monument (**CHS 19**) is a multi-period site that comprises a group of Neolithic ritual monuments with one of the most complete non-defensive Iron Age complexes so far identified in the Western Isles. The Neolithic cairns and standing stone date from between 4300 BC and 2500 BC, while the Iron Age aisled house is within the date-range 800 BC to AD 400.
- Sithean Tuath Scheduled Monument (**CHS 21**) is a Bronze Age burnt mound and is the first such monument to be identified in the Western Isles Islands Area, although the type is well-known from Orkney, Shetland, Caithness and South-Western Scotland. From analogy with the Northern Isles a burnt mound of this order of size is most likely to date to c. 1800 BC to c. 600 BC.
- The Iron Age (c. 800 BC to c. AD 400) is well represented among the cultural heritage sites with seven monuments wholly or partly dating from this period. These are Caisteal Odair Promontory Fort Scheduled Monument (**CHS 12**), Foshigary Settlement Scheduled Monument (**CHS 13**), Dun A'Ghallain Dun Scheduled Monument (**CHS 14**), Buaile Risary Settlement and Cup-Marked Stone Scheduled Monument (**CHS 18**), Dun Scarie Scheduled Monument (**CHS 22**) and Dun Grogarry Scheduled Monument (**CHS 24**). With the exceptions of Foshigary Settlement and Buaile Risary Settlement, all of the aforementioned are defensive settlement types.
- Geirisclett Settlement Scheduled Monument (**CHS 16**) is a multi-phase settlement that had use during the mid-Iron Age (c.400 BC to c.200 AD) as well as the Norse (c. AD 900 to AD 1000) and post-medieval periods.

10.8.2 Medieval sites (AD 600 – AD 1600)

The Project Site

There are no known cultural heritage sites of Medieval date within the Project site.

200 m Buffer

There is one known cultural heritage site of Medieval date within 200 m of the Project site:

- A set of Medieval artefacts (CHS 4) including bone needles and pins, parts of bone combs, bone whorls, bone fasteners, bone wilk picks and borers, bronze needles and pins was found at several places, including Scolpaig. It is not possible to state exactly which items among those listed came from Scolpaig. This assemblage of artefacts is of local archaeological importance and **low** archaeological sensitivity.

5 km Study Area

There is a further one known cultural heritage site of Medieval date within the 5 km Study Area:

- Cille Pheadair Cross Scheduled Monument (**CHS 26**) was found in the ancient graveyard of Cille-pheadair, the location of which is said to be a grassy plateau to the south of where the cross now stands. The cross was re-erected about 1830-40 on a pedestal c. 2 m high on the summit of a small hill some 970 m south-south-west of the Project site. The Scheduled Monument is of national cultural heritage importance and **high** archaeological sensitivity.

10.8.3 Post-medieval and modern sites

The Project Site

There are seven known post-medieval cultural heritage sites within the Project site. These are all of local cultural heritage importance and **low** cultural heritage sensitivity.

- A housing settlement labelled 'Scolpig' is shown in Reid's Plan of the island of North Uist of 1799. The settlement is located northwest of Loch Scolpaig at the location of the farmstead (**CHS 6**) and outbuildings, possibly including **CHS 27**, **CHS 28**, **CHS 29** and **CHS 32**, and is depicted as a cluster of 11 structures. The map was not available for consultation online and this information was supplied by WICAS.
- Of the maps consulted for this assessment, Johnson's 1850 map was the earliest to record Scolpaig farmstead (**CHS 6**) where it was depicted as a rectangular building.
- The earliest map to record the project site in any detail was the 1879 Ordnance Survey 25-inch map. Here four roofed buildings (**CHS 6**, **CHS 27, CHS 28** and **CHS 32**) were recorded along with an associated enclosure (**CHS 30**) and part of the field system (**CHS 31**).
- The 1903 Ordnance Survey 25-inch map demonstrated that a further small building (**CHS 29**) had been added to the farmstead complex, and all structures associated with the farmstead were roofed and, presumably, in use. The Project site included enclosed agricultural land, some of which is likely to have been pastureland given the presence of a cattlefold on the farmstead.
- The 1968 Ordnance Survey 1:2500 map recorded all of the structures within the Project site although **CHS 29** was depicted as roofless.

200 m Buffer

There are five known post-Medieval or modern cultural heritage sites within 200 m of the Project site:

- The 1879 Ordnance Survey 25-inch map recorded Scolpaig house (CHS 2) as a farmhouse with adjoining farm building. The farmhouse meets the criteria for category C Listing based on its importance as a representative example of a small early to mid-nineteenth century Improvement period farmhouse complex in Na h-Eileanan Siar. From the HES documentation on the Listing application, the farmhouse is also rare in its retention of a range of outbuildings, including the remains of a walled garden. The building has been assessed to have low cultural heritage sensitivity.
- The same map also recorded Scolpaig Bay field system (CHS 8) which is of lesser cultural heritage importance and lesser cultural heritage sensitivity. Ardanroin township (CHS 10) was depicted as a collection of six roofed buildings, one of which has an adjoining enclosure to the west while Balelone Township Old Fields (CHS 11) comprised a square farmstead with a rectangular building to the north and a series of fields to the east and north-east. Both of these townships are of local cultural heritage importance and low cultural heritage sensitivity.
- None of the maps consulted recorded Scolpaig Bay Commemorative Monument (CHS 9), which is of lesser cultural heritage importance and lesser archaeological sensitivity. No details of the monument are recorded on NRHE.

5 km Study Area

- Both Kilmuir Burial Ground (**CHS 23**), which contains graves from the eighteenth century, and the early nineteenth century Baleloch House (**CHS 25**) were recorded on the 1879 Ordnance Survey maps. These category B Listed Buildings are of regional cultural heritage importance and **medium** archaeological sensitivity.
- Kilmuir Parish Church (**CHS 20**) was built in 1894 and was recorded on the 1903 Ordnance Survey map. This category C Listed Building is of local cultural heritage importance and **low** archaeological sensitivity.

10.8.4 Previous Archaeological Investigations within the Project Site

No commercial, local authority or research fieldwork is known to have been carried out within the Project site.

The WICAS informally inspected a series of test pits excavated over the Project site. No cultural heritage remains were noted in the test pits and, consequently, there is no written report on the inspection (K. Murphy *pers.comm*.). There were two visits undertaken by the Museum Tasglann nan Eilean (MnE) and CnES Archaeological Service which had been responsive to the sale of the farm. The initial visit comprised an assessment of the interior fittings of the building, to inform potential for recovery of key artifacts in line with MnE's collections policies. The second visit was the recovery of identified objects and basic recording of the structures. These visits did not constitute a formal site visit, assessment or survey associated with the proposed development (K. Murphy *Pers Comm*).

10.8.5 Aerial Photographs and Satellite Images

One aerial photograph from 1987 was available for inspection on the National Collection of Aerial Photography website. This photograph demonstrated that the farm buildings and field boundaries within the Project site remained in existence in 1987, although the scale of the image was such that the condition of the buildings could not be ascertained. Satellite images from the twenty-first century showed that only one of the farm buildings within the Project site (**CHS 29**) was unroofed in 2005. Building **CHS 28** was roofed in 2009 but the roof had partially collapsed by 2019. No previously unrecorded cultural heritage features were noted on any of the aerial photographs or satellite images consulted.

10.8.6 Field Survey

A walkover survey of the Project site was carried out on 26th May 2021 in dry, overcast conditions. The survey found that of the farm buildings within the Project site, one was roofed (**CHS 6**), three were in ruins (**CHS 28**, **CHS 29** and **CHS 32**) and one had been modernised and was being used by nesting birds (**CHS 27**). The walls of the enclosure

(**CHS 30**) and of the field boundary (**CHS 31**) were largely intact although quite tumbled in places. No previously unrecorded cultural heritage sites were noted during the walkover survey.

10.8.7 Statutorily Designated Cultural Heritage Sites

Of the 32 sites identified within the 5 km study area, 16 are designated. These comprise:

- Dun Scolpaig Scheduled Monument (**CHS 1**);
- Caisteal Odair Promontory Fort Scheduled Monument (**CHS 12**);
- Foshigary Settlement Scheduled Monument (**CHS 13);**
- Dun A'Ghallain Dun Scheduled Monument (**CHS 14**);
- Eilean Domhnuill Settlement Scheduled Monument (**CHS 15**);
- Geirisclett Settlement Scheduled Monument (**CHS 15**);
- Geirisclett Chambered Cairn Scheduled Monument (**CHS 17**);
- Buaile Risary Settlement and Cup-Marked Stone Scheduled Monument (**CHS 18**);
- South Clettraval Chambered Cairns, Standing Stone and Aisled House Scheduled Monument (**CHS 19**);
- Kilmuir Parish Church C Listed Building (**CHS 20**);
- Sithean Tuath Scheduled Monument (**CHS 21**);
- Dun Scarie Scheduled Monument (**CHS 22**);
- Kilmuir Burial Ground B Listed Building (**CHS 23**);
- Dun Grogarry Scheduled Monument (**CHS 24**);
- Baleloch House B Listed Building (**CHS 25**), and
- Cille Pheadair Cross Scheduled Monument (**CHS 26**).

Table 10-7 Significance of the Cultural Heritage Sites

CHS No.	Site Name	Designation	Cultural Heritage Importance/ Sensitivity
1	Dun Scolpaig, dun (site of) and tower	Scheduled	National/High
2	Scolpaig house	Meets the criteria for category C Listing	Local/Low
3	Scolpaig House cup-marked stone	None	Lesser/Lesser
4	Scolpaig axehead and assorted artefacts	None	Local/Low
5	Scolpaig possible souterrain	None	Regional/Medium
6	Scolpaig farmstead	None	Local/Low
7	Scolpaig midden and beaker	None	Lesser/Lesser
8	Scolpaig Bay field system	None	Lesser/Lesser
9	Scolpaig Bay Commemorative Monument	None	Lesser/Lesser
10	Ardanroin township	None	Local/Low
11	Balelone Township Old Fields	None	Local/Low
12	Caisteal Odair Promontory Fort	Scheduled	National/High
13	Foshigary Settlement	Scheduled	National/High

CHS No.	Site Name	Designation	Cultural Heritage Importance/ Sensitivity
14	Dun A'Ghallain Dun	Scheduled	National/High
15	Eilean Domhnuill Settlement	Scheduled	National/High
16	Geirisclett Settlement	Scheduled	National/High
17	Geirisclett Chambered Cairn	Scheduled	National/High
18	Buaile Risary Settlement and Cup-Marked Stone	Scheduled	National/High
19	South Clettraval Chambered Cairns, Standing Stone and Aisled House	Scheduled	National/High
20	Kilmuir Parish Church	C Listed	Local/Low
21	Sithean Tuath	Scheduled	National/High
22	Dun Scarie	Scheduled	National/High
23	Kilmuir Burial Ground	B Listed	Regional/Medium
24	Dun Grogarry	Scheduled	National/High
25	Baleloch House	B Listed	Regional/Medium
26	Cille Pheadair Cross	Scheduled	National/High
27	Scolpaig byre (farmstead complex)	None	Local/Low
28	Scolpaig farm building (farmstead complex)	None	Local/Low
29	Scolpaig structure (farmstead complex)	None	Local/Low
30	Scolpaig enclosure (farmstead complex)	None	Local/Low
31	Scolpaig stone dyke (farmstead complex)	None	Local/Low
32	Scolpaig structure (farmstead complex)	None	Local/Low

Statement of Cultural Heritage Sensitivity

Based on the eighteenth and nineteenth century remains of Scolpaig farmstead (**CHS 6** and **CHS 27** to **CHS 32**), the assessment has found that the Project site has low cultural heritage sensitivity. However, the presence of the nationally important prehistoric remains of Dun Scolpaig Dun Scheduled Monument (**CHS 1**) combined with the prehistoric beaker sherd (**CHS 7**), the axehead and assorted artefacts (**CHS 4**) and the possible souterrain (**CHS 5**) all indicate the use of the wider area around the Project site for settlement and ritual purposes during the prehistoric period. Given the prehistoric use of the area, which is likely to have included the Project site, the overall cultural heritage sensitivity of the Project site is **high**. These factors also suggest that there is **high** potential for the survival of previously recorded cultural heritage remains, features, deposits and artefacts within the Project site.

10.9 POTENTIAL IMPACTS

10.9.1 Direct Impacts

The following impacts have been established through scoping and consultation with key stakeholders. Cumulative effects are addressed in Section 10.12. The potential impacts identified for each phase of the Project are:

Construction

- Direct physical damage to known and unknown historic assets from construction activities; and
- Vibration from construction traffic compromising the integrity of existing ruinous buildings.

Operation

- Vibration from rocket launches resulting in damage to known and unknown historic assets.

Decommissioning

- Potential adverse direct effects upon the remains of the seven post-Medieval buildings and structures identified within the Project site.

Potential direct impacts on the archaeological resource are typically permanent and irreversible.

10.9.2 Indirect Impacts

Potential setting effects are expected during the operational phase only and include:

- Indirect impact of the proposed tower on the setting of archaeological and cultural heritage assets.

10.10 MITIGATION

10.10.1 Mitigation of Direct Impacts

Ref	Design Mitigation	Description
GMO1	Design Mitigation	• Reuse of existing infrastructure where possible: one existing farm building upgraded and the existing access road from the A865 will be upgraded. • Substantial reduction of original project infrastructure (Figure 3.1) and footprint, to avoid peat, sensitive habitats and the National Scenic Area (NSA). • Project revised to provide a venue for sub-orbital launch vehicles, substantially smaller than orbital launch vehicles proposed in the Scoping Report;
GM02	Construction Mitigation Register & Environmental Manager	A Construction Mitigation Register (CMR) will be collated detailing the mitigation commitments in the EIA and relevant planning conditions. A dedicated Construction Environmental Manager (CEM) will have responsibility to ensure all measures in the register are delivered during the construction period. The CMR will outline all required mitigation commitments and relevant planning conditions for ornithological, ecological, cultural heritage and hydrological receptors, providing details of key sensitivities present and timings. The CEM will contract necessary survey expertise, advise on, and monitor the implementation and compliance of works with construction phase environmental mitigation and good practice measures.

Ref	Design Mitigation	Description
ARC01	Historic Building Recording Survey	A Historic Building Recording (HBR) survey of the farmhouse, the farm buildings, the enclosure and the drystone dyke will be carried out prior to the commencement of any works relating to the proposed development so that the present state of the structures can be recorded and any resulting change to these as a result of vibration measured. The Historic Building Recording survey will be repeated after every 10 rocket launches or every 18 months, or other appropriate timeframe agreed between WICAS and the developer.
ARC02	Written Scheme of Investigation / Evaluation	A programme of archaeological works will be carried out in accordance with a Written Scheme of Investigation (WSI) in order to establish the presence or absence of cultural heritage remains or deposits within areas of the project site that will be subject to ground disturbance. The evaluation is likely to comprise up to 10% of the project footprint.
ARC03	Watching Brief	An archaeological watching brief will be carried out during specified ground-breaking works on the site. If discovered, any cultural heritage remains will be preserved in-situ through avoidance of direct effects. Where this is not possible, preservation through record, using some or all of the following methods; archaeological survey, building recording, evaluation, excavation, post-excavation analyses and publication, should be achieved following consultation with the WICAS in accordance with SPP and PAN 2/2011.
ARC04	Protection of historic farm buildings and associated features	Parts of the enclosure (CHS 30) are directly impacted by the construction of the access track and may be also impacted by the construction of the launch pad soakaway. Clean sand excavated from the construction works will be used to build up ground levels along the route of the launch pad access road. An initial sand protection layer of minimum 200 mm will be laid over the existing land to provide protection to any archaeology which may exist The stone dyke (CHS 31), is currently partially buried with windblown sand. This feature will be excavated and recorded prior to lowering a section of wall to allow the access road to be constructed. When the sand layer has been brought to the appropriate level it will be overlayed with a geotextile membrane and the crushed stone access track and wearing surface. All exposed sand will be overlayed with turfs excavated during the construction works. Necessary protection for farm buildings within and adjacent to the project site will be agreed with WICAS to prevent accidental damage to the fabric of the buildings.

10.11 IMPACT ASSESSMENT

10.11.1 Direct physical damage to known and unknown historic assets from construction activities

Impact (without mitigation)

The Project site has been agricultural land since at least the latter part of the nineteenth century and has seen little disturbance to topsoil deposits since that time. Given that a prehistoric settlement is recorded within 200 m of the Project site and that prehistoric artefacts have been uncovered in close proximity to the Project site, there is good potential for the survival of hitherto unrecorded sub-surface archaeological remains within the Project site. The movement of construction machinery over, or near to, sensitive areas, could result in the disturbance or destruction of a feature, including through compaction of archaeological deposits.

- Seven post-medieval structures have been identified within the Project site boundary (**CHS 6**, **CHS 27**, **CHS 28**, **CHS 29**, **CHS 30**, **CHS 31** and **CHS 32**) that may be damaged by construction works;
- Widening or upgrading of the existing access road could have a potential adverse direct effect upon the remains of Ardanroin township (**CHS 10**) as the extent of the township may not be confined to those remains visible today. Similarly, evidence of a historic settlement that may have preceded the current farm complex suggests that there is potential for unknown or buried remains associated with this period;
- One of the byres within the farmstead (**CHS 27**) will be upgraded which could potentially lead to changes to the historical elements and/or structural integrity of the building, resulting in a direct effect.

Mitigation

- For unknown or buried remains, a Written Scheme of Investigation (WSI) will be agreed and submitted to WICAS detailing proposals for an archaeological evaluation covering 10 % of the construction / ground-breaking areas (ARC01).
- A Historic Building Recording (HBR) survey of the buildings and structures within the Project site will be undertaken prior to construction and at agreed intervals throughout the lifetime of the Project. The level of HBR survey will be agreed with WICAS (ARC01);
- The appropriate farm buildings will be protected during the construction phase to prevent accidental damage by plant (ARC04);
- An Archaeological Watching Brief will be present on site during ground-breaking works to monitor excavations and for the protection of known remains. If remains are encountered, these will be recorded and excavated in accordance with the WSI (ARC03);

Magnitude

The upgrading of farm building **CHS 27** would result in permanent material alterations to the fabric of the structure that would represent a slight change to the pre-project conditions, resulting in a **minor** direct effect upon this structure. Construction of the access road to the launchpad would impact the enclosure (**CHS 30**) and Scolpaig stone dyke (**CHS 31**). Clean sand excavated from construction works will be used to build up ground levels along the route of the launch pad access road. An initial sand protection layer of minimum 200 mm will be laid over the existing land to provide protection to any archaeology which may exist. The stone dyke at point 31, which is partially buried with windblown sand, will be excavated and recorded prior to lowering a section of wall to allow the access road to be constructed. When the sand layer has been brought to the appropriate level it will be overlayed with a geotextile membrane and the crushed stone access track and wearing surface.

The changes represent permanent, material changes to the fabric of the remains that would represent a slight change to the pre-project conditions, resulting in a **minor** adverse direct effect upon these two structures. The upgrading and widening of the access road have the potential to result in a **negligible** adverse direct effect upon Ardanroin township (**CHS 10**).

Residual Significance

All of the cultural heritage receptors within the Project site are assessed to be of **low** cultural heritage importance, however there is potential for buried / unknown remains. With the implementation of proposed mitigation and management measures, the magnitude of the impact is assessed to be **low**. Therefore, it is anticipated that there will be **minor** residual effects which are **not significant.**

10.11.2 Vibration from construction traffic compromising the integrity of existing farm buildings

Impact (without mitigation)

Potential adverse direct effects upon the remains of the seven post-medieval buildings identified within the Project site (**CHS 6**, **CHS 27**, **CHS 28**, **CHS 29**, **CHS 30**, **CHS 31** and **CHS 32**) could be caused by vibration from construction and site traffic. Two of the buildings (**CHS 6** and **CHS 27**) are roofed, appear to be in good condition and are unlikely to be adversely affected by vibration arising from the Project. The remaining three buildings (**CHS 28**, **CHS 29** and **CHS 32**) are in a ruined condition that could make them more susceptible to damage from vibration.

Mitigation

A Written Scheme of Investigation (WSI) to be agreed with WICAS prior to the commencement of any groundworks within the project site (ARC02). An HBR survey will be undertaken to assess the current condition of the following structures: **CHS 6**, **CHS 27**, **CHS 28**, **CHS 29**, **CHS 30**, **CHS 31** and **CHS 32**. The effects upon the condition of the farm buildings would be measured by comparison between the pre-project HBR survey and subsequent HBR surveys The enclosure (**CHS 30**) and the stone dyke (**CHS 31**) will be buried under sand (AC04) following the initial HBR survey and that these structures may not be accessible for the follow-up surveys. The results of the surveys will be shared with WICAS, CnES and the Developer so that any measures to protect features are agreed.

Magnitude

It is anticipated that the daily construction traffic will comprise standard mechanical excavators, bulldozers and forward tip dumpers. The duration of the construction period will be approximately five months across the full site. The vibration generated from construction traffic and corresponding impacts are not possible to quantify based on the limitations of assessment described in Section 10.5. However, as a precautionary measure, the initial HBR survey will define a baseline condition for the relevant structures. Any subsequent loss to buildings integrity will be identified via proposed mitigation measures and the appropriate remedial works will be agreed in conjunction with WICAS. Magnitude is assessed as **slight.**

Residual Significance

The cultural heritage receptors within the project site are of **low** cultural heritage importance. With the implementation of proposed mitigation and management measures, the magnitude of the impact is assessed to be **slight**. Therefore, it is anticipated that there will be **minor** residual effects which are **not significant.**

10.11.3 Vibration from rocket launches compromising the integrity of existing ruinous buildings

Impact (without mitigation)

Ruinous structures by their nature could potentially be adversely directly affected by exposure to vibration. There is potential for vibration from rocket launches to cause further slippage of material from the three ruinous farm buildings (**CHS 28**, **CHS 29** and **CHS 32**) and the drystone walls of the enclosure (**CHS 30**) and stone dyke (**CHS 31**) resulting in damage to these cultural heritage sites.

Mitigation

- A pre-project baseline Historic Building Recording (HBR) survey of the buildings (**CHS 6**, **CHS 27**, **CHS 28**, **CHS 29** and **CHS 32**) and structures (**CHS 30** and **CHS 31**) within the Project site. The level of HBR survey will be agreed with WICAS and will be caried out after every 10 rocket launches or every 18 months, whichever occurs sooner, or other frequency agreed between WICAS and the Developer. (ARC01);
- Suitable protection measures (burial with sand) for the protection of the drystone walls of the enclosure (**CHS 30**) and stone dyke (**CHS 31**) (ARC 04).

Magnitude

An assessment of noise and anticipated levels of vibration relating to the operational phase of the Project (see Chapter 19: Noise and Vibration; and Appendix 19-1: Noise Technical Report) indicated that the launching of rockets of the scale considered within this report is unlikely to be a significant source of vibration due to the relatively low levels of sound and air overpressure likely to be generated, and the sound would be dominated by mid-range frequencies which are less prone to result in induced vibration in structures than low frequencies. However, that assessment was based on human receptors rather than cultural heritage receptors. Given the uncertainty in terms of impacts on historic buildings integrity, precautionary monitoring of cultural heritage features at an early stage is proposed to identify evidence of degradation and determine appropriate remedial actions. The magnitude of the impact is assessed as **slight.**

Residual Significance

The cultural heritage receptors within the project site are of **low** cultural heritage importance. With the implementation of proposed mitigation and management measures, the magnitude of the impact is assessed to be **slight**. Therefore, it is anticipated that there will be **minor** residual effects which are **not significant.**

Table 10-8 Summary of Direct Impacts

CHS No.	Site Name	Feature Sensitivity	Impact Magnitude	Significance of Impact	Phase
6	Scolpaig farmstead	Low	None	None anticipated from construction activities, construction vibration or vibration from rocket launches.	Construction
10	Ardanroin township	Low	Slight	Negligible anticipated from construction activities. None anticipated from rocket launches.	Construction

CHS No.	Site Name	Feature Sensitivity	Impact Magnitude	Significance of Impact	Phase
27	Scolpaig byre	Low	None	None anticipated from construction activities, construction vibration or vibration from rocket launches.	Construction
28	Scolpaig farm building (in ruins)	Low	Slight	Negligible anticipated from construction activities, construction vibration or vibration from rocket launches.	Construction and Operation
29	Scolpaig farm building (in ruins)	Low	Slight	Negligible anticipated from construction activities, construction vibration or vibration from rocket launches.	Construction and Operation
30	Scolpaig enclosure	Low	Slight	Negligible anticipated from construction activities, construction vibration or vibration from rocket launches.	Construction and Operation
31	Scolpaig stone dyke	Low	Slight	Negligible anticipated from construction activities, construction vibration or vibration from rocket launches.	Construction and Operation
32	Scolpaig farm building (in ruins)	Low	Slight	Negligible anticipated from construction activities, construction vibration or vibration from rocket launches.	Construction and Operation

10.11.4 Indirect impact of the proposed tower on the setting of archaeological and cultural heritage assets Impact (without mitigation)

Each launch will require a temporary tower or launch rail to support and guide the launch vehicle (LV). The height of the tower will vary according to individual specification of the LV, but will not exceed 20 m. The baseline studies identified 16 designated sites that could potentially be indirectly adversely impacted by the project. The ZTV indicates that the majority of the designated cultural heritage sites would have no inter-visibility with the Site (Figure 10.3). Consequently, the Project would have no impact upon the settings of 11 Scheduled Monuments, two category B Listed Buildings and one category C Listed Building. However, two Scheduled Monuments (**CHS 1** and **CHS 26**) would have theoretical inter-visibility with the Project site.

Mitigation

No mitigation is proposed for this impact.

Magnitude

Two Scheduled Monuments would have visibility to the proposed tower:

Dun Scolpaig Dun – a wireframe illustrating the setting of Dun Scolpaig Dun Scheduled Monument (**CHS 1**) is provided in Figure 10.4. A photomontage was prepared from the main road (A865) approaching the Project from the south-west (Figure 10.6) showing the wider setting of Dun Scolpaig with and operational rendering of the Project.

Dun Scolpaig Dun is located on an islet upon Loch Scolpaig which, in addition to providing its immediate setting, was deliberately chosen as a defensible location for what would most likely have been a high-status dwelling. In addition to its functional relationship with the loch, the dun has a spatial relationship with both the loch and the surrounding landscape that includes the hills of Beinn Riabhach to the south-west and Beinn Scolpaig to the north-north-east, as well as the sea to the west. The dun was strategically situated to have visibility to and from the hills and the sea, making it a prominent feature in the landscape and increasing its defensive capabilities. Dun Scolpaig Dun Scheduled Monument is situated approximately 480 m from the launch pad.

Indirect effects upon Dun Scolpaig Dun Scheduled Monument are anticipated during the operational phases of the Project when the proposed tower would be visible beyond the Scheduled Monument when viewed from the south shore of the loch. The topography between the Scheduled Monument and the Project site would screen some of the visibility of the proposed tower and most of the visibility to the launchpad. The vehicle turning point would not be visible although some of the upgraded access road would be visible for the lifetime of the Project. The operational phase of the Project would be intermittent rather than permanent and would, have a temporary effect upon the setting of Dun Scolpaig Scheduled Monument.

The Project would have no impact on any intervisibility between Dun Scolpaig Dun Scheduled Monument and other contemporary designated cultural heritage sites. In addition, the Project would have no impact on the ability to understand the monument and appreciate the contribution that its setting makes to its function as a highly visible but spatially inaccessible monument.

It is assessed that for each launch, the Project would constitute a negligible alteration from the pre-project conditions and the magnitude of impact is assessed as **negligible**.

Cille Pheadair Cross – a wireframe showing the context of Cille Pheadair Cross Scheduled Monument (**CHS 26**) is provided in Figure 10.5. Cille Pheadair Cross was removed from its original location in the ancient graveyard of Cille-pheadair or Kilphedder, which was approximately 120 m to the south-south-west, in the 1830s or 1840s, thus separating the monument from its original context and setting. Cille Pheadair Cross is located atop a hill to the south of the Project site and is within a wider pastoral landscape that has changed remarkably little since the nineteenth century. It is a prominent feature in the landscape and there is intervisibility between the cross and the ruined church of Cille-pheadair to the south. The decision to relocate the cross to the top of a small hill indicates an intention that the cross be visible when approached from both north and south.

The proposed tower would be visible from Cille Pheadair Cross Scheduled Monument (Figure 10.5). However, the view to the launchpad and vehicle turning area would be screened by the residential dwelling at An Ataireachd Ard and the access road would be screened from view by the local topography.

The Project would not affect the ability to understand and appreciate the monument and its setting and would have no impact on the inter-visibility between the cross and the ruined church of Cille-pheadair or Kilphedder. As the operation phase of the Project would be intermittent (maximum of 10 launches / year) and only the northern part of the Site is

visible from Cille Pheadair Cross, it is assessed that the Project would constitute a negligible alteration from the pre-project conditions and the magnitude of impact is assessed as **negligible**.

Residual Significance

The two designated cultural heritage receptors that would have visibility to the Project site are of **high** cultural heritage importance. The magnitude of the impact from the tower upon Dun Scolpaig Dun Scheduled Monument (**CHS 1**) and Cille Pheadair Cross Scheduled Monument (**CHS 26**) is assessed to be **negligible**. Therefore, it is anticipated that there will be **negligible** residual effects which are **not significant.**

10.11.5 Summary of Indirect Impact Assessment

Table 10-9 Summary of Indirect Impact Assessment (setting).

CHS No.	Site Name	Site Designation	Site Sensitivity	Impact Magnitude	Significance of Impact
1	Dun Scolpaig	Scheduled	High	Negligible/No change	None
12	Caisteal Odair Promontory Fort	Scheduled	High	Negligible/No change	None
13	Foshigary Settlement	Scheduled	High	Negligible/No change	None
14	Dun A'Ghallain Dun	Scheduled	High	Negligible/No change	None
15	Eilean Domhnuill Settlement	Scheduled	High	Negligible/No change	None
16	Geirisclett Settlement	Scheduled	High	Negligible/No change	None
17	Geirisclett Chambered Cairn	Scheduled	High	Negligible/No change	None
18	Buaile Risary Settlement and Cup-Marked Stone	Scheduled	High	Negligible/No change	None
19	South Clettraval Chambered Cairns, Standing Stone and Aisled House	Scheduled	High	Negligible/No change	None
20	Kilmuir Parish Church	C Listed Building	Low	Negligible/No change	None
21	Sithean Tuath	Scheduled	High	Negligible/No change	None
22	Dun Scarie	Scheduled	High	Negligible/No change	None

CHS No.	Site Name	Site Designation	Site Sensitivity	Impact Magnitude	Significance of Impact
23	Kilmuir Burial Ground	B Listed Building	Medium	Negligible/No change	None
24	Dun Grogarry	Scheduled	High	Negligible/No change	None
25	Baleloch House	B Listed Building	Medium	Negligible/No change	None
26	Cille Pheadair Cross	Scheduled	High	Negligible/No change	None

10.12 CUMULATIVE EFFECTS

No other proposed or recently consented projects subject to EIA have been identified within the study area. Cumulative effects have been scoped out of the assessment for this topic.

10.13 CONCLUSIONS

The baseline assessment indicates that the Project site sits within a rich archaeological landscape that has been used for settlement and ritual purposes since the Neolithic period. There are important prehistoric remains within 200 m of the Project site, and the land has been assessed as having **high** archaeological potential for buried and unknown remains. The cultural heritage sites within the Project site are farm buildings and agricultural structures that date from at least the mid-nineteenth century and are potentially of eighteenth-century date. Cartographic evidence has demonstrated that the farm complex was expanded significantly between 1850 and 1879 and that four of the five farm buildings were roofed and, presumably, in use in 1968. The assessment has found that there are seven known and undesignated cultural heritage sites within the Project site, all of which could be directly affected by the Project. These consist of two intact farm buildings (**CHS 6** and **CHS 27**), three ruinous former farm buildings (**CHS 28**, **CHS 29** and **CHS 32**), one enclosure (**CHS 30**) and one stone dyke (**CHS 31**. These structures have assessed to have low cultural heritage importance, although Scolpaig Farmhouse (CHS 3) has attracted local interest due to its unique set of outbuildings and unique example of 'improvement' period farmhouse.

The key potential direct effects that could arise from the project are:

- Direct physical damage to known and unknown historic assets from construction activities;
- Vibration from construction traffic compromising the integrity of existing farm buildings; and
- Vibration from rocket launches compromising the integrity of existing ruinous buildings.

Proposed mitigation includes:

- Historic Building Recording Survey - a Historic Building Recording survey of the farm buildings, the enclosure and the drystone dyke will be carried out prior to the commencement of any works relating to the proposed development to record the present state of the structures any monitor resulting change to these as a result of project activities. The Historic Building Recording survey will be repeated after every 10 rocket launches or every 18 months, or other frequency agreed with between the Developer and WICAS.
- Written Scheme of Investigation (WSI) and trial trench evaluation - a programme of archaeological works will be carried out in accordance with a Written Scheme of Investigation (WSI) in order to establish the presence or absence of cultural heritage remains or deposits within those areas of the project site that will be subject to ground disturbance. An archaeological trial trench evaluation of up to 10% of the project footprint will be undertaken.

- Archaeological watching brief - an archaeological watching brief will be carried out during ground breaking works.
- Protection of historic features - Parts of the enclosure and dyke (CH30 and CHS 31) are directly impacted by the construction. Following recording the structures these will be protected with sand excavated as part of the development. Necessary protection for farm buildings within and adjacent to the project site will be agreed with WICAS to prevent accidental damage to the fabric of the buildings.

As part of the wider site management commitments, a Habitat and Amenity Management Plan will be developed, including cultural heritage resources as part of the wider development objectives. The HAMP will be developed as part of an Advisory Forum with key stakeholders and community representatives. With mitigation, impacts are concluded to be **not significant** in terms of direct effects on cultural heritage receptors.

The setting assessment found that Dun Scolpaig Dun Scheduled Monument (**CHS 1**) and Cille Pheadair Cross Scheduled Monument (**CHS 26**) would have visibility of the project site and proposed tower. The intervening buildings between Cille Pheadair Cross and the proposed tower combined with the temporary nature of the Project means that impacts on these two nationally important monuments is **not significant**. The setting assessment also found that the project would have no significant impact upon the settings of a further 11 Scheduled Monuments, two category B Listed Buildings and one category C Listed Building located within the 5 km study area.

10.14 REFERENCES

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11 TRAFFIC AND TRANSPORT

CONTENTS

11 TRAFFIC AND TRANSPORT

11.1 INTRODUCTION

Potential impacts on traffic and transport have been scoped out of the EIA due to the nature and limited scale of the Project, whereby no likely significant effects are anticipated, which has been agreed through consultation with the planning authority and CnES Roads department. Therefore, no transport assessment has been undertaken for the Project. This chapter summarises the information gathered, and initial assessment undertaken to provide the basis for scoping out potential impacts relating to traffic and transport under the EIA Regulations.

11.2 CONSULTATION

The key points raised by stakeholders during Scoping and pre-application consultation regarding traffic and transport are presented in Table 11-1.

Table 11-1 Key issues raised by stakeholders during consultation

Stakeholder	Comment	Action to address	Section cross-reference
CnES planning Scoping opinion (2018)	Details should be provided of any proposed public road improvements, in particular any replacement bridge proposals and related flood risk and construction issues.	No upgrades to public roads are required. However, the Developer is committed, and prepared to, contribute to road repairs, where any damage should occur from construction-related traffic. Flood risk associated with the Project and Scolpaig Farm is mitigated through design measures, detailed in Chapter 4: Project Description and Chapter 17: Hydrology, Hydrogeology and Geology.	Chapter 4: Project Description, Chapter 17: Hydrology, Hydrogeology and Geology.
CnES planning Scoping opinion (2018)	It is accepted that assessment of construction and operational phase traffic emissions may be 'scoped out' of the EIA as being unlikely to have a significant impact on the environment, but the advice of Comhairle Environmental Health should be sought regarding control and mitigation measures that may be required.	Construction and operational traffic impacts are likely to be lessened further following reduced scope and footprint of proposals (from orbital to sub-orbital development). Given traffic movements during the construction and operational phases are assessed as not significant, the emissions arising from traffic are also concluded to be not significant.	Chapter 4: Project Description, Chapter 18: Air Quality and Heat, Chapter 3: Site Selection and Alternatives.
CnES Roads Application response (2019) (19/00311/PPD)	The access road junction along the A865 will require to be surfaced to at least 3 m along the road as to minimise the risk of damage to the roadside.	The first 5 m of the access track, measured from the A865, will be finished with a hard-wearing surface such as Bitmac or concrete.	Chapter 4: Project Description.

Stakeholder	Comment	Action to address	Section cross-reference
CnES Roads Application response (2019) (19/00311/PPD)	The Developer must ensure that surface water does not flow onto the main road from the access road; any surface water at the access or along the road should be diverted toward suitable land drainage.	Access road longitudinal gradient falls away from the main road at the tie in, therefore no risk of surface water flowing from access on to main road. Surface water from access road will be routed toward natural overland drainage via roadside ditches/swales.	Chapter 4: Project Description and Chapter 17: Hydrology, Hydrogeology and Geology.
General Public Application response (2019) (19/00311/PPD)	125 respondents objected to the proposed spaceport because of the unknown impact of development on local ferry services and disruption to the sense of tranquillity. The likelihood of congestion and road closures due to an increased volume of traffic and unsuitability of existing roads was also noted as a concern.	The volumes of traffic anticipated during the construction and operation phases of the Project are relatively low and not expected to negatively impact local ferry services or cause congestion on the local road network. Construction traffic is predicted to be an average of 16-19 loads per week during the 20–24 week construction period. No abnormal loads are required. Standard construction management measures will be in place to ensure there is no disruption to existing road users or disturbance to local communities. Construction contractors are likely to be predominantly locally based and all aggregate material sources locally. A commitment has been made to source aggregate from quarries in Benbecula or Uist. No road closures are proposed as part of standard traffic management measures for the Project. A temporary clearway is proposed (with no stopping) to reinforce the existing Highway Code on single track roads, as a precautionary measure to avoid congestion caused by incidental spectators or vehicles obstructing access along the route and ensure continued flow of traffic.	Chapter 4: Project Description.

Stakeholder	Comment	Action to address	Section cross-reference
CnES planning /Roads Correspondence regarding EIA scope 25/03/2021	It is agreed that traffic and transport is not an EIA matter and accepted that there would be limited impacts at operational stage but potential construction stage impacts are noted on what is a minor road network. The minimum requirement is that all affected road surfaces should be reviewed and strengthened where any damage was to occur. The Developer should be willing and prepared to contribute to road repairs due to the increased pressure on the surfaces from repeated heavy loads.	The Developer commits to implement this standard good practice measure as a condition to any planning consent.	Chapter 4: Project Description, Annex C: Schedule of Mitigation.
WIEPCG, including Emergency Planning Coordinator, CnES Roads and Police Scotland 24/01/2022	Agreement that a traffic management measure comprising a clearway is required as a precautionary measure to avoid congestion on the A865, caused by incidental spectators or vehicles obstructing access along the single track route during a launch.	Launch day traffic management measure included as committed mitigation. Full details provided in Table 11-2.	Section 11.3, 11.5.2

11.3 PROJECT COMMITMENTS

The Developer is committed to implementing standard best practice mitigation measures during the Project, which will include:

Table 11-2 Management and mitigation measures

Ref.	Title	Description
COM02	Public access and users of limited mobility	Pedestrian access to the area will be enhanced through the upgrading and widening of the existing access road from the A865 to Scolpaig Farm and additional layby adjacent to Loch Scolpaig. An additional 10 parking spaces will be installed which will be available to the public, including one accessible space and two extended spaces for larger vehicles. The existing 'kissing gate' will be replaced by standard pedestrian access to facilitate access for users of limited mobility.
GM04	Site Access Management and Safety (Construction)	• Provision of appropriate signage, notices during construction period and information on operational launch activities. • Best practice construction traffic measures to minimise material/dust on public roads i.e. All HGVs to be sheeted to reduce dust and stop spillage on public roads; and wheel cleaning arrangements in place, where necessary.

Ref.	Title	Description
GM05	Pre-Launch Communications: Advance Alert and Community Notifications	An Advance Alert / Pre-Launch Contact Service will provide advance notice of activities relevant to key stakeholders including emergency services, fishermen, hauliers and closest residential receptors. Stakeholders can register for the alert service on a dedicated email address and can view the range activity programme on a dedicated website. The Spaceport Operator will additionally publish notifications in local/social media, their website and at key information points in the surrounding locality to the wider community and stakeholders informed of key project activities and any associated restrictions. Measures are likely to include: • Regular updates via e-mail to local community groups. • Website – showing schedule of planned activity. • Social Media – posts about planned activity.
GM07	Construction Hours	Movement of HGVs will be restricted to 0700-2000 Monday to Friday and 0700 – 1800 on Saturdays. There will be no Sunday working.
GM08	Launch day traffic management measures	Traffic management measures are not required in terms of the management / operations of the Spaceport site from a launch safety perspective. However, Western Isles Emergency Planning Coordinating Group (WIEPCG) has stipulated that precautionary measures be put in place to manage against the risk of potential congestion arising from incidental spectators or vehicles (more generally) stopping or parking in laybys causing obstruction on single track roads. Police Scotland will be responsible for monitoring the route and have stated that for each launch event management measures will include: • A dedicated police patrol to monitor traffic during a launch event. • A temporary clearway (no stopping) along the A865 (from Clachan to Lochmaddy via the west-side of North Uist) during each launch day. This is to ensure traffic flow is maintained along this route for the benefit of all road users and will promote the existing Highway Code responsibilities for vehicles on single track roads - i.e. no stopping on the single track road, the verge or in passing places and will be strictly enforced with the police having power to move/remove vehicles. • Proactive media releases to notify local community of planned launch days and discourage motorists from causing congestion along the route. • As an emergency planning measure only, a Temporary Traffic Regulation Order (TTRO) will be applied for, which will include powers for the police to invoke a road closure, in the unlikely event that traffic congestion could lead to potential obstruction or danger for road users. The efficacy of these measures will be reviewed following initial launches with the WIEPCG, with the opportunity to step-down measures, if appropriate for future launches.
GM09	Road Maintenance	The Developer commits to undertaking a pre-construction and post-construction survey of the public road routes used by construction traffic. Should any damage occur as a result of HGV activity the Developer will contribute to relevant repairs.

11.4 BASELINE DESCRIPTION

The development site, which is located on part of the former Scolpaig Farm, is situated in the northwest corner of North Uist off the A865. The A865 route passes through the Uist chain of islands, running from Lochmaddy on North Uist, initially north and westwards around the west coast, past Scolpaig, before proceeding south across Benbecula to Lochboisdale on South Uist. The A867 provides a shorter route to the south from Lochmaddy joining the A865 at Clachan-a-Luib (Figure 11.1). Much of the A865, particularly down the west coast comprises a narrow single track with passing places. An unclassified road, the Committee Road, traverses through North Uist from Botarua to Knockline and provides a shortcut for local traffic between Sollas and Knockline. The road has a weight limit and HGVs are therefore not permitted to use this route.

There are few settlements in the vicinity of Scolpaig, with most settlement concentrated predominantly to the south from Balemartin to Hosta, Balranald and Bayhead, and then further northeast towards Ceann Traigh Vallay and Sollas. Traffic on the A865 in the vicinity of Scolpaig is very low, compared to other roads around North Uist, and is predominantly used for local access to individual dwellings, Griminish Pier, agricultural land or recreational access to Scolpaig Bay. Traffic is likely to increase towards the tourist season by those taking scenic routes around North Uist and along the Hebridean Way (although this is promoted as a cycle route). The route will also be used to access the St Kilda Viewpoint Visitor Centre (approximately 0.5 km east of the Project), should it be constructed.

11.5 SUMMARY ASSESSMENT

11.5.1 Construction phase

Project construction works and traffic associated with the construction and operational phases are detailed in Chapter 4: Project Description. In summary, it is anticipated that over the construction period there will be approximately 380 deliveries of materials to the site. It is anticipated that the construction traffic will use the route from Clachan along the west side of the island to the site along the A865. On the basis of a 20–24 week construction timetable, the average weekly heavy vehicle movements during the construction works are an average of approximately 16-19 per week, although this may by higher or lower depending on the construction schedule. Project commitments will ensure disruption to public road users is minimised (GM04) and any damage to public roads is avoided or rectified during construction such that **no likely significant effects** are anticipated (GM09).

11.5.2 Operations phase

Project-related traffic and transport

The site preparations for each launch will vary between launch operators and launch vehicles, site mobilisation will require the delivery of a range of containerised and portable infrastructure, up to a maximum of 15 units, including fuelling systems, staff and welfare units, shipping containers, launch vehicle and tower. It is likely that many of the deliveries will be combined, for example, the launch vehicle and the tower are often integrated into one complete system. Material deliveries are also likely to be integrated into the mobilisation, however there may be up to two separate deliveries. Daily personnel movements during the week are expected to be restricted to a small number of standard vehicles or Light Goods Vehicles each day. A launch campaign is likely to last no more than two weeks, from site mobilisation, the launch day, and finally, site demobilisation, where all containers are removed from site.

The transport of fuels and propellants, including hazardous materials is strictly regulated under separate regimes. Transport of fuels and propellants will be the responsibility of the Launch Operator, however the Spaceport Operator will assess proposals to ensure they comply with relevant regulations, understood to include the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG Regs) and the European agreement (ADR).

A dedicated Hazardous Materials Management Plan (Appendix 17.1) outline proposals for the transport, storage and pollution control associated with the proposed material inventory at the site. The management of materials will form part of a detailed Safety Case, which will form part of the license submission to the Civil Aviation Authority (CAA) and will be subject to ongoing review under the relevant regulations, including requirements of the Space Industry Regulations 2021. A detailed risk assessment as part of a ground safety analysis will also be required for every launch, for the identification and elimination/reduction of hazards and risks associated with the operation of the Spaceport under the principles of ALARP (as low as reasonably practicable). An outline risk register is provided in Appendix 21.1 Risk Register and includes control measures to ensure safe transit of materials to the Spaceport.

The most appropriate method of transportation of any materials to the islands will be determined by the Spaceport Operator and Launch Operators, on a case-by-case basis, in consultation with stakeholders, including CalMac and WIEPCG. Certain equipment and materials will require to be transported by dedicated charter vessel to avoid impacting on existing ferry services.

Project-related traffic is anticipated to result in a limited and negligible increase in traffic on public roads and engagement with local suppliers and stakeholders will ensure there is no increased pressure on local ferry services. Measures are in place as part of separate launch licensing processes and relevant safety regulations to ensure there are no safety risks to local road users. Therefore, no **likely significant effects** from project-related traffic are anticipated.

Public traffic management

The A865 at Scolpaig is a lightly trafficked main road, with single track and passing places and could be at risk of becoming congested in the vicinity of the Spaceport at Scolpaig on a launch day, should there be a substantial increase in traffic associated with incidental spectators or other road users stopping or parking along the road, the verges or in passing places. This could lead to disruption to local road users.

Traffic management measures have been stipulated following consultation with WIEPCG, including Police Scotland and CnES Roads, to ensure traffic flow is maintained on the A865 in the vicinity of Scolpaig for all users. Traffic management measures are not required in terms of the operations associated with the Spaceport activities, but as a precautionary measure to avoid any potential congestion caused by incidental spectators or vehicles obstructing access along the route for all road users, including the local community and emergency services.

Police Scotland will be responsible for monitoring the route during a launch event with a dedicated police patrol. A temporary clearway will be enforced along the A865 from Clachan, via the west side of North Uist to Lochmaddy during each launch day (Figure 11.1). This enforces existing Highway Code responsibilities for vehicles on single track roads i.e. no stopping on the single track road, the verge or in passing places. The police will have powers to move/remove vehicles obstructing safe passage.

Up to 10 launches per year are proposed for the Spaceport, there may be instances where a launch cannot proceed on the day as planned and is rescheduled to a subsequent back-up day, in the worst case resulting in a further 1-2 days where a launch may be reattempted. It is anticipated that clearway measures would be in place for only part of a single day in most cases. Proactive media releases will ensure advanced notification to the local community of planned launch days and discourage motorists from causing congestion along the route. A Temporary Traffic Regulation Order (TTRO) will be applied for (and the public consulted in advance), which will include powers for the police to invoke a road closure for a short period until the launch is complete, in the unlikely event traffic congestion could lead to potential obstruction or danger for road users, as an emergency planning measure only. With the provision of the proposed clearway measures, it is not anticipated that any road closures would be required.

These measures will be reviewed following initial launches with the WIEPCG to ensure they are effective, and disruption is minimised as far as practicable, with the opportunity to step-down measures, if appropriate for future launches. Therefore, **no likely significant effects** on public road users are anticipated.

11.6 CONCLUSIONS

Given the relatively small scale of the Project, limited infrastructure requirements, and the commitment to best practice construction and traffic management measures for both the construction and operational phases, no likely significant effects on traffic and transport receptors are anticipated.

12 AVIATION, RADAR AND TELECOMMUNICATIONS

CONTENTS

12 AVIATION, RADAR AND TELECOMMUNICATIONS

12.1 INTRODUCTION

This Chapter of the EIA Report describes the potential impacts of the Project on aviation, radar and telecommunications. The characteristics of civil and military infrastructure, and safeguarding areas, are defined and described within the assessment of baseline conditions.

Potential impacts on receptors are identified for the Project and where relevant, mitigation measures are proposed to avoid, reduce, or offset any likely significant effects.

Ministry of Defence (MOD) maritime operations are assessed in Chapter 13: Marine Users and Assets. This chapter focusses on terrestrial, aviation and radar interests of the MOD.

12.2 STUDY AREA

The study area for aviation, radar and telecommunications receptors is defined by respective stakeholders based on the potential zone of effect or safeguarding area required to protect their assets from disruption to communications, disruption to monitoring activities or to avoid airspace conflict. Stakeholders have identified potential impact pathways on their assets through consultation, detailed in Table 12-1.

12.3 LEGISLATIVE FRAMEWORK AND POLICY CONTEXT

The following legislation and policies are considered relevant to this assessment:

- Space Industry Act 2018: The Project will be operated, regulated and licensed under the Space Industry Act 2018, which requires any person or organisation wishing to operate a spaceport to obtain the relevant licence. The Act is implemented by the Space Industry Regulations 2021 which sets out in detail the requirements for each licence, including a detailed Safety Case and Assessment of Environmental Effects. The Civil Aviation Authority (CAA) is the regulating authority.
- Air Navigation Order 2016 and Air Navigation (Amendment) Order 2021: alternatively, a permission may be granted for a launch from the CAA through an Air Navigation Order (ANO). A Safety Case will also be required under these regulations.
- Transport Act 2000: The Airspace Change Proposal (ACP) process is employed to consider any changes to airspace use. Changes to the design of UK airspace are required to follow the airspace design process of the CAA. The CAA, as the UK's independent aviation regulator, has responsibility for deciding whether to approve changes proposed to the design of airspace over the UK – the airspace structure and instrument flight procedures within it. For this Project there is a requirement for the periodic, and for short periods of time, closure of the airspace above and to the west of the Scolpaig area. Two ACPs are currently progressing to facilitate this first, an ACP[1] to permit use of the airspace under a Temporary Danger Area regime (which is a temporary airspace arrangement); and second, an ACP[2] to permanently change to the relevant airspace. The ACPs are at 'Step 4: Submit Proposal to CAA' and 'Step 2a: Develop and Assess' respectively.

[1] Refer to https://airspacechange.caa.co.uk/PublicProposalArea?pID=368 for further information.

[2] Refer to https://airspacechange.caa.co.uk/PublicProposalArea?pID=344 for further information.

- Planning Circular 2/03: Safeguarding of Aerodromes, Technical Sites and Military Explosives Storage Areas and Outer Hebrides Local Development Policy (OHLDP) Policy EI 11: Safeguarding: For all development proposals the planning authority will take account of the advice of the relevant agencies with regard to safeguarding and consultations zones notified by the Health and Safety Executive (HSE), CAA, Highlands & Islands Airports Limited (HIAL), NATS, Ministry of Defence (MOD), and Meteorological Technical Sites (i.e. Met Office radars).

12.4 SUPPORTING SURVEYS AND STUDIES

A desk-based review and stakeholder consultation was undertaken to characterise the baseline conditions and inform the assessment for aviation, radar and telecommunications receptors.

12.5 DATA GAPS AND UNCERTAINTIES

No specific data gaps were identified in the preparation of this assessment. Consultation has been undertaken to identify all receptors, including safeguarding zones, and discussions are ongoing to ensure appropriate mitigation measures are in place to avoid potential disruption to established activities, as part of anticipated conditions to the planning application and through the separate licensing processes under the relevant regulations, detailed in Section 12.3.

12.6 CONSULTATIONS

The key points raised by stakeholders during Scoping and pre-application consultation are presented in Table 12-1.

Table 12-1 Key issues raised by stakeholders during consultation

Stakeholder	Comment/Consultation	Response/Action taken	Section cross-reference
UK Space Agency (UKSA) (2019-2021)	Various discussions with UKSA around airspace, safety, regulations and operational procedures for spaceport activities.	Advice incorporated into preparations for Airspace Change Proposal (ACP) and operations.	N/A
Civil Aviation Authority (CAA) (2020-2021)	Various discussions with CAA around airspace, provision of information and advice around the use of Temporary Danger Areas (TDA) and the Airspace Change Proposal (ACP) process, to support the launch operational activities.	The consortium has submitted two ACPs for the airspace above the Scolpaig area, which are in progress. In addition, the Consortium has held several briefings with the CAA on the operational procedures that would be employed for sub-orbital launches at the Spaceport to ensure impacts on aviation interests are avoided or minimised.	N/A

Stakeholder	Comment/Consultation	Response/Action taken	Section cross-reference
Highlands and Islands Airports (HIAL) Scoping opinion 19/06/2018, Application response (2019)	This development would not infringe the safeguarding surfaces for Benbecula Airport. However, we are awaiting approval and publication of new flight procedures at Benbecula Airport which would need to be assessed against the proposal. Should they remain as submitted to the CAA, Highlands and Islands Airports Limited are unlikely to object to this proposal.	The Developer is currently engaged with CAA as part of the Airspace Change Proposal process to ensure any changes to airspace as a result of launch activities will be addressed to ensure no significant adverse effects on HIAL assets and activities.	N/A
HIAL Application response (2019)	Due to the Spaceport's position and nature of the proposed operation, Benbecula Airport should be contacted at least 24 hours before a proposed launch takes place. This is in the interest of aircraft safety. Provided that these conditions are met Highlands and Islands Airports Limited is unlikely to object to this proposal.	Aviation stakeholders will be made aware of launch activities through the issue of a Notice to Airmen (NOTAM) at least 14 days prior to launch. Specific timelines for notifications in the lead up to a launch event will be agreed with individual stakeholders. Discussions held with local air traffic control team on launch activities and the Spaceport will comply with the 'at least 24 hours' notification period requested through a Notification Plan.	Section 12.10
HIAL Correspondence 28/09/2021	With reference to the revised position and height of the launcher tower [*email 13/08/2021*]; it would not infringe the safeguarding surfaces for Benbecula, Barra and Stornoway Airports. However, we continue to await approval and publication of new instrument flight procedures (IFPs) at Benbecula Airport which would need to be assessed against the proposal. Should the IFPs remain as submitted to the CAA, HIAL is unlikely to object to this proposal. HIAL is required to be notified as soon as practicable to coordinate notice to HIAL Aerodromes before a proposed launch takes place. This is in the interest of safety of flight. Provided that these conditions are met HIAL is unlikely to object to this proposal.	Aviation stakeholders will be made aware of launch activities through the issue of a Notice to Airmen (NOTAM) at least 14 days prior to launch. Specific timelines for notifications in the lead up to a launch event will be agreed with individual stakeholders. Discussions held with local air traffic control team on launch activities as part of the Notification Plan.	Section 12.10
Met Office Application response (2019)	The [project] is approximately 99.4 km from our meteorological radar at Druim-A-Starraig and is unlikely to impact on its operation. So, we have no objections to the proposal.	Scoped out of the assessment.	N/A

Stakeholder	Comment/Consultation	Response/Action taken	Section cross-reference
Defence Infrastructure Organisation (DIO) / Ministry of Defence (MOD) Application response (2019)	The application site occupies the statutory technical safeguarding zone (maximum height 15.2 m) protecting the operation of Remote Radar Head (RRH) Benbecula Air Defence Radar (ADR) at South Clettraval and, by virtue of both proximity and the nature of the proposed use, has the potential to have a significant impact on the operation of MOD Hebrides Military Test and Evaluation (T&E) Range.	The Project team remain in consultation with the MOD directly and via the Airspace Change Process to ensure concerns raised are appropriately addressed and agreed mitigation is implemented. An agreement with MOD will be in place. A Spaceport Programme Schedule will be developed in agreement with MOD to ensure they are notified in advance of planned activities and there is no conflict between respective activities. NOTAMs and NtMs will be issued as part of launch procedures and the latter forms part of the Spaceport's Maritime Management Procedures and Notification Plan.	Section 12.10, Chapter 13: Marine Users and Assets, Appendix 13-1: Maritime Management Procedures
DIO/MOD Application response (2019)	Whilst the MOD has no statutory safeguarding concerns relating to the physical infrastructure elements of this application, there are concerns that the intended use of the site may have significant and detrimental effects on the operation of MOD technical assets, the Hebrides military T&E ranges and may result in degradation of capability. Without appropriate deconfliction, the operation of radar from the site may conflict with Safeguarded technical assets operating in this area.		
DIO/MOD Application response (2019)	In order to minimise the impact of the development on operational capability, MOD request that a number of conditions are added to any planning consent granted including a Spaceport Programme Schedule, Notice to Airmen (NOTAMs) and Notice to Mariners (NtMs).		
DIO/MOD Application response (2019)	Additional concerns relate to the possibility of projectiles / debris falling during a rocket launch and flight, in or close to military T&E ranges which has not only potential health and safety impacts but may impact on T&E activities.	MOD will be engaged in advance of planned activities through a Spaceport Programme Schedule to ensure there is no conflict with respective activities. Measures are in place to ensure there is no risk to other maritime activities (addressed in Chapter 13: Marine Users and Assets) with implementation of Maritime Management Procedures. A safety case will be undertaken for every launch to ensure risks are as low as reasonably practical.	Chapter 13: Marine Users and Assets, Appendix 13-1: Maritime Management Procedures

Stakeholder	Comment/Consultation	Response/Action taken	Section cross-reference
DIO/MOD Meeting 10/01/2020	MOD's concerns raised in relation to the impact the Scolpaig Spaceport may have on the activities on the MOD Hebrides T&E Range, including: 1. Interference with range sensors used for safety of flight, clear range procedures and tracking. 2. Constraints on the use of the D701 danger areas. 3. Other Spaceport activities, not necessarily those conducted on a launch day, that may impact on the use of the wider-MOD range facilities.	The Project team remain in consultation with the MOD directly and via the Airspace Change Process to ensure concerns raised are appropriately addressed and agreed mitigation is implemented. A Spaceport Programme Schedule detailing planned launch activities will be submitted to MOD within agreed timescales, with initial notification at least 3 months prior to launch.	Section 12.10, Chapter 13: Marine Users and Assets
DIO/MOD Correspondence 22/07/2021	Confirmed that there are no technical safeguarding concerns relating to situating a 20 m launch tower at the launch pad location.	A tethered tower of maximum 20 m height may be erected on site, which will be temporarily assembled for a launch event and dismantled following completion of launch.	N/A
DIO/MOD Correspondence 21/07/2021	RAF Air Command (AC) has consulted within the Battlespace Management Force Headquarters (FHQ) across to Space Command and Defence Airspace and Air Traffic Management (DAATM) and there is a broad consensus that the 6-month notification period can be reduced to 3-months. Space Command also liaised with the Department for Transport and they were content that a 3-month notification period was 'not out of sync' [compatible] with licensing timescales. AC are aware that DAATM are in liaison with the Spaceport operators and are content that the airspace considerations particularly in respect to the Hebrides ranges are being coordinated.	Timescales noted and committed to in proposed mitigation AR03 Spaceport Programme Schedule.	Section 12.10

Stakeholder	Comment/Consultation	Response/Action taken	Section cross-reference
DIO/MOD Correspondence 21/07/2021	AC has noted they would wish to gain a better understanding of the effects regarding information on trajectories, telemetry and tracking radars which will remain useful to inform on impact to Air Defence operations, as the scheme develops. Equally, assuming that it will be a licensing requirement, AC would anticipate the requirement for a Debris Radius to avoid the potential of debris falling on the Benbecula RRH site. Failing any UK legislation, they would again look to the FAA regulation as best practice.	The SO will continue to liaise with DIO (and other MOD stakeholders as required by) throughout the licensing phases on all aspects of the launch operation and associated processes. The original design included permanent tracking radar location points – these have been removed from project infrastructure. The Safety Case will assess any potential risk from falling debris and will be minimised to ensure ALARP.	N/A
NATS Application response (2019)	The proposed development has been examined from a technical safeguarding aspect and does not conflict with our safeguarding criteria. Accordingly, NATS (En Route) Public Limited Company ("NERL") has no safeguarding objection to the proposal. However, please be aware that this response applies specifically to the above consultation and only reflects the position of NATS (that is responsible for the management of en route air traffic) based on the information supplied at the time of this application.	Scoped out of the assessment.	N/A
NATS Correspondence 18/08/2021	The proposed development [w*ith reference to the revised position and height of the launcher tower – email 13/08/2021*] has been examined from a technical safeguarding aspect and does not conflict with our safeguarding criteria. Accordingly, NATS (En Route) Public Limited Company ("NERL") has no safeguarding objection to the proposal	Scoped out of the assessment.	N/A

12.7 ASSESSMENT METHODOLOGY

12.7.1 Approach to assessment

The general EIA process and methodology is detailed in Chapter 6: Approach to EIA. The assessment focuses on a desk-based review of relevant receptors, consultation with key stakeholders and ongoing consultation under separate licensing processes to ensure appropriate management and mitigation measures are in place for the safeguarding of existing aviation, radar and telecommunications assets and activities, such that no likely significant effects arise from activities relating to the Project.

12.8 BASELINE DESCRIPTION

12.8.1 Airports and airspace

The nearest civil aviation facility is Benbecula Airport, which lies approximately 20 km south-east of the Project. The airport serves as a hub for the southern isles including North and South Uist, as well as providing travel connections with Glasgow and Inverness Airports. Benbecula Airport is owned and operated by Highlands and Islands Airports Limited (HIAL). The Project lies outside the CAA safeguarding consultation zone centred around Benbecula Airport, as indicated in the OHLDP (CnES, 2018).

Airspace around the world is divided into Flight Information Regions (FIR) managed by a controlling authority with a responsibility for ensuring air traffic services are provided to the aircraft flying within it. The CAA is the controlling authority for the UK, and NATS provides air traffic services for them (NATS, 2021).

The Scottish Area Control Centre (ScACC) controls aircraft over Scotland, Northern Ireland, Northern England and the North Sea from 2,500 ft up to 60,000 ft. In the UK there are currently five classes of airspace: A, C, D, E and G. Airspace above Scolpaig is Class G. The classification of the airspace within a FIR determines the flight rules that apply and the minimum air traffic services that are to be provided. Classes A, C, D and E are areas of controlled airspace and G is uncontrolled airspace. In addition to being given a class, which specifies rules for flying, controlled airspace may be further defined by its 'type' depending on where it is and the function it provides.

In addition to airspace classes designated for flying rules, UK airspace contains a network of corridors (termed airways), which are usually ten miles wide and reach up to a height of 24,500 ft from a base of between 5,000 – 7,000 ft. They mainly link busy areas of airspace known as Control Areas (CTA), which are situated near one or more major aerodromes. At a lower level, Control Zones (CTZ) are established around each aerodrome to protect aircraft operating in immediate vicinities.

12.8.2 Defence

The Western Isles is part of the MOD's Low Flying Area (LFA) 14, which covers 57,604 km^2 across the north of Scotland, Western Isles, Orkney and Shetland (MOD, 2011). The Western Isles are outwith the nearest Tactical Training Area (TTA) 14T, which covers the north-west of the Scottish mainland and permits flying to 100 ft above ground level. The Western Isles fall within Allocated Region (AR) 1, which includes the north coast of mainland Scotland to the central belt, for low flying night activity.

The Project lies within the MOD safeguarding consultation zone, as indicated in the OHLDP (CnES, 2018). A MOD Air Defence Radar facility is located approximately 3.5 km south of the site at South Clettraval.

12.8.3 Telecommunications

There are no fixed telecommunications link masts located within 2 km of the Project. The Ofcom Spectrum Information System portal (Ofcom, n.d.) was reviewed to confirm that no point-to-point fixed links overlap with the study area.

Appropriate radiocommunication licences from Ofcom will be applied for to Ofgem post-consent for any radio transmitting devices required for communications during the operation of the Spaceport.

NATS is the UK civil en-route Air Navigation Service Provider (ANSP). NATS operates a number of long-range Primary Surveillance Radars (PSR) positioned to provide maximum coverage of UK airspace, which are important for the safe provision of air traffic services to civil, military, national and international air traffic. The Project lies outwith the NATS

safeguarding consultation zone as indicated in the OHLDP (CnES, 2018). No other assets or safeguarding zones have been identified by NATS during consultations to date (Table 12-1).

A Met office meteorological radar at Druim-A-Starraig is located near Stornoway, approximately 99.4 km north-east of the Project site.

12.9 POTENTIAL IMPACTS

The potential impacts on aviation, radar and telecommunications, without mitigation, which have been identified as relevant for the Project are:

- Restricted access to airspace for military, civil and commercial aircraft during launch operations; and
- Disruption to MOD technical assets in the MOD safeguarding zone during launch operations.

No potential impacts are anticipated during the construction and decommissioning phases.

Potential impacts on telecommunications and meteorological radars have been scoped out from further assessment due to distance from sensitive receptors. Consultation with NATS, HIAL and Met Office stakeholders confirmed that no telecommunication or monitoring assets would be impacted by the proposed Project (Table 12-1). However, these stakeholders will continue to be consulted throughout the development process and, where appropriate, through the subsequent regulatory processes for the Airspace Change Proposal under the Transport Act 2000, the Spaceport (Spaceport Operator's Licence) and individual launches (Launch Operator's Licence) under the Spaceport Industry Regulations 2021.

12.10 MITIGATION AND MANAGEMENT MEASURES

The following mitigation and management measures are proposed to remove, avoid, reduce and, where possible, offset any impacts which could, either by themselves or in combination with others, have a significant adverse effect. These measures are considered in the assessment of residual effects in Section 12.11.

Table 12-2 Mitigation measures

Ref.	Title	Description
R02	Regulatory Mitigation (Launch Vehicles and Launch Events)	Each launch will be licensed and regulated under: • The Space Industry Act 2018 and the Space Industry Regulations 2021; or • Permission under the Air Navigation Order 2016 (Air Navigation (Amendment) Order 2021); and • Marine (Scotland) Act 2010 for launches that involve deposits in the marine environment. The launch operator is required to submit a detailed Safety Case which includes both a ground safety analysis and a flight safety analysis to the regulator (UK Civil Aviation Authority, CAA). The ground safety analysis covers the transport, handling and storing of any hazardous material in relation to the launch vehicle and testing payloads amongst a range of other activities. A flight safety analysis covers must cover potential blast and fragmentation impacts, releases of toxic chemicals, and any major accidents or hazards resulting from collision or separation of LV components.

Ref.	Title	Description
AR01	Airspace Change Proposal Process	The Airspace Change Proposal process will ensure that all potential impacts will be reduced to an acceptable level once suitable mitigation measures are implemented and agreed in consultation with key stakeholders.
AR02	Notice to Airmen	Aviation stakeholders will be made aware of launch activities through the issue of a Notice to Airmen (NOTAM) at least 14 days prior to launch. Specific timelines for notifications in the lead up to a launch event can be agreed with individual stakeholders and captured within the Notification Plan (AR04).
AR03	Spaceport Programme Schedule	A Spaceport Programme Schedule will be agreed with relevant stakeholders to safeguard assets and to minimise the impact of the development on operational capability of those assets. This will be submitted no less than three months prior to the commencement of any launch and will include information on planned launches, with more detailed information (as it becomes available) provided closer to launch. Details are likely to include information about the planned launch timing, trajectory, jettisoned stages, stage recovery and other relevant Spaceport and launch operations.
GM06	Notification Plan	A formalised plan will be developed setting out the range of statutory and other key stakeholders who will be notified in advanced of rocket launches in the interest of aviation, maritime and community safety e.g., HIAL, MOD, MCA, UKHO etc. The plan will set out who will be contacted, at what stage of the launch process and the information to be submitted at each stage. The notification plan also includes the contact processes for post launch notifications and unplanned events.

12.11 IMPACT ASSESSMENT

12.11.1 Impact overview

All aviation, radar and telecommunications assets are considered to be of **high** importance. Potential direct impacts of the Project on affected assets are considered **major** adverse without mitigation.

The purpose of the Airspace Change Proposal process is to ensure that suitable mitigation will be agreed and implemented in consultation with aviation, defence and other radar and telecommunications stakeholders such that no significant residual effects result from the operation of the proposed Project.

12.11.2 Restricted access to airspace for military, civil and commercial aircraft during launch operations

The Project requires Airspace Change Proposals to be approved by the CAA (AR01), as a volume of airspace between and around the launch site and the trajectory of the sub-orbital vehicle stages is required to be vacant before, during and after launches. In the short term, an application for a Temporary Danger Area is being progressed with the CAA. In the longer term, a 'permanent change' to the 'notified airspace design' around the proposed Project will be secured, an application for which was lodged with the CAA in March 2021. The airspace changes proposed are to provide protection for the area for other airspace users, and (subject to CAA approval) the new segment of protected airspace will connect the proposed launch site with the existing 'Danger Areas' managed by QinetiQ, using the surveillance and communication capabilities of the Hebrides Range to manage the airspace and launch activities. The CAA will seek to minimise risks from the Project to all other airspace users through consultation with key aviation stakeholders as part of this process.

Through implementation of mitigation measures (Table 12-2) such as Notice to Airmen (AR02) and Pre-Launch Notification (GM06), which will be agreed with stakeholders as part of the Airspace Change Proposal (AR01) currently underway, **no significant effects** are anticipated.

12.11.3 Disruption to MOD technical assets in the MOD safeguarding zone during launch operations.

The MOD has raised concerns with respect to the potential for disruption to the operation of MOD technical assets due to launch activities at the MOD Hebrides Military T&E Range, resulting in degradation of capability. Permanent on-site tracking radar no longer forms part of the current proposed infrastructure for the Project, therefore reducing potential for conflict with MOD's own infrastructure. The Developer remains in consultation with the MOD directly to ensure wider concerns are appropriately addressed and an agreement will be in place between both parties. Through implementation of mitigation measures such the Spaceport Programme Schedule (AR03), which will be agreed in direct consultation with the MOD, **no significant effects** are anticipated.

12.12 CUMULATIVE EFFECTS

The Airspace Change Proposal process is considered a cumulative assessment which takes into account the ability of the designated airspace and systems managing travel in that airspace safely meet the requirements of all stakeholders.

There are no other relevant projects in close enough proximity to the project study area that require further cumulative assessment.

12.13 ASSESSMENT SUMMARY AND CONCLUSIONS

The key findings of the assessment are summarised as follows:

- The Project lies within the MOD safeguarding consultation zone. A Spaceport Programme Schedule will be agreed with the MOD to safeguard assets and to minimise the impact of the Project on operational capability of those assets, therefore **no significant effects** are concluded.
- The Airspace Change Proposal process will ensure that suitable mitigation will be agreed and implemented in consultation with aviation and defence stakeholders such that no significant residual effects result from the operation of the Project.
- Potential impacts on telecommunications and meteorological radars have been scoped out from further assessment due to distance from sensitive receptors. The Project also lies outside the CAA safeguarding consultation zone centred around Benbecula Airport. Consultation with NATS, HIAL and Met Office stakeholders confirmed that no telecommunication or monitoring assets would be impacted by the proposed Project. However, these stakeholders will continue to be consulted, as appropriate, throughout the various licensing process for launches and **no significant effects** are concluded.

12.14 REFERENCES

Comhairle nan Eilean Siar (CnES) (2018). Outer Hebrides Local Development Plan. Adopted Plan. November 2018 [online]. Available at: https://www.cne-siar.gov.uk/planning-and-building/planning-service/development-planning/development-plan/local-development-plan/ (accessed 02/12/2021)

NATS (2021). Introduction to Airspace, Flight Information Regions [online]. Available at: https://www.nats.aero/ae-home/introduction-to-airspace/ (accessed 02/12/2021)

Ofcom (n.d). Spectrum information portal [online]. Available at: https://www.ofcom.org.uk/spectrum/information/spectrum-information-system-sis/spectrum-information-portal (accessed 02/12/2021)

13 MARINE USERS AND ASSETS

CONTENTS

13 MARINE USERS AND ASSETS

13.1 INTRODUCTION

This chapter of the EIA Report describes the potential impacts of the Project on marine users and assets. Marine interests are defined and described, including navigational assets, key vessel routes and activity (including shipping and navigation, Ministry of Defence interests, commercial fisheries, recreational users) and fixed marine assets, such as telecommunications, disposal sites and oil and gas wells. Potential impacts are identified, and where relevant, mitigation measures are proposed to avoid, reduce, or offset any identified adverse effects.

A detailed analysis of the risk to marine users does not form part of the EIA process. Each launch will be regulated via a launch licence issued to the Launch Operator (LO) from the Civil Aviation Authority (under the Space Industry Regulations 2021 or a permission granted under the Air Navigation Order 2016 (Air Navigation (Amendment) Order 2021), and a marine licence from Marine Scotland (under the Marine (Scotland) Act 2010). As part of the regulatory process for each launch, a detailed and quantitative assessment of navigational risk will form a core part of the Safety Case associated with each launch activity[1]. The consenting process for each launch involves close consultation, including a legally binging 'Agreement with Relevant Authorities' (described in Section 13.10), with maritime stakeholders to agree and develop appropriate mitigations.

This chapter focuses on characterising baseline maritime activity in terms of existing marine users and activities and considers how proposed safety management measures to mitigate risk may lead to disruption to these activities during a launch event. A brief assessment of potential hazards to maritime interests is covered in the chapter, with reference to the Safety Case and the navigational risk assessment process.

This chapter should be read in conjunction with:

- Appendix 13-1: Maritime Management Procedures; and
- Appendix 21-1: Risk Register.

13.2 STUDY AREA

The study area has been defined as the 'Space Launch Hazard Area (SLHA)[2]' (Figure 13.1) and represents the maximum extent of Spaceport activities in marine waters, to include all possible iterations and boundaries associated with potential launch vehicle (LV) trajectories, splashdown areas for LV stages[3], safety buffers and other related activities associated with a single launch event. A full description of the launch event process is provided in Chapter 4: Project Description. In practice, a single launch event (and associated activities) will occupy a small part of the SLHA. A representative launch profile is illustrated in Figure 4-5.

[1] This process also considers the baseline / pattern of life, the launch vehicle operational phase, flight profile and failure mode assessment and the mitigations applied by the Range Operator, Spaceport Operator and Launch Operator to address safety risks. The requirements of this process are prescribed in the Space Industry Regulations 2021.

[2] 'Space Launch Hazard Area' means the area where the licensee's range control services consist of or include identifying a volume of airspace or an area or areas of land or sea falling within the designated range (a "hazard area") which require restrictions, exclusions or warnings for keeping the area clear at relevant times of: (a) persons or things that might pose a hazard to the operator's spaceflight activities; and (b) persons or things to which the operator's spaceflight activities might pose a hazard (as defined by the Space Industry Regulations 2021.

[3] 'Splashdown area' is the predicted area in which the debris or components or payload contact with the sea surface.

The SLHA extends up to a maximum of 250 km from the site to accommodate a range of LV flight trajectories and orientations. No flight paths are intended to cross any landmass, including islands: St Kilda, Flannan, Boreray, Monach, Haskeir and Causamul.

13.3 LEGISLATIVE FRAMEWORK, REGULATION AND POLICY CONTEXT

The following legislation and policies are considered relevant to the assessment:

13.3.1 Legislation and Regulation

- Marine (Scotland) Act 2010 and Marine and Coastal Access Act 2009: The Marine (Scotland) Act provides a framework to help balance competing demands on Scotland's seas. Deposits within 12 nautical miles (nm) fall under the Marine (Scotland) Act 2010), from 12 nm to 200 nm under Marine and Coastal Access Act 2009, and beyond 200 nm of the Scottish coast falls under article 21(2) of the Marine Scotland Act 2010. A marine licence is likely to be required for each launch event, and possibly for each jettisoned payload (stage) depending which regulation they fall under, for the deposit of LV payload into the sea.
- Space Industry Act 2018 and Space Industry Regulations 2021: Under the regulations, facilities supporting the launch of sub-orbital and orbital Launch Vehicles (LVs) will require a Spaceport Operator (SO) to obtain a Spaceport Licence, based on the submission of a Safety Case, which will ensure safety measures are in place to protect marine users. Both the Spaceport Operator and the accompanying Safety Case will continually be assessed by the Civil Aviation Authority (CAA) as regulator, to ensure compliance with relevant statutory requirements. Similarly, all Launch Operators (LO) will also require a licence for each launch event, supported by a Safety Case for any launch from the Spaceport.
- Air Navigation Order 2016 (Air Navigation (Amendment) Order 2021: launches may be undertaken through an Air Navigation Order (ANO), instead of a Spaceport Licence, and will equally require a LO to prepare a Safety Case for any launch from the Spaceport.

13.3.2 National Planning Policy

- Scotland's National Marine Plan (NMP): The NMP sets out a national strategy and overarching framework for all marine activity in Scottish waters. It facilitates sustainable development and use of Scottish seas in a way that will protect and enhance the marine environment whilst promoting both existing and emerging industries. The plan covers both Scottish inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles). The following specific policies apply:
  - FISHERIES 1 takes account of the EU's Common Fisheries Policy such that marine planners and decision makers should aim to ensure that existing fishing opportunities and activities are safeguarded wherever possible.
  - FISHERIES 2 focuses on the potential impact on fishing, including, the cultural and economic importance of fishing, in particular to vulnerable coastal communities as well as the environmental impact on fishing grounds (such as nursery, spawning areas), commercially fished species, habitats and species more generally.
  - REC & TOURISM 2 expects proposals to consider whether proposals are likely to adversely affect the qualities important to recreational users, including the extent to which proposals may interfere with the physical infrastructure that underpins a recreational activity. It also considers the extent to which any proposal interferes with access to and along the shore, to the water, use of the resource for recreation or tourism purposes and existing navigational routes or navigational safety.
  - TRANSPORT 1 considers navigational safety in relevant areas used by shipping now and in the future will be protected, adhering to the rights of innocent passage and freedom of navigation contained in UN Convention on the Law of the Sea (UNCLOS). Factors that will be taken into account when reaching decisions regarding

development and use include the extent to which the locational decision interferes with existing or planned routes used by shipping, access to ports and harbours and navigational safety.

- TRANSPORT 6 looks at how marine planners and decision makers and developers should ensure displacement of shipping is avoided where possible to mitigate against potential increased journey lengths (and associated fuel costs, emissions and impact on journey frequency) and potential impacts on other users.

There is currently no Regional Marine Plan (RMP) in place for the Outer Hebrides, however there are aspirations to initiate the RMP development process in late 2021.

13.4 SUPPORTING SURVEYS AND STUDIES

No specific surveys or studies were commissioned for the project, however, data acquired from the following existing sources have been utilised to inform the baseline assessment, which have also been supplemented by consultations with statutory, and non-statutory marine stakeholders.

13.4.1 Automatic Identification System (AIS) data

Automatic Identification System (AIS) is a maritime navigation safety communications system adopted by the International Maritime Organization (IMO) to provide vessel information, primarily for the purposes of maritime safety. AIS data are collected by various organisations and can be analysed to provide a source of spatial information about vessel movements within the geographical limits of the system. AIS is a carriage requirement for SOLAS vessels and is an integral part of the EU Vessel Traffic Monitoring and Information Directive (2002/59/EC).

AIS data from ABPmer was accessed to illustrate the vessel transit data for different ship categories within the study area. For 2015, AIS data was sampled from the first seven days of each month, providing 84 days of data. The AIS vessel transit data for 2015 was processed by ABPmer on behalf of the Marine Management Organisation (MMO), using data supplied by the Maritime and Coastguard Agency (MCA), under MMO project number 1066, 'Mapping UK Shipping Density and Routes from AIS'[4].

Average weekly density data (2012 – 2017) derived from MMO data from the NMPI was also included. These data show the number of vessels using class A AIS (vessels >300 gross tonnes, all passenger ships regardless of size) and vessels carrying class B AIS (vessels <300 tonnes, fishing vessels > 15 m, some recreational craft).

The AIS data utilised are described in the baseline by vessel type: cargo and tankers, commercial fisheries, passenger and recreational, and maritime safety-related vessels (Figure 13.2 and 13.3).

13.4.2 VMS Amalgamated Fishing Intensity Layers (2009 - 2013)

Vessel Monitoring System (VMS) amalgamated fishing intensity data, compiled by Marine Scotland, provides information on the location and type of all fishing vessels greater than 15 m overall length. Anonymised VMS data for all UK vessels landing in UK ports were combined with landings information. Fishing activity was identified by applying a speed threshold and creating a 'heat map', identifying the areas of fishing activity for relevant fleets. The years 2009 to 2013 were amalgamated to produce intensity layers for shellfish, demersal and pelagic fisheries (see Figure 13.4a and Figure 13.4b).

[4] Available at: https://www.abpmer.co.uk/blog/view-the-new-uk-2015-national-dataset-of-marine-vessel-traffic/

13.4.3 ScotMap

ScotMap is a Marine Scotland project which provides spatial information on the fishing activity of Scottish-registered commercial fishing vessels under 15 m in overall length (Kafas *et al*, 2014). The data was collected during interviews with individual vessel owners and operators and relates to fishing activity for the period 2007 to 2011. The data is aggregated and analysed to provide information on the monetary value, relative importance (relative value) and the usage (number of fishing vessels and crew) of seas around specific inshore fishing regions in Scotland (Figure 13.5).

13.5 DATA GAPS AND UNCERTAINTIES

The AIS data coverage is incomplete in the western section of the study area, likely due to loss of signal. However, consultation with Marine Scotland confirmed that this coverage was sufficient for the needs of the impact assessment (Table 13-1). The 2015 AIS dataset has been supplemented with 2012 – 2017 AIS average weekly data, which is a combined version of the annual AIS average weekly density datasets created by the Marine Management Organisation (MMO). While the data do not represent the most recent vessel activity, these are regarded as sufficient to understand general activity and marine users across the extensive SLHA. AIS activity will be reviewed again during the Safety Case analysis and licensing process for individual launch events, at which point up-to-date AIS will be obtained for the specific launch profile and for the particular LV.

In addition, not all vessels or marine craft carry, or are required to carry AIS. AIS is carried by: all ships of 300 gross tonnage and upwards, engaged on international voyages; cargo ships of 500 gross tonnage and upwards, not engaged on international voyages; and passenger ships, irrespective of size. All European Union flagged fishing vessels over 15 m overall length are required to be equipped with AIS[5], therefore the majority of the inshore fleet (under 10 m overall length) is unlikely to be represented in the data. A proportion of small vessels may carry AIS voluntarily. Recreational vessels without AIS are assumed to occupy much of the inshore waters. With the exception of inshore fisheries, all other vessel types are assumed to be well represented in the datasets.

The addition of the Marine Scotland ScotMap data, although provided voluntarily by the inshore fleet, attempts to address the gap in AIS data for fishing activity for the inshore fleet within the study area. While it is dated, it provides a general representation of important fishing grounds, throughout much of the inshore waters in the study area. Furthermore, consultation with a local fisheries representative confirms that the inshore waters are generally equally important to the inshore fleet and this is assumed in the assessment (Table 13-1).

13.6 CONSULTATIONS

The key points raised by stakeholders during Scoping and pre-application consultation regarding marine users and assets are presented in Table 13-1.

[5] The Merchant Shipping (Vessel Traffic Monitoring and Reporting Requirements) (Amendment) Regulations 2011

Table 13-1 Key issues raised by stakeholders during consultation

Stakeholder	Comment	Response/Action taken	Section cross-reference
Defence Infrastructure Organisation (DIO) / Ministry of Defence (MOD) Application response (2019)	MOD's concerns raised in relation to the impact the Scolpaig Spaceport may have on the activities on the MOD Hebrides Range, including constraints on the use of the D701 danger areas.	Commitment to provide prior notification of activities through a Spaceport Programme Schedule, with consultation initiated at least 3-month's prior to planned launches.	Section 13.10 and airspace mitigation detailed in Chapter 12: Aviation, Radar and Telecoms
DIO/MOD Application response (2019)	Additional concerns relate to the possibility of projectiles / debris falling during a rocket launch and flight, in or close to military T&E ranges which has not only potential health and safety impacts but may impact on T&E activities.	MOD will be engaged in advance of planned activities through a Spaceport Programme Schedule to ensure there is no conflict with respective activities. Measures are in place to ensure there is no risk to other maritime activities with implementation of Maritime Management Procedures. A safety case will be undertaken for every launch to ensure risks are as low as reasonably practical.	Appendix 13-1: Maritime Management Procedures, Section 13.11
Marine Scotland Licensing Operations Team (MS-LOT) Telephone Discussion 30/10/2020	Exploratory discussion on general issues around marine requirements for the EIA: MS-LOT clarified that a Marine Licence would be required for each individual launch; Key concerns relate to navigational impact and subject to consultation with the MCA, each launch may require a Navigational Risk Assessment; The EIA process should engage more substantially with marine users, particularly fisheries stakeholders to consult with them in terms of the potential impacts of the project; Submission of more detailed project information would inform a formal response from Marine Scotland in terms of the scope and content of the EIA.	Requirements, scope and content for a NRA agreed with MCA, no NRA is provided with this EIA Report. A high-level assessment is made, only. Briefing note issued to key marine stakeholders (06/09/2021) and consultation with Western Isles Fisherman's Association (20/10/2021). Project background (Briefing Note) issued to MCA, UKHO, MS-LOT (10/11/2020). Detailed response from MSLOT received 18/12/20.	Appendix 13-1 Maritime Management Procedures, Section 13.11.

Stakeholder	Comment	Response/Action taken	Section cross-reference
Maritime and Coastguard Agency (MCA) Correspondence 06/11/2020	The MCA would expect consideration of the following in the EIA: • potential risk to shipping and navigation (consideration of all vessel types); • emergency response (search and rescue); and • a process to be in place for a Navigation Risk Assessment to determine the relevant risk mitigation measures to ensure the risk to shipping remains ALARP. The EIA would need to detail the plans for debris recovery and debris intended to be left on the seabed.	An assessment of risk to marine users and activity will be undertaken for each launch event and submitted with any future licence application. Further correspondence with MCA confirmed that launch specific NRAs, within or accompanying a Safety Case, will be undertaken for each marine licence application. Therefore, no NRA is provided with this EIA Report. A high level assessment is made, only. The Developer is in direct consultation with MCA with regard to process for NRA for any future licence application to CAA and MS-LOT for respective licences for a launch.	Appendix 13-1 Maritime Management Procedures, Section 13.11.
MCA Correspondence 06/11/2020	The EIA should address the impact on all human infrastructure i.e. offshore renewables, oil and gas, cables and pipelines, etc., identified within study area. Anything outside of the study area may be scoped out as appropriate. The in-combination effect with other plans and projects in the marine environment may also need to be addressed.	All relevant infrastructure has been considered in the assessment. Existing MOD Range activities form part of the baseline. Cumulative impacts have been scoped out of the assessment.	Section 13.8 and 13.11 Appendix 13-1: Maritime Management Procedures
MCA Meeting 12/11/2020	For EIA, MCA would expect a Shipping and Navigation chapter including characterisation of the marine users in the area, the perceived risk in the marine environment from the activities undertaken at the spaceport, and how this will be addressed going forward.	The chapter primarily addresses the impact of disruption to marine users resulting from the Project as a result of safety measures, exclusion zones and warning zones established to protect marine users from the risk of collision from jettisoned LV payloads (stages). A Safety Case will include a detailed quantitative risk assessment of potential hazards during launch event and proposed notification and safety measures to ensure there is no risk to marine users. This forms a standard part of the CAA licence and is prescribed in the Space Industry Regulations 2021.	Section 13.8 and 13.11 Appendix 13-1: Maritime Management Procedures

Stakeholder	Comment	Response/Action taken	Section cross-reference
MCA Meeting 12/11/2020	As the spaceport is being built for the purposes of launch activities which will impact the marine environment, this needs to be considered as part of an EIA chapter on Shipping and Navigation. MCA noted that a more detailed NRA would be required for each launch activity; and that multiple launches could be covered by one NRA if they were in scope, and the NRA can remain valid for up to two years.	An assessment of risk to marine users and activity will be undertaken for each launch event and submitted with any future licence application. Further correspondence with MCA confirmed that launch specific NRAs, within or accompanying a Safety Case, will be undertaken for each marine licence application. Therefore, no NRA is provided with this EIA Report. A high level assessment is made, only. The Developer is in direct consultation with MCA with regard to process for NRA for any future licence application to CAA and MS-LOT for respective licences for a launch.	Appendix 13-1: Maritime Management Procedures, Section 13.11
MCA Meeting 12/11/2020	MCA confirmed that no launch/debris modelling would be required for the purposes of navigation safety at the EIA stage but the EIA should demonstrate the consideration of impact on shipping and navigation based on an understanding of traffic, other offshore infrastructure and local ports and harbours in vicinity.	Impact of floating stages on mariners covered in assessment. Full assessment will be undertaken in any NRA for any future licence applications for a launch.	Appendix 13-1: Maritime Management Procedures, Section 13.11
MS-LOT Correspondence 24/11/2020	Marine Scotland does not consider that this project is an EIA project under The Marine Works (EIA) (Scotland) Regulations 2017 so will not be responding to information submitted from an EIA perspective.	Noted. Marine Scotland will be consulted through any future licence applications for a launch.	Section 13.3 and 13.10
MS-LOT Correspondence 18/12/2020	A marine licence will be required for each deposit made and where multiple deposits, for example, an LV consisting of multiple distinct stages being deposited at different points during the launch, multiple licences may be required depending on where the stages are to be deposited. This is due to the different legislation covering different areas of the marine environment: • Within 12 nm and over 200 nm falls under the Marine Scotland Act 2010 • Between 12 and 200 nm falls under the Marine and Coastal Access Act 2009	The Launch Operator, or their appointed agent, will be responsible for applying for a marine licence(s) for their respective launch campaign, under the relevant legislation.	N/A

Stakeholder	Comment	Response/Action taken	Section cross-reference
MS-LOT Correspondence 18/12/2020	Concerned about risk of debris from launch physically injuring a person, vessel or equipment when it falls into ocean. Expect to see risks fully assessed, including cumulative assessment considering other similar activities taking place in same area and any mitigation measures proposed to minimise risk. Encourage engagement with local stakeholders. Recommend contact with MCA, National Lighthouse Board (NLB), UK Chamber of Shipping and Scottish Fishermen's Federation to seek their views on who is likely to be within launch corridors during a launch, how best to engage with those users and what mitigation could be put in place.	An assessment of risk to marine users and activity will be undertaken for each launch event and submitted with both the launch licence and marine licence applications to the CAA. Risk is mitigated through management measures including prior notification, advanced warnings and provision of exclusion zones and warning zones based on LV flight trajectories and accompanying buffers. Consultation with all relevant stakeholders has been carried out with respect to general Spaceport operations and management of the marine area through briefing notes issued 03/11/2020, 06/09/2021 and various meetings. Engagement will continue throughout subsequent licensing processes. A community notification plan and advance alert service will ensure early notification of proposed launch campaigns.	Appendix 13-1: Maritime Management Procedures
MCA, UKHO, MS-LOT, NLB Meeting 24/06/2021	Agreed that preferred terminology of 'Space Launch Hazard Area', in terms of overall operational limits of the marine activities, to be presented on navigational charts. Specific activities within these areas would be notified by Notification to Mariners or Navigational Warnings.	Operational limits updated in Project plans to reflect preferred terminology.	N/A
MCA, UKHO, MS-LOT, NLB Meeting 24/06/2021	Discussion around approach to EIA and NRA, requirement to identify hazards and impacts associated with launches and procedures in place to safely manage flights and jettisoned stage deposits in marine environment.	Confirmed that the hazard and risk assessment will form part of safety case assessment and to support future Marine Licence applications. High-level assessment and overview in EIA only (which is specific to planning consent for Spaceport only). Further clarification on approach and safety measures detailed in subsequent meeting (17/09/2021) and review of draft Maritime Management Procedures with MCA and UKHO.	N/A
MCA, UKHO, MS-LOT, NLB Meeting 24/06/2021	NLB identified at least two of their assets that may be within the Space Launch Hazard Area and where their staff would require access.	Noted and included in baseline. Stakeholder will be engaged throughout subsequent licensing processes.	Section 13.8

Stakeholder	Comment	Response/Action taken	Section cross-reference
DIO/MOD Correspondence 21/07/2021	Broad consensus (across relevant departments) that the 6-month notification period can be reduced to 3-months. Space Command also liaised with Department for Transport and were content that a 3-month notification period was not out of sync with licensing timescales. RAF Air Command are aware that Defence Airspace and Air Traffic Management (DAATM) are in liaison with the Spaceport operators and are content that the airspace considerations particularly in respect to the Hebrides ranges are being coordinated.	Timescales noted and committed to in proposed mitigation (AR03) Spaceport Programme Schedule.	Chapter 12: Aviation, Radar and Telecoms
Sea tour operator 06/09/2021	Independent response to maritime stakeholder briefing note circulated on 06/09/2021. Response supportive of the development and requested notification prior to launch event to amend operations accordingly.	Stakeholder details incorporated into an outline Notification Plan, as part of the Maritime Management Procedures.	N/A
MCA, UKHO Meeting 17/09/2021	Agreements with relevant authorities requires a letter of agreement to be in place between the spaceport and the MCA (as a relevant authority1) to address how they will work together. MCA in process of drafting template.	Measure included as key regulatory mitigation for launches.	Section 13.10
MCA, UKHO Meeting 17/09/2021	Advised format of NRA can be flexible to avoid duplication as long as MCA requirements were addressed within the documents. This could be a dedicated chapter within the Safety Case. The MCA would expect the same information, whether through the Safety Case or marine licensing regime to satisfy MCA requirements. Must cover key elements of NRA i.e. baseline, identification of hazards, mitigation, scoring of risk within ALARP framework.	Noted. Process outlined in Maritime Management Procedures. Safety Case will be completed through subsequent licensing processes outlined in Section 13.3 Legislative Framework, Regulation and Policy Context and Section 13.10 Mitigation and Management Measures.	Appendix 13-1: Maritime Management Procedures Section 13.3 and 13.10.
MCA, UKHO Meeting, Correspondence 17/09/2021, 03/11/2021	Comments received on draft Maritime Management Procedures, including advice on terminology, notification procedures, stage recovery and charting.	Recommendations incorporated in procedures. These procedures are likely to evolve through subsequent consultation and launch licensing processes through CAA and MS-LOT.	Appendix 13-1: Maritime Management Procedures

Stakeholder	Comment	Response/Action taken	Section cross-reference
Western Isles Fisherman's Association (WIFA) / Outer Hebrides Regional Inshore Fisheries Group (IFG) Correspondence 27/09/2021	Based on feedback from both shellfish and pelagic vessels the proposed Spaceport Facility at North Uist will pose a significant negative impact on fishing vessels that currently fish within the hazard area. Pelagic activity for mackerel occurs in the outer area during January and February, depending on the timing of south-western migration, with a fleet of up to 30 Scottish and Irish vessels. The blue whiting fishery also takes place in the outer area in April as the fish migrate northwards (all large vessels usually in the region of 60 – 100 metres) and only fish for limited periods of the year and any disruption to their fishing patterns could result in losses of millions of pounds on a daily basis. The inshore grounds to the West of the Hebrides located within the hazard area are some of the most productive shellfish grounds in Europe, with lobster and brown crab being the main target species.	Noted and referenced in baseline. Consultation with local fisheries representatives, through representatives such as the IFG and WIFA, has been initiated and to date, indicative agreements have been made for a Dedicated Fisheries Forum and commitment to explore opportunities for charter vessels (where feasible) to support Spaceport operations. Consultation will continue throughout the development process and prior to launch activities to minimise further disruption as far as practicable. Other fisheries representatives were contacted via a Project Briefing Note (06/09/2021), including Scottish Fishermen's Federation (SFF), Scottish Whitefish Producers and Mallaig and Northwest Fisherman's Association, however, no response received to date.	Section 13.8, 13.10 and 13.11
WIFA / OH IFG Correspondence 27/09/2021	Highlighted the existing prohibitions to static gear in the region, with extensive commercial static creel fisheries undertaken by up to 30 local vessels targeting lobster and brown crab from 1 April – 31 October each year. There is a prohibition on the use of pots in the inshore water from 1 November – 31 December and from 1 January – 31 March each year when vessels return to the more sheltered waters of the Minches to fish mainly for *nephrops*. Those smaller vessels are already restricted by the number of days they fish as most fish from Monday to Friday as their market days for selling live catch is either Saturday or Sunday. During the summer months those vessels gross from £1,000 - £2,000 per day depending on their size and disruptions of 2-4 hours in having to move away from the hazard area would result in them losing most of their fishing day before they could steam back to their grounds after launching.	Inshore Fishing (Prohibition of Fishing and Fishing Methods) (Outer Hebrides Order) 2017 considered in the assessment. Consultation with local fisheries representatives, through representatives such as the IFG and WIFA, has been initiated and to date, indicative agreements have been made for a Dedicated Fisheries Forum and commitment to explore opportunities for charter vessels (where feasible) to support Spaceport operations. Consultation will continue throughout the development process and prior to launch activities to minimise further disruption as far as practicable.	Section 13.8 and 13.11

Stakeholder	Comment	Response/Action taken	Section cross-reference
WIFA / OH IFG Correspondence 27/09/2021	If the proposed Spaceport station is to proceed then consideration should be given to structure launch periods during the period from 1 November – 31 March during the period when the inshore area is already closed to mobile fish for conservation purposes. Any launching during the period from 1 April – 31 October should be targeted to weekends when most of the inshore fleet will be landing their catch and economic impact would be greatly reduced during that period.	Consultation with local fisheries representatives, through representatives such as the IFG and WIFA, has been initiated and to date, indicative agreements have been made for a Dedicated Fisheries Forum and commitment to explore opportunities for charter vessels (where feasible) to support Spaceport operations. Consultation will continue throughout the development process and prior to launch activities to minimise further disruption as far as practicable.	Section 13.10
WIFA / OH IFG Correspondence 27/09/2021	The inshore shellfish sector expects to be compensated for any losses that they would incur during the summer months if they are forced away from their productive grounds during the period of the season when their catches are highest and compensation should be based on evidence-based landings for any vessels loss of earnings during the corresponding launch period in the previous year.		
WIFA / OH IFG Correspondence 27/09/2021	Furthermore, research should be undertaken to ascertain whether the noise from launching will have any adverse impact on lobsters in inshore grounds, as reductions in catches are reported following thundery weather periods.	No likely significant effects identified in relation to underwater noise, therefore is scoped out of the assessment.	Chapter 16: Marine Ecology
Sea tour operator 10/10/2021	In response to briefing note circulated on 06/09/2021, operator noted that the area of disruption (SLHA) would severely impact on the area of travel for trips to St Kilda while operating from April to October.	Recreational trips to St Kilda noted as important vessel routes. Impact on recreational users assessed in chapter and mitigation proposed to minimise disruption impacts.	Section 13.8, 13.10 and 13.11

Stakeholder	Comment	Response/Action taken	Section cross-reference
WIFA / OH IFG Meeting 20/10/2021	The fishing fleet operating regularly throughout the study area includes a small fleet of viviers, operating out of Scrabster and one locally based. The inshore fleet (generally under 10 m overall length) includes single-handed vessels operating out of Griminish. These vessels use gears comprised of parlour pots and creels, particularly targeting high value lobster fishery. Gear would be deployed and recovered anywhere from a daily basis to every 2-3 days in the inshore waters of the study area.	Noted and referenced in baseline.	Section 13.8
WIFA / OH IFG Meeting 20/10/2021	Provided information on the ongoing initiative to install AIS on the inshore fleet by 2024, and the higher resolution nature of the data.	The Developer will continue to liaise with WIFA on possibility of available AIS data to inform Safety Case and NRA for future launches.	N/A
WIFA / OH IFG Meeting 20/10/2021	Agreement that communication and notification procedures should be reviewed to identify improvements to current system, to include (for example) an annual meeting and launch specific notification procedure.	The Developer commits to consult directly with the fisheries sector to review and agree communication and notification procedures and explore opportunities for the inshore fleet to potentially support operations associated with the Spaceport.	Section 13.10

13.7 ASSESSMENT METHODOLOGY

13.7.1 Approach to assessment

The general EIA process and methodology is detailed in Chapter 6: Approach to EIA. The approach used to assess potential impacts on marine users and assets has also considered guidelines produced by SNH (2018) and Fisheries Innovation Scotland (Batts *et al.*, 2017), in conjunction with relevant legislation and policy guidance as detailed in Section 13.3.

13.7.2 Assessment criteria

The following criteria have been utilised to inform the assessment of likely significant effects, including consideration of importance of maritime features (Table 13-2), in the context of the study area, and magnitude of impact on receptors (Table 13-3).

Importance

The importance of maritime features is based on geographically important areas, such as shipping channels, access to ports and fishing grounds, and intensity of use, detailed in Table 13-2. The table is not intended to be prescriptive and provides a guide only; for example, local routes and assets may be considered as important to local industry and communities as those designated for international use.

Table 13-2 Importance of maritime interests

Importance	Criteria
High	Internationally important routes or marine assets. Intensively used shipping route or fishing grounds, major port approach channel or IMO routing measure with no alternative routes.
Medium	Nationally or regionally important routes or marine assets. Moderately used shipping route or fishing grounds, routes to local ports or harbours. Some/limited alternative routes or wider fishing available.
Low	Local routes and marine assets. Low use shipping routes or fishing grounds, no specific routes to ports or harbours. Alternative routes and wider fishing grounds available.
Very Low	Very limited or no shipping, fishing activity or assets, no defined channels or routes to ports or harbours.

Magnitude of impact

Sensitivity of receptors is an important consideration when determining the magnitude of impact. The sensitivity of receptors to potential impacts of the Project is based on their capacity to avoid, tolerate, recover from, or adapt to a particular impact.

The following factors are also considered when characterising the potential magnitude of a particular impact:

- **Extent**: the geographical area or number of marine users likely to be affected;
- **Scale**: the size, volume, amount and / or intensity;
- **Duration**: whether the impact is short, medium or long-term, permanent or temporary;
- **Frequency and timing**: the characterisation of when the impact will occur; and
- **Reversibility**: the characterisation of how easily / quickly the impact will be reversed if applicable.

The magnitude of an impact is defined by the following criteria presented in Table 13-3.

Table 13-3 Magnitude of impact

Magnitude	Criteria
High	Major alteration to key elements / features of the baseline (pre-development) conditions such that post-development character / composition / attributes will be fundamentally changed.
Medium	Loss or alteration to one or more key elements / features of the baseline conditions such that post-development character / composition/ attributes of baseline will be partially changed.
Low	Minor shift away from baseline conditions. Change arising from the loss / alteration will be discernible but underlying character / composition / attributes of baseline condition will be similar to pre-development circumstances / patterns.
Very Low	Very slight change from baseline condition. Change barely distinguishable, approximating to the 'no change' situation.

Significance of effects

The significance of an effect results from the interaction between an impact's magnitude and the importance of those receptors that might be affected.

Table 13-4 is used to support the identification of significant effects to ensure that the process is transparent. However, the matrix table provides a guide for the assessor and is not intended to be prescriptive. Professional judgement is used to determine the likely significance of effects. An impact assessed as having a *moderate* or *major* effect on a receptor is considered to be significant in the context of the EIA Regulations and is examined in more detail in this chapter.

The approach taken in the assessment is to assess the effects of residual impacts once any mitigation has been taken into account.

Table 13-4 Significance of effect

	Magnitude			
Importance	**High**	**Medium**	**Low**	**Very Low**
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible
Very Low	Negligible	Negligible	Negligible	Negligible

13.8 BASELINE DESCRIPTION

13.8.1 Harbours, anchorages and navigational markers

The Project is located on the north-west coast of North Uist at Scolpaig Farm. The nearest harbour is Griminish, located 2.5 km to the north-east, and outwith the study area. The harbour is owned by Comhairle Nan Eilean Siar and is primarily used by fishing vessels. Lochmaddy Pier is the port for the ferry link to Uig, Skye and is located on the east coast of North Uist. Leverburgh, to the north-west on the Isle of Harris, is one of the main ports for boat trips to St Kilda. Sightseeing trips to St Kilda also operate from Miavaig Pier in Loch Roag, on the Isle of Lewis.

There are no designated anchorages located within the study area, however there are a number of small anchorages throughout much of the coastal bays along the west coast of the Western Isles.

The Northern Lighthouse Board (NLB) has one asset within the study area, Haskeir lighthouse, which is located 13.3 km to the north-west of the launch site. Monach lighthouse is located18.2 km to the south of the launch site, outwith the SLHA and Flannan lighthouse is 71.4 km to the north of the launch site, to the east of the SLHA. NLB has noted that access for staff is required to these lighthouses (Table 13-1).

Key navigational features in the vicinity of the Project are presented in Figure 13.1.

13.8.2 Other marine assets, designations and activities

Maritime telecommunications

One telecommunications cable passes through the study area, 'HAVFRUE' (Figure 13.1). There are no power network cables routing through the study area.

Military interests

A Ministry of Defence (MOD) Firing Danger Area encompasses much of the study area and part of a Navy Exercise Area extends into the southern extent of the study area (Figure 13.1). A number of training activities are undertaken

throughout the waters of the Western Isles, including the bi-annual Joint Warrior exercises, one of the largest military exercises in Europe, bringing together the Royal Navy, the Royal Air Force and the British Army, as well as forces from other NATO and allied nations[6].

The MOD Hebrides Range base is located to the south at Geirinis in South Uist and consists of a deep range complex weapons trials and in-service firings, and an inner range for ground-based air defence Test and Evaluation. The Range carries out trials and training for land, air and sea weapons systems, which includes waters throughout the study area[7]. MOD Range interests relating to terrestrial, airborne and radar, are assessed in Chapter 12: Aviation, Radar and Telecommunications.

Oil and gas assets

There is one oil and gas well within the study area and several to the eastern extent of the SLHA, however all are recorded as 'decommissioned' or 'dry holes'. Offshore oil and gas activity is currently restricted or excluded within the existing range /military exercise area illustrated in Figure 13.1.

Marine renewables

There are two areas identified as 'Wave Draft Plan Options' under the draft Sectoral Marine Plan from 2013, these are referenced as 'West Hebrides'. However, these draft plans were never formally adopted by Scottish Ministers, but the draft options were included in the National Marine Plan and are retained on Marine Scotland Maps for reference (Marine Scotland, 2019). No proposals for wave energy developments have been made to-date within or near the study area.

The Sectoral Marine Plan for Offshore Wind Energy (2020) identifies two 'Plan Options' or 'Areas of Search' for offshore wind leasing rounds 44 km and 64 km east of the study area boundary and to the north of Lewis (Figure 13.1). No marine licence applications for offshore wind energy developments have been made to-date for these areas. However, the areas currently form part of the site options for the current ScotWind offshore wind leasing round, due to be announced in January 2022.

Disposal sites

One historic chemical munitions disposal site is located within the study area 'Empire Fal', a scuttled ship with defective bombs from the 1940's, however, is on the boundary of the proposed SLHA for easterly launches. There is a closed dredge spoil site located within the study area, which is recorded as 'not been used for at least 10 years, or specifically closed' and is classified as 'fish waste' (Figure 13.1).

Marine aquaculture

There are no existing fish, shellfish or commercial seaweed farms in the vicinity of the study area. However, Marine Scotland's Wild Harvesting of Seaweed and Seagrass Strategic Environmental Assessment indicates the entire coast of the Western Isles to be areas where seaweed and seagrass (wracks) are known to be harvested (Marine Scotland, 2016).

[6] https://www.royalnavy.mod.uk/news-and-latest-activity/operations/united-kingdom/exercise-joint-warrior (accessed 03/11/2021)

[7] https://www.ltpa.co.uk/SitesAndRanges/Hebrides (accessed 03/11/2021)

13.8.3 Vessel routes and maritime vessel activity

General routes and vessel activity

The West of the Hebrides deepwater shipping route traverses the study area between St Kilda and the larger Western Isles group (Figure 13.1). This traffic separation scheme (TSS) is a maritime traffic-management route-system governed by the International Maritime Organization (IMO) to regulate vessel navigation.

AIS Average Weekly Density data (2012 – 2017) indicate approximately 5-10 vessels transit the study area per week, along the IMO shipping route that navigates the west coast of the Western Isles (Figure 13.2). Areas with a density of 1-5 vessels per week are also distributed throughout the wider study area, indicative predominantly of fishing vessel activity but also some cargo and tanker transits.

Figure 13.3 presents individual AIS vessel track data in the vicinity of the study area by vessel type for 2015 and amalgamated to reflect average weekly density by vessel type for 2012-2017 in Figure 13.2. Each is described in more detail below.

Tanker and cargo vessels

Figure 13.2 and Figure 13.3 show that there is regular use of the study area by tankers and cargo vessels, primarily via the IMO shipping route but also with some transits west of St Kilda and through the wider study area. However, this vessel activity is low compared to transits through eastern waters between the Western Isles and mainland of Scotland. Tanker and cargo vessels represent the majority of average weekly traffic (4-8 weekly transits), predominantly along the IMO shipping route (Figure 13.2).

Fishing Vessels

Fisheries spatial data

The AIS datasets indicate that fishing activity for vessels greater than 15 m overall length is undertaken predominantly in offshore fishing grounds, beyond the 6 nm inshore waters, and to the north of Lewis (Figure 13.2 and Figure 13.3). Weekly densities are highest in the northern LV trajectory in fishing grounds from Geikie Slide to Halibut Bank and off the Butt of Lewis. There is also activity in and around the 'Flannan Ground' and eastwards towards the west coast of Lewis.

These patterns of AIS fishing vessel activity correlate with the VMS datasets indicating high intensity squid, herring, mackerel and demersal fishing grounds to the north and east of the study area (Figure 13.4a and Figure 13.4b). While demersal mobile and static gears and mackerel fishing vessels operate across grounds throughout the centre of the study area from Geikie Slide and west of St Kilda (Figure 13.4a and Figure 13.4b). High intensity fishing grounds for herring are also located off St Kilda (Figure 13.4a).

Lobster fishing grounds cover much of the inshore west coast from the south of Lewis down to the southernmost tip of the Outer Hebrides (Figure 13.4b). Crab fishing grounds are of greatest intensity around the Flannan Ground and the Butt of Lewis, with lower level fishing down through the study area (Figure 13.4b).

For the inshore fleet (vessels under 15 m overall length) there are no available AIS or VMS data to identify spatial vessel activity. However, data from the ScotMap interview-based study indicate that inshore lobster and crab creeling is likely to be undertaken along much of the inshore waters along the west coast of the Western Isles (Figure 13.5). Approximately 6-10 vessels may operate within 6 nm of the coast, reducing to 1-3 vessels out towards St Kilda. Higher vessel numbers may operate around the Sound of Monach and Ardivachar Rocks.

Fisheries consultation

Consultation with a representative of Western Isles Fisherman's Association (WIFA) and the Outer Hebrides Inshore Fishery Group (IFG) indicated that the fishing fleet operates regularly throughout the study area, and includes a small fleet of viviers, operating out of Scrabster and one locally based (Table 13-1). The inshore fleet (generally under 10 m overall length) includes single-handed vessels operating out of Griminish. These vessels use gears comprised of parlour pots and creels, particularly targeting high value lobster fishery. It was noted that the inshore waters of the SLHA may be targeted for crab and lobster by up to 30 creel vessels and that during the summer months those vessels may gross from £1,000 - £2,000 per day depending on their size (WIFA, *pers. comm.* (Table 13-1)), however, these figures are unverified. WIFA noted that gear would be deployed and recovered anywhere from a daily basis to every 2-3 days in the inshore waters of the study area.

Under the *Inshore Fishing (Prohibition of Fishing and Fishing Methods) (Outer Hebrides) Order 2017* fishing for any species of sea fish with a creel or parlour pot is prohibited in the Barra Head (Berneray) to Harris Protected Area between 1st January and 31st March in each year, and 1st November and 31st December in each year. Therefore, the inshore creel fleet is limited to fishing within inshore waters of the study area between April to October each year.

WIFA indicated that the pelagic fishery operates towards the outer area of the SLHA around January and February, depending on the timing of the south-western migration for particular pelagic species, with a fleet of up to 30 Scottish and Irish vessels. The blue whiting fishery also operates in this area in April, fishing only for limited periods of the year (WIFA, *pers. comm.* (Table 13-1)). Other fisheries representatives were contacted via a Project Briefing Note (06/09/2021), including Scottish Fishermen's Federation and Scottish Whitefish Producers, however no formal response has been received to date.

Passenger and recreational vessels

There are no Scottish passenger ferry routes through the study area or along the west coast, with all operating from the east coast of the Western Isles and inter-island. There is low frequency but regular transit routes of high speed craft carrying AIS through the summer months coming from Loch Roag and Leverburgh to Boreray and St Kilda (Figure 13.3), with some of these transits understood to be undertaken by a number of cruise and tour operators, including (but not necessarily limited to) Kilda Cruises, Seatrek and Uist Sea Tours, for recreational interest. Low frequency transit passenger vessel routes transit St Kilda from further afield.

Recreational vessels captured by AIS is very low, however, there are routes apparent in the AIS data or known to be regularly undertaken, particularly from Bhaltos/Valtos and Miabhaig/Miavaig and a number of other marinas off the west coast of the Western Isles, all transiting to St Kilda and with one route to the Monach Islands (Figure 13.3).

AIS analyses from the RYA UK Coastal Atlas of Recreational Boating (2014-2017) correlate with the general AIS data, with low level activity out of Aird Asaig to the north, Leverburgh to the south and Eriskay and Barra further south, generally transiting towards the Monach Islands and St Kilda (RYA, 2019). The nearest sailing clubs are Uist Boat Club to the south of the study area at Paibeil and Comann na Mara in Lochmaddy.

The St Kilda Challenge is a sailing event that typically occurs every second year and involves a yacht race with options of a passage race between Rathlin Island (Northern Ireland) and St Kilda as well as a sprint race around St Kilda, which would start and finish in Lochmaddy (via the Sound of Harris)[8].

[8] https://www.thestkildachallenge.co.uk/ (accessed 03/11/2021)

The Scottish Marine Recreation and Tourism Survey (SMRTS) indicates that activities such as sea angling, power boating, motor cruising and sailing are likely to occur in the vicinity of and within the study area (Marine Scotland, 2017).

Further detailed baseline information and potential impacts on marine and coastal recreational users are described and assessed in detail in Chapter 7: Community, Recreation and Tourism.

Maritime safety-related vessels

Other vessels operating in and transiting through the study area include military or law enforcement vessels and search and rescue vessels (SAR), including Her Majesty's Coastguard (HMCG)[9] and Royal National Lifeboat Institution (RNLI), although transits are too low to be recorded on the AIS average density datasets (categorised as 'non-port service craft'). There are limited AIS transits of potential military vessels in the study area, however, as described in Section 13.8.2 (Military interests), there is likely to be substantial activity relating to the various training operations and which may not be registered on AIS. NLB vessels are known to transit the area to access lighthouse assets, including Haskeir lighthouse which is located within the SLHA (see Table 13-1 for consultation with NLB and lighthouse details in Section 13.8.1).

13.8.4 Summary

The baseline conditions within the study area are summarised as follows:

- There are no major shipping and fishing ports or harbours within the study area. Griminish, north-east of the study area is a key fishing port with many of the local fleet operating from here. Leverburgh on the Isle of Harris is one of the main ports for boat trips to St Kilda. There are no designated anchorages located within the study area, however there are a number of small anchorages throughout much of the coastal bays of the west coast of the Western Isles. There are no prescribed passenger ferry routes transiting the area, with all key ferry ports based on the east coast of the Western Isles. Access to key ports, harbours and anchorages are not anticipated to be restricted by the Project and therefore are scoped out and will not be assessed further.
- The NLB has one asset within the study area, Haskeir lighthouse, which is outwith but between the proposed splashdown zones and is considered to be of **high** importance.
- There are no operational or proposed (in planning) marine renewables or aquaculture within the study area. These receptors are scoped out and will not be considered further.
- There is one 'decommissioned' or 'dry' oil and gas well, one closed dredge disposal site and one historic chemical munitions site (scuttled ship) within the study area. While not operational, these assets are scoped in for further assessment due to their potential for disturbance by LV stage deposits on the seabed and are considered to be of **low** importance.
- The MOD operates out of MOD Hebrides Range to the south, has a firing danger area within the study area and undertakes a range of aerial, firing and marine training activities in the area. Not all MOD vessel activity will be recorded on publicly available AIS, therefore broad activity is assumed across the study area. MOD maritime activities are interests of national and international security and therefore considered to be of **high** importance in the study area.
- Overall vessel activity through the study area is low to moderate with an average of 8-10 vessels transiting weekly. Tankers, cargo and fishing vessels represent the majority of vessel activity in the area. There are prescribed routes for recreational vessels and chartered passenger vessels to St Kilda and the Monach Islands, in particular.

[9] Her Majesty's Coastguard (HMCG) is a section of the Maritime and Coastguard Agency (MCA) responsible for the initiation and co-ordination of all maritime search and rescue within the UK Maritime Search and Rescue Region.

- There is an IMO deepwater shipping route transiting from north to south of the Western Isles and through the study area. This route is used by a number of cargo and tanker vessels on a regular basis but is of lower intensity than routes east of the Western Isles and there are no key ports associated with shipping within the study area. Shipping activity is considered to be of **medium-high** importance.
- There are key fishing grounds for demersal, pelagic and shellfish fisheries throughout the offshore waters of the study area and inshore pot and creel fishing along much of the coastal inshore waters within the study area and wider west coast of the Western Isles. Given the extensive footprint of the SLHA and the LV flight paths, and broad spatial coverage of fishing grounds for both the inshore and offshore fleets, fisheries receptors are assessed to be of **medium-high** importance in the study area.
- Recreational vessel activities are likely to be limited to the coastal areas and of lower intensity on the exposed west coast area compared to the wider Outer Hebrides. Sailing vessels transit the coastal waters and chartered vessels and high-speed craft / passenger vessels visit St Kilda, Monach Isles and transit through the study area to other islands throughout the Outer Hebrides. These receptors are assessed to be of **low-medium** importance in the study area.
- Other key vessels undertaken maritime safety-related operations, including HMCG and RNLI undertaking SAR operations, and NLB access of lighthouse assets, have relatively low frequency transits throughout the study area, however, are assessed to be of **high** importance due to the nature of their operations.

13.9 POTENTIAL IMPACTS

The following potential impacts, including any with potential positive or negative and direct, indirect or secondary effects have been established through consultation with key stakeholders (see Section 13.6).

13.9.1 Construction and Decommissioning phase

No impacts have been identified for the construction and decommissioning phases of the Project.

13.9.2 Operations phase

Scoped in

The potential impacts of the Project on maritime receptors, without mitigation, which have been identified as relevant to the Project are:

- Collision of jettisoned and floating stages with marine users and assets within the flight path of a LV;
- Snagging of vessels on anchor or fishing gear on LV stage deposits on seabed; and
- Disruption to marine users due to marine safety restrictions during a launch event (including shipping (cargo and tankers), recreational users, fisheries, MOD activities and maritime safety-related vessels).

13.10 MITIGATION AND MANAGEMENT MEASURES

The following mitigation and management measures are proposed to remove, avoid, reduce and, where possible, offset any impacts which could, either by themselves or in combination with others, have a significant adverse effect. These measures are considered in the assessment of residual effects in Section 13.11.

Table 13-5 Mitigation measures

Ref.	Title	Description
GM01	Design mitigation	Space Launch Hazard Area boundaries are defined to avoid landmasses, St Kilda seabird colonies, marine transboundary interactions and marine assets.
R01	Regulatory Mitigation (Spaceport)	The Spaceport will be licensed and regulated under the Space Industry Act 2018 and Space Industry Regulations 2021. The Safety Case is the main way in which an applicant for a Spaceport Licence demonstrates compliance. The focus of the Safety Case is in managing potentially catastrophic events and is based on hazard identification /incident scenarios with corresponding measures to prevent or limit the consequences of an accident of incident to demonstrate that the risk is as low as reasonably practical (ALARP). An Assessment of Environmental Effects (AEE) also forms part of the licence application for the Spaceport and is taken into account by the Regulator (UK Civil Aviation Authority, UK CAA) in terms of deciding whether or not to grant a licence. Once the licence is granted, the Safety Case is used as the basis for ongoing monitoring, review and assessment. Reviews can also be triggered by a range of events including a change to the operations or infrastructure, or if new information relating to safety matters arises
R02	Regulatory Mitigation (Launch Vehicles and Launch Events)	Each launch will be licensed and regulated under: • The Space Industry Act 2018 and the Space Industry Regulations 2021; or • Permission under the Air Navigation Order 2016 (Air Navigation (Amendment) Order 2021); and • Marine (Scotland) Act 2010 for launches that involve deposits in the marine environment. The launch operator is required to submit a detailed Safety Case which includes both a ground safety analysis and a flight safety analysis to the regulator (UK Civil Aviation Authority, CAA). The ground safety analysis covers the transport, handling and storing of any hazardous material in relation to the launch vehicle and testing payloads amongst a range of other activities. A flight safety analysis covers must cover potential blast and fragmentation impacts, releases of toxic chemicals, and any major accidents or hazards resulting from collision or separation of LV components.
R03	Agreement with Relevant Authorities	Space Industry Regulations, Article 43, *Chapter 3. Agreements with relevant authorities* requires a letter of agreement to be in place between the spaceport and prescribed relevant authorities to address how they will work together to ensure maritime impacts are avoided or minimised as far as practicable: • To co-ordinate the monitoring of the movements of mariners to which the SO/LOs activities might pose a hazard; and • To allow for warnings to be issued to mariners or other action to be taken to avoid or mitigate any loss or damage. The Agreement specifies the content and timescales for engagement and communications between the Licensee (SO/LO), the UK Civil Aviation Authority (UK CAA), Maritime Coastguard Agency (MCA), the UK Hydrographic Office (UKHO), Her Majesty's Coastguard (HMCG) and such other public bodies with whom it may be necessary to communicate i.e. The Northern Lighthouse Board (the "Relevant Authorities").

Ref.	Title	Description
MU01	Maritime Management Procedures	The Maritime Management Procedures will ensure the safe launch of LVs from the spaceport and include prior notification procedures and operational procedures throughout a launch campaign. Key measures to eliminate risk and minimise disruption to marine users include procedures relating to: • Maritime notifications – pre-launch, mission deviation, post-launch; (community updates through various mediums, advance alert service, Notice to Mariners (NtM), Navigation Warnings (NavWarning)); • Demarcation of safety and restricted zones – Exclusion Zone, Warning Zone, Restricted zone; • Surveillance and Area clearance – Range control systems, including VHF marine band radio, VHF terrestrial radar and airborne radar (if required), safety vessels and maritime patrol aircraft; • Launch vehicle recovery – LV tracking, drift modelling (to establish dispersion area) and recovery vessel; • Deposit charting – notification procedure with MCA/UKHO; and • Emergency response plan.
MU02	Dedicated Fisheries Forum	• The Developer commits to convene a forum to provide direct communications between local fisheries sector and the Spaceport. The purpose of the Forum will be to support ongoing development and refinement of notification procedures, explore opportunities for the inshore fleet to potentially support operations associated with the Spaceport e.g., local vessels for patrol and recovery vessels (where feasible) to support operations.
AR03	Spaceport Programme Schedule	• A Spaceport Programme Schedule will be agreed with relevant stakeholders to safeguard assets and to minimise the impact of the development on operational capability of those assets. This will be submitted no less than three months prior to the commencement of any launch and will include information on planned launches, with more detailed information (as it becomes available) provided closer to launch. Details are likely to include information about the planned launch timing, trajectory, jettisoned stages, stage recovery and other relevant Spaceport and launch operations.

13.11 IMPACT ASSESSMENT

13.11.1 Collision of jettisoned and floating stages with marine users and assets within flight path of a LV

Impact Overview (without mitigation)

The baseline assessment identifies a range of features and marine users within the SLHA that may be impacted by direct strike from jettisoned LV stages associated with a launch, or collision with floating stages awaiting recovery. Direct strike could, in the worst case, result in loss of life or catastrophic damage to property, should marine users, vessels or fixed marine assets be within the splashdown area for a jettisoned LV stage. Marine vessels may also be at risk of damage from collision with floating and drifting LV stages.

Mitigation and Management

The boundary of the SLHA has been defined to avoid land masses, marine assets and transboundary interactions SLHA (GM01). There are a diverse range of LV specifications, and the nature of the risk to marine assets and users within the

SLHA will be highly dependent on the parameters of the launch, the specification of the LV and nature of the mission. The key mitigation to reduce risk to maritime safety will be defined through the licensing process for each launch, which includes a flight safety analysis, part of the Safety Case which forms the core submission of an application for a launch licence and is regulated by the UK CAA. The flight safety analysis is based on a process of modelling the range of scenarios associated with each launch, and incorporates the full range of potential unplanned events, splashdown zones and dispersion areas. Potential impacts on marine users and assets are assessed, as part of a Navigational Risk Assessment (R01 and R02). This analysis will provide the basis for defining a series of controls to eliminate or reduce the potential safety risks to 'as low as reasonably practical' (ALARP), including a suite of procedures for maritime notification, area clearance, LV recovery, mission deviation, post-launch and emergency response (MU01).

These measures will include:

- Baseline characterisation, safety analysis and consultation may identify areas or timing to avoid where there is high intensity activity or sensitive marine assets (including seabed assets, such as the telecoms network or chemical munitions disposal sites);
- The designation of Exclusion Zones[10], to exclude mariners from part of the SLHA where a LV stage splashdown area has been established, and Warning Zones[11], both areas are continuously monitored by the RO.
- Advance notification of activities through Preliminary Notice to Mariners (PNtM), Notice to Mariners (NtM), Sécurité broadcasts and Navigation Warning (NavWarning), and other measures as defined in the Notification Plan (stakeholder-specific notification plan with timings and method of communication throughout the planning and execution of a launch);
- Surveillance, area clearance and communications through Range control systems, including VHF marine band radio, VHF terrestrial radar and airborne radar (if required for long range launches), safety vessels and maritime patrol aircraft;
- LV recovery process through tracking, drift modelling (with latest weather forecast data to define dispersion area) and recovery vessel.
- Mission deviation procedures for jettisoned stages; and
- Deposit notification procedure.

Appendix 13-1: Maritime Management Procedures, sets out the outline process for undertaking a Safety Case assessment (including baseline characterisation, identification of hazards, mitigation and scoring of risk within ALARP framework), the management measures and mitigations likely to be in place.

Every launch is strictly regulated under the Space Industry Regulations 2021, or Air Navigation Order 2016 (Air Navigation (Amendment) Order 2021), and Marine (Scotland) Act 2010. The NRA will form part of the flight safety analysis, which in turn forms a part of the core Safety Case that is required for the licence for each launch under the Space Industry Regulations and will be assessed by the CAA. The information provided to meet the requirement of a NRA will also form part of a Marine Licence, which will be determined by MS-LOT, with input from the MCA, NLB and other stakeholders (R02). Furthermore, an 'Agreement with Relevant Authorities' will form the basis of a formalised agreement between the CAA, MCA and UKHO for communications, consultation and agreement for all launch activities.

[10] Exclusion Zone - means part of a hazard area to which entry by any vehicle, ship, aircraft, or other craft, individual or domestic animal is excluded (as defined by the Space Industry Regulations 2021)

[11] Warning Zone - means part of a hazard area to which entry is not restricted but which is subject to a requirement to provide a warning notice in accordance with Regulation 51 of the Space Industry Regulations 2021

This will ensure activities of all authorities are coordinated to monitor mariners, where launch activities might pose a hazard, and ensure warnings are issued to prevent loss or damage (R03).

Assessment of Residual Effects

Magnitude of Impact

The processes in place to characterise and assess risk as part of the Safety Case for each launch are designed to achieve ALARP, through implementation of mitigation and monitoring measures, for each launch. The legal requirement of an 'Agreement with Relevant Authorities' enshrines a formalised consultation and communication process with key agencies responsible for launch safety and wider maritime safety (R03). There are two separate regulatory processes under the Space Industry Regulations 2021 and the Marine (Scotland) Act 2010 that will assess the proposals for managing marine safety for each launch (R01 and R02).

A core part of the Safety Case comprises a baseline assessment and quantitative risk assessment to determine a planned flight path under the application of the principle of ALARP. No planned flight path will cross any land mass after leaving the Spaceport at Scolpaig, where there is potential for jettisoned stages to be deposited. The Maritime Management Procedures in place during a launch event will ensure that the risk of direct strike by a jettisoned stage is very low (under principle of ALARP), with prior notification to marine users, clearance of the Exclusion Zone, and continued surveillance to ensure the area is clear for launch (Appendix 13-1: Maritime Management Procedures). No launch will proceed unless the Exclusion Zone is clear, ensuring the risk to mariners is ALARP (*Area Clearance Procedure* in Appendix 13-1).

Fixed marine assets in the study area, including the NLB lighthouse, telecommunications cable, the 'decommissioned' or 'dry' oil and gas well, closed dredge disposal site and historic chemical munitions site, will all be avoided by flightpath design through the Safety Case analysis.

LV stages will be designed for retrieval (utilising a parachute system) or to sink to the seabed. Procedures are in place to track jettisoned stages from point of splashdown by modelling the drift (using on-the-day weather forecast data) to determine dispersion area and subsequently the search area (search datum position calculated), utilisation of a locator in some LVs and deployment of a recovery vessel for retrieval. Communication protocols will be in place to notify mariners of the potential hazard to navigation until the stage is recovered.

With the implementation of proposed mitigation and management measures to achieve ALARP for each launch, the risk to marine users and marine assets must be determined as *low* or *insignificant* for a launch to proceed, therefore the magnitude of impact in the context of EIA is assessed to be **very low.**

Significance of residual effects

Marine users and assets are considered to be of **high** to **medium** importance in the study area. The magnitude of impact is considered **very low**. Therefore, residual effects will be **negligible** and **not significant.**

13.11.2 Snagging of vessels on anchor or fishing gear on LV stage deposits on seabed

Impact overview (without mitigation)

Vessels at anchor and fishing vessels with gears deployed may be at risk of snagging on LV stage deposits on the seabed, presenting a navigational hazard and danger to marine users, resulting in loss of or damage to material assets, or in the worst case, risk to life.

Mitigation and management

Within the Maritime Management Procedures (MU01), a process is in place for the notification of deposits to MCA and UKHO and requirement for charting, where LV stages are not recovered. Any requirement for stage deposits to be charted will be assessed by the UKHO on a case-by-case basis, and will take account of the size and location of the deposit, and whether they are deemed to be a risk to mariners i.e. shallow inshore waters, or heavily fished seabed.

All launches, including planned flight path and location of stage splashdown, will be regulated by the CAA under the Space Industry Regulations through the Safety Case required for each launch licence, and all deposits must be licensed by MS-LOT (R02). The LO will be required to apply for a marine licence for deposits on the seabed, which will detail the LV-specific components, deposits and any design or management measures required to minimise environmental impact and risk to mariners.

Assessment of Residual Effects

Magnitude of Impact

It is likely that the majority of LV stages will be recovered as they will hold important data and equipment, however, booster stages or payload fairings may not be recovered. Where LV stages are not designed for retrieval, the stage will be designed to sink to prevent hazard to mariners from floating marine debris. The nature of these deposits will comprise cylindrical stages of aluminium or composite material. A typical booster stage (for a 2-stage LV) is likely to be within dimensions of approximately 2.6 m length and 0.2 m diameter, weighing approximately 30 kg, while a payload fairing (cone) 1.1 m length by 0.5 m diameter at its widest. The stage containing a booster with payload or sustainer with payload is likely to be recovered. Example specifications of stage components for 1-stage and 2-stage LVs are detailed in Chapter 4: Project Description.

There will be a relatively low frequency of deposits, with up to 10 launches per year, with typically two jettisoned stages per launch, of which at least one stage would be planned for retrieval. The location of deposits is likely to vary throughout the extensive SLHA.

With the implementation of proposed mitigation and management measures to achieve ALARP for each launch, and the low frequency and relatively small size of deposits, the magnitude of impact in the context of EIA is assessed to be **very low**.

Significance of residual effects

Marine users and assets are considered to be of **high** to **medium** importance in the study area. The magnitude of impact is considered **very low**. Therefore, residual effects will be **negligible** and **not significant.**

13.11.3 Disruption to marine users due to marine safety restrictions during a launch event

Impact overview (without mitigation)

Marine users may be subject to some access restrictions within defined Exclusion Zones during a launch event to ensure safe navigation and that there is no risk of collision with a jettisoned LV stage. This may lead to temporary disruption of regular and planned transit routes, disruption to maritime activities (such as fishing or MOD operations), or limit access to marine assets within the study area during a launch event, leading to journey delay, increased journey time or journey abandonment.

Mitigation and management

To minimise and avoid disruption to marine users during a launch event, the Maritime Management Procedures (MU01) will include a suite of measures to engage with the maritime community, provide prior notification of launches, live communications during a launch, and following launch completion, for timely update on clearance of the sea area so mariners can resume transit through the Exclusion Zone.

Preliminary Notice to Mariners (PNtM) and Notice to Mariners (NtM) will provide advanced notification to marine users in the area. This will ensure that marine users avoid the affected area during a launch event and are aware of potential restrictions in advance such that they can make alternative arrangements, where possible. NavWarnings will provide live updates on launch activities on the day of launch and timely notification when Exclusion Zones are removed to enable marine users to access or transit the impacted sea area as soon as it is safe to do so.

Assessment of residual effects

Magnitude of impact

The Project proposes a maximum of 10 launches per year. It is anticipated that there will be a four-hour window, for available airspace on the day that the LO can launch. Occasionally a launch may be delayed, due to technical or weather-related issues, and there may be a requirement for 1-2 'back-up days' where the launch may be reattempted. This will similarly result in a four-hour window of availability to launch. A launch is expected to be completed within a matter of minutes (2 - 12 minutes for most types of LV that will be deployed from the Spaceport).

The planned trajectory and flight path for each launch will vary, including location and distance of trajectory and total area demarked as an Exclusion Zone / Warning Zone. Therefore, the area impacted across the SLHA will also vary and the likelihood of the same area being impacted for launches throughout a year is low or would be very infrequent. It should be noted that not all planned launches will have a marine component, as some launches may undertake static testing only, therefore reducing the frequency of disruption to marine users.

The area where access is prohibited, by an Exclusion Zone, will be limited to the predicted splashdown area and modelled dispersion area around jettisoned stages and an additional safety buffer to ensure the risk to mariners is ALARP. Therefore, only limited areas of the planned flight path for a launch will be restricted by temporary exclusions until the area is deemed safe to transit. Mariners will still be able to transit through the wider Warning Zone, within and around the flight path, where warning notices will be issued asking mariners to avoid approaching Exclusion Zones, and therefore may prompt a deviated or alternative course. A representative launch profile and approximate Exclusion Zone for jettisoned stages is illustrated in Figure 4-5.

Shipping (cargo and tankers)

Shipping may be subject to access restrictions related to the location of defined Exclusion Zones during a launch event. This may interrupt planned transit routes, particularly for traffic following through the IMO shipping route, and lead to journey delay and increased journey time for shipping traffic, including cargo and tanker vessels. Cargo and tankers transiting through the study area will be restricted for the duration that an Exclusion Zone is active, anticipated to be no more than four hours during the day of a launch, following which safe transit can resume. The first stage splashdown of booster or payload fairing is, in most cases, likely to be within the inshore area, where access will quickly resume once splashdown has been confirmed. While the second stage splashdown for payload is likely to be located further offshore and may require a longer period of exclusion until the launch has complete and the stage is retrieved. The launch from lift off to final splashdown of stage is likely to be completed within a matter of minutes (typically 2 – 12 minutes depending on the LV).

An estimated 4-8 transits pass through the shipping route each week. A proportion of these vessels may be impacted by a planned launch but with prior notification, may have alternative routes available to avoid the Exclusion Zone and continue transit. Disruption is likely to be infrequent, with no more than 10 launches in a year, for a short and temporary duration over a limited area where jettisoned stages will splashdown, including an additional safety buffer. Transit will be able to continue within any associated Warning Zone defined in the Safety Case. The location of an Exclusion Zone is also likely to range widely within the study area for each launch, in many cases avoiding the need to restrict access through the IMO shipping route. A briefing note was issued to the UK Chamber of Shipping to inform their members of the proposed Spaceport activities[12] and engagement will continue throughout the subsequent regulatory processes to ensure disruption is avoided or minimised as far as practicable.

The likelihood of several cargo and tankers being disrupted at the same location, on the day and timing of a launch is very low given the relatively low frequency of AIS transits through the study area. Furthermore, the implementation of mitigation and management measures intend to provide sufficient notice to shipping stakeholders of planned launches and limit disruption to their operations as far as practicable. Disruption will be over a limited spatial extent, infrequent and temporary in duration. Therefore, the magnitude of impact on shipping is considered **low**.

Significance of residual effects

Shipping is considered to be of **medium-high** importance in the study area. With the implementation of proposed mitigation and management measures the magnitude of impact is considered **low**. Therefore, it is anticipated that there will be **minor** residual effects, which are **not significant.**

Commercial fisheries

The access restrictions implemented during a launch event may lead to disruption of regular transit routes to fishing grounds or landing ports, leading to increased journey time or delay. The application of Exclusion Zones within the study area may also lead to temporary displacement from fishing grounds for inshore fisheries and the offshore fleet, or in the worst case, abandonment of planned fishing activity, depending on the planned LV trajectory and location of predicted splashdown for jettisoned stages.

The local inshore fleet (vessels generally <15 m overall length) is most likely to be affected by launch activities as they regularly fish much of the inshore waters, generally within 6-12 nm of the coast (Figure 13.5). With existing restrictions on creel fishing within the study area and wider west coast for five months of the year (January to March and November to December in each year), any further restrictions on access arising from launch events during the periods they can fish may have a further adverse impact on the fleet. Conversely, launches undertaken during this restricted period would avoid and reduce potential frequency of potential disruption to fishing activity in any year, however, the timing of launches cannot be guaranteed and are driven by the LO, client and mission requirements.

For the larger fleet (vessels >15 overall length), demersal and pelagic fishing grounds are generally further offshore, with lobster creeling grounds towards inshore waters of the study area. Fishing activity is likely to be less frequent for the offshore fleet, with few transits per week in the study area, however greater activity is evident towards the northern extent of the SLHA (Figure 13.2, 13.3) but is widespread with distinct grounds targeting specific species throughout the study area (Figure 13.4a and Figure 13.4b).

Fishing activity, or transit to fishing grounds through the study area will be displaced from the Exclusion Zone for the duration it is active, in the worst-case up to over four hours during the day of a launch, following which, safe transit and

[12] No formal response received at time of writing (02/12/2021).

fishing can resume. The launch itself from lift-off to completion is likely to last a matter of minutes. Transit and fishing activity can continue within the Warning Zone throughout the launch mobilisation, but vessels will be advised to remain clear of any Exclusion Zone. The first stage splashdown of booster or payload fairing is, in most cases, likely to be within the inshore area, where access will quickly resume once splashdown has been confirmed and the stage is recovered or has sunk to the seabed. While the second stage splashdown for payload is likely to be located further offshore and may require a longer period of mariner exclusion until the launch has complete and the stage is retrieved.

Prior engagement with fisheries will determine where there are potential conflicts with the fishing season, and advanced warning provided to enable them to make alternative arrangements to fish other grounds, if possible, or take alternative transit routes during the proposed period for launch. A proposed launch will be notified several weeks or months in advance, as a marine licence application will be required for each launch and notice of an application for a marine licence must be published, with general indication of the month or likely week of launch declared through NtM and the particular day of launch confirmed closer to launch. Mariners will be informed through the NtM in advance and through NavWarning on the day of launch. Local fisheries are accustomed to occasional restrictions during MOD Hebrides Range activities in the study area and will be familiar with the similar processes of notification that will be implemented through the Maritime Management Procedures (MU01) (Appendix 13-1: Maritime Management Procedures).

Consultation with local fisheries representatives, through representatives such as the IFG and WIFA, has been initiated and to date, indicative agreements have been made for a Dedicated Fisheries Forum and commitment to explore opportunities for charter vessels (where feasible) to support Spaceport operations. Consultation will continue throughout the development process and prior to launch activities to minimise further disruption as far as practicable (MU02).

Disruption to any fishing activity is likely to be infrequent, with no more than 10 launches in a year, for a short and temporary duration over a limited area where jettisoned stages (payloads) will be deposited, including an additional safety buffer. The location of any Exclusion Zone is also likely to vary within the SLHA for each launch. Activity will be able to resume soon after the launch is complete and payload recovered. Fishing will be able continue throughout available grounds within the wider study area (SLHA). Notification and management measures will ensure advanced warning to enable fisheries to make alternative arrangements, where possible, and timely updates to mariners on completed launches to allow fishing to resume at the earliest opportunity. Ongoing issues associated with aspects relating to Spaceport operations and notifications will be raised directly via a dedicated fisheries forum. Therefore, the magnitude of impact on commercial fisheries is considered **low**.

Significance of residual effects

Commercial fisheries are considered to be of **medium-high** importance in the study area. With the implementation of proposed mitigation and management measures the magnitude of impact is considered **low**. Therefore, it is anticipated that there will be **minor** residual effects, which are **not significant.**

MOD and Hebrides Range

The MOD undertakes a range of training exercises throughout the study area, including air defence and naval operations. The Project launch events and restrictions within the SLHA may conflict with MOD maritime operations, should there be spatial and temporal overlap of respective activities.

Spaceport 1 plans to utilise the MOD Hebrides Range to support sub-orbital launch activities, utilising the controlled air and sea space and leveraging the existing range tracking, telemetry and flight termination systems on a procurement as needed basis. Therefore, any scheduling and operational conflicts will be resolved through this process. The SO will have an agreement in place with the Defence Infrastructure Organisation's MOD Safeguarding Department on operations

and will liaise with the MOD to ensure there is no conflict with planned activities. This will include a 3-month notification period (AR03). Each launch will be separately licensed, and MOD consulted through these regulatory processes. Therefore, the magnitude of impact on MOD activities in the marine environment is considered **very low**.

Significance of residual effects

The MOD and Hebrides Range activities are considered to be of **high** importance in the study area. With the implementation of proposed mitigation and management measures the magnitude of impact is considered **very low**. Therefore, it is anticipated that there will be **negligible** residual effects, which are **not significant**.

Recreational users

The access restrictions may lead to disruption to recreational users in coastal waters of the SLHA and along key routes to outer islands of interest, including St Kilda to the west and Monach Isles to the south of the SLHA, which are popular visitor destinations, with regular local charters throughout the tourist season. Recreational users are most likely to be impacted in inshore waters and charters to islands.

Recreation users transiting through the study area will be restricted within the Exclusion Zone for the duration it is active, in the worst-case over four hours during the day of a launch, following which safe transit can resume. Transit can continue within the Warning Zone throughout the launch mobilisation, but users will be advised to remain clear of any Exclusion Zone. The first stage splashdown of booster or payload fairing is, in most cases, likely to be within the inshore area, where access will quickly resume once splashdown has been confirmed and the stage is recovered or has sunk to the seabed. While the second stage splashdown for payload is likely to be located further offshore and may require a longer period of mariner exclusion until the launch has complete and the payload (stage) is retrieved, but where recreational activity is likely to be limited.

Disruption to recreational vessel activity is likely to be infrequent, with no more than 10 launches in a year, for a short and temporary duration over a limited area where jettisoned stages will be deposited, including an additional safety buffer. The location of any Exclusion Zone is also likely to vary within the SLHA for each launch. Activity will be able to resume soon after the launch is complete. Notification and management measures will ensure advanced warning to enable recreational users to make alternative arrangements, where possible, and timely updates to mariners on completed launches to allow transits to resume at the earliest opportunity. Therefore, the magnitude of impact on recreational users is considered **low**.

Significance of residual effects

The MOD and Hebrides Range activities are considered to be of **low-medium** importance in the study area. With the implementation of proposed mitigation and management measures the magnitude of impact is considered **very low**. Therefore, it is anticipated that there will be **minor** residual effects, which are **not significant**.

Maritime safety-related vessels

Other marine users relating to maritime safety, such as HMCG and RNLI undertaking search and rescue (SAR) operations and NLB attending lighthouse assets, may similarly be impacted by the implementation of the proposed access restrictions, limiting their ability to undertake emergency activities and access marine assets and destinations within the study area.

SAR operations will take priority over any scheduled launch event, a launch event will be paused or postponed enabling transit of search and rescue vessels in the event of an emergency. The Pre-Launch Procedure within the Maritime Management Procedures (MU01) includes measures to contact HMCG for information on SAR and again following launch

completion and during vehicle recovery procedure. Following lift off, the launch will be complete within a matter of minutes and the area safe for emergency services to transit, therefore limiting any delay to their transit to an incident/call-out. The likelihood of these coinciding is very low. The SO will also liaise with NLB to ensure the timing of planned launch events does not conflict with required access to and from NLB assets, including Haskeir lighthouse. Therefore, the magnitude of impact is considered to be **very low**.

Significance of residual effects

Vessels relating to maritime safety operations are considered to be of **high** importance in the study area. With the implementation of proposed mitigation and management measures the magnitude of impact is considered **very low**. Therefore, it is anticipated that there will be **negligible** residual effects, which are not significant.

13.12 CUMULATIVE EFFECTS

No other developments, recently consented or proposed under the EIA Regulations, will overlap or have connectivity with the proposed Project or Study Area. Therefore, there are no pathways for cumulative impacts and no likely significant cumulative effects are anticipated.

13.13 ASSESSMENT SUMMARY AND CONCLUSIONS

The study area has been defined as the 'Space Launch Hazard Area' (SLHA) and represents the maximum extent of Spaceport activities in marine waters. In practice, a single launch event (and associated activities) will occupy a small part of the SLHA and some launches may not have a marine component (e.g. static testing only).

The Project (Spaceport) is located on the north-west coast of North Uist at Scolpaig Farm. There are no major shipping and fishing ports or harbours within the study area. Griminish, north-east of the study area is a key fishing port with many of the local fleet operating from here. There are no designated anchorages located within the study area. There are no prescribed passenger ferry routes transiting the area, with all key ferry ports based on the east coast of the Western Isles. Access to key ports, harbours and anchorages are not anticipated to be restricted by the Project and are therefore scoped out of the assessment.

Overall vessel activity through the study area is low to moderate with an average of 8-10 vessels transiting weekly. Tankers, cargo and fishing vessels represent the majority of vessel activity in the area. There are prescribed routes for recreational vessels and chartered passenger vessels to St Kilda and the Monach Islands, in particular. There is an IMO deepwater shipping route transiting from north to south of the Western Isles, and through the study area. This route is used by a number of cargo and tanker vessels on a regular basis but is of lower intensity than routes east of the Western Isles, and there are no key ports associated with shipping within the study area.

The MOD operates out of MOD Hebrides Range to the south, has a firing danger area within the study area and undertakes a range of aerial, firing and marine training activities in the area. There are key fishing grounds for demersal, pelagic and shellfish fisheries throughout the offshore waters of the study area, and inshore pot and creel fishing along much of the coastal inshore waters within the study area and wider west coast of the Western Isles. Although these are subject to restrictions for a substantial period throughout the year.

A detailed analysis of the risk to marine users and assets does not form part of the EIA process. Each launch will be regulated via a launch licence issued to the Launch Operator from the Civil Aviation Authority (under the Space Industry Regulations 2021), and a marine licence from Marine Scotland (under the Marine (Scotland) Act 2010). As part of the

regulatory process for each launch, a detailed and quantitative assessment of navigational risk will form a core part of a Safety Case associated with each launch activity, ultimately ensuring the risk to mariners is as low as reasonably practical. The consenting process for each launch involves close consultation with maritime stakeholders to agree and develop appropriate mitigations, including a legally prescribed 'Relevant Agreement' with specific maritime safety bodies.

Maritime Management Procedures in place during a launch event, including prescribed flight paths, prior notifications of launches, exclusion zones and maritime surveillance, will ensure that no vessel or marine asset is at risk of direct strike by a jettisoned stage. A notification and retrieval process will also be in place for floating launch vehicle (LV) stages, ensuring risk of collision is minimised as far as practicable. With the proposed mitigation and management measures, the impacts on marine users and assets are concluded to have **negligible** residual effects and are **not significant**.

Vessels at anchor and fishing vessels with gears deployed may be at risk of snagging on LV stage deposits on the seabed, presenting a navigational hazard and danger to marine users. Within the Maritime Management Procedures, a process is in place for the notification of deposits to MCA and UKHO and requirement for charting, where LV stages are not recovered. Any requirement for stage deposits to be charted will be assessed by the UKHO on a case-by-case basis and will take account of the size and location of the deposit and whether they are deemed to be a risk to mariners.

It is likely that the majority of LV stages will be recovered as they will hold important data and equipment, however, booster stages or payload fairings may not be recovered. Where LV stages are not designed for retrieval, the stage will be designed to sink to prevent hazard to mariners from floating marine debris. The nature of these deposits will comprise cylindrical stages of aluminium or composite material and will be relatively small, around 2-3 meters in length. With the implementation of proposed mitigation and management measures and the low frequency and relatively small size of deposits, the magnitude of impact in the context of EIA is assessed to be very low and residual effects are concluded to be **negligible** and **not significant**.

Marine users (including shipping, commercial fisheries, MOD-related vessels, recreational users and maritime safety-related vessels) will be displaced from defined Exclusion Zones during a launch event to ensure the safety of navigation and other marine users, and that there is no risk of collision with a jettisoned LV stage. This may lead to temporary disruption of regular and planned transit routes, disruption to maritime activities, or limit access to marine assets within the study area during a launch event. To minimise and avoid disruption, Maritime Management Procedures will include a suite of measures to engage with the maritime community, provide prior notification of launches, live communications during a launch, and following launch completion for timely update on clearance of the sea area so mariners can resume transit through the Exclusion Zone. The area where access is prohibited will be limited to the predicted splashdown and modelled dispersion area around jettisoned stages, and an additional safety buffer to ensure the risk to mariners is as low as reasonably practical. Therefore, only limited areas of the planned flight path for a launch will be restricted by temporary exclusions until the area is deemed safe to transit.

Disruption to marine vessel activity is likely to be infrequent, with no more than 10 launches in a year, for a short and temporary duration (up to four hours, with a launch completing within a matter of minutes (2 - 12 minutes)) over a limited area where jettisoned stages will be deposited. With the implementation of proposed mitigation and management measures the assessment concludes for all marine interests that there will be **minor** or **negligible** residual effects, which are **not significant**.

13.14 REFERENCES

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14 ORNITHOLOGY

CONTENTS

14 CHAPTER TOPIC

14.1 INTRODUCTION

This chapter of the EIA Report evaluates the likely significant effects of the Project on ornithological interests. It identifies, describes and assesses the likely significant effects on ornithological interests resulting from the construction, operation and decommissioning of the project, including the potential for habitat loss or change due to the construction or decommissioning of the project infrastructure, disturbance (noise and visual) due to construction activities and disturbance due to operation of the Project (predominantly from launch activities). The assessment was undertaken by Atlantic Ecology Ltd and Aquatera Ltd.

This chapter summarises the baseline conditions including the distribution and abundance of bird species recorded on site. The assessment focuses on the relevant features of designated sites including Special Protection Areas (SPAs) and Ramsar sites with connectivity to the Project and other protected species in the wider countryside found to be regularly present at the site during field surveys. Other species of regional and local interest have also been considered as appropriate. Potential impacts are identified and where relevant, mitigation measures are proposed to avoid, reduce, or offset any identified adverse effects.

There are no other proposed developments requiring consideration under the EIA Regulations, therefore an assessment of potential cumulative effects of the Project with other existing or proposed developments is not required.

The detailed methodology and findings of all field surveys undertaken to inform this assessment are presented in Appendix 14-1: Ornithology Technical Report. In line with best practice guidance (SNH, 2016b), environmentally sensitive bird information is contained in a separate confidential annex (see Appendix 14-2: Ornithology Confidential Annex). This information is available to statutory bodies but is not for public release. Information to inform a Habitats Regulations Appraisal (HRA) is presented in Annex B: Information to Inform HRA.

14.2 STUDY AREA

The onshore and offshore study areas are shown in Figure 14.1 and Figure 14.2, respectively. The study areas include all areas within the anticipated zone of influence of the Project, as defined in SNH guidance (SNH, 2017; CIEEM, 2018). The 'zone of influence' is the area over which important ecological features may be subject to significant effects as a result of the Project. All statutory designated sites with ornithological interests as qualifying interests within 2 km of the Project site were identified in the Scoping Report, and those with potential connectivity with the Project, as indicated in the scoping opinion, are shown in Figure 14.1 and Figure 14.2. Following the findings of the noise modelling assessment, a further three sites (St Kilda SPA, Seas off St Kilda SPA and Flannan Isles SPA) were included in the assessment (see Figure 14.2). There is also one non-statutory site, RSPB Balranald Reserve, satellite parts of which lie within 1 km of the Project site (see Figure 14.1).

All records of eagles (golden eagle *Aquila chrysaetos* and white-tailed eagle *Haliaeetus albicilla*) nesting within 6 km of Scolpaig Farm (ownership boundary) were considered in the assessment. All other specially protected breeding bird species within the site and out to 2 km from the site boundary have been identified and considered in the assessment. For all other bird species, those within a 500 m buffer around the site boundary were identified and considered in the assessment.

14.3 LEGISLATIVE FRAMEWORK AND POLICY CONTEXT

The following legislation was taken into account during this assessment:

- The Council Directive on the Conservation of Wild Birds 2009/147/EC (EU Birds Directive);
- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (UK Government, 1994);
- The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2019 (Scottish Government, 2019);
- The Wildlife and Countryside Act 1981 (as amended) (WCA);
- The Nature Conservation (Scotland) Act 2004 (as amended); and
- The Wildlife and Natural Environment (Scotland) Act 2011 (Scottish Government, 2011).

Planning policies relevant to the assessment are presented below:

- Scottish Planning Policy (Scottish Government, 2014). This sets out all of the Scottish Government's Planning Policy of particular relevance to this assessment. It replaces National Planning Policy Guidance 14: Natural Heritage which describes how policies for conservation and enhancement of flora and fauna should be reflected in land use planning;
- Planning Advice Note (PAN) 1/2013 – Environmental Impact Assessment (Scottish Government 2013a);
- PAN 51: Planning, Environmental Protection and Regulation (revised 2006) (Scottish Government, 2006);
- PAN 60: Planning for Natural Heritage (Scottish Government, 2000); and
- Outer Hebrides Local Development Plan (Comhairle nan Eilean Siar, 2018).

In the absence of specific guidance relating to commercial spaceport developments, various guidance documents relating to the assessment of impacts of onshore wind farms on bird populations have been used instead, where relevant. The following guidance and data sources have been used to inform the ornithological assessment:

- Assessing the significance of impacts from onshore wind farms on birds outwith designated areas: version 2 (SNH, 2018a);
- Assessing the cumulative impact of onshore wind farms on birds (SNH, 2018b);
- Assessing connectivity with Special Protection Areas (SPAs) (SNH, 2016a);
- Environmental Statements and Annexes of Environmentally Sensitive Bird Information Guidance for Developers, Consultants and Consultees. Version 2 (SNH 2016b);
- A Handbook on Environmental Impact Assessment (SNH, 2018a);
- Recommended bird survey methods to inform impact assessment of onshore wind farms (SNH 2017);
- Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater and Coastal. Version 1.1 (Chartered Institute of Ecology and Environmental Management (CIEEM), 2018);
- Birds of Conservation Concern 4 (BoCC) 'Red list' (Eaton *et al.*, 2015); and
- Scottish Biodiversity List (SBL) (Scottish Government, 2013b).

14.4 SUPPORTING SURVEYS AND STUDIES

14.4.1 Desk study

A desk study was undertaken to compile existing baseline and contextual data for the ornithological interests of the study area and its surrounds, including the locations of any relevant statutory and non-statutory designated sites and historical records. The following sources of information were used for the desk study exercise:

- NatureScot SiteLink website (https://sitelink.nature.scot/home) – statutory designated site boundaries, including SPAs and SSSI citation details;
- Records of birds reported in the last five years to the county bird records databases in the vicinity of the bird survey area were requested from the Outer Hebrides Birds Recorder in April 2020 and May 2021;
- Records of breeding raptors and owls within 6 km of the survey area were requested from the Uist Raptor Study Group in April 2020;
- The Birds of Scotland (Forrester *et al.*, 2007);
- Natural heritage zones (NHZ) bird population estimates (Wilson *et al.*, 2015) for NHZ3 ('Western Isles, Coll and Tiree'); and
- Summary information on breeding seabird population sizes for the Western Isles is taken from Seabird Populations of Britain and Ireland (Mitchell *et al.*, 2004).

14.4.2 Field surveys

Monthly day-time survey visits were undertaken between April 2019 and March 2021, covering two breeding seasons (2019, 2020) and two non-breeding season periods (September to March). With exception of the second winter period, a full day of survey work was undertaken on each survey visit covering the whole of the bird survey area. During these visits a variety of survey methods were employed to record the breeding and non-breeding birds present at the site each month. The work entailed a combination of walkover and vantage point surveys around the coast and across the terrestrial areas, so that all parts of the study area were covered on each visit. The October 2020 to March 2021 (i.e., the second winter period) survey coverage was reduced to a core area focused on the Project site (effectively the Scolpaig track and farm buildings buffered to 500 m) and survey visits frequency was increased to approximately fortnightly to increase the likelihood of encountering wintering species that may use the site for only short periods, such as geese species.

In addition to the day-time surveys, evening/night-time surveys were undertaken between April and July to survey for crepuscular and nocturnally active species such as corncrake *Crex crex*. Full details of the methodology and findings of all surveys including survey dates and weather conditions are given in Appendix 14-1: Ornithology Technical Report. A brief overview of each survey type is provided in Table 14-1.

Table 14-1 Summary of bird survey work undertaken

Survey period	Survey Type/Method	Time period	Observation hours/visits
Year 1	Moorland Bird Survey (MBS). This is a generic method to determine the distribution and abundance of breeding birds suitable for day-time active species of moorland and open country and is based on a modified Brown and Shepherd (1993) method.	April, May, June, July 2019	Four visits, once per month through breeding season.
	Black Guillemot Survey. A count of breeding black guillemots was undertaken based on the method by Walsh *et al.*, 1995). Areas of suitable rocky coast habitat were identified and surveyed from shore-based vantage points.	April 2019	One early morning April visit.

Survey period	Survey Type/Method	Time period	Observation hours/visits
	Corncrake Survey. Areas of suitable habitat were identified during the day and then surveyed at dusk/night for breeding corncrake (and other nocturnally active species) using the method developed for corncrake by Gilbert *et al.*, 1998.	May, June, July 2019	Three late evening/night-time visits (one per month).
	Wetland Bird Survey (WeBS) and rocky coast survey methods (BTO, 2017; Austen *et al.*,2017) were used to survey the distribution and abundance of waterfowl, waders and other birds using the lochs, wetlands, coast and near-shore areas of sea.	April 2019 to March 2020	Once per month.
	Non-breeding season walkover and vantage point surveys covering all areas not covered by the WeBS/rocky shore surveys were undertaken to record all other bird species. In addition, as time allowed, *ad hoc* survey effort was put into searching for hunting raptors and short-eared owls from vehicle-based vantage points along the Scolpaig track and the A865 road.	August 2019 to March 2020	Once per month.
Year 2	Moorland Bird Survey (MBS), method as above.	April, May, June, July 2020	Four visits, once per month through breeding season.
	Black Guillemot Survey, method as above.	April 2020	One early morning April visit.
	Corncrake Survey, method as above.	May and June 2020	Two late evening/night-time visits (one per month).
	Wetland Bird Survey (WeBS) of core survey area only, method as above.	April 2020 to March 2021	Once per month up to September. Twice per month from October 2020 to March 2021.
	Non-breeding season walkover and vantage point surveys of core survey area only, method as above.	August 2020 to March 2021	Once per month up to September. Twice per month from October 2020 to March 2021.

14.5 DATA GAPS AND UNCERTAINTIES

Ornithological surveys cannot guarantee detection of all bird species / individuals that use the survey area. Surveys were not conducted in some weather conditions (e.g., during strong winds, snow cover and reduced visibility), when birds could potentially use the survey area in different ways. However, the baseline surveys covering two consecutive breeding seasons, and two non-breeding season periods, are considered to provide a robust dataset to inform the impact assessment. Scolpaig Farm (and its vicinity) is well known ornithologically as it is regularly visited by birdwatchers who

report records of interests to the Outer Hebrides Birds Recorder. Additional information from birdwatchers reduces the possibility that any ornithological sensitivities of relevance are excluded from the assessment.

As a consequence of the interim grazing regime (short duration tenancy agreement) that will be put in place, it is likely that neither the 2019 (heavily grazed) nor 2020 (negligibly grazed) bird survey results on breeding species abundance and distribution will be fully representative of the baseline conditions that will prevail at the time the Project would proceed. In light of the potential for breeding numbers to be influenced by grazing regime, and in keeping for assessment assumptions to be inherently cautious, the baseline number of breeding pairs of a species is taken to be the highest number recorded in either of the two survey years.

14.6 CONSULTATIONS

The key points raised by stakeholders during Scoping[1] and pre-application consultation regarding ornithology are presented in Table 14-2. A summary of the ornithology points raised in 640 representations received from members of the public and organisations in response to the June 2019 planning application is also included in Table 14-2.

Table 14-2 Key issues raised by stakeholders during consultation

Stakeholder	Comment	Response/Action taken	Section cross-reference
NatureScot Scoping response 01/08/2018	Protected sites: NatureScot indicated key areas of potential impact are in relation to the bird interests within nearby protected sites: • North Uist Machair and Islands SPA; • West Coast of the Outer Hebrides pSPA; • Vallay Island SSSI.	These three sites have been considered in the assessment. Information to inform an HRA has been undertaken.	Annex B: Information to Inform HRA. Appendix 14-1: Ornithology Technical Report
	Proposed surveys: Overall, the proposed surveys should be sufficient to assess the impacts on the adjacent designated sites however NatureScot advised that the Wetland Bird Surveys (WeBS) should be extended to include April and May to consider migratory goose species including SPA designated Greenland barnacle geese.	WeBS type counts were undertaken in all months of the year. Survey methodology defined and agreed with SNH. Details of survey methodology, analysis and results provided in Ornithology Technical Report.	Appendix 14.1: Ornithology Technical Report

[1] The Scoping Report (June 2018) was for a larger development comprising two launch pads for up to 20 launches a year for much larger (up to 500kg) rockets and ancillary infrastructure including two assembly buildings, a fuel store, admin/security building and access roads.

Stakeholder	Comment	Response/Action taken	Section cross-reference
	Protected species: The area has potential to be used by roosting raptors particularly golden eagle, sea eagle, hen harrier and short-eared owl. NatureScot advised that four walkovers of the site be undertaken in addition to WeBS surveys to ensure that any roost sites for these species do not go undetected.	Walkover surveys covering the whole survey area were conducted monthly through Year 1 winter period. Walkover surveys of core survey area conducted twice monthly through Year 2 winter period. On all these visits surveyors looked for signs of roosting raptors in suitable habitat.	Appendix 14-1: Ornithology Technical Report
NatureScot email Correspondence with CnES 27/03/2019	Commenting on an outline of proposed bird survey aims, NatureScot confirmed that a year-round bird survey was required. Emphasised that, in addition to recording breeding and wintering birds, the survey needed to cover migratory species, and record roosting raptors.	NatureScot advice taken into account in the design and execution of bird and otter survey work.	Appendix 14-1: Ornithology Technical Report
NatureScot email correspondence Operations Officer 18/06/2019	SNH confirmed that they are content with the proposed survey methodology and that all survey requirements have been addressed.	Surveys undertaken in line with the agreed scope of work.	Detailed information on methodology and findings in Appendix 14-1: Ornithology Technical Report
NatureScot meeting. To provide update on 2019 breeding bird survey findings and agree content of future	SNH highlighted the importance of coastal bathymetry to birds e.g., foraging red-throated diver generally use waters <15m deep. Coastal bathymetry should be considered in the assessment.	Bird survey covered coastal waters. Red-throated divers not recorded using coastal waters during the breeding season. Potential impacts on coastal birds are considered in assessment.	Baseline information on species foraging and roosting in coastal waters is presented in Appendix 14-1: Ornithology Technical Report

Stakeholder	Comment	Response/Action taken	Section cross-reference
planning submission. 05/11/2019	Potential for impacts on raptors nesting outwith the survey area should be considered.	Noted. Records of birds reported to the county bird records databases from the vicinity of Scolpaig Farm were requested from the Outer Hebrides Birds Recorder in April 2020 and May 2021. Records of raptors and owls breeding within 6 km of site boundary in the past five years were requested from the Uist Raptor Study Group in April 2020. Several local ornithologists with long familiarity with the area were also contacted regarding historical records.	Baseline information on raptors is presented in Appendix 14-1: Ornithology Technical Report and Appendix 14-2: Ornithology Confidential Annex
	The key potential impacts for inclusion in the HRA were identified as disturbance (noise and visual) and potential impacts of any rocket stages falling into the marine SPA. SNH advised that the potential for the latter should be based on the technical risk assessment for the infrastructure.	Noted. HRA (and EIA) includes consideration of these potential impacts.	Annex B: Information to Inform HRA
NatureScot online meeting to update SNH on findings of year 2 bird surveys, noise analysis and findings of draft HRA. 10/07/2020	SNH confirmed that the record of corncrake recorded at the site during the second year of bird surveys is the first corncrake record on the site since 1993. It is possible that this could be because of the absence of grazing on site since Scolpaig Farm was transferred to CnES ownership.	The desk study determined that the most recent record of corncrake at Scolpaig prior to 2020 was a calling bird heard by a local ornithologist in 2003. Up to two calling males were also recorded by RSPB in 2021.	Corncrake survey and status information presented in Appendix 14-1: Ornithology Technical Report
NatureScot email correspondence Post-meeting note Operations Officer 14/08/2020	SNH indicated that inclusion of corncrake in the HRA will not be necessary. SNH may request standard conditions to ensure no damage to nest or disturbance (e.g., keeping vegetation to below 20 cm if construction takes place during the breeding season and/or completing construction outwith the breeding season 1 April – 1 September.	Corncrake included in impact assessment but scoped out screened out at Stage 2 of HRA. Mitigation measures to avoid impacts on corncrake are included in the impact assessment, based on creating a short-sward-height Disturbance Prevention Zone in the vicinity of the launch site.	Section 14.11: Impact assessment
	SNH confirmed that (North Uist Machair and Islands) SPA breeding ringed plover feature would not need to be considered as part of the HRA;	Breeding ringed plover screened out at Stage 2 of HRA.	Annex B: Information to Inform HRA

Stakeholder	Comment	Response/Action taken	Section cross-reference
	SNH requested that the list of impacts for inclusion in the HRA should give consideration of impacts in the event of an accident e.g., misfiring of a rocket or an explosion. SNH noted that the proposal has been heavily risk assessed from a health and safety aspect.	HRA includes consideration of these potential impacts of accidents. Project Risk Register collates key risks associated with the development.	Annex B: Information to Inform HRA Chapter 20: Climate Change, Accidental and Unplanned Events Chapter 20.1 Risk Register
Email to NatureScot and RSPB, update on year 2 survey 18/12/2020	NatureScot and RSPB informed of recent progress on survey programme and changes to winter survey area and visit frequency.	No response received.	N/A
Marine Scotland email response 18/12/2020	Expect to see full assessment of the launches upon ornithological interests in the area both in regard to the disturbance, or potential for, injury caused by noise from the launch and from impact with any falling debris. This assessment should include impacts upon birds both directly (i.e., from being hit by the deposits) and indirectly (i.e., potential for ingestion of any deposits not recovered).	The EIA and HRA includes consideration of potential impacts on seabird receptors from disturbance, falling LV deposits, ingestion of and entanglement with deposits, and intoxication are included in assessment.	Impact assessment Section 14.9.2, 14.9.5, 14.11.4 and 0 Annex B: Information to Inform HRA
NatureScot teleconference 15/07/2021	Expect to see consideration of potential impacts on spawning grounds for herring i.e., as part of the Seas of St Kilda SPA – key feeding grounds for bird species associated with St Kilda SPA.	The EIA and HRA includes consideration of potential indirect impacts on seabird receptors from impacts on fish populations	Impact assessment Section 14.9.2, 14.9.5, 14.9.6,
12/11/2021 NatureScot online meeting to discuss corncrake mitigation measures	Discussion of potential mitigation measures to prevent disturbance to corncrake and otter. Follow-up written advice on this matter received from NatureScot by email (25 November 2021).	Mitigation measures to avoid impacts on corncrake are included in the impact assessment. In particular, creating a short-sward-height Disturbance Prevention Zone in the vicinity of the launch site, and provision of tall-grass habitat for corncrake away from launch site.	Section 14.11: Impact assessment

14.6.1 Planning Application Representations

A planning application to develop a proposed Spaceport at Scolpaig Farm in North Uist was submitted to the Comhairle nan Eilean Siar on 26 June 2019 (Planning Reference 19/00311/PPD). The planning application attracted significant

public attention and consequently, approximately 640 representations from the public were received. Comments raised from both the public and consultees highlight key issues and concerns of relevance to the EIA process. Given the relationship to the EIA process, an analysis was undertaken of the representations submitted. The complete analysis is provided in Appendix 5-1: Review of Planning Representations.

Approximately 72% (460 of 640) of objections related to ornithological interests associated with the site. Key concerns related to the disruption to breeding and migrant birds, and that the site is close to the RSPB reverse at Balranald. Concern for impacts on golden eagle and white-tailed eagle were cited by 43% (272) of respondents. In addition, 35% (226) of respondents expressed concern for the potential for corncrake to be disturbed and 2% (10) respondents expressed concern that the declining fulmar population will be disturbed and adversely affected by the development.

14.7 ASSESSMENT METHODOLOGY

14.7.1 Approach to assessment

The general EIA Report process and methodology is detailed in Chapter 6: Approach to EIA. The approach used to assess likely significant effects on ornithological interests has considered guidelines produced by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018) in conjunction with relevant legislation and planning and policy guidance detailed in Section 14.3.

Potential impacts are considered for two receptor categories: designated sites and bird populations. Bird population receptors are considered at the species level. Where it is appropriate, the potential effects on breeding birds are assessed separately to potential effects on non-breeding birds (e.g., passage migrants or wintering birds).

The assessment of effects is limited to receptors for which there is potential for a likely significant effect. A likely significant effect is defined as an effect which cannot be ruled out as being of significance under the EIA regulations without undertaking detailed assessment.

14.7.2 Screening of receptors

Designated nature conservations sites (e.g., Natura 2000 sites, Sites of Special Scientific Interest) with ornithological interests are screened for consideration as part of a detailed assessment on the basis of the potential strength of connectivity between the designated site and the area anticipated to be affected by the Project. This process essentially addresses whether the Project could affect the qualifying bird interests of the designated site or the habitat that supports them. The potential for connectivity is informed by the baseline bird survey (Appendix 14-1: Ornithology Technical Report), other survey data and information on species ecology and ranging behaviour. Designated sites with no or negligible connectivity are screened out, those with at least low connectivity are carried forward for assessment.

Species receptors are screened for assessment on the basis of the conservation importance (see below) of the individuals that would be affected by the Project and the extent to which they use the area anticipated to be affected. For practical purposes, species screening considers the use by a species of the area covered by the baseline bird survey area, approximately the whole of Scolpaig Farm buffered to 300 m (Appendix 14-1: Ornithology Technical Report). This is a cautious approach to screening because most potential effects would be spatially localised and not affect birds across the whole of the survey area.

Species receptors evaluated as having at least low importance were carried forward for assessment provided they also made only regular use of the survey area and/or were present in more than negligible numbers in the context of the

wider North Uist population. Species receptors evaluated as having very low importance (Table 14-4) were screened out irrespective of the extent to which they used the survey area.

14.7.3 Assessment criteria

The assessment of effects is informed by the consideration of the importance of ornithological features and magnitude of impact on receptors as described below.

Determination of Importance

A key part of the EIA process is the determination which ornithology species receptors that are potentially affected by a development are sufficiently important to justify a detailed assessment. The method used to determine species receptor importance is described below. The importance of bird species receptors is determined for all species present within the baseline in accordance with CIEEM guidance.

Importance of ornithology species receptors is determined by consideration of four characteristics of a species receptor:

- The geographic scale at which the population using the Project site;
- The species' level of legislative protection;
- The species' conservation status;
- Whether the individuals potentially affected form part of the qualifying interest of a designated site.

The starting point to determining importance was to establish the geographic scale of importance according to one of five categories (described below, Table 14-3). In addition to assessing impacts of the qualifying interests of designated sites, NatureScot guidance states that EIA should assess impacts on the status of a species at appropriate wider geographical scales (SNH, 2018a). In this case the appropriate wider scales are considered to be either the national (UK) or regional scale, as appropriate. The region in which the Project site is situated is the NatureScot-defined 'Western Isles, Coll and Tiree' Natural Heritage Zone 3', (NHZ3) (Wilson *et al.,* 2015).

Table 14-3 Criteria used to determination receptor geographic importance scale

Geographic scale of Importance	Geographical context	Criteria
Very high	International	At least 1% of European/flyway population
High	National	At least 1% of UK population
Medium	Regional	At least 1% of regional population (NHZ3 Western Isles, Coll and Tiree)
Low	Local	At least 1% of North Uist population
Very Low	Sub-local	Less than 1% of North Uist population

Professional judgement was then applied to combine geographic scale of importance with information on the other criteria (legislative protection, conservation status and designated site interest) to assign the importance of each species receptor to one of five categories: very low, low, moderate, high and very high. The importance categorisation outcomes

for the combinations of the characteristics are summarised in summarised in Table 14-4. Further information on the method used to determine importance is provided below. In cases of categorisation being borderline, or uncertainty between two categories, the higher category was considered to be appropriate and in line with guidance that the EIA process should be inherently precautionary.

All wild bird species receive general protection under the Wildlife and Countryside Act 1981 (as amended) (WCA). A minority of species receive enhanced legislative protection, for example, those listed on Schedule 1 of the WCA. The species that receive this enhanced protection are typically those with small national population size.

The conservation status of UK species is regularly assessed by using the Birds of Conservation Concern (BoCC) methodology which assigns species conservation status to one of three lists according to recent information on population trends (Eaton *et al*., 2015). These are the red list (species of highest conservation concern), the amber list (species of moderate conservation concern) and the green list (species with a favourable conservation status). The Scottish Biodiversity List (SBL) is a list of species with a poor conservation status drawn up by the Scottish Government and conservation organisations. SBL species are recognised as those that require conservation actions and/or the need to avoid negative impacts in order to secure their long-term conservation. A high proportion of SBL species are also on the BoCC red-list and/or listed on Schedule 1 of the WCA. The receptor species that have enhanced protection and/or that are on the BoCC red-listed or SBL-listed are determined to have greater importance (Table 14-4).

Table 14-4 Criteria used to determine receptor importance

Receptor importance category	Determination criteria		
	Geographic scale of importance	Conservation status and level of legislative protection	SPA/Ramsar/SSSI qualifying species connectivity
Very high	Any	Any	Yes - high
	National	Red-list / SBL and/or enhanced protection (S1/A1)	None or negligible
High	Any	Any	Yes - low/moderate
	National	Green or Amber list, and general protection only	None or negligible
	Regional	Red-list / SBL, and/or enhanced protection (S1/A1)	None or negligible
Medium	Regional	Green or Amber list, and general protection only	None or negligible
	Local	Red-list / SBL, and/or enhanced protection (S1/A1)	None or negligible
Low	Local	Green or Amber list, and general protection only	None or negligible

Receptor importance category	Determination criteria		
	Geographic scale of importance	Conservation status and level of legislative protection	SPA/Ramsar/SSSI qualifying species connectivity
	Sub-local (i.e., site level)	Red-list / SBL, and general protection only	None or negligible
Very low	Sub-local (i.e., site level)	Green or Amber list, and general protection only	None or negligible

Magnitude of impact

The determination of magnitude of an impact on a receptor takes into consideration properties of the effect and properties of the receptor under consideration. For these properties in combination expert judgement is used to predict what degree of change a receptor is likely to undergo and determine the magnitude category of any impact, as defined in Table 14-5.

The following properties of an effect are considered when characterising the magnitude of potential impact on a receptor:

- **Extent**: the geographical area and the proportion of a bird receptor population likely to be affected by an effect;
- **Scale**: the size, volume, amount and / or intensity of an effect;
- **Duration**: whether the impact is short, medium or long-term, permanent or temporary;
- **Frequency and timing**: the characterisation of when the impact will occur; and
- **Reversibility**: the characterisation of how easily / quickly the impact will be reversed if applicable.

The following properties of receptors influence their response (at an individual or population level) to an effect and are taken into considered in the determination of impact magnitude:

- **Susceptibility**: a measure of the susceptibility of individuals to an effect;
- **Tolerance**: a measure of a receptor population's ability to absorb change; and
- **Resilience**: a measure of a receptors population's ability to recover from an impact.

It should be noted that the concepts of tolerance (the inverse of sensitivity) and resilience as applied here are properties of the receptor population considered in the assessment. Unless otherwise stated, and in accordance with NatureScot guidance, the assessments consider the impacts of the Project on the regional populations (NHZ3). Thus, in determining impact magnitude, consideration is given to the degree to which a regional population can tolerate the change resulting from an effect, for example changes to survival and productivity rates and whether it is likely to be able to recover from an impact when the effect no longer occurs. Tolerance and resilience are affected by many factors that affect demographic processes; in all cases, poor conservation status and small population size are both likely to reduce tolerance and resilience.

Different species are more or less affected by a given effect and this variation in susceptibility to an effect needs to be taken into consideration in determining impact magnitude. Susceptibility, as used here, describes the extent to which

individuals of a species are susceptible to showing an adverse response to a particular effect. For example, the nests of ground-nesting birds are susceptible to trampling whilst those that nest in trees or on cliffs are not. The disturbance response by birds to human activities is also known to show large between-species differences (Whitfield *et al*., 2008).

The general criteria used to guide categorisation of impact magnitude are set out in Table 14-5. The magnitude of an impact on a bird receptor population is determined by consideration of the predicted change to the receptor population in terms of numbers, rates of mortality and productivity and geographic range. In this respect, predicted changes that would lead to less than 0.5% reduction in the size of a receptor population or that would result in a (relative) change to its mortality or productivity rate of less than 0.5% are considered to be of **negligible** magnitude. Similarly, changes to these population parameters of between 0.5% and 1% are considered to be of **very low** magnitude, and changes of between 1% and 5% are considered to be of **low** magnitude. The corresponding thresholds for defining impacts of medium and high magnitude are not defined because no impacts on birds from the Project are predicted to exceed the 5% threshold used to define the upper limit of the low magnitude category.

Table 14-5 Magnitude of impact

Magnitude	Criteria
High	Total loss or very major alteration to key elements/ features of the baseline conditions such that post-development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether.
Medium	Major alteration to key elements / features of the baseline (pre-development) conditions such that post-development character / composition / attributes will be fundamentally changed.
Low	Loss or alteration of the baseline conditions such that post-development character / composition/ attributes of baseline will be partially changed.
Very Low	Minor shift away from baseline conditions. Change arising from the loss / alteration will be discernible but underlying character / composition / attributes of baseline condition will be similar to pre-development circumstances / patterns.
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the 'no change' situation.

Significance of effects

The significance of an effect results from the interaction between its magnitude and the importance of those receptors that might be affected. Professional judgement is used to determine the likely significance of effects.

Table 14-6 is used to support the identification of significant effects to ensure that the process is consistent and transparent. CIEEM, 2018 suggests avoiding reliance on a matrix approach, however, the table provides a guide for the assessor and is not intended to be prescriptive. Professional judgement is also used to determine the likely significance of effects. An impact assessed as having a moderate or major effect on a receptor is considered to be significant in terms of the impact assessment process.

The approach taken in the assessment is to assess the effects of residual impacts once any mitigation has been taken into account.

Table 14-6 Matrix of magnitude of impact and importance used as a guide to assess the significance of effects[2]

	Magnitude				
Importance	**High**	**Medium**	**Low**	**Very Low**	**Negligible**
Very high	Major	Major	Moderate	Minor	Negligible
High	Major	Moderate	Minor	Negligible	Negligible
Medium	Moderate	Moderate	Minor	Negligible	Negligible
Low	Moderate	Minor	Negligible	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible	Negligible

14.8 BASELINE DESCRIPTION

The section describes the baseline conditions at the Project site and its vicinity.

14.8.1 Future Baseline

The future baseline relates to consideration of how on-going change could affect conditions at the site without the development of the project, including the potential for changes that may occur before the construction or operation of the proposed project. CIEEM guidance (CIEEM, 2018) advises that baseline conditions need to be carefully defined and take into consideration potential changes to the baseline that could occur, for example, between the undertaking of baseline surveys and a project proceeding.

Following the transition from private ownership to CnES ownership in 2019, changes have occurred at the site (i.e., the Scolpaig Farm landholding as a whole) with potential to affect the site's ecology and birdlife. These changes are independent of the predicted effects of the Project that are assessed in this chapter. The two most substantial changes that have occurred (and are on-going) relate to public access and the livestock grazing regime. The potential implications for birds of these changes are discussed further below and have been integrated into the impact assessment where relevant.

Habitat Change

Under private ownership, all parts of Scolpaig Farm were subject to grazing by sheep and cattle. This resulted in pasture habitats, especially around the farm buildings, developing a short-grass sward. In October 2019, shortly after ownership transition to CnES, all livestock were removed from the site (after the breeding bird surveys for 2019 were completed). This resulted in substantially reduced grazing pressure throughout the second year of the baseline bird survey (April 2020 to March 2021). Subsequently, the grazing regime during each of the two years of baseline bird survey was notably different (Appendix 14-1: Ornithology Technical Report). As a result, there was a distinct difference in the height of grassland vegetation, particularly on the better-quality pasture around the farm buildings and machair habitats. On the basis of known habitat preferences, it is considered likely that the taller vegetation conditions of 2020 benefited species such as corncrake and redshank, and were to the detriment of species that require relatively short vegetation such as lapwing (Appendix 14-1: Ornithology Technical Report).

[2] The indicative significance category of each combination is shown in each cell. Shaded cells of major and moderate indicate potentially significant impacts in terms of the Environmental Impact Assessment (EIA) Regulations.

At the time of writing, CnES is developing a programme of livestock grazing at Scolpaig Farm under a short-duration tenancy agreement, to be initiated in 2022. The tenancy agreement is based on traditional agricultural practices and aims to provide an opportunity for local, eligible residents to benefit from the grazing resource, whilst enhancing the surrounding Scolpaig Farm habitats for wildlife, for example corncrake, wetland birds, bumblebees and species rich grasslands. The grazing regime was developed in line with guidance provided by the RSPB, and focuses on managing grassland vegetation during the bird breeding season, which in turn affects habitat suitability for different species of ground-nesting birds. To promote sward heterogeneity, the plans include compartmental (field to field) variations in grazing pressure, designed to recreate traditional management practices and provide the habitat requirements of the range of grassland bird species and other priority grassland wildlife present.

Public Access

Under private ownership, public access to Scolpaig Farm was not facilitated despite existing footpath routes included in the Western Isles core path network (Chapter 7: Community, Recreation and Tourism). For example, under private ownership, the gate at the main access point to Scolpaig Farm remained padlocked. Following the transition of ownership to CnES, a 'kissing gate' was installed at the end of the Scolpaig track, facilitating public (pedestrian) access to the site. The new access arrangements and the change of perception of the site as being under 'public ownership' is thought to have led to a marked increase (based on anecdotal reports from surveyors and local reports) in the number of islanders and tourists visiting the site for recreation. During the bird survey visits, recreational uses included walking, exercising dogs, swimming (in Scolpaig Bay), cycling, birdwatching and angling. Some recreational activities have potential to negatively impact habitat (e.g., trampling and erosion) and wildlife (e.g., disturbance and trampling, and dog induced disturbance, or predation of bird eggs and chicks).

14.8.2 Nature Conservation Designations

The Project site is not located within any statutory nature conservation designations. A number of statutory designated sites with ornithological interests are located sufficiently close for there to be potential for connectivity between the designated site and the area potentially affected by the Project, at least for some of the cited interests (see Table 14-7 and Figures 14.1 and 14.2). Following characterisation of anticipated LV deposits, the extent of the planned LV deposit splashdown zone and recovery operations and the results of acoustic modelling, three sites additional to those identified during Scoping were also included in the assessment: St Kilda SPA, Seas off St Kilda SPA and Flannan Islands SPA. The potential for the Project to affect European designated nature conservation sites with ornithological interests is examined in detail in Annex B: Information to Inform HRA.

Table 14-7 Ornithological designations with potential to be affected by the Project

Name	Designation	Closest Distance from Project boundary (km)	Designated features	Comments
West Coast of the Outer Hebrides	SPA	0	Breeding birds: red-throated diver. Non-breeding birds: black-throated diver; eider; great northern diver; long-tailed duck; red-breasted merganser; Slavonian grebe.	Marine site

Name	Designation	Closest Distance from Project boundary (km)	Designated features	Comments
North Uist Machair and Islands	SPA	2.8	Breeding birds: corncrake; dunlin; oystercatcher; redshank, ringed plover. Non-breeding birds: (Greenland) barnacle goose; purple sandpiper; ringed plover; turnstone.	
North Uist Machair and Islands	Ramsar	2.8	Breeding birds: dunlin; ringed plover. Non-breeding birds: (Greenland) barnacle goose; ringed plover; turnstone.	Same boundary as North Uist Machair and Islands SPA
Vallay	SSSI	2.8	Non-breeding (Greenland) barnacle goose; breeding bird assemblage.	Within boundary of North Uist Machair and Islands SPA/Ramsar site.
Balranald Bog and Loch nam Feithean	SSSI	3.1	Breeding bird assemblage.	Within boundary of North Uist Machair and Islands SPA/Ramsar site.
Mointeach Scadabhaigh	SPA	9	Breeding red-throated diver and breeding black-throated diver	
Mointeach Scadabhaigh	SSSI	9	Breeding red-throated diver and breeding black-throated diver.	Same boundary as Mointeach Scadabhaigh SPA
Seas off St Kilda	SPA	37	Breeding birds: fulmar; gannet; guillemot; puffin; European storm-petrel; seabird assemblage.	Marine site. Protects foraging habitat for seabirds nesting on St Kilda
St Kilda	SPA	58	Breeding birds: fulmar; gannet; great skua; guillemot; kittiwake; Leach's petrel; European storm-petrel; Manx shearwater; puffin; razorbill; seabird assemblage.	Boundary includes the surrounding waters up to approximately 4 km from the islands
St Kilda	SSSI	63	Breeding birds: fulmar; gannet; great skua; guillemot; kittiwake; Leach's petrel; European storm-petrel; Manx shearwater; puffin; razorbill; seabird assemblage.	Covers same terrestrial areas as St Kilda SPA, (SSSI excludes surrounding waters).
Flannan Isles	SPA	67	Breeding birds: fulmar; guillemot; kittiwake; Leach's petrel; puffin; razorbill; seabird assemblage.	Boundary includes the surrounding waters up to approximately 2 km from the islands

Name	Designation	Closest Distance from Project boundary (km)	Designated features	Comments
Flannan Isles	SSSI	69	Breeding birds: fulmar; guillemot; kittiwake; Leach's petrel; puffin; razorbill; seabird assemblage.	Covers same terrestrial areas as Flannan Isles SPA, (SSSI excludes surrounding waters).

North Uist Machair and Islands SPA and Ramsar sites cover the same area and largely protect the same bird interests. The qualifying interests recorded during the field surveys are detailed in Section 14.8.4. No purple sandpipers were recorded during any of the surveys, and turnstone, sanderling and non-breeding ringed plover were all recorded only occasionally and in very small numbers, therefore, there is no prospect of any likely significant effects on these species so these are not considered further in the impact assessment.

Several SSSI designations for birds also apply to the area covered by North Uist Machair and Islands SPA/Ramsar site including Vallay SSSI and Balranald Bog and Loch nam Feithean SSSI. The notified ornithological interests of these SSSIs are the same as those for the SPA/Ramsar site. Therefore, the assessment of the SPA/Ramsar site also effectively covers the potential for impacts on these SSSIs.

St Kilda SPA, St Kilda SSSI, Seas off St Kilda SPA, Flannan Isles SPA and Flannan Isles SSSI are offshore sites designated to protect internationally important breeding seabirds and their marine foraging and resting areas. These designated sites are screened-in for further impact assessment because there is potential for their qualifying interests to be affected by the impacts associated with launch vehicle deposits that will fall into the offshore splashdown zone to the west and north-west of the Project site. The qualifying interests of Seas off St Kilda SPA are fulmar, gannet, guillemot, puffin, European storm-petrel, and the breeding seabird assemblage as a whole. St Kilda SPA additionally has Leach's petrel, great skua, kittiwake and Manx shearwater as qualifying interests. The Seas off St Kilda SPA is a very large (3,995 km^2), recently designated, marine site designed to protect the marine foraging grounds of seabirds nesting on St Kilda SPA (St Kilda SPA covers only the various islands of the St Kilda archipelago and the nearby surrounding sea). The two SPAs are functionally linked, and to a large extent protect the same seabird populations. The qualifying interests of Flannan Isles SPA are fulmar, guillemot, puffin, razorbill, kittiwake, Leach's petrel, and the breeding seabird assemblage as a whole. The notified ornithological interests of the St Kilda SPA and St Kilda SSSI are the same, as are the notified interests of the Flannan Isles SPA and Flannan Isles SSSI. Therefore, the assessment of each of the SPAs also effectively covers the potential for impacts on the corresponding SSSI of the same name.

West Coast of the Outer Hebrides SPA is considered of very high (international) importance in this impact assessment. The qualifying interests recorded during the field surveys are detailed in Section 14.8.4. No long-tailed ducks, Slavonian grebes, black-throated divers or breeding red-throated divers were recorded during the field surveys, and eider duck and red-breasted merganser were recorded only irregularly in very low numbers; there is no prospect of any likely significant effects on any of these species so these are not considered further in the impact assessment.

Mointeach Scadabhaigh SPA holds nationally breeding populations of breeding red-throated and black-throated divers. No black-throated divers were recorded during any of the field surveys and only a single record of one red-throated diver was recorded in the adjacent coastal waters in November, outwith the breeding season. This SPA is therefore not considered further in the assessment. This site is also designated SSSI (Mointeach Scadabhaigh), for the same bird species. This SSSI is not considered further in the assessment for the same reasons as the SPA.

14.8.3 Non-Statutory Nature Conservation Designations

Small satellite areas of the RSPB Balranald Reserve are located approximately 1 km (at closest) from the site boundary; the main part of this reserve is approximately 4 km (at closest) from the site boundary. This reserve is not a statutory designation, however most of the reserve (but not the satellite areas close to the Project site) lies within the boundary of North Uist Machair and Islands SPA and Balranald Bog and Loch nam Feithean SSSI, described above.

14.8.4 Current bird species baseline

Species accounts are provided below for all species that are categorised as having at least low importance based on the criteria in Table 14-4. The accounts provide summary information on the use of the Project site and its vicinity based on the findings of the baseline field surveys reported in full in Appendix 14-1: Ornithology Technical Report and where relevant, Appendix 14-2: Ornithology Confidential Annex. For practical purposes the Project site and its vicinity is defined here as baseline bird survey area (Scolpaig Farm buffered to approximately 300 m). The species accounts also include summary information on regional and local population size, and potential connectivity to designated sites.

Information on bird species that are categorised as having very low importance are provided in Appendix 14-1: Ornithology Technical Report. All species categorised as having very low importance are screened out for detailed impact assessment.

Raptors and Owls

White-tailed eagle

White-tailed eagles were seen in small numbers, predominantly in the autumn and winter months. Most of the records were of birds in adult plumage and it is considered likely that these were individuals from the nearest breeding territory.

On most occasions when present, only a single adult bird was seen, but two adults judged to be a male and female were seen together in February 2020 and at times engaged in talon grappling behaviour. A third un-aged bird was seen with them. An immature bird was also present on the December visit. A single 1st-winter bird was present on the March visit. The bird seen in December was feeding on carrion (suspected to be a seal carcass) on the west coast of the survey area.

Historical data obtained from Uist Raptor Study Group shows that the closest white-tailed eagle breeding site is located several kilometres from the site boundary at Site A (see Appendix 14-2: Ornithology Confidential Annex). The Project site lies just outside the assumed core foraging range of this pair during the breeding season (SNH, 2016a) therefore it is reasonable to conclude that the adult white-tailed eagles seen at the site are most likely to be from this breeding territory. White-tailed eagles are a relatively recent (1990s) colonist of North Uist following their successful reintroduction to Scotland, and there are currently several breeding pairs. There were 23 pairs breeding in the NHZ3 in 2013 (Wilson *et al.*, 2015), however monitoring in 2018 indicated that the NHZ3 population has since increased to at least 32 pairs (Challis *et al.*, 2019).

White-tailed eagle is an Annex I species and is also protected under Schedules 1, 1A and A1 of the Wildlife and Countryside Act 1981, which provides protection against disturbance at its breeding sites, against harassment at any location and against destruction of its nests. However, it is not a qualifying interest of any nearby designated sites. White-tailed eagle is categorised as a species of **high importance** (Table 14-4) that regularly uses the survey area for hunting, it is therefore **screened-in** for detailed impact assessment.

Golden eagle

Golden eagles were seen occasionally and in all seasons of the year, mainly in the vicinity of Beinn Scolpaig. All but one record was of adults, usually single individuals but a pair was seen on the March 2020 visit. An immature individual was seen on the July 2019 survey visit. It is likely that golden eagles were visiting the survey area to hunt, probably targeting rabbits and carrion. The bird seen in December 2019 was seen to drop down to the west coast where it was presumably attracted to the same carcass where a buzzard was seen feeding.

Golden eagles breed in the interior and east coast of North Uist. The closest breeding site is located approximately 1 km from the site boundary (see Appendix 14-2: Ornithology Confidential Annex) which is within the assumed 6 km core foraging range for this species during the breeding season (SNH, 2016a), therefore it is likely that the adult birds seen were from this breeding site. There were approximately 81 pairs of golden eagle breeding in the Western Isles in 2003, of which around 20% breed on the Uists (Wilson *et al.*, 2015). The number of pairs in NHZ3 has probably since risen slightly, in line with the 7% increase between 2003 and 2015 reported for the 'Hebridean Islands' area in the results of the most recent national survey Hayhow *et al.*, 2017. Incomplete monitoring of the Western Isles in 2018 recorded 51 pairs, of which 33 pairs were in Lewis and Harris and 18 pairs in the Uists (Challis *et al.*, 2019).

Golden eagle is an Annex 1 species and is also protected under Schedules 1, 1A and A1 of the Wildlife and Countryside Act 1981, which provides protection against disturbance at its breeding sites, against harassment at any location and against destruction of its nests. However, it is not a qualifying interest of any nearby designated sites.

Golden eagle is categorised as a species of **high importance** (Table 14-4) that regularly uses the survey area for hunting, it is therefore **screened-in** for detailed impact assessment.

Merlin

Merlins were seen on two occasions only, in April 2019 and December 2019. The April record was during the breeding season, and this bird flew to an area of suitable breeding habitat outside the survey area (see Appendix 14-2: Ornithology Confidential Annex). Merlins breed in low numbers in North Uist on moorland habitat. The relatively high densities of suitable small-bird prey species (meadow-pipit, skylark and wheatear) means that the survey area is likely to be attractive hunting habitat for merlins breeding locally. There are estimated to be 53 pairs of merlin breeding in the NHZ3 in 2008 (Wilson *et al.*, 2015), though this number is likely to be an underestimate (Robin Reid, *pers. comm*.).

The Uist Raptor Study Group holds no records of merlin nesting within 2 km of the site boundary; however, it is likely that this could reflect low survey effort for this species.

The merlin seen in December is likely to be a wintering bird from the Icelandic population. Merlin is a moderately common wintering species on coastal habitat in North Uist.

Although merlin is categorised as a species of high importance (Table 14-4) it was only rarely recording in the survey area. It is therefore considered that there is no prospect of any likely significant effects on this species, and it is thus **screened out** for requiring detailed impact assessment.

Peregrine

Peregrines were recorded on three occasions only during the survey year, all outside the breeding season. This species ranges widely across all terrestrial habitats, but especially rocky coasts, and feeds on medium-sized bird prey such as rock dove and waders. Peregrine is a scarce breeding bird on North Uist; the closest known breeding site is more than 10 km away on east side of the island, which is well outwith the assumed core foraging range of 2 km during the breeding

season for this species (SNH, 2016a). There were estimated to be 16 pairs of peregrine breeding in the NHZ3 in 2014 (Wilson *et al.*, 2015).

Although peregrine is categorised as a species of high importance (Table 14-4) it was only rarely recorded in the survey area and not during the breeding season. It is therefore considered that there is no prospect of any likely significant effects on this species, and it is thus **screened out** for requiring detailed impact assessment.

Hen harrier

Hen harriers were regularly seen hunting in the survey area during all seasons of the year, with up to three individuals seen on some visits. In all cases the birds seen were most likely to be adults and/or young from local breeding territories, possibly within 2 km of the survey area (see Appendix 14-2; Ornithology Confidential Annex).

Hen harrier is a widespread but uncommon breeding species of moorland habitat on North Uist. The NHZ3 breeding population is estimated to be 56 pairs (including the recently established population of around eight pairs on Lewis), (Wilson *et al.*, 2015; Robin Reid *pers. comm.).* Almost all of the NHZ3 breeding population is found in the Uists which reflects the absence of short-tailed field vole from the other islands in NHZ3.

The Uist Raptor Study Group holds no records of hen harrier nesting or roosting sites within 2 km of the site boundary but has records of regular breeding activity of up to several pairs in the extensive area of young plantation forest approximately 3 km south-east of Scolpaig.

Hen harrier is an Annex 1 species but is not a qualifying interest of any nearby designated sites. It is also protected under Schedules 1 and 1A of the WCA, which provide protection against disturbance at its breeding sites and against harassment at any location.

Hen harrier is categorised as a species of **high importance** (Table 14-4) that regularly uses the survey area for hunting, it is therefore **screened-in** for detailed impact assessment.

Short-eared owl

Short-eared owls were regularly recorded hunting in the survey area with year-round sightings of up to three individuals recorded. It is possible that one pair of short-eared owl bred within the survey area (see Appendix 14-2: Ornithology Confidential Annex). The birds seen were most likely to be adults and/or young from local breeding territories within approximately 2 km of the survey area. Short-eared owl is a widespread but uncommon breeding species of moorland habitat on North Uist. The NHZ3 breeding population is estimated to be 281 pairs (Wilson *et al.*, 2015) however given the scarcity of short-eared owls on the NHZ3 islands outside the Uists (this is likely to be caused by the absence of short-tailed vole, their main prey species, from the other islands), the NHZ3 figure of 281 pairs estimated for this species by Wilson *et al.*, 2015 appears to be unrealistically high.

The Uist Raptor Study Group holds no records of short-eared owl nesting within 2 km of the site boundary but has records regular breeding of up to several pairs in the extensive area of young plantation forest approximately 3 km south-east of Scolpaig.

Short-eared owl is an Annex 1 species but is not a qualifying interest of any nearby designated sites.

Short-eared owl is categorised as a species of **medium importance** (Table 14-4) that regularly uses the survey area for hunting and possibly nesting, it is therefore **screened-in** for detailed impact assessment.

Seabird species

Red-throated diver

There were no records of red-throated diver using the survey area during the breeding season, either of birds on potential breeding habitat, or birds using the adjacent coastal waters for foraging. A single bird was seen flying over the survey area in July 2020 to a marine coastal habitat south of the site. Loch Sniogrivat, the small freshwater lochan near the summit of Beinn Scolpaig, was regularly examined; although this lochan appears broadly suitable for nesting there were no signs of nesting attempts. The only red-throated diver recorded during the non-breeding months of the year was a single winter plumage bird seen foraging in Scolpaig Bay in November 2019 (see Appendix 14-1: Ornithology Technical Report).

Breeding red-throated diver is a qualifying interest of Mointeach Scadabhaigh SPA and West Coast of the Outer Hebrides SPA, however the survey findings provide no evidence of connectivity between these sites and the survey area. It appears that the survey area has negligible importance for breeding or wintering red-throated diver. Red-throated diver is therefore not considered further in the assessment.

Although red-throated diver is categorised as a species of **high importance** (Table 14-4), use of the survey area by this species is negligible and limited to occasional occurrence outside the breeding season. It is considered that there is no prospect of any likely significant effects on this species, and it is **screened out** of the impact assessment.

Great northern diver

Non-breeding great northern divers were recorded in small numbers within the inshore waters around the site in the winter and spring (see Appendix 14-1 Ornithology Technical Report). Typically, only a single bird was seen on a survey visit. The peak count of eight individuals in late April 2019 coincides with spring migration period, a time when numbers in the Western Isles increase.

Great northern diver is an Annex 1 species, and the non-breeding birds are a qualifying interest of West Coast of the Outer Hebrides SPA, which holds 1,298 wintering individuals (SNH, 2016c). The low numbers of individuals recorded represent a very small (well below 1%) of the SPA population size.

Great northern diver is categorised as a species of **very high importance** (Table 14-4) on account of the high connectivity to the West Coast of the Outer Hebrides SPA, and one that regularly uses the inshore waters of the survey area in small numbers. This species is therefore **screened-in** for detailed impact assessment.

European shag

Low to moderate numbers (typically 20 – 40, peak count 73 in November 2019) of shags were recorded roosting on the rocky coast in the west and north of the survey area throughout the year. Shags were also seen foraging in small numbers in the sea, usually near the roost sites (see Appendix 14-1: Ornithology Technical Report). The shags using the survey area included a mix of adult and immature birds. It is not known if the adult birds seen during the breeding season months (April to July 2019) were actively breeding individuals or not. It is possible that one or two pairs of shag bred out of view in Sloc Rubha sea cave, however the JNCC Seabird Monitoring Programme database has no historical records of this species breeding in the survey area. The closest known breeding colony is on the small island of Causamul approximately 8 km south-west of the survey area, and there are other small colonies on Haskeir, the Monach Islands and in the Sound of Harris.

Approximately 2,600 pairs of shag were counted breeding in the Western Isles in the Seabird 2000 census (Mitchell *et al.*, 2004), a figure which has probably since reduced in line with the national decline of this species (JNCC, 2020). Shags

are a non-migratory species, therefore most of the birds breeding in the Western Isles and their young are also likely winter in the region. European shag is a BoCC red-listed species (Eaton *et al.*, 2015).

European shag is categorised as a species of **medium importance** (Table 14-4) that regularly uses the survey area throughout the year in low to moderate numbers for roosting and feeding. This species is therefore **screened-in** for detailed impact assessment.

Arctic tern

Arctic terns were only recorded in May, June and July the period when this species breeds (see Appendix 14-1: Ornithology Technical Report). Approximately ten pairs bred in the survey area, mainly in the vicinity of Loch Sgileabhat and with a few additional pairs along the north coast. According to JNCC Seabird Monitoring Programme database larger numbers of Arctic tern bred in the survey area in 2002, when around 40 pairs nested in a colony on the north-east coast more than 1 km from the Project site boundary, as well as small colony near Loch Sgileabhat. Arctic tern is a common breeding bird in the Western Isles, with a population of around 4,000 pairs (Mitchell *et al.*, 2004). Arctic tern is an Annex 1 species but is not a qualifying interest of any nearby SPA. Arctic tern also has a poor conservation status, occurring on both the BoCC red list (Eaton *et al.*, 2015) and SBL.

Arctic tern is categorised as species of **medium importance** (Table 14-4) that regularly uses the survey area in low numbers for breeding and feeding. This species is **screened-in** for detailed impact assessment.

Common gull

Common gulls bred in moderate numbers (21 pairs in 2019 and 39 pairs in 2020) but were seldom seen outside the breeding season (August to February) (see Appendix 14-1: Ornithology Technical Report). Breeding birds were distributed around the southern and western shores of Loch Scolpaig and in an area of wet moorland in the far north of the survey area. The JNCC Seabird Monitoring Programme database has records of at least 42 pairs (84 individuals) breeding in the survey area in 2002. Common gull is a common breeding bird in the Western Isles, with a population of around 1,700 pairs (Mitchell *et al.*, 2004). Common gull is BoCC amber listed (Eaton *et al.*, 2015).

Common gull is considered to be a species of **medium importance** (Table 14-4) on account that more than 1% of the regional population breed within survey area and is therefore **screened-in** for detailed impact assessment.

Waders

Lapwing

Lapwings were recorded in low to moderate numbers throughout the year, especially in the breeding season (see Appendix 14-1: Ornithology Technical Report). An estimated 22 pairs bred in the survey area in 2019 reducing to 17 pairs in 2020. Breeding territories were concentrated on the machair and pasture habitats around Loch Scolpaig and Scolpaig farmhouse, and along the eastern boundary of the survey area. Small numbers (peak count 18 birds) were present during autumn and winter months.

Lapwing is a common breeding bird in the Western Isles where it is an important component of the machair and croft land breeding wader community. The most recent survey of the Uists estimated a population of 4,337 pairs (Jackson *et al.*, 2004). Lapwing is a BoCC red-listed species (Eaton *et al.*, 2015) and is listed on the SBL.

Lapwing is categorised as a species of **medium importance** (Table 14-4) that regularly uses the survey area in low numbers for breeding and feeding. This species is therefore **screened-in** for detailed impact assessment.

Curlew

Curlews were recorded in only low numbers throughout the year with a peak of ten birds recorded in May 2019 (see Appendix 14-1: Ornithology Technical Report). An estimated four pairs bred in the survey area in 2019 and 2020, with breeding territories concentrated in the moorland and rough grassland habitats to the south and east of Beinn Scolpaig. The birds seen outside the breeding season were distributed around the coast and in the vicinity of Loch Scolpaig.

Curlew is a moderately common breeding bird in the Western Isles where it occurs on moorland and rough pasture habitats. There were estimated to be 477 pairs of curlew breeding in the NHZ3 in 2005 (Wilson *et al.*, 2015). Curlew is also a common passage and wintering species of coastal habitats. Curlew is BoCC red-listed (Eaton *et al.*, 2015) and is listed on the SBL.

Curlew is categorised as a species of **medium importance** (Table 14-4) that regularly uses the survey area in low numbers for breeding and feeding. This species is **screened-in** for detailed impact assessment.

Redshank

Redshanks were recorded in low numbers during the breeding season and were occasionally seen along the coast outside the breeding season (see Appendix 14-1: Ornithology Technical Report). An estimated seven pairs bred in the survey area in 2019, increasing to 15 pairs in 2020. This increase may have been linked to the lower grazing pressure and generally taller vegetation around Loch Scolpaig in the 2020 breeding season compared to in 2019. Breeding territories were concentrated in the marsh and damp pasture habitats and around the margins of lochs.

Redshank is a common breeding bird in the Western Isles where it is an important component of the machair and croft land breeding wader community. The most recent survey of the Uists estimated a population of 3,216 pairs (Jackson *et al.*, 2004). The peak number of breeding pairs at the site exceeds 1% of the North Uist population.

Breeding redshank is a qualifying interest of North Uist Machair and Islands SPA, located approximately 3 km from the Project site. At this distance there is likely to be negligible connectivity and any redshank breeding within the SPA would be unaffected by the Project. Redshank is amber listed (Eaton *et al.*, 2015).

Redshank is categorised as a species of **low importance** (Table 14-4) that regularly uses the survey area in low numbers for breeding and feeding. This species is therefore **screened-in** for detailed impact assessment.

Dunlin

Dunlins were recorded in low numbers during the breeding season and were occasionally seen on passage along the coast outside the breeding season (see Appendix 14-1: Ornithology Technical Report). An estimated two pairs bred in the survey area in both 2019 and 2020, on damp machair habitat around the shores of Loch Scolpaig. A flock of ten passage birds (most likely birds heading for Icelandic breeding grounds) were seen in May on Scolpaig Bay.

Dunlin is a common breeding bird in the Western Isles where it is an important component of the machair and croft land breeding wader community; it also commonly breeds on blanket bog habitat. The most recent survey of the Uists estimated a population of 1,877 pairs (Jackson *et al.*, 2004). There are estimated to be 5,996 pairs breeding in the NHZ3 (Wilson *et al.*, 2015).

Dunlin (*schinzii* subspecies only) is an Annex 1 species and breeding birds are a qualifying interest of North Uist Machair and Islands SPA, located approximately 3 km (at closest) from the Project site. At this distance there is likely to be negligible connectivity and any dunlin breeding within the SPA would be unaffected by the Project. Dunlin is BoCC amber-listed (Eaton *et al.*, 2015) and is listed on the SBL.

Dunlin is categorised as a species of **low importance** (Table 14-4) that regularly uses the survey area in low numbers for breeding and feeding. This species is therefore **screened-in** for detailed impact assessment.

Golden plover

Golden plovers were recorded in only very low numbers (peak two birds) and during the breeding season (see Appendix 14-1: Ornithology Technical Report). One pair held a breeding territory on moorland habitat within the survey area in both 2019 and 2020. A group of 18 birds flew south over the survey area on the September 2019 survey visit; these were likely to have been passage migrant birds.

Golden plover is a common breeding bird in the Western Isles where it occurs on moorland and blanket bog habitats. There were estimated to be 4,194 pairs of golden plover breeding in the NHZ3 in 2005 (Wilson *et al.*, 2015). Golden plover is an Annex 1 species but is not a qualifying interest of any nearby designated sites. Golden plover is BoCC amber-listed (Eaton *et al.*, 2015) and is listed on the SBL.

Although golden plover is categorised as a species of **low importance,** the survey area is used by only a single breeding pair and only occasionally for feeding by non-breeding birds. It is therefore considered that there is no prospect of any likely significant effects on this species, and it is thus **screened out** for requiring detailed impact assessment.

Oystercatcher

Oystercatchers were recorded in moderate numbers from early spring and onwards through the breeding season and were absent or scarce during the autumn and winter months (see Appendix 14-1: Ornithology Technical Report). An estimated 39 pairs bred in the survey area in 2019, making oystercatcher the most abundant breeding bird species in the survey area. Breeding territories were widely distributed across concentrated on machair, maritime heath, rocky coast and pasture habitats. The survey results suggest that breeding birds started to return from January onwards and had departed by August.

Oystercatcher is a very common breeding bird in the Western Isles where it is an important component of the machair and croft land breeding wader community. The most recent survey of the Uists estimated a population of 4,143 pairs (Jackson *et al.*, 2004).

Breeding oystercatcher is a qualifying interest of North Uist Machair and Islands SPA, located approximately 3 km from the Project site. At this distance there is likely to be negligible connectivity and any oystercatcher breeding within the SPA would be unaffected by the Project. Oystercatcher is amber listed (Eaton *et al.*, 2015).

Oystercatcher is categorised as a species of **low importance** (Table 14-4) that regularly uses the survey area in low numbers for breeding and feeding. This species is therefore **screened-in** for detailed impact assessment.

Ringed plover

Ringed plovers were recorded in low numbers during the breeding season (up to 12 pairs present) and were occasionally seen along the coast during the winter months with a peak of three birds recorded in March 2020 (see Appendix 14-1: Ornithology Technical Report). An estimated nine pairs bred in the survey area in 2019, increasing to an estimated 12 pairs in 2020, with breeding territories concentrated around the coast on short-vegetation machair and maritime heathland habitats.

Ringed plover is a common breeding bird in the Western Isles where it is an important component of the machair breeding wader community. The most recent survey of the Uists estimated a population of around 1,034 pairs (Jackson *et al.*, 2004).

Breeding and non-breeding populations of ringed plover are qualifying interests of North Uist Machair and Islands SPA, located approximately 3 km from the Project site. At this distance there is likely to be negligible connectivity and any ringed plover (breeding or non-breeding) within the SPA would be unaffected by the Project. Ringed plover is a red list species (Eaton *et al.*, 2015).

Ringed Plover is categorised as a species of **medium importance** (Table 14-4) that regularly uses the survey area in moderate numbers for breeding. This species is therefore **screened-in** for detailed impact assessment.

Waterfowl species

Barnacle goose

This species was not seen using the survey area during any of the survey visits. The only barnacle geese seen during the survey visits were small flocks (2 to 46 birds) flying over the survey area on several occasions during the winter and autumn months. However, the areas of short-sward grassland within the survey area, particularly the machair grassland to the west of Scolpaig farmhouse, provide suitable potential feeding habitat for this species. Abundant fresh goose droppings found on short machair grassland near Scolpaig Bay in January 2020 may indicate that this species had been feeding there (alternatively the droppings could have been of greylag geese). Local birdwatchers have also reported occasionally seeing this species feeding at Scolpaig including a flock of approximately 400 birds seen in early April 2020.

Barnacle geese of the Greenland breeding population overwinter in very large numbers in NHZ3, with 14,379 individuals counted in the most recent census (Mitchell and Hall, 2020). The coastal grasslands of North Uist and adjacent smaller islands are a stronghold, with 7,252 birds counted in the most recent census (Mitchell and Hall, 2020). These numbers are considered to be of international importance as they comfortably exceed 1% of the size (approximately 72,000 birds) of the Greenland breeding population of the species.

Non-breeding barnacle geese are a qualifying interest of the North Uist Machair and Islands SPA/Ramsar site. At the time of the 2018 census there were approximately 3,500 counted in this SPA. When last assessed, the condition was 'Favourable Maintained[3]' with no negative pressures identified.

The closest regular wintering sites to the Project site that are part of this SPA are Vallay island (approximately 3 km to the north-east) and the Balranald machair (approximately 4 km to the south-west). Both of these sites are well within the 15 km core foraging distance during the winter season for this species (SNH, 2016a), therefore any barnacle geese using within the survey area or flying over the site are likely to have connectivity to the SPA.
Barnacle goose is categorised as a species of **very high importance** (Table 14-4) on account of the high connectivity to the North Uist Machair and Islands SPA, and one that occasionally uses the survey area in small to moderate numbers for feeding. This species is therefore **screened-in** for detailed impact assessment.

Whooper swan

Three whooper swans, two adults and a first-summer bird (possibly a family party) over-summered on Loch Scolpaig in 2019 (see Appendix 14-1: Ornithology Technical Report). One of these birds was found dead in July 2019 (age unknown). These summering whooper swans showed no behaviour suggestive of breeding or territory holding. Whooper swan is an irregular breeder in Scotland, with small numbers over-summering (Forrester and Andrew, 2007). This species has occasionally bred in the Western Isles and Loch Scolpaig would appear to provide broadly suitable habitat.

[3] Latest assessed condition on 15 February 2014 (NatureScot, SiteLink)

Three whooper swans were observed flying into Loch Scolpaig on the March 2020 survey visit but left soon afterwards due to disturbance by a dog walker. On the same visit a group of 15 migrating birds was seen heading north (presumably to Iceland) over the sea, west of the survey area.

A group of approximately 90 whooper swans was seen on 19 March 2020 by an islander that lives close to the survey area (record reported to the Surveyor). These birds appear to have spent the night roosting on Loch Scolpaig and were likely to have been a migrant flock making a short stop before heading on to Iceland. A flock of 92 whooper swans (possibly the same flock) was reported from Loch Scolpaig on 30 March 2020, with 83 of these birds departing to the north-west in the afternoon. A further group of 24 whooper swans (presumably north bound migrant flock) was reported resting locally to the Surveyor on 4 April 2020 (Outer Hebrides Bird Recorder).

Whooper swan is a moderately common winter visitor and common passage migrant in the Western Isles. The NHZ3 wintering population is estimated at 813 individuals (peak count) Wilson *et al.*, 2015). Whooper swan is an Annex 1 species but is not a qualifying interest of any nearby designated sites. Whooper swan Schedule 1 on the WCA and is BoCC amber-listed.

Whooper swan is categorised as a species of **high importance** (Table 14-4) that regularly uses the survey area in low numbers summering and wintering, and occasionally in moderate numbers as a migration stop-off site. It is therefore **screened-in** for detailed impact assessment.

Red-breasted merganser

Red-breasted mergansers were recorded on one occasion only with a peak count of seven birds recorded in the coastal waters in January 2020.

Non-breeding red-breasted merganser is a qualifying interest of the West Coast of the Outer Hebrides SPA, which holds 239 individuals (SNH, 2016c). Nevertheless, the numbers using the survey area represent only a small proportion of the West Coast of the Outer Hebrides SPA population and were only present irregularly. There are recent historic records of this species successfully breeding on Loch Scolpaig.

There is no regional (NHZ3) wintering population estimate available for red-breasted merganser; based on the extent of available habitat and the counts for West Coast of the Outer Hebrides SPA, it is considered likely that between 500 and 1,000 individuals' winter in the region. Red-breasted merganser is BoCC green-listed.

Red-breasted merganser is categorised as a species of **very high importance** (Table 14-4) on account of the potential connectivity with the West Coast of the Outer Hebrides SPA. However, the baseline survey data indicates that this species occurs in the survey area only very occasionally and in then only in small numbers. This is not surprising as the coastal habitats around the Project site are of low suitability for this species. For these reasons, it is considered that there is no prospect of any likely significant effects on this species and it is **screened out** of the impact assessment.

Wigeon

Two pairs of wigeon were recorded breeding at Loch Scolpaig in 2019 and a single pair in 2020 (see Appendix 14-1: Ornithology Technical Report). This species has a relatively small national breeding population size; there are reported to be approximately 400 pairs nesting in the UK, most of which are in Scotland (Forrester and Andrews, 2007), though this may be an underestimate (there has been no dedicated national survey of this species). The number breeding in the NHZ3 is unknown but is likely to be between 20 and 100 pairs, therefore a single pair probably represents between 1 % and 5 % of the population (the NHZ3 population is probably a few tens of pairs).

In recognition of the small size of the UK breeding population and the uncertainty over the regional population size, wigeon is categorised as a species of **medium importance** (Table 14-4), with up to two pairs breeding in the survey area. Wigeon is therefore **screened-in** for detailed impact assessment.

Corncrake

This species was not recorded in the survey area during the 2019 breeding season. However, three males were heard calling from suitable habitat relatively near to the survey area during the 2019 dusk/night survey visits (see Appendix 14-2: Ornithology Confidential Annex).

In the 2020 breeding season, a single calling male (assumed to represent a breeding pair) was recorded inside the survey area, and other calling birds were again present locally at the same locations as in 2019 (see Appendix 14-2: Ornithology Confidential Annex). The lack of sheep grazing in 2020 resulted in the development of areas of tall grassland vegetation and providing suitable breeding habitat for this high conservation value species. Corncrake monitoring surveys by the RSPB recorded two calling males at Scolpaig in 2021 (J.Boyle (RSPB), *pers comm.)* There are historical records of calling corncrakes at Scolpaig, but prior to 2020, calling birds had not been recorded since 2003, and before that in 1996.

The Western Isles, Coll and Tiree (NHZ3) are the UK stronghold for breeding corncrakes, supporting approximately 83% of the UK population of around 900 singing males (Eaton *et al.*, 2021). In 2016, 747 calling males were reported from NHZ3, with 130 of these in North Uist (Eaton *et al.*, 2021).

Corncrake is an Annex 1 species and a qualifying interest of North Uist Machair and Islands SPA located approximately 3 km from the Project site however at this distance, any corncrakes breeding within the SPA would be unaffected by the Project. Corncrake is listed on Schedule 1 of the WCA. It is also BoCC red-listed (Eaton *et al.*, 2015) and is a SBL species.

Corncrake is categorised as a species of **medium importance** (Table 14-4) that breeds in low numbers in the survey area. It is therefore **screened-in** for detailed impact assessment.

Other species

Three passerine species that were recorded breeding in the survey area are categorised as having **low importance** (Table 14-4), namely skylark (up to 20 pairs), starling (up to eight pairs) and twite (up to two pairs). These species are all BoCC red-listed (Eaton *et al.*, 2015) and SBL species. In all cases the numbers breeding in the survey area are considered unlikely to exceed 1% of the North Uist population as these species are either very common (skylark and starling) or common (twite) widespread breeding species in North Uist. These three species are **screened-in** for detailed impact assessment.

14.8.5 Ornithological receptors brought forward for assessment

A summary of the evaluation of ornithological receptors is shown in Table 14-8 and Table 14-9.

Table 14-8 Summary of screening evaluation of ornithological designated site receptors

Designated site name	Designation	Receptor importance	Connectivity with proposed Project	Further consideration required? Rationale
West Coast of the Outer Hebrides	SPA	Very high	Yes	Yes, connectivity for non-breeding great northern diver qualifying interest
North Uist Machair and Islands	SPA & Ramsar	Very high	Yes	Yes, connectivity for non-breeding barnacle goose qualifying interest
Vallay	SSSI	Very high	Yes	Yes, effectively the same assessment as for North Uist Machair and Islands SPA
Balranald Bog and Loch nam Feithean	SSSI	Very high	Yes	Yes, effectively the same assessment as for North Uist Machair and Islands SPA
Mointeach Scadabhaigh	SPA	Very high	No	No, no connectivity
Mointeach Scadabhaigh	SSSI	Very high	No	No, no connectivity
Seas off St Kilda	SPA	Very high	Yes	Yes, multi-species connectivity with offshore splashdown zone
St Kilda	SPA	Very high	Yes	Yes, multi-species connectivity with offshore splashdown zone
St Kilda	SSSI	Very high	Yes	Yes, effectively the same assessment as for St Kilda SPA
Flannan Isles	SPA	Very high	Yes	Yes, multi-species connectivity with offshore splashdown zone
Flannan Isles	SSSI	Very high	Yes	Yes, effectively the same assessment as for Flannan Islands SPA

Table 14-9 Summary of the screening evaluation of ornithological species receptors

Receptor Species	Receptor importance	Geographic scale of importance	Conservation status lists (BoCC and SBL)	WCA legislative protection level	Are birds a qualifying interest of a nearby SPA?	Use of proposed Project site and its vicinity (bird survey area)	Screened-in for detailed assessment
White-tailed eagle	High	Regional	Red, SBL	Schedules 1, A1 and 1A	No	Hunting, year-round by low numbers, breeds locally	Yes
Golden eagle	High	Regional	Green	Schedules 1, A1 and 1A	No	Hunting, year-round by low numbers, breeds locally	Yes
Hen harrier	High	Regional	Red, SBL	Schedules 1 and 1A	No	Hunting, year-round by low numbers, breeds locally	Yes
Short-eared owl	Medium	Regional	Amber	General	No	Hunting, year-round by low numbers, breeds locally	Yes
Peregrine	High	Regional	Green	Schedule 1	No	Occasional hunting by very low numbers	No
Merlin	High	Regional	Red	Schedule 1	No	Occasional hunting by very low numbers	No
Red-throated diver	High	Local	Green	Schedule 1	No	Irregular in very low numbers, non-breeding	No
Great northern diver	Very high	Local	Amber	Schedule 1	Yes	Regular in low numbers, non-breeding	Yes
European shag	Medium	Local	Red, SBL	General	No	Regular in low-moderate numbers year-round, roosting and feeding	Yes
Arctic tern	Medium	Local	Red, SBL	General	No	Regular in low numbers, breeding	Yes
Common gull	Medium	Regional	Amber	General	No	Regular in moderate numbers, breeding	Yes
Lapwing	Medium	Local	Red, SBL	General	No	Regular in low numbers, breeding and non-breeding	Yes
Curlew	Medium	Local	Red, SBL	General	No	Regular in low numbers, breeding and non-breeding	Yes
Redshank	Low	Local	Amber	General	No	Regular in low numbers, breeding	Yes
Dunlin	Low	Local	Amber	General	No	Regular in very low numbers, breeding and passage	Yes

Receptor Species	Receptor importance	Geographic scale of importance	Conservation status lists (BoCC and SBL)	WCA legislative protection level	Are birds a qualifying interest of a nearby SPA?	Use of proposed Project site and its vicinity (bird survey area)	Screened-in for detailed assessment
Golden plover	Low	Sub-local	Amber, SBL	General	No	Regular in very low numbers, breeding	No
Oystercatcher	Low	Local	Red, SBL	General	No	Regular in low numbers, breeding	Yes
Ringed plover	Medium	Regional	Red, SBL	General	No	Regular in low numbers, breeding and non-breeding	Yes
Barnacle goose	Very high	Regional	Amber	General	Yes	Irregular, feeding by low to moderate numbers of non-breeding birds. Area within a nationally important wintering stronghold	Yes
Whooper swan	High	Local	Amber	Schedule 1	No	Regular in low numbers in summer and winter, and irregular as passage migrant in up to moderate numbers. Potential for future breeding	Yes
Red-breasted merganser	Very high	Local	Green	General	Yes	Irregular (1 winter record) in very low numbers. Coastal habitats at site have low suitability for this species	No
Wigeon	Medium	Regional	Amber	General	No	Regular in low numbers, breeding	Yes
Corncrake	Medium	Local	Red, SBL	General	No	Absent in 2019. 1 calling male present in 2020. Two calling males present in 2021. North Uist is a nationally important breeding stronghold	Yes
Skylark	Low	Sub-local	Red, SBL	General	No	Regular in moderate numbers, breeding	Yes
Starling	Low	Sub-local	Red, SBL	General	No	Regular in low numbers, breeding and non-breeding	Yes
Twite	Low	Sub-local	Red, SBL	General	No	Regular in low numbers, breeding and non-breeding	Yes

14.9 POTENTIAL IMPACTS

The potential impacts of the Project on birds have been established through scoping (Table 14-2 and consultation with key stakeholders (Section 14.6), and are listed below, including those with potential for positive or negative and direct, indirect or secondary effects. Some of these potential impacts are scoped-in for detailed assessment as it is considered that these have potential for significant effects on one or more ornithological receptors. Other potential impacts are screened out of a detailed assessment because it is not considered plausible they could cause significant effects.

14.9.1 Impacts scoped-in for detailed assessment

The potential impacts of the Project on important ornithological receptors, without mitigation, that are scoped-in for detailed assessment are as follows:

Construction

- Direct habitat loss / change due to construction of the Project infrastructure; and
- Disturbance (noise and visual) due to construction activities.

Operation and maintenance

- Visual and noise disturbance during site launch preparations and demobilisation;
- Acoustic disturbance generated from launch events; and
- Risk of bird strike and entanglement from jettisoned stages.

Decommissioning

Impacts during decommissioning are expected to be similar to, but not to exceed, those arising during the construction phase.

14.9.2 Impacts Scoped-out

A number of potential impacts that could affect birds have been scoped-out because it is clear that it is not plausible they could have significant effects on receptor populations. These are as follows:

- Misfiring, explosions and other accidents;
- Risk of entrapment in storage tanks/buildings;
- Direct ingestion of jettisoned components and absorption of toxic contaminants by seabirds; and
- Indirect impacts on birds from effects on fish prey.

These scoped-out impacts are briefly described below together with the reasoning for why they are scoped-out.

14.9.3 Misfiring, explosions and other accidents

Rockets and rocket propellants are potentially hazardous, a misfiring or accident could lead to an explosion with the potential to cause mortality or injury to birds and to damage habitat. Compliance with safety regulations and protocols for handling and storing hazardous substances and the safe operation of rockets and equipment will minimise the possibility of occurrence and limit the potential magnitude of an event (an Outline Hazardous Materials Management Plan is provided in Appendix 17-1). The operating record of rocket launch facilities carried out elsewhere indicates that the frequency of accidents is very rare. It is therefore reasonable to assume that the likelihood of a serious event occurring is very small.

Were an explosion or other unplanned event to occur at ground level, it is reasonable to assume that it would occur in the vicinity of the launch site (i.e., launch pad, compound, workshop or storage shed) and that the potential for bird mortality and injury, or significant habitat damage would be spatially limited to a defined radius. Bird densities in the vicinity of the launch site are low and, with the possible exception of corncrake, the species nesting there do not include the nest sites of species categorised as having high or very high importance. Were an explosion or other accident to occur at height, it would most likely occur over the coast or sea, where bird densities are low. The probability that birds could be killed or injured by falling debris from an explosion at height is very small; at worse it is not likely to affect more than a few individuals

In the case of a launch that failed after the LV became airborne, it would most likely fall into the sea. Such a failed launch would give potential for there to be some smaller items of debris, of a size that seabirds could potentially ingest, particularly if there was an explosion. Nevertheless, it is anticipated failed launches would be very rare events. It is likely that that the great majority of floating debris from a failed launch would be quickly recovered by the clean-up operation that would follow, unless items sank (in which case they would not pose a significant hazard to birds). Quantities of other potential contaminants that could be released are very small and would be quickly dispersed and diluted to negligible concentrations.

The impact on birds of misfiring, explosions and other accidents is scoped out of requiring assessment on the grounds that a serious event is very unlikely to occur and at worst is likely to affect only a few individuals or very small areas of habitat. It is therefore not plausible that there could be a significant effect on any bird receptor.

14.9.4 Risk of entrapment of birds in storage tanks/buildings

The Project includes the installation of two external liquid storage tanks and modifications to the existing out-buildings. Storage tanks and buildings can pose an entrapment hazard to birds if poorly designed and maintained. The potential risk is greatest to hole-nesting species, for example starling and rock dove, as these actively seek out openings when searching for nesting and roosting sites.

One of the proposed tanks is an above-ground water storage tank measuring approximately 4.9 m x 5.4 m x 3.1 m high. The other is a liquid storage tank measuring approximately 8.2 m x 11.4 m partly sunk into the ground and contained within concrete walls of approximately 2 m high. Both tanks will be fully enclosed; they will have galvanised steel covers and the open ends of any vent pipes will be covered with fine-mesh grilles (mesh size of approximately 1 cm). These design elements will prevent the possibility of birds entering the tanks and becoming entrapped.

The building specifications for the proposed workshop, control centre and storage shed will include inspections to ensure there are no holes or gaps large enough for birds to enter, and any ventilation vents will be fitted with suitable grilles to prevent bird ingress. These design elements will prevent the possibility of birds entering buildings and becoming entrapped.

The design and maintenance of the proposed tanks and building will mean it is not possible for birds to become entrapped. Therefore, entrapment is scoped-out and not considered further.

Note. The baseline surveys found that starlings use some of the existing buildings for nesting. The conversion of one out-building for use by the Project will prevent starlings (a BoCC Red-List species) that currently nest there from doing so in the future. Where appropriate, nest boxes will be provided for these birds to ensure they continue to have somewhere to nest [ORN05].

14.9.5 Direct ingestion of jettisoned components and absorption of toxic contaminants by seabirds

In their consultation response Marine Scotland advised that the potential impacts on seabird receptors of direct ingestion of jettisoned LV components and absorption of toxic contaminants should be examined. It is well established that some surface-feeding seabird species will ingest items of floating 'rubbish' such as plastic, polythene bags and polystyrene beads (presumably mistaken as items of food) which, because of their indigestibility, can go on to cause harm and even death. Similarly, should such ingested items contain toxins then the digestive process could lead to the toxin absorption, with negative effects on the bird's health.

Each launch is regulated my Marine Scotland under the Marine (Scotland) Act 2010 and will be assessed individually in terms of the risk posed to marine environment, including birds. However, to pose a hazard to seabirds, jettisoned items would need to float and be small enough for a seabird to ingest (approximately <10 cm). Given that water depths in the fallout zone generally greatly exceed 30 m (the 30 m bathymetry contour lies approximately 1 km offshore and the 50 m contour approximately 15 km offshore) any jettisoned items that sink would quickly become unavailable to foraging birds and thus not pose a hazard (however they may pose a hazard to other wildlife). Thus, the potential for significant effects on seabird receptors will depend on the nature of the jettisoned items in terms of their quantity, size, type of material and density.

LV components are all of a relatively large size, far larger than could be ingested by a seabird (Chapter 4: Project Description). Jettisoned LV components will have a high degree of structural strength, being designed to withstand impact high aerodynamic forces and facilitate recovery from the sea undamaged. Therefore, the jettisoned items are not likely to break up into smaller parts of a size which seabirds could ingest. It is concluded there is no risk that seabirds will ingest or be intoxicated by jettisoned LV components and therefore this effect is not considered further.

A failed rocket launch could give rise to floating marine debris that could be ingested by seabirds. However, it not plausible that this would have significant impacts on any seabird receptor. Terminated or failed launches are expected to be rare events, and the quantities of floating debris would be small. Furthermore, the debris items would not be toxic. It is concluded that the risks of ingestion and intoxication of seabirds from failed launch debris is extremely small and therefore this effect is not considered further.

14.9.6 Indirect impacts on seabirds through effects on prey fish

During consultation, NatureScot requested that assessment includes consideration of indirect impacts on seabirds through effects on fish spawning and nursery grounds, in particular effects on herring (*Clupea harengus*).

An assessment on fish spawning and nursery grounds is examined in Chapter 16: Marine Ecology. This included examination of the potential for impact on fish species from the direct ingestion/absorption of jettisoned components or toxic contaminants ingestion/absorption. The EIA concluded that for all potential impacts examined there will be negligible or very low magnitude adverse residual effects on fish receptors which are not significant. There would be negligible knock-on indirect impacts on seabird species prey of fish and this impact is scoped out.

14.10 MITIGATION AND MANAGEMENT MEASURES

14.10.1 Proposed mitigation

The following mitigation and management measures are proposed to remove, avoid, reduce and, where possible, offset any impacts which could, either by themselves or in combination with others, have a significant adverse effect. A number of standard mitigation measures, including best practice methods, have been identified to avoid effects associated with the construction phase of the Project on ornithological interests. Additional receptor-specific mitigation measures have

been identified to avoid significant effects on ornithological receptors. These measures are considered in the assessment of residual effects in Section 14.11.

Table 14-10 Mitigation measures

Ref.	Title	Description
R02	Regulatory Mitigation (Launch Vehicles and Launch Events)	Each launch will be licensed and regulated under: • The Space Industry Act 2018 and the Space Industry Regulations 2021; or • Permission under the Air Navigation Order 2016 (Air Navigation (Amendment) Order 2021); and • Marine (Scotland) Act 2010 for launches that involve deposits in the marine environment. The launch operator is required to submit a detailed Safety Case which includes both a ground safety analysis and a flight safety analysis to the regulator (UK Civil Aviation Authority, CAA). The ground safety analysis covers the transport, handling and storing of any hazardous material in relation to the launch vehicle and testing payloads amongst a range of other activities. A flight safety analysis covers must cover potential blast and fragmentation impacts, releases of toxic chemicals, and any major accidents or hazards resulting from collision or separation of LV components.
COM01	Habitat and Amenity Management Plan & Operational Environmental Manager	A Habitat and Amenity Management plan will be developed post-consent to expand the current habitat enhancement proposals and integrate these with commitments arising from the EIA / planning process as part of a wider HAMP. Under CnES ownership, the site is currently being managed to allow access for recreational use, community grazing opportunities, and enhancement of habitats in consultation with the RSPB. An outline HAMP outlining key commitments and principals is provided in Appendix 7-2 and will be developed post consent in conjunction with a consultative Advisory Group. Coordination and management of the HAMP will be delivered by an Environmental Officer contracted by Spaceport 1. Commitments and development principals centre around the following: • Habitat enhancement for specific species and habitats; • Public (including users of limited mobility) access; • Community grazing opportunities; • Cultural heritage; and • Fisheries.
ECO03	Ground Reinstatement and Vegetation Clearance	To facilitate site restoration, reinstatement of vegetation will be focused on natural regeneration utilising vegetated turves or soils stripped and stored with their intrinsic seed bank. To encourage stabilisation and early establishment of vegetation cover, where available, topsoil and vegetation turves in keeping with the surrounding vegetation type will be used to provide a dressing for the final surface.
GM01	Design Mitigation	• Reuse of existing infrastructure where possible: one existing farm building upgraded and the existing access road from the A865 will be upgraded.

Ref.	Title	Description
		• Substantial reduction of original project infrastructure (Figure 3.1) and footprint, to avoid peat, sensitive habitats and the National Scenic Area (NSA). • Project revised to provide a venue for sub-orbital launch vehicles, substantially smaller than orbital launch vehicles proposed in the Scoping Report; • Space Launch Hazard Area boundaries are defined to avoid landmasses, St Kilda seabird colonies, marine transboundary interactions and marine assets.
GM02	Construction Mitigation Register & Construction Environmental Manager	A Construction Mitigation Register (CMR) will be collated detailing the mitigation commitments in the EIA and relevant planning conditions. A dedicated Construction Environmental Manager (CEM) will have responsibility to ensure all measures in the register are delivered during the construction period. The CMR will outline all required mitigation commitments and relevant planning conditions for ornithological, ecological, cultural heritage and hydrological receptors, providing details of key sensitivities present and timings. The CEM will contract necessary survey expertise, advise on, and monitor the implementation and compliance of works with construction phase environmental mitigation and good practice measures.
ME01	Safety / Recovery Vessel Protocols	The safety/recovery vessel will adhere to the 'Scottish Marine Wildlife Watching Code (SMWWC), within practical feasibility. Any components from 1-stage or 2-stage LVs which are intended to be recovered will incorporate a parachute recovery system for safe landing and be designed to float to facilitate their recovery. Parachute systems will be recovered as part of the jettisoned stage recovery process
ORN01	Breeding Bird Protection Plan (BBPP)	A Breeding Bird Protection Plan will be developed and submitted to CnES and NatureScot for approval for implementation during the construction period. The BBPP will include measures to avoid disturbance and damage to nests. Measures will include, but are not restricted to the following: • If construction works must occur during the breeding season (April – August), bird surveys will be undertaken by a suitably qualified surveyor prior to commencement of works, to locate active nests and to inform how works can best be programmed to avoid disturbance; • Any active nests will be cordoned off to a suitable distance (agreed in consultation with NatureScot) and construction activities delayed within the cordon until the young have fledged (or breeding attempt has failed); • Maintain a short vegetation in the vicinity of construction area as a measure to deter corncrake, as described in ORN02.
ORN02	Pre-Construction/Construction Vegetation management - Corncrake	If construction is scheduled to occur during the breeding season (April – August), in advance of the breeding season, vegetation within 10 m of the area potentially directly affected by construction activities will be kept short (<10cm) by regular mowing, and unattractive for breeding corncrakes. Tall grass habitat will be created elsewhere at Scolpaig

Ref.	Title	Description
		Farm to ensure there continues to be suitable habitat for corncrake locally available.
ORN03	Operational measures – general (terrestrial)	Immediately prior to launching, a visual examination of the vicinity of the launch area (approximately 150 m radius around launch pad) will be made to check that no birds are present. If birds are found to be present, low intensity scaring methods such as a person walking through the 150 m zone would be deployed to clear the area of birds so that at the time of launch no birds are present. This measure is designed to prevent birds being potentially exposed to peak noise levels in excess of 115 dB (below the 140 dB noise level at which hearing damage would be expected to occur).
ORN04	Operational Measures - corncrake	Vegetation sward height within approximately 150 m of the launch platform will be kept short (<10 cm) during the breeding season (April – August, inclusive) to deter breeding corncrake (corncrake is a WCA Schedule 1 species that nests in tall grassland and herbage). Tall grass habitat will be created elsewhere at Scolpaig Farm to ensure there continues to be suitable habitat for corncrake at the site.
ORN05	Nest boxes for nesting starlings displaced from buildings	The conversion of the existing outbuildings for use by the Project will prevent the few pairs of starlings that currently nest there from using them in the future. Where appropriate, nest boxes will be provided for these birds to ensure they continue to have somewhere to nest.
ORN06 / ECO02	Speed limit and Signage	A 10 mph speed limit on the site access track will be implemented to reduce disturbance effects and reduce potential for wildlife collisions, (namely otter and bird species). Appropriate signage within the site will be used to alert site personnel and visitors to the presence of wildlife (breeding birds and otter) and may be installed at specific areas or during seasons to avoid disturbance where appropriate.

14.11 IMPACT ASSESSMENT

14.11.1 Direct habitat loss / change due to construction of the development infrastructure

Impact overview (without mitigation)

This impact would result in the loss/change of an area of foraging, or breeding habitat taken up by the footprint of the rocket launch platform and associated development infrastructure and the upgrading of the Scolpaig Farm track.

Mitigation

A number of general best practice mitigation measures will be implemented to ensure that the effects of habitat loss are minimised (see Table 14-10). Site clearance works including stripping of vegetation will occur, where possible, outwith the bird breeding season (April to August) to ensure no active nests, eggs or young birds are damaged or destroyed by the works (ORN01).

The conversion of the existing outbuildings for use by the Project will prevent the few pairs of starlings that currently nest there from using them in the future. Where appropriate, nest boxes will be provided for these birds to ensure they continue to have a nesting location (ORN05).

To facilitate site restoration, reinstatement of vegetation will be focused on natural regeneration utilising vegetated turves or soils stripped and stored with their intrinsic seed bank. To encourage stabilisation and early establishment of vegetation cover, where available, topsoil and vegetation turves in keeping with the surrounding vegetation type will be used to provide a dressing for the final surface (ECO03).

Under CnES ownership, the site is being managed to allow access for recreational use, community grazing opportunities, and enhancement of habitats with input from the RSPB. A Habitat and Amenity Management Plan will be developed post-consent to expand the current habitat enhancement proposals and integrate these with commitments arising from the EIA / planning process. An outline HAMP outlining key commitments and principals is provided in Appendix 7-2 and will be development in detail in conjunction with an Advisory Group. Coordination and management of the HAMP will be delivered by an Environmental Manager employed by Spaceport1.

Assessment of residual effects

Magnitude of impact

The habitat loss and change associated with construction of the Project is assumed to correspond to the extent of the launch site (this includes the rocket launch platform and adjacent hardstanding; vehicle turning area and car parking area; pollution control infrastructure, new or upgraded sections of access track). This area comprises of a range of habitats including wet dwarf shrub heath, dune grassland and wet heath. The predicted permanent habitat loss is approximately 0.79 ha.

In addition, surrounding habitat could potentially undergo a degree of short-term alteration due to surface disturbance by construction machinery and excavations. The additional area that could be affected in this way is largely restricted to existing grassland verges, and machair, which are expected to recover rapidly from indirect impacts. The baseline bird survey results indicate that the areas affected by habitat loss/change do not provide breeding or foraging habitat likely to be critically important for any breeding or foraging bird species. Furthermore, the predicted habitat changes would not necessarily be adverse for some species.

The area of permanent habitat loss (approximately 0.79 ha) is small compared to the extent of alternative habitat in the locality (the area of Scolpaig Farm alone is approximately 276 ha) and the wider region, that is available to breeding and foraging birds. The scale of habitat loss is also small in comparison to the typical size of the breeding territories of the bird species potentially affected, especially given that any one territory would bear only a fraction of the habitat loss. For example, the individual breeding territories of oystercatcher, ringed plover, lapwing, dunlin and corncrake are each likely to cover several hectares.

Although, for the reasons explained above, habitat loss/change would not affect any breeding bird territory in its entirety, a number of territories are anticipated to experience small-scale changes to the nature and extent of their habitat. It is judged that the following species would be affected in this way:

- Lapwing, 2 pairs;
- Redshank, 2 pairs;
- Oystercatcher, 4 pairs;
- Corncrake, 1 calling male (presumed 1 pair);
- Skylark, 1 pair; and
- Starling, 2 pairs (nesting in outbuildings).

In a worst-case scenario, habitat loss/change could lead to the breeding failure of these pairs during the year of construction, for example due to the reduced availability of foraging and chick-rearing habitat within the territory. Following restoration, areas affected by short-term habitat alternation are expected to quickly recover (by the following year) their value to breeding birds. Given that the total area of permanent habitat change is only approximately 0.79 ha (i.e., a small fraction of the size of the territories of the birds potentially affected) and that this would be is spread across the Project site, the effect of habitat loss/change is not anticipated to have more than a negligible effect over the longer term.

The BBPP mitigation measures (ORN01) will prevent construction activities associated with habitat loss/change causing the direct destruction of nests and young. It should also be noted that the same breeding pairs that would experience habitat loss/change could also be potentially adversely affected by disturbance from construction activities (assessed below).

The areas of anticipated habitat loss and change are very small in comparison to the typical size of the foraging range of raptors and owls. For example, small birds of prey such as kestrel are likely to have hunting ranges of at least a hundred hectares, whilst the hunting ranges of eagle species are likely to extend of several thousand hectares. For this reason, habitat loss/change is predicted to have a negligible effect on the availability of hunting habitat for raptor and owl species.

It is judged that habitat loss/change due to the Project infrastructure is an adverse impact of **negligible** magnitude for some ornithological receptors, and will have no effect on others (Table 14-11).

Significance of residual effects

SPA qualifying interests

Habitat loss/change due to construction of development infrastructure is predicted to have no effects on the qualifying species or habitat of the designated sites assessed. The residual effects of habitat loss/change on these **very high** importance receptors are judged to be **negligible** adverse, and therefore considered **not significant**.

Breeding birds

The residual effects of habitat loss/change due to construction of development infrastructure are predicted to affect six breeding bird species and are judged to be of **negligible** magnitude (Table 14-11). These breeding bird receptors are categorised as **low** or **medium** importance. The residual effects of habitat loss/change due to construction of development infrastructure on these breeding bird receptors are judged to be **negligible** adverse and therefore considered **not significant** (Table 14-11).

Foraging birds

The residual effects of habitat loss/change due to construction of development infrastructure on foraging raptors and short-eared owl, all species categorised as **high** importance, are judged to be of **negligible** magnitude (Table 14-11). The residual effects of habitat loss/change due to construction on foraging raptors and short-eared owl is judged to be **negligible** adverse and therefore considered **not significant** (Table 14-11).

Roosting birds

The residual effects of habitat loss/change due to construction of development infrastructure on roosting raptors and European shag, species categorised as **high** or **medium** importance, would be of **negligible** magnitude (Table 14-11). The residual effects of habitat loss/change due to construction of development infrastructure on roosting birds are judged to be **negligible** adverse and therefore considered **not significant** (Table 14-11).

Table 14-11 Summary of significance of residual effects on bird species receptors from habitat loss/change due to construction of development infrastructure.

Species	Receptor Importance	Magnitude	Significance of residual effects	Beneficial / Adverse
White-tailed eagle (foraging)	High	Negligible	Negligible (not significant)	Adverse
Golden eagle (foraging)	High	Negligible	Negligible (not significant)	Adverse
Hen harrier (foraging)	High	Negligible	Negligible (not significant)	Adverse
Short-eared owl (foraging)	High	Negligible	Negligible (not significant)	Adverse
European shag (roosting/foraging)	Medium	No effect		No effect
Arctic tern (breeding)	Medium	No effect		No effect
Great northern diver (non-breeding)	Very high (SPA)	No effect		No effect
Common gull (breeding)	Medium	No effect		No effect
Lapwing (breeding)	Medium	Negligible	Negligible (not significant)	Adverse
Redshank (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Curlew (breeding)	Medium	No effect		No effect
Dunlin (breeding)	Low	No effect		No effect
Oystercatcher (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Ringed plover (breeding)	Medium	No effect		No effect
Barnacle goose (non-breeding)	Very high (SPA)	No effect		No effect
Whooper swan (non-breeding)	High	No effect		No effect
Wigeon (breeding)	Medium	No effect		No effect
Corncrake (breeding)	Medium	Negligible	Negligible (not significant)	Adverse
Skylark (breeding)	Low	Negligible	Negligible (not significant)	Adverse

Species	Receptor Importance	Magnitude	Significance of residual effects	Beneficial / Adverse
Starling (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Twite (breeding)	Low	No effect		No effect

14.11.2 Disturbance (noise and visual) due to construction activities

Impact overview (without mitigation)

Disturbance is likely to be highest during construction stage due to the increased activity of personnel and vehicles on-site, which can be an important source of potential disturbance. The on-site construction phase for the Project is expected to last approximately five months. There is uncertainty regarding the time of year construction would occur. Therefore, for the purposes of assessment, a worst-case is assumed in which construction could occur at any time of year. Noise and visual disturbance associated with construction activities could potentially disturb birds using the vicinity of the Project site (i.e., the rocket launch pad and hardstanding, Project building, access track, vehicle turning area and car park and temporary construction compound). The area over which construction activity disturbance could occur includes Scolpaig Bay, however birds using other parts of the coast and sea are likely to be too far away from construction activity to be affected.

Construction activity has potential to cause disturbance to breeding and non-breeding bird species. These include five common breeding wader species (categorised as low or medium importance), non-breeding barnacle geese (very high importance due to SPA connectivity, but present only irregularly) and non-breeding great-northern diver (very high importance due to SPA connectivity, but present only irregularly in Scolpaig Bay). The potential for disturbance to occur will vary between species according to each species' tolerance of human activity (see Table 14-14).

The consequences of disturbance will depend on the intensity, frequency, and duration of disturbance events, and the availability of suitable alternative nearby foraging and roosting habitat. Disturbance, if severe enough, can potentially displace birds from areas of habitat they would otherwise choose to use and is thus equivalent to habitat loss. However, some displaced birds may be able to successfully relocate to alternative habitat elsewhere. Disturbance can also affect time and energy budgets of birds, potentially leading to reduced feeding and breeding success. Birds subject to disturbance may have reduced foraging success or be displaced to less favourable foraging habitat, either of which could reduce their survival prospects. Breeding birds subject to disturbance by construction activities could experience reduced breeding success, for example caused by the chilling, abandonment or predation of eggs and chicks leading to breeding attempt failure.

Mitigation

If construction work occurs within the April to August period it could cause disturbance of birds breeding within the vicinity of the Project site. In this case a Breeding Bird Protection Plan (BBPP) will be implemented (ORN01). The mitigation measures set out in the BBPP would ensure compliance with legislation designed to protect breeding birds and their eggs, young and nest sites. The Wildlife and Countryside Act 1981 (As amended) (WCA) prohibits disturbance of species listed on Schedule 1 when they are breeding, therefore the BBPP will include measures to ensure that no breeding Schedule 1 species are disturbed. Bird species not listed on Schedule 1 receive general protection under the WCA including the prohibition of the destruction or harm of adults, young, eggs and active nests, and any actions that would prevent adult birds from accessing their nests or young.

Where construction works affecting areas that could be used by breeding birds must take place between April and August (inclusive), the Construction Environmental Manager will organise for an appropriate breeding bird survey to be undertaken ahead of works commencing to identify specific sensitivities including nest sites. If any breeding Schedule 1 birds were to be found, potentially disturbing activities would be suspended within an appropriate cordon (dependent on the location of the birds and the species involved, to be agreed with NatureScot). The BBPP will also include measures to ensure the safeguarding of the active nests of all other bird species.

Based on the results of baseline surveys (see Appendix 14-1: Ornithology Technical Report), corncrake is the only Schedule 1 species recorded breeding within close proximity to the Project site, and therefore considered likely to be at potential risk from construction activities. Anecdotal information suggests that corncrakes probably have relatively high proximity tolerance to human activity, for example in the Hebrides they commonly breed in gardens and around croft buildings. However, due to the difficulty of observing them directly, there is a lack quantitative of information regarding how they respond to disturbance. Corncrake nests are potentially vulnerable to destruction by trampling and construction machinery. Typically, corncrake nests are in areas of tall grass and herbage and are very well hidden. To avoid the possibility of corncrake nest destruction, in advance of any works scheduled to occur during the breeding season (April to August, inclusive), vegetation within 10 m of the areas potentially directly affected by construction will be kept short (<10 cm) by regular mowing, to ensure it is not suitable for nesting corncrakes (ORN02).

Assessment of residual effects

Magnitude of impact

SPA qualifying interests

Construction activities could potentially disturb birds foraging within the vicinity of the construction works, either on the land or the nearby coastal waters (Scolpaig Bay), potentially at a distance of up to a few hundred metres from the source. Barnacle geese (qualifying interest of North Uist Machair and Islands SPA) that occasionally forage on the short-sward grassland in the vicinity of the Project site and the very low numbers of great northern diver (qualifying interest of West Coast of the Outer Hebrides SPA) that occasionally forage in Scolpaig Bay could be temporarily displaced, at least during times of the day that construction work is occurring. Disturbance impacts would be temporary, but would last for the duration of the works (approximately five months) and thus affect one non-breeding season period only. The area potentially affected by construction disturbance would be a very small fraction (well below 0.1%) of the extensive areas of alternative foraging habitat available, both inside these designated sites and locally elsewhere. It is concluded that the potential for construction activity to cause disturbance to these qualifying species and reduce foraging success of affected individuals is negligible. Construction disturbance is judged to be an effect of **negligible** magnitude on all SPA qualifying interests.

Breeding birds

Construction disturbance impacts would be temporary but would last for the duration of the works, potentially affecting one breeding season. It is therefore categorised as a short-term effect. Although birds breeding within up to a few hundred meters of the Project activities may show a disturbance response, in most cases the response is likely to be temporary and inconsequential. The worst-case response is that some birds could experience reduced breeding or feeding success or be displaced to alternative areas where some may not be able to breed successfully.

The identification of the breeding birds could experience disturbance from construction activity and the assumed proportion that would be displaced is informed by published literature (Ruddock and Whitfield, 2007; Whitfield *et al.*, 2008; Goodship and Furness, 2019) and expert judgement (Table 14-12 and Table 14-13).

The peak number of Schedule 1 raptor species (white-tailed eagle, golden eagle and hen harrier) recorded nesting within the nest-site disturbance distance for each species is shown in Table 14-12. It is not likely that construction activities

would cause disturbance of nesting pairs of these species as there are no known previous nests sites of these species (see Appendix 14-2: Ornithology Confidential Annex) within the distance at which these they are considered to be vulnerable to disturbance (Ruddock and Whitfield, 2007) (Table 14-12).

The maximum disturbance distance at which activity is considered likely to cause disturbance of breeding short-eared owl is between 300 and 500 m (Ruddock and Whitfield, 2007). During the years covered by the baseline survey one pair of short-eared owl possibly nested within 300 – 500 m of the Project site, however searches failed to locate a nest site; mostly likely the nest was greater than 500 m from the closest location that would be affected by construction activity. It is therefore not considered likely that construction activity would result in the disturbance of nesting short-eared owl.

Table 14-12 Peak numbers of raptor species and short-eared owl recorded breeding within the disturbance distance determined by Ruddock & Whitfield (2007)

Species	Disturbance distance (Ruddock & Whitfield, 2007)	Peak number of breeding pairs (or roosting individuals) within the construction area buffered by maximum disturbance distance
White-tailed eagle	Up to 50 – 500 m	0
Golden eagle	Up to 750 – 1,000 m	0
Hen harrier	Up to 500 – 750 m	0
Short-eared owl	Up to 300 – 500 m	1 pair possibly nested between 300 and 500m of Scolpaig track, more likely it nested >500 m away.

During the baseline survey, it was observed that the non-breeding whooper swan pair that 'summered' at Loch Scolpaig in 2019 showed either no response, or only a minor response (slowly swam away from the track) to pedestrians using the Scolpaig track. It is therefore likely that any non-breeding whooper swans using Loch Scolpaig would show only a minor disturbance response to construction activity.

For assessment purposes, the maximum distance from construction activity at which it is assumed disturbance to tern, gull and wader species would occur is based on a cautious interpretation of the flight initiation distances for breeding birds reported by Goodship and Furness (2019) (Table 14-13). Goodship and Furness (2019) review the disturbance response of birds to human activity in terms of a flight initiation distance (FID) and Minimum Approach Distance (MAD) for a range of breeding and non-breeding bird species. MAD is defined as the distance at which humans should be separated from wildlife to avoid any disturbance to the behaviour (including alert response or flight initiation) of the wildlife (Livezey *et al.*, 2016). MAD is considered to be more relevant to this assessment than FID, however, estimates of MAD are not reported by Goodship and Furness for all species. No published information was found on disturbance distances for breeding wigeon, corncrake and passerine species. Therefore, disturbance distances assumed for these species is based on professional judgement, taking into consideration the known behavioural ecology of these species and observations of their responses to human activity at Scolpaig (Table 14-13).

For the purposes of assessment, it is assumed that the worst-case consequence of construction disturbance is that breeding pairs with a notional territory centre within the assumed disturbance distance of construction activity would be displaced and would not be able to breed successfully (Table 14-13). The disturbance distances used to determine the

worst-case number of breeding pairs of a species that would be affected by construction disturbance are shown in Table 14-13.

It is considered that the worst-case described above is highly precautionary. For example, experience at the MOD Hebrides Range on South Uist shows that most of the breeding species potentially affected by construction disturbance at the Project site can successfully breed in close proximity (including inside fenced operational work compounds) to routine military activities associated with the practice firing of anti-aircraft missiles and crofting activities. Starling and corncrake commonly successfully breed in areas with moderate to high levels of human activity (such as around houses and crofts). Thus, for these species it is likely that fewer birds would be adversely affected by construction disturbance than cautiously predicted in Table 14-13.

Table 14-13 The number of breeding pairs assumed to be at risk from disturbance effects from construction activities (based on proximity of notional territory centres or nest sites). Disturbance distances reported by Goodship & Furness (2019) are also shown.

Species	Disturbance distance assumed for impact assessment	Peak number of pairs at risk of disturbance	Reported Disturbance Distance (Goodship & Furness, 2019)	Comment on Disturbance distance
Arctic tern	250 m	0	200 m	Minimum approach distance
Common gull	200 m	2	60 m	Flight initiation distance
Lapwing	200 m	9	41 m	Flight initiation distance
Redshank	200 m	6	55 m	Minimum approach distance
Curlew	200 m	1	63 m	Flight initiation distance
Dunlin	200 m	1	90 m	Minimum approach distance (for non-breeding birds)
Oystercatcher	200 m	12	85 m	Minimum approach distance
Ringed plover	200 m	1	77 m	Minimum approach distance
Wigeon	250 m	1	Not reported	Minimum approach distance likely to be <200m. Birds breeding on Loch Scolpaig known to tolerate pedestrians using the Scolpaig track (approx. 200 m away)

Species	Disturbance distance assumed for impact assessment	Peak number of pairs at risk of disturbance	Reported Disturbance Distance (Goodship & Furness, 2019)	Comment on Disturbance distance
Corncrake	100 m	Up to 2 without mitigation, or 0 with Mitigation ORN03, which will mean there is no habitat suitable for corncrake close to construction activities (suitable habitat will be provided elsewhere)	Not reported	Based on survey experience, Minimum Approach Distance likely to be <50m. Corncrake commonly choose to breed in gardens and around farm buildings.
Skylark	100 m	2	Not reported	Based on survey experience, MAD likely to be <50m
Starling	100 m	5	Not reported	Based on survey experience, Minimum Approach Distance likely to be <50m. This species commonly chooses to breed in buildings and stone walls.
Twite	100 m	0	Not reported	Based on survey experience, Minimum Approach Distance likely to be <50m

Based on the disturbance distance assumptions described above and the number of territories predicted to be at risk of disturbance (see Table 14-13), it is predicted that the number of breeding pairs which could experience breeding failure as a consequence of disturbance and using what are considered to be worst realistic case assumptions from Project construction activities would be as follows:

- Common gull, 2 pairs;
- Lapwing, 9 pairs;
- Redshank, 6 pairs;
- Curlew, 1 pair;
- Dunlin, 1 pair;
- Oystercatcher, 12 pairs;
- Ringed plover, 1 pair;
- Wigeon, 1 pair;
- Corncrake, up to two calling males (presumed 2 pairs), reducing to zero due with mitigation;
- Skylark, 2 pairs;
- Starling, 5 pairs;

Although on the basis of the baseline survey results up to two corncrake territories are identified as potentially at risk of disturbance from construction activities, disturbance will be avoided by mitigation measures ORN01 and ORN03. Therefore, there will be no impact and no effect on breeding corncrake due to construction disturbance.

For the breeding wigeon receptor, in recognition that the single breeding pair predicted to be potentially adversely affected is likely to represent at least 1% of the regional population, it is judged that construction disturbance is categorised as **low** in magnitude.

For all other breeding species identified as being at risk, the number of territories predicted to be affected by construction disturbance is well below 1 % of the regional receptor population. Therefore, for these species, the impact of construction disturbance on their regional population receptors, both in terms of the number affected and the potential for breeding success change, is judged to be an effect of **negligible** magnitude.

Foraging birds

Construction activities could potentially disturb birds foraging within the vicinity of the construction works. Any foraging birds (e.g., raptors and short-eared owl), could be temporarily displaced from foraging habitat in the vicinity of the construction works, at least during times of the day that construction work is occurring. However, in all cases the species potentially affected have large foraging ranges, the area affected by construction disturbance is likely to be a relatively small fraction of the regular foraging range and there are very extensive areas of alternative foraging habitat available locally. It is therefore concluded that the potential for disturbance to lead to reduced foraging success for the affected birds is negligible. Construction disturbance is judged to be an effect of **negligible** magnitude on all foraging raptors and short-eared owl.

Roosting birds

Baseline surveys located no roost sites of raptors or seabirds within 500 m of the construction works. Therefore, the potential for construction activity to cause disturbance of such roost sites is considered to be **negligible**.

Significance of residual effects

A summary of the likely residual effects of construction disturbance on the ornithological receptors is shown in Table 14-14.

Implementation of the mitigation measures ORN01 and ORN02 (see Table 14-10) will ensure that there are no likely significant residual effects on breeding birds as a result of disturbance (noise and visual) due to the construction works.

SPA qualifying interests

The residual effects of construction disturbance on foraging great northern diver and barnacle goose would be of **negligible** magnitude. These species are categorised as **very high** importance on account of high connectivity to North Uist Machair and Islands SPA and West Coast of the Outer Hebrides SPA respectively, where they are a qualifying interest. The significance of any residual effects of operational disturbance on these species is therefore considered **negligible** adverse and therefore considered **not significant**.

Breeding birds

Disturbance of Schedule 1 breeding species due to construction activities will be avoided by implementation of mitigation measures ORN01, ORN02 and ORN06 (see Table 14-10). In particular, there will be no impact and no effect on breeding corncrake as a result of construction disturbance.

The residual effects of construction disturbance on breeding wigeon are judged to be of low magnitude (see Table 1 17). Breeding wigeon are categorised as having medium importance (Table 1 14). The residual effects of construction disturbance on the breeding wigeon receptor are judged to be minor adverse and therefore considered not significant (Table 1 14).

For all other breeding bird receptors identified at risk, the residual effects of construction disturbance are judged to be of **negligible** magnitude (Table 14-14). These breeding bird receptors are categorised as **low** or **medium** importance. The residual effects of construction disturbance on all breeding bird receptors except wigeon are judged to be **negligible** adverse and therefore considered **not significant** (Table 14-14).

Foraging birds

The residual effects of construction disturbance on foraging raptors and short-eared owl, all species categorised as **high** importance, would be of **negligible** magnitude (Table 14-14). The residual effects of construction disturbance on foraging raptors and short-eared owl are judged to be **negligible** adverse and therefore considered **not significant** (Table 14-14).

Roosting birds

The residual effects of construction disturbance on roosting raptors and European shag, species categorised as **high** or **medium** importance, would be of **negligible** magnitude (Table 14-14). The residual effects of construction disturbance on roosting birds are judged to be **negligible** adverse and therefore considered **not significant** (Table 14-14).

Table 14-14 Summary of effects on bird species receptors due to construction disturbance

Species	Receptor Importance	Magnitude	Significance of residual effects	Beneficial / Adverse
White-tailed eagle (foraging)	High	Negligible	Negligible (not significant)	Adverse
Golden eagle (foraging)	High	Negligible	Negligible (not significant)	Adverse
Hen harrier (foraging)	High	Negligible	Negligible (not significant)	Adverse
Short-eared owl (foraging)	High	Negligible	Negligible (not significant)	Adverse
Great northern diver (non-breeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
European shag (roosting/foraging)	Medium	Negligible	Negligible (not significant)	Adverse
Arctic tern (breeding)	Medium	Negligible	Negligible (not significant)	Adverse
Common gull (breeding)	Medium	Negligible	Negligible (not significant)	Adverse
Lapwing (breeding)	Medium	Negligible	Negligible (not significant)	Adverse
Curlew	Medium	Negligible	Negligible (not significant)	Adverse

Species	Receptor Importance	Magnitude	Significance of residual effects	Beneficial / Adverse
(breeding)				
Redshank (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Dunlin (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Oystercatcher (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Ringed plover (breeding)	Medium	Negligible	Negligible (not significant)	Adverse
Barnacle goose (non-breeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Whooper swan (non-breeding)	High	Negligible	Negligible (not significant)	Adverse
Wigeon (breeding)	Medium	Low	Minor (not significant)	Adverse
Corncrake (breeding)	Medium	No effect		No effect
Skylark (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Starling (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Twite (breeding)	Low	Negligible	Negligible (not significant)	Adverse

14.11.3 Visual and noise disturbance during site launch preparations and demobilisation

Impact overview (without mitigation)

Launch preparation and demobilisation activities could potentially disturb breeding, foraging or roosting birds within the vicinity of the Project site. For example, disturbances from on-site activity by site personnel and vehicles before and after launch events, and from other maintenance activities. These activities could potentially disturb birds up to a few hundred meters from the launch site (i.e., the launch pad, fenced compound and buildings).

Mitigation

A number of general best practice mitigation measures will be implemented to ensure that the effects of operational disturbance from increased activity of personnel and vehicles on-site are reduced (Table 14-10). Disturbance from vehicle traffic associated with operation and maintenance activities will be reduced by adherence to a 10 mph speed limit within the site (ORN06). Disturbance from site personnel during operation and maintenance activities will be reduced with appropriate signage site to alert site personnel and visitors to the presence of breeding birds (ORN06), and guidance around avoiding disturbance within sensitive areas during the breeding season (April to August).

The potential for operational activities in the vicinity of the launch site to disturb breeding corncrake will be prevented by managing vegetation within approximately 150 m of the launch pad so that it is unattractive to corncrake (ORN04). This mitigation measure is designed to prevent LV launch noise (and other operational activities) having an adverse effect on corncrake; it is discussed in full in Section 14.11.4.

Assessment of Residual Effects

Magnitude of impact

The potential for birds to show a disturbance response to site launch preparations, demobilisation and other maintenance activities is similar to the construction phase, however potential disturbance sources will be limited to the presence of site personnel and vehicle activity. The source of disturbance will be more geographically restricted than during the construction phase (limited to the immediate vicinity of the launch site and vehicle access areas), and events will be of shorter duration but will occur at irregular intervals throughout the duration of the operational phase. To estimate the magnitude of the disturbance impact from these operation and maintenance activities, the species-specific disturbance distances and assumed behavioural response by birds used previously for the assessment of construction disturbance (Section 14.11.2) are assumed to be equally appropriate.

The duration of site launch preparation activities before a launch and demobilisation activities following a launch could last from several days up to a maximum of two weeks duration. Site mobilisation will require the delivery of up to a maximum of 15 units including fuelling systems, staff and welfare units, shipping containers, launch vehicle and tower however it is likely that many of the deliveries will be combined. Daily personnel movements during the launch campaign are expected to be restricted to a small number of standard vehicles or Light Goods Vehicles each day. Traffic movements at other times will be limited to occasional visits to carry out maintenance activities.

Based on the same assumptions used for estimating the magnitude of construction disturbance, it is predicted that the number of breeding pairs which could experience breeding failure as a consequence of disturbance by launch event preparation and launch event demobilisation activities (excluding disturbance from rocket launch events) would be as follows:

- Lapwing, 2 pairs;
- Redshank, 2 pairs;
- Dunlin, 1 pair;
- Oystercatcher, 4 pairs;
- Ringed plover, 1 pair;
- Corncrake, up to two calling males (presumed 2 pairs), reducing to zero due with mitigation;
- Skylark, 2 pairs;
- Starling, 5 pairs.

The predicted numbers of pairs identified as at potential risk from disturbance (listed above) is based on the proximity of territories recorded in the baseline survey to the launch site. It does not take into consideration the potential for birds to habituate to low-level operation and maintenance activities, something that would reduce the potential for adverse disturbance. Experience from other sites in the Outer Hebrides, for example the MOD Hebrides Range on South Uist, shows that many of these species can habituate to disturbance (especially vehicle movements) and successfully breed despite regular human activity occurring close by. For example, ringed plover, oystercatcher and starling will successfully nest in vehicle parking area inside fenced compounds.

Up to two corncrake territories are identified as potentially at risk of disturbance from construction activities, disturbance would be avoided.

Although on the basis of the baseline survey results up to two corncrake territories are identified as potentially at risk of disturbance from launch event preparation / demobilisation activities, disturbance will be avoided by implementation of corncrake mitigation measure (ORN04).

Significance of Residual Effects

SPA qualifying interests

The residual effects of operational disturbance during site launch preparations and demobilisation on foraging great northern diver and barnacle goose would be of **negligible** magnitude. These species are categorised as **very high** importance on account of high connectivity to North Uist Machair and Islands SPA and West Coast of the Outer Hebrides SPA respectively, where they are a qualifying interest. The significance of any residual effects of operational disturbance during site launch preparations and demobilisation on these species is therefore considered **negligible** adverse and therefore considered **not significant**.

Breeding birds

With the exception of wigeon, the residual effects of operational disturbance during site launch preparations and demobilisation on breeding birds are judged to be of **negligible** magnitude. These breeding bird receptors are categorised as **low** or **medium** importance. The residual effects of operational disturbance during site launch preparations and demobilisation on all breeding bird receptors except wigeon are judged to be **negligible** adverse and therefore considered **not significant**.

The residual effects of operational disturbance during site launch preparations and demobilisation on breeding wigeon are judged to be of **low** magnitude. Breeding wigeon are categorised as having **medium** importance. The residual effects of operational disturbance during site launch preparations and demobilisation on the breeding wigeon receptor is judged to be **minor** adverse and therefore considered **not significant.**

Were the mitigation measures designed to prevent operational disturbance to breeding corncrake (ORN04) not successful, the effects of operational disturbance during site launch preparations and demobilisation on the breeding corncrake receptor would be judged to be **minor** adverse and therefore considered **not significant**.

Foraging birds

The residual effects of operational disturbance during site launch preparations and demobilisation on foraging raptors and short-eared owl, all species categorised as **high** importance, would be of **negligible** magnitude. The residual effects of operational disturbance during site launch preparations and demobilisation on foraging raptors and short-eared owl is judged to be **negligible** adverse and therefore considered **not significant**

Roosting birds

The residual effects of operational disturbance during site launch preparations and demobilisation on roosting raptors and European shag, species categorised as **high** or **medium** importance, would be of **negligible** magnitude. The residual effects of operational disturbance during site launch preparations and demobilisation on roosting birds are judged to be **negligible** adverse and therefore considered **not significant**

14.11.4 Acoustic disturbance generated from launch events

Impact overview (without mitigation)

A maximum of ten LV launches are expected a year and noise from launches could potentially disturb breeding, foraging or roosting birds in the vicinity of the development and the launch trajectory. Acoustic disturbance directly associated with the launch event comprises:

- LV powered phase: primarily from the effects of loud and relatively sudden noise (and also through associated visual disturbance); and
- Sonic boom: for some specifications of LV, it is possible that the second stage would reach supersonic speeds during descent therefore generating an audible sonic boom at some offshore locations.

Noise Propagation

Loudness of a noise, and by implication the potential effects on birds, reduces with distance from the sound source in accordance with an inverse square relationship. This means that noise levels dissipate relatively quickly with increasing distance, for example if distance from the source is halved, the noise level would be expected to reduce to one quarter. Similarly, the way that a noise propagates from a source is also affected by atmospheric conditions, particularly wind. In the case of the rocket launches, the trajectory of the rocket also needs to be taken into consideration.

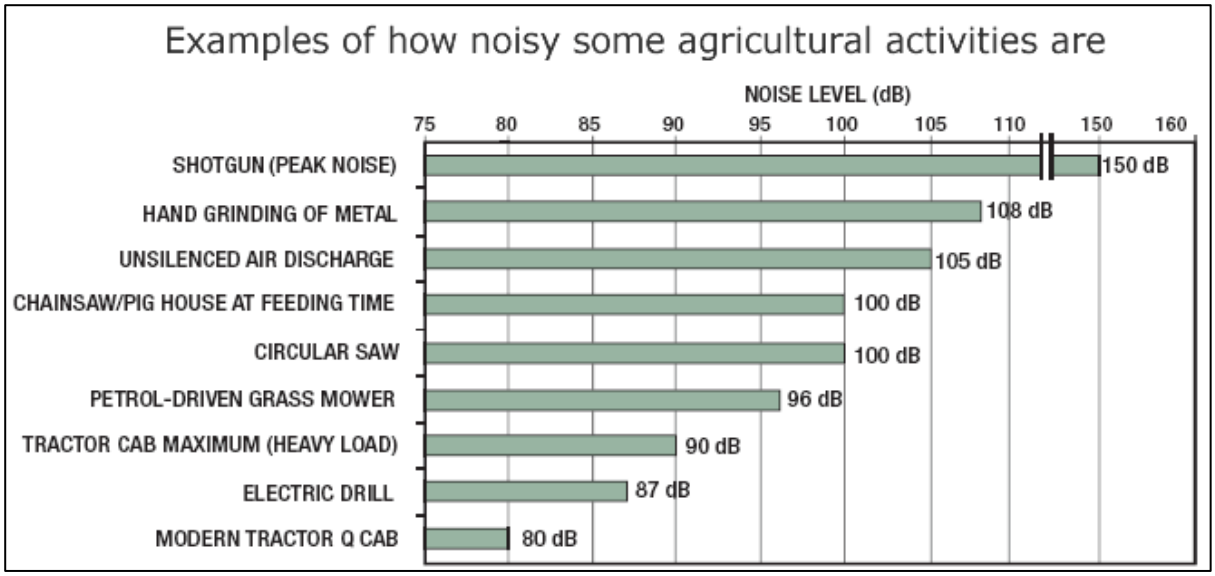
Noise level context

Wild birds may experience a range of loud noises in the environment. Under baseline conditions, the proposed project site has a low incidence of anthropogenic noise, for example from agricultural vehicles, occasional passing aircraft and occasional sports shooting outside the breeding season. At a wider scale, birds experience noise from ground-launched missile firings from the MOD Hebrides Range on South Uist and from Joint Warrior military exercises held biannually in the Western Isles and which generate noise from ships and low-flying aircraft such as helicopters and fighter jets. At times there will also be relatively high levels of background natural noise caused by wind and breaking waves. Many of the birds using the Project site also spend time at other sites, both within the Western Isles and further afield, where they may experience a range of loud noises, some examples of which are:

- Thunder, 120 – 130 dB at source;
- Auditory bird scaring gas gun, 130-150 dB;
- Fireworks, legal limit 120 dB;
- Low flying jet aircraft, 110-130 dB;
- Helicopter, 100 dB;
- Large breaking waves, 80 dB.

Additional examples of the typical loudness of agricultural noises that birds may encounter is shown in the Image 14.1.

Image 14.1 Examples of noise levels from agricultural activities[4]



Responses by birds to noise

The potential for noise to affect wild birds depends on other factors besides its loudness, in particular sound pitch (low to high), constancy, duration, frequency of occurrence and whether it occurs suddenly (e.g., an explosion) or builds gradually (e.g., an approaching vehicle). Very loud noises can potentially cause temporary or permanent damage to hearing. However, the predicted noise levels of the LV launch events and from any subsequent sonic boom from the descent of particular specifications of 2-stage LVs are well below the threshold noise level (approximately 140 dB) at which hearing damage is known to occur in birds (Hashino *et al.*, 1988; Dooling and Popper, 2007). Therefore, the assessment of the effects of LV launch noise and sonic boom is limited to considering the behavioural response that birds may make.

The consequences of disturbance will depend on the intensity, frequency, and duration of disturbance events, and the availability of suitable alternative nearby foraging and roosting habitat. The potential for birds to be affected by noise can be modulated by the extent to which individuals may have habituated to a particular type of noise. Noise disturbance, if severe enough, can potentially displace birds from areas of habitat they would otherwise choose to use and is equivalent to habitat loss. However, some displaced birds may be able to successfully relocate to alternative habitat elsewhere. Noise disturbance can also affect time and energy budgets of birds, potentially leading to reduced feeding and breeding success. Birds subject to disturbance may have reduced foraging success or be displaced to less favourable foraging habitat, either of which could reduce their survival prospects. Breeding birds subject to noise disturbance could experience reduced breeding success, for example caused by the chilling, abandonment or predation of eggs and chicks leading to breeding attempt failure.

There are numerous studies on how birds respond to aircraft noise, including sonic booms. Generally, these studies show that birds have a high tolerance to aircraft noise (e.g., Ellis *et al.*, 1991; Manci *et al.*, 1988; Grubb and King, 1991; Kushlan, 1979; Kuehne *et al.*, 2020). A study into the effects of overflying jets (to within 150 m of active nests) and simulated sonic boom on eight species of nesting raptors concluded that jet passes and sonic booms often caused noticeable alarm, including birds taking flight and occasionally leaving the nest site (Ellis *et al.*, 1991). However, significant negative responses were rare, and these responses did not appear to limit productivity or the return of adults

[4] From https://www.hse.gov.uk/agriculture/topics/noise.htm#noise-action, (accessed Nov 2021)

to nest sites the following year (Ellis *et al.*, 1991). Peak aircraft sound level experienced by the birds in this study varied according to how close aircraft approached their nest; for the main aircraft type sound levels were approximately 110 dB at 61 m away and approximately 100 dB at 152 m away. Similarly, peak simulated sonic boom levels (using a propane canon) were 126-134 dB at 100 m away and 98-103 dB at 1.1 km away. Experimental playback of aircraft noise at a crested tern colony in Australia showed that at decibel levels of between 90 dB and 95 dB (the loudest noise playback scenarios presented), between 10 % and 20 % of individuals in the colony showed a startle (stood up and raised wings) or escape fight response (Brown, 1990). At the lower playback noise levels presented (65 dB to 85 dB) birds rarely showed more than scanning behaviour or increased levels of alertness (Brown, 1990).

Mitigation

Due to the nature of the rocket noise source, there are no physical mitigation measures available that would reduce the level of noise associated with rocket launch events or sonic boom. However operational mitigations have been developed to reduce the impact of launch noise generation.

On planned launch days, mitigation measure ORN04 would be deployed to reduce the potential for birds to experience very loud noise from rocket launches. Immediately prior to launching, a visual examination of the vicinity of the launch area (approximately 150 m radius around launch pad) will be made to check that no birds are present. If birds are present, low-intensity scaring methods such as a person walking through the 150 m zone would be deployed to clear the area of birds so that at the time of launch no birds are present.

Unlike the other bird species that may use the close vicinity of the launch pad, corncrakes are difficult to see on account of their skulking behaviour, their activities being concealed from view by the vegetation. Therefore, the visual bird checks of the vicinity of the launch pad immediately prior to a rocket launch event described above (ORN04) would not guarantee there were no corncrakes present. If any corncrakes were present close to the launch site, as a Schedule 1 species, any disturbance to encourage them to temporarily move further away whilst a rocket launch took place would contravene the Wildlife and Countryside Act 1981 (as amended). Therefore, additional mitigation is proposed for corncrake (ORN04) that is designed to prevent this species potentially being exposed to peak launch noise levels in excess of 115 dB. This will be achieved by creating a 'corncrake disturbance prevention zone' comprising an area around the launch pad that has no suitable vegetation for corncrake. The limits of this area would be defined by the modelled worst-case peak noise contour for 115 dB; this approximates to a circle with a radius of 150 m centred on the launch pad. Corncrakes only frequent areas that have relatively tall grass and rank herbage, typically of at least 20 cm height. Therefore, by manipulating vegetation height, it is relatively straightforward to deter corncrake from using a particular area. Vegetation control would be achieved by a programme of regular mowing to maintain a vegetation sward height of below 10 cm through the corncrake breeding season (April – August, inclusive).

The opportunity to manage grassland habitat (under the COM01) at Scolpaig Farm to benefit corncrakes has been identified as having potential to deliver significant conservation gains for this species. The potential for such management is limited to those parts of Scolpaig Farm that have suitable grassland pasture, and these are restricted to the areas within approximately 400 m of Scolpaig Farm and some smaller areas further east adjacent to Scolpaig track. The scale of the 'corncrake disturbance prevention zone' described above (approximately a circle of 150 m radius) is designed to be large enough to prevent corncrakes experiencing rocket launch noise above 115 dB, yet not so large as to significantly compromise the potential for corncrake habitat creation elsewhere at Scolpaig Farm. NatureScot was consulted with regard to the size of the proposed 'corncrake disturbance prevention zone'. In recognition of the uncertainty regarding corncrake response to launch noise it is proposed that evidence is collected on the response of corncrakes to rocket launches and the size of the 'disturbance prevention zone' is periodically reviewed in light of this evidence. The response of corncrakes to rocket launch could be examined by comparing the number and distribution of calling male corncrakes at Scolpaig in the week before a launch event occurs with the number and distribution of calling

males in the week following a launch event. It would also be possible to monitor the response using more sophisticated methods such as radio-telemetry, though this would involve catching and tagging birds.

Assessment of residual effects

Magnitude of impact

Launch noise levels and assessment assumptions

Noise modelling for the worst case (i.e., loudest) rocket design predicts that birds that are within an approximate circle with a radius of 150 m centred on the launch pad would experience noise levels in excess of 115 dB. 115 dB, is well below the threshold noise level (approximately 140 dB) at which hearing damage is known to occur in birds (Hashino *et al.*, 1988; Dooling and Popper, 2007).

The results of modelled noise predictions based on the worst-case scenario (in terms of acoustic outputs) of a launch event are summarised in Chapter 19: Noise and Vibration and presented in Appendix 19-1: Noise Technical Report. The predicted peak launch noise level contours are shown in Figure 2 in Appendix 19-1: Noise Technical Report. The modelled noise contours centred on the launch site indicate that the peak noise levels >115 dB would occur at distances up to approximately 150 m from the launch pad. The duration of loud noise associated with LV launches will vary according to the type of LV design used. The worst-case specification for noise generation is a LV powered phase of up to 120 s, however the launch noise will not be audible for the whole of this time. Peak-noise levels experienced at ground level show a pattern of rapid fall-off with increasing distance from the launch pad (Figure 2 in Appendix 19-1: Noise Technical Report).

LV launches would be relatively infrequent events that could occur at any time of year. A maximum of ten rocket launches would occur each year, with the possibility that all of these could occur during the breeding season period. Noise from the rocket launch could result in immediate adverse effects to breeding birds such as eliciting flight escape responses which although short-lived could result in adverse effects such as nest abandonment, increased predation risk of eggs or young which ultimately can result in reduced breeding success. However, it is unlikely that the disturbance would be frequent enough to cause permanent displacement from the area.

The assumed responses of ornithological receptors to the noise from rocket launches are shown in Table 14-15. The behavioural responses described in Table 14-15 are based on published literature of studies of wild birds to various sources of anthropogenic noise, and expert judgement. The lack of empirical evidence from studies on how birds respond to rocket launch events means there is inevitably some uncertainty regarding how birds will actually respond; this uncertainty is taken into account by using assumptions that are considered to be conservative, therefore, these assumed responses are likely to be precautionary.

For the purposes of this assessment, it is assumed that birds with breeding territory centres in the areas where peak rocket noise levels exceed 110 dB would fail to breed successfully. It is also assumed that half of the pairs with breeding territory centres in areas experiencing between 110 dB and 105 dB peak rocket noise levels would fail to breed successfully (Table 14-15). It is further assumed that although birds with territory centres experiencing lower peak noise levels may show a short duration behavioural response to the rocket noise, this would not have any adverse consequence, for example permanent displacement or reduced breeding success (Table 14-15).

It is considered that the above assumptions are likely to be precautionary, though it is acknowledged that there is a paucity of empirical evidence of how breeding birds respond to rocket launches, particularly in Scotland. Breeding wader survey information from the MOD Hebrides Range on South Uist shows that breeding waders appear to have a relatively high tolerance to the loud, short duration noise created by missile firings, with suitable habitat in the vicinity of launch holding good densities of successfully breeding individuals (personal observation; Jackson, 1988; Jackson *et al.*, 2004).

It is also worth considering the general view of regulators. NatureScot, in their consultation response of 12/03/2020 to the proposed Sutherland Space Hub (a consented rocket launch facility in northern Scotland based on orbital launches), located in close proximity to the Caithness and Sutherland Peatlands SPA, stated:

> *"From our own experience of blasting for construction and from military jets, it appears that sudden, loud noise events have short term effects and do not appear to result in the permanent displacement of breeding birds. Therefore, our advice is that there is no basis for concluding adverse impact from the launches themselves".*

Similarly, an assessment by NASA (NASA, 2011) on the biological impacts of space rocket launches on wildlife in the eastern USA concludes the following:

> *"Disturbance to wildlife from launches would be brief and is not expected to have lasting impact or a measurable negative effect on migratory bird populations. No evidence has indicated that serious injuries to wildlife have resulted from prior launches in the region, and no long-term adverse effects are anticipated. The brief noise peaks that would be produced by launch are comparable to the levels produced by close-range thunder (120 to 140 dB peak)."*

Table 14-15 The assumed response of ornithological receptors to rocket launch noise in zones of peak noise level around the launch pad

Peak decibels range (dB)	Approx. distance range from launch pad[5]	Assumed likely response by birds	Assumed consequence
>115	0 - 150 m	All individuals likely to show a flight escape response, leaving nest or young, and remaining air-borne for at least duration that noise exceeds stated level, before slowly re-settling with an extended alert period before re-settling. Some individuals may show permanent displacement. Foraging birds (e.g., raptors, geese and divers) likely to temporarily relocate to an alternative foraging area. Habituation not likely with repeated regular exposure.	No effect on mortality rate. Potential for major reduction in breeding success and a temporary negligible reduction in foraging activity. For purposes of assessment, it is assumed that the breeding pairs with territory centres in the zone are displaced elsewhere but fail to reproduce successfully.
115 – 110	150 – 300 m	All individuals likely to show a flight escape response, leaving nest or young, and remaining air-borne for at least duration that noise exceeds stated level, before slowly re-settling with an extended alert period before re-settling. No individuals likely to show permanent displacement. Foraging birds (e.g., raptors, geese and divers) likely to temporarily relocate to an alternative foraging area. Partial habituation likely with repeated regular exposure.	No effect on mortality rate. Breeding birds are not displaced from their territory but potential for major reduction in breeding success and a temporary negligible reduction in foraging activity. For purposes of assessment, it is cautiously assumed that the breeding pairs with territory

[5] Noise modelling predicts that noise exceedance contours only approximate to concentric rings around launch pad, see Figure 2 in Appendix 19-1: Noise Technical Report.

Peak decibels range (dB)	Approx. distance range from launch pad[5]	Assumed likely response by birds	Assumed consequence
			centres in the zone fail to reproduce.
110 - 105	300 – 500 m	Most individuals likely to show a flight escape response, leaving nest or young, and remaining air-borne for duration that noise exceeds stated level, before quickly re-settling and resuming their original behaviour. Foraging birds (e.g., raptors, geese and divers) likely to temporarily relocate to an alternative foraging area. Partial habituation likely with repeated regular exposure.	No effect on mortality rate. Breeding birds are not displaced from their territory but potential for minor reduction in breeding success and a temporary negligible reduction in foraging activity. For purposes of assessment, it is cautiously assumed that half of the pairs with territory centres in the zone fail to reproduce.
105 - 95	500 - 1100 m	Most individuals may show alert behaviour or scanning response for duration that noise exceeds stated level but few if any birds take flight, birds then quickly resume their original behaviour. Foraging birds (e.g., raptors, geese and divers) likely to temporarily relocate to an alternative foraging area. Partial habituation likely with repeated regular exposure.	For purposes of assessment, it is assumed there is effectively no change to baseline conditions.
95 - 90	1100 -1600 m	Some individuals may show alert behaviour or scanning response for duration that noise exceeds stated level but not likely to take flight. Birds then quickly resume their original behaviour. Some foraging birds (e.g. raptors, geese and divers) likely to temporarily relocate to an alternative foraging area. Partial habituation likely with repeated regular exposure.	For purposes of assessment, it is assumed there is effectively no change to baseline conditions.
<90	1600 m	No discernible effect on behaviour	No change to baseline conditions.

Sonic boom noise levels and assessment assumptions

The occurrence of sonic boom noise generated by returning LV components would be restricted to certain or LV types/specifications (the other LVs will not create sonic booms). Therefore, given that there are to be a maximum of ten LV launches per year, launches that could create a sonic boom are likely to occur on less than ten occasions per year. The duration of each sonic boom would be less than one second.

The modelled sonic boom noise levels range from 67 to 97 Perceived Decibel Level (PLdB) occurring at distances of between 37 km and 209 km outwards from the launch site (see Chapter 19: Noise and Vibration and Appendix 19-1: Noise Technical Report). The predicted sonic boom footprints (Figures 14.3a, 14.3b and 14.3c) would mostly occur far

offshore, well outside the bird survey area. Therefore, the birds anticipated to hear sonic booms are limited to offshore seabird species, in particular the qualifying interests of the Seas off St Kilda SPA, St Kilda SPA and Flannan Isles SPA.

The likely behavioural responses shown by seabirds to sonic boom noise are assumed to be similar to those described for other bird species in response to the equivalent peak noise level generated by LV launches, as set out in Table 14-15. On this basis, seabirds in the sonic boom footprint are anticipated to show only a mild behavioural response to a sonic boom.

SPA qualifying interests

A maximum of ten rocket launches would occur each year, with the possibility that all of these could occur during the over-wintering period. The SPA qualifying interests that could be disturbed by LV launch noise are the wintering great northern diver and red-breasted merganser (qualifying interests of West Coast of the Outer Hebrides SPA) that use the coastal waters near the proposed LV launch site for feeding, and wintering barnacle geese (qualifying interest of North Uist Machair and Islands SPA) that may occasionally use the short-sward grassland within the vicinity of the Project site. Launch noise disturbance has potential to reduce foraging success of the birds affected. Birds within approximately 800m of the launch site (this approximately corresponds to the modelled peak noise contour of 100 dB) could show a flight response and relocate to an alternative location. However, the results of the two-year baseline bird survey show that the numbers of individuals of these species likely to be present this close to the launch site and be affected in this way would be a minor proportion of these qualifying interests' respective population sizes. As a result of mitigation measure ORN04, there will be no SPA qualifying species will experience launch noise in excess of 115 dB. Disturbance of these SPA qualifying interests as a result of LV launch noise would be of short duration and any effects on birds are likely to be temporary, with birds likely to resume their original behavioural soon after the launch noise has ceased. It is concluded that the potential for acoustic disturbance generated by launch events to lead to reduced foraging success for the affected birds is negligible.

The maximum (worst-case) sonic boom noise that would be experienced within St Kilda SPA is below 85 PLdB, and the maximum (worst-case) sonic boom that would be experienced anywhere within the Seas off St Kilda SPA would be between <75 and<95 PLdB (see Figures 14.3a, 14.3b and 14.3c). For the planned most northerly LV trajectory, the maximum (worst-case) sonic boom noise that would be experienced within the Flannan Islands SPA is below 85 PLdB (see Figure 14.3b). The sonic boom noise level that would be experienced within these three SPAs is considered likely to elicit no more than a mild, short-duration behavioural response (for example, temporary increased alertness and scanning) with birds likely to quickly resume their original activity.

Acoustic disturbance due to both launch noise and sonic boom is judged to be an effect of **negligible** magnitude on all SPA qualifying interests (Table 14-18).

Breeding birds

The number of breeding pairs with notional territory centres within peak launch noise range bands of >115 dB, 110-115 dB, 105-115 dB and 95-105 dB are presented in Table 14-16.

Table 14-16 Peak number of breeding pairs (based on nest sites or notional territory centres) at risk of noise disturbance effects based on the predicted noise level contours from the noise assessment (Chapter 19: Noise and Vibration and Appendix 19-1: Noise Technical Report). Number is the highest count from 2020 and 2021 breeding seasons.

Species	Number of territory centres within >115 dB exceedance zone	Number of territory centres within 115-110 dB exceedance zone	Number of territory centres within 110-105 dB exceedance zone	Number of territory centres within 105-95 dB exceedance zone	Comment
White-tailed eagle	0	0	0	0	
Golden eagle	0	0	0	0	
Hen harrier	0	0	0	0	
Short-eared owl	0	0	0	1, possibly	Nesting not confirmed in 100-95db band
Arctic tern	0	0	0	11	
Common gull	0	1	4	13	
Lapwing	0	1	6	5	
Redshank	1	1	4	3	
Curlew	0	1	0	2	
Dunlin	0	0	1	1	
Oystercatcher	2	2	8	16	
Ringed plover	0	1	1	6	
Corncrake	0	0	Up to 2 without mitigation, or 0 with mitigation (ORN03)	0	Absent in 2019, 1 calling male present in 2020. Two calling males present in 2021
Whooper swan	0	0	0	0	Two adults summered on Loch Scolpaig in 2019, largely within 105-95 dB peak noise zone.
Wigeon	0	0	0	2	Breeds in emergent vegetation along south shore of Loch Scolpaig
Skylark	1	2	2	17	-

Species	Number of territory centres within >115 dB exceedance zone	Number of territory centres within 115-110 dB exceedance zone	Number of territory centres within 110-105 dB exceedance zone	Number of territory centres within 105-95 dB exceedance zone	Comment
Starling	3	4	2	1	Nesting in buildings
Twite	0	0	1	1	

Based on the assumed responses to rocket launch noise described above, it is predicted that the worst-case number of breeding pairs which could experience breeding failure as a consequence of disturbance from rocket launches would be as follows:

- Common gull, 3 pairs;
- Lapwing, 4 pairs;
- Dunlin, 1 pair;
- Curlew, 1 pair;
- Oystercatcher, 8 pairs;
- Ringed Plover, 2 pairs;
- Redshank, 4 pairs;
- Corncrake, up to 2 calling males (presumed 2 pairs), reducing to zero due with mitigation;
- Skylark, 4 pairs;
- Starling, 6 pairs; and
- Twite, 1 pair.

These breeding pairs include all the breeding pairs previously identified as being at risk of breeding failure due to disturbance from operation and maintenance activities other than rocket launches (see Section 14.11.3).

The perceived noise levels of sonic booms are anticipated to be too low to elicit a behavioural response from breeding birds except for seabirds breeding on St Kilda and the Flannan Isles. On these islands, breeding seabirds are predicted to perceive very short duration (<1s) sonic boom noise up to 85 PLdB, a noise level and duration which is likely to elicit no more than a mild, short duration behavioural response, for example a temporary increase in alertness.

For all breeding species regional receptor populations, acoustic disturbance generated from launch events and sonic boom is judged to be an effect of **negligible** magnitude. For corncrake, the conclusion of negligible magnitude assumes that measures to deter corncrakes from breeding close to the launch site (ORN04) are successful.

Foraging birds

Acoustic disturbance generated from launch activities could potentially disturb foraging birds such as raptors and short-eared owls and cause them to be temporarily displaced from foraging habitat in the vicinity of the Project site, at least during times of the day that the operational activities are occurring. Launch events would occur for a limited number of times per year (up to ten per year), and the associated load noise be of very short duration (the powered phase for worst-case scenario is 20 seconds but may not be audible for the whole). Any disturbance effects from rocket launch

events are likely to be temporary; birds are likely to return to the area to forage within a short timeframe once the operational activity has ceased. The area affected by operational disturbance would be a small fraction of the foraging habitat available to raptors and short-eared owls, with extensive areas of alternative foraging habitat available locally. It is therefore concluded that the potential for disturbance to lead to reduced foraging success for the affected birds is negligible.

The predicted perceived noise levels of sonic booms are anticipated to be too low to elicit a behavioural response from feeding birds except for seabirds foraging well offshore. Seabirds foraging offshore within areas overlapping the sonic boom footprint are predicted to perceive very short duration (<1s) sonic boom noise levels that range from 67 PLdB to 97 PLdB and are typically well below 95 PLdB. Noise levels of this magnitude and duration are likely to elicit no more than a mild, short duration behavioural response, for example a temporary cessation in foraging activity and increase in alertness.

Acoustic disturbance generated from launch events and sonic boom is therefore judged to be an effect of **negligible** magnitude on all foraging raptors, short-eared owl and seabird species.

Roosting birds

The roost site near Griminish Point that is regularly used by up to moderate numbers of European shags and low numbers of cormorants is located more than 1 km from the rocket launch pad and predicted to experience peak noise levels of below 95 dB. It is therefore unlikely that these birds would show more than a mild and temporary disturbance response to rocket launch events.

The roosts of Schedule 1 raptor species are not likely to be affected by rocket launch disturbance because baseline surveys found no evidence of these species roosting within 1 km of the Project site.

The predicted perceived noise level from sonic booms is anticipated to be too low to elicit a behavioural response from birds roosting on land and along the coast.

Acoustic disturbance generated from launch events and sonic boom is therefore judged to be an effect of **negligible** magnitude on all roosting birds.

Significance of residual effects

SPA qualifying interests

The residual effects of acoustic disturbance generated from launch events and sonic boom on wintering great northern diver, red-breasted merganser (qualifying interests of West Coast of the Outer Hebrides SPA) and barnacle geese (qualifying interest of North Uist Machair and Islands SPA) would be of **negligible** magnitude.

The residual effects of acoustic disturbance from sonic booms on the qualifying breeding seabird interests of St Kilda SPA, Seas off St Kilda SPA and Flannan Isles SPA would be of **negligible** magnitude (Table 14-18). Acoustic disturbance is judged to be an effect of **negligible** magnitude on all foraging SPA qualifying interests (Table 14-18).

These species are categorised as **very high** importance on account of high connectivity to a SPA where they are a qualifying interest. The significance of any residual effects of acoustic disturbance generated from launch events and sonic booms on these species is therefore judged to be **negligible** adverse and therefore considered **not significant**.

Breeding birds

The residual effects of acoustic disturbance generated from launch events and sonic boom on breeding birds are judged to be of **negligible** magnitude (Table 14-17 and Table 14-18). These breeding bird receptors are categorised as **low** or **medium** importance. The residual effects of acoustic disturbance generated from launch events and sonic boom on all breeding bird receptors are judged to be **negligible** adverse and therefore considered **not significant** (Table 14-17 and Table 14-18).

Note. Were the mitigation measures designed to prevent disturbance to breeding corncrake (ORN04) not successful, the effects of acoustic disturbance on the breeding corncrake receptor would be judged to be **minor** adverse and therefore considered **not significant**.

Foraging birds

The residual effects of acoustic disturbance generated from launch events and sonic boom on foraging raptors and short-eared owl, all species categorised as **high** importance, would be of **negligible** magnitude (Table 14-17 and Table 14-18). The residual effects of acoustic disturbance generated from launch events and sonic boom on foraging raptors and short-eared owl is judged to be **negligible** adverse and therefore considered **not significant** (Table 14-17 and Table 14-18).

Roosting birds

The residual effects of acoustic disturbance generated from launch events and sonic boom on roosting raptors and European shag, species categorised as **high** or **medium** importance, would be of **negligible** magnitude (Table 14-17 and Table 14-18). The residual effects of acoustic disturbance generated from launch events and sonic boom on roosting birds are judged to be **negligible** adverse and therefore considered **not significant** (Table 14-17 and Table 14-18).

Table 14-17 Summary of predicted effects on bird species receptors due to acoustic disturbance from rocket launch events (excluding sonic booms)

Species	Receptor Importance	Magnitude	Significance of residual effects	Beneficial / Adverse
White-tailed eagle (foraging)	High	Negligible	Negligible (not significant)	Adverse
Golden eagle (foraging)	High	Negligible	Negligible (not significant)	Adverse
Hen harrier (foraging)	High	Negligible	Negligible (not significant)	Adverse
Short-eared owl (foraging)	High	Negligible	Negligible (not significant)	Adverse
Great northern diver (non-breeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Red-breasted merganser (non-breeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
European shag (roosting/foraging)	Medium	Negligible	Negligible (not significant)	Adverse
Common gull (breeding)	Medium	Negligible	Negligible (not significant)	Adverse
Lapwing	Medium	Negligible	Negligible (not significant)	Adverse

Species	Receptor Importance	Magnitude	Significance of residual effects	Beneficial / Adverse
(breeding)				
Redshank (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Dunlin (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Curlew (breeding)	Medium	Negligible	Negligible (not significant)	Adverse
Oystercatcher (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Ringed plover (breeding)	Medium	Negligible	Negligible (not significant)	Adverse
Barnacle goose (non-breeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Whooper swan (non-breeding)	High	Negligible	Negligible (not significant)	Adverse
Corncrake (breeding)	Medium	Negligible	Negligible (not significant)	Adverse
Skylark (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Starling (breeding)	Low	Negligible	Negligible (not significant)	Adverse
Twite (breeding)	Low	Negligible	Negligible (not significant)	Adverse

Table 14-18 Summary of effects on bird species receptors due to acoustic disturbance from sonic boom generated by falling launch vehicle deposits

Species	Receptor Importance	Magnitude	Significance of residual effects	Beneficial / Adverse
Fulmar (breeding/feeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Gannet (breeding/feeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Common guillemot (breeding/feeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Razorbill (breeding/feeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Puffin (breeding/feeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse

Species	Receptor Importance	Magnitude	Significance of residual effects	Beneficial / Adverse
Kittiwake (breeding/feeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Great skua (breeding/feeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Manx shearwater (breeding/feeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Leach's petrel (breeding/feeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Storm petrel (breeding/feeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse
Seabird assemblage (breeding/feeding)	Very high (SPA)	Negligible	Negligible (not significant)	Adverse

14.11.5 Risk of bird strike and entanglement from LV deposits falling into splashdown areas

Impact overview (without mitigation)

There is potential for falling LV deposits to collide with seabirds at splashdown, potentially resulting in injury or death. There is also potential for parachutes to pose an entanglement risk to seabirds.

Jettisoned stages of the LV would fall into the Atlantic within pre-designated splashdown zones within the space launch hazard area, ranging up to 250 km west or north-west of the launch site (see Figure 14.2). The number of jettisoned stages and the exact location within the splashdown zone in which the jettisoned stages would fall will vary with each LV. Representative project envelopes for the size of the LV components are listed below:

1-stage 10.8 m LV

- Booster and payload – 9.7m
- Payload fairing (cone) – 1.1m

2-stage 6.45 m LV

- Booster – 2.8 m (cone may stay attached)
- Sustainer and payload – 3.6 m

Typically, there would be two deposits per LV. A representative project envelope for the deposited components of a 1-stage LV would comprise the booster and payload (measuring 9.7 m x 0.7 m, weighting 787 kg) which would have an estimated speed at the point of impact of 23 mph. The payload fairing cone would be jettisoned separately, a smaller object with dimensions 1.1 m x 0.5 m – 0.1 m with an estimated speed at the point of impact of 120 mph. For the 2-stage LV, a representative project envelope for the deposits would comprise a booster measuring 2.65 m x 0.2 m and weighing approximately 30 kg with an estimated speed at the point of impact of 475 mph. The sustainer and payload is a larger deposit with dimensions 3.62 m x 0.15 m, also weighing approximately 30 kg with an estimated speed at the point of impact of 40 mph.

In most cases, a parachute recovery system will provide a controlled and relatively slow final descent for deposits. In most cases, the LV deposits would be recovered by small boat for reuse or safe disposal. Stages of the LV not planned for recovery will be designed to sink

Mitigation

No flight paths of launch vehicles are intended to cross any land mass upon leaving the launch pad at Scolpaig.

Recovery boats will operate within an approved Boat Operation Protocol (ME01). This will include measures to limit impacts on seabirds and other marine wildlife. Planned vessel routes will avoid areas where seabirds are known to regularly concentrate (e.g., the vicinity of breeding colonies) and adopt travel speed of below 15 knots when high densities of seabirds are present on the sea surface.

Parachutes will be recovered from the sea to avoid the risk of an entanglement hazard to seabirds and other marine wildlife (ME01). Used parachutes will be brought pack to port for safe disposal.

Assessment of residual effects

Magnitude of impact

The assessment of this impact is limited to a high-level examination of the potential for significant numbers of birds to be killed or injured by falling LV deposits. The magnitude of the potential collision risk to seabirds is estimated by considering the size of the collision area (the area of sea surface where a bird is in danger of collision) and the density of a seabird species in the splashdown area.

Allowing for the possibility that LV deposits could be spinning at splashdown, the collision risk area for the deposits from one launch event will approximate to the sum of areas of circles whose diameter corresponds to the maximum dimension of each deposit. Seabirds are not point 'targets' but rather have a length and breadth. Therefore, an allowance needs to be made to the collision risk area whereby the diameter of the circles for each deposited item is increased by an amount corresponding to the maximum dimension of the bird species under consideration. For the purposes of estimating risk, and given the desire to err on the side of caution, it is considered reasonable to increase the diameter of the circles by 1 metre to account for physical size of the seabird species likely to be affected (1 m is larger than the maximum physical dimension any of the seabird species of interest).

Seabird densities for offshore areas around the UK, including the splashdown area, have been derived from the European Seabirds at Sea dataset (Kober *et al.*, 2010). The results in Kober *et al*. indicate that average densities in the splashdown area for the species considered may exceed 1 bird per km^2 but do not exceed 10 birds per km^2. Therefore, for the purposes of impact assessment, a worst-case density of 10 birds per km^2 is assumed for all seabird species.

The worst-case for collision risk from LV deposits would be from launches involving the 1-stage LV as this has the largest-sized deposits. For this type of LV there would be two deposits: a booster and a payload fairing. Therefore, the worst-case collision area (based on the representative project envelope for this type of LV) is calculated to be:

- Collision area for booster is $(9.7+1)/2)^2 \times 3.14 = 90$ m^2;
- Collision area for payload fairing is $((2.6+1)/2)^2 \times 3.14 = 10$ m^2; and
- Total collision area = 100 m^2 (0.0001 km^2).

Assuming a worst-case average density of 10 seabirds per km^2, the average number of a seabird species inside the collision area at the time of splashdown would be 0.001. Based on the worst-case assumptions stated, it is calculated

that on average one individual would be involved in a collision with falling LV deposits for every 1,000 LV launches. It is concluded that the collision risk to seabirds from falling LV deposits is a negligible risk.

The calculation of worst-case collision risk above assumes that birds do not undertake any avoidance behaviour. However, for deposits that descend by parachute, seabirds in the collision area are likely to have time to avoid falling deposits by moving away.

Given that any parachutes used would be limited to a few in number and recovered soon after a launch event, and also given that marine birds are distributed at low densities over very large areas, it is judged that the likelihood that a bird would become entangled is very low and so would be a very rare event.

It is judged that the effect of launch vehicle deposits is an adverse impact of **negligible** magnitude for all qualifying interests of the Seas off St Kilda SPA, St Kilda SPA, Flannan Isles SPA and West Coast of the Outer Hebrides SPA.

Significance of residual effects

Seas off St Kilda SPA, St Kilda SPA, Flannan Isles SPA and West Coast of The Outer Hebrides SPA are categorised as receptors of very high importance. With the implementation mitigation measures (ORN06), the magnitude of the effect of launch vehicle deposits is assessed to be **negligible.**

The significance of any residual effects of launch vehicle deposits on Seas off St Kilda SPA, St Kilda SPA, Flannan Isles SPA and West Coast of The Outer Hebrides SPA would be a **negligible** adverse effect and **not significant**.

14.12 CUMULATIVE EFFECTS

There are no other proposed developments requiring consideration under the 2017 EIA Regulations therefore an assessment of potential cumulative effects of the Project with other existing or proposed developments is not required.

14.13 ASSESSMENT SUMMARY AND CONCLUSIONS

A two-year baseline survey was undertaken between April 2019 and March 2021 covering two breeding seasons (2019, 2020) and two non-breeding season periods (September to March). The aim of the survey was to establish baseline ornithological conditions in the survey area in terms of the distribution, abundance and status of bird species across Scolpaig Farm and the immediately surrounding area. The bird survey was complimented by a desk study that collated available historical ornithological information and wider context information. The results of the bird survey and desk study are presented in Appendix 14-1: Ornithology Technical Report.

The baseline survey identified that Scolpaig Farm is used by a wide variety of breeding and non-breeding bird species, with these ornithological interests are in line with those found more widely along the west coast of North Uist. The ornithological interests of the survey area centre on breeding birds in particular, nine species of breeding waders, wigeon, Arctic tern, common gull and corncrake. The survey area is also used as a foraging site by a range of locally breeding bird of prey species and wintering visitors such as great-northern diver, whooper swan and occasionally barnacle goose.

Stakeholder consultation was undertaken with statutory bodies, NGOs and the local community. Consultation responses relating to ornithology were received from numerous representations, with many expressing concerns that the Project could have negative impact on wild birds. Additional consultation was undertaken with Nature Scot and RSPB covering survey methodologies, updates on approaches and guidance / advice on specific issues related to the EIA.

Screening of bird receptors on the basis of criteria relating to conservation importance identified 21 bird species that merited detailed consideration and assessment in the EIA (i.e., this chapter). Screening of potential impacts on bird receptors identified five that merited detailed assessment in the EIA Report, namely habitat loss/change; construction disturbance, operation disturbance, acoustic disturbance from rocket launches and the risk of collision/entanglement with jettisoned launch vehicle deposits. A number of other potential impacts were scoped-out of requiring detailed assessment but were considered in less detail. These include impacts from accidents (e.g., misfiring or explosion), risk of entrapment in storage tanks/buildings, ingestion of jettisoned components, and indirect impacts on seabirds from effects on fish prey.

Screening identified potential for the Project to affect five Special Protection Areas (SPA) (sites in the UK-wide network of European sites that are designated to protect the most important areas of bird habitat and their associated bird populations). For this reason, it was determined that the Project requires a Habitats Regulations Appraisal (HRA) report. The HRA report is presented in Annex B: Information to Inform HRA. The five SPAs examined in the HRA are: North Uist Machair and Islands SPA, West Coast of the Outer Hebrides SPA, St Kilda SPA, Seas off St Kilda SPA and Flannan Isles SPA.

The EIA considers whether other site designations (e.g., Sites of Special Scientific Interests and Ramsar sites) with ornithological features, could be affected by the Project. It was identified that the other sites of relevance share the same ornithological interests as the corresponding SPA designations. The HRA report effectively also examines the potential for the Project to affects the other site designations.

The EIA set outs several mitigation measures that are designed to avoid or reduce adverse impacts on birds from the Project. These include measures to minimise habitat loss/change, to manage disturbance and to minimise the potential hazard to birds from launch vehicle deposits. The proposed mitigation also includes the development of a Habitat and Amenity Management Plan (HAMP). An outline of the proposed HAMP is presented in Appendix 7-2. This sets out the key principals for the future management of Scolpaig Farm in ways that safeguard, and where appropriate enhance, its nature conservation value for birds and other wildlife, and in conjunction with other uses and interests associated with the site.

Several mitigations measures relate to corncrake, a rare breeding bird species for which North Uist has particularly high conservation importance. Through managing grass sward height, the corncrake mitigation measures are designed to deter birds from breeding in areas where they are could be disturbed (e.g. the vicinity of the launch site) and encourage them to breed in other areas away from disturbance sources.

Following best practice, the species assessments examine the potential impacts of the Project on regional receptor populations. The assessments consider the magnitude of potential impacts, for example in terms of extent (e.g., geographical area and proportion of population affected), duration and frequency. The determination of impact magnitude takes into consideration the proposed mitigation measures. The assessments also take into consideration receptor characteristics, such as impact susceptibility, tolerance to change and conservation status. Where there is potential for impact magnitude to vary (for example with respect to the type of launch vehicle used) the assessment is based on a consideration of the worst-case scenario assumptions. Where there is uncertainty, assessments use suitably cautious assumptions. For example, the baseline number breeding pairs of a species in an area that would be affected by habitat change or disturbance is assumed to be the highest number found breeding either of the two baseline survey years.

The assessment concludes that for all ornithological receptors that the potential residual impacts of habitat loss and change caused by construction of development infrastructure are of zero or **negligible** magnitude and **not significant**.

Using cautious assumptions, it is concluded for all ornithological receptors except breeding wigeon, that the potential residual impacts of disturbance caused by construction activity are of zero or **negligible** magnitude and **not significant**. For breeding wigeon (up to two pairs of this scarce breeding species breed at Loch Scolpaig) the potential residual impact is concluded to be of **low** magnitude and **not significant**.

Using cautious assumptions, it is concluded for all ornithological receptors that the potential residual impacts of disturbance caused by operation and maintenance activities are of zero or **negligible** magnitude and **not significant**. Using cautious assumptions, it is concluded for all ornithological receptors that the potential residual impacts of acoustic disturbance caused by LV launches and sonic booms are of zero or **negligible** magnitude and **not significant**.

Using cautious assumptions, it is concluded for all ornithological receptors that the potential residual impacts of bird strike and entanglement risk from LV deposits falling into splashdown area are of zero or **negligible** magnitude and **not significant**.

There are no other proposed developments requiring consideration under the 2017 EIA Regulations therefore an assessment of potential cumulative effects is not required.

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15 TERRESTRIAL ECOLOGY

CONTENTS

15 TERRESTRIAL ECOLOGY

15.1 INTRODUCTION

This chapter of the EIA Report describes the potential impacts of the Project on terrestrial ecology receptors including international and nationally designated sites; heathland, peatland and machair habitats; otter (*Lutra lutra*) and great yellow bumblebee (*Bombus distinguendus*).

Reference should also be made to Chapter 14: Ornithology for impacts on avian species and Chapter 16: Marine Ecology for impacts on seals, including potential disturbance at designated seal haul-outs. Impacts on Groundwater Dependent Terrestrial Ecosystems (GWDTEs) are considered both in this chapter and Chapter 17: Hydrology, Hydrogeology, and Geology.

This chapter is supported by the following appendices:

- Appendix 15-1: Vegetation Survey;
- Appendix 15-2 Otter Survey Report (2019); and
- Appendix 15-3: Otter Survey Report (2021).

This chapter is supported by the following Annex:

- Annex B: Information to Inform HRA

The chapter is also supported by the following figures:

- Figure 15.1: Study Areas and Statutory Designated Sites;
- Figure 15.2: Phase 1 Habitat Survey Results;
- Figure 15.3: National Vegetation Classification Survey (NVC) Results;
- Figure 15.4: Potential Groundwater Dependency.

The primary contributor to this chapter was Arcus Consultancy Services Ltd. (Arcus) (Primary Chapter Author) with additional contribution provided by Highland Ecology Ltd. (vegetation surveys) and Western Isles Marine and Environment Ltd (WIME) (otter surveys, chapter support).

15.2 STUDY AREA

The Study Area, which included the Desk Study Areas, Survey Areas and the relevant buffer areas, was dependent on the nature of the baseline data sought and are detailed in Section 15.5.1 , 15.5.2 and illustrated on Figure 15.1.

15.3 LEGISLATIVE FRAMEWORK AND POLICY CONTEXT

The following legislation and policies are considered relevant to the assessment:

Legislation

- European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive); aims to restore and protect natural habitats and species listed in the Annexes to the Directive;

- The Wildlife and Countryside Act (WCA) 1981 (as amended); consolidates existing national legislation to implement European legislation. The Act sets out a range of offences against birds, other wildlife and vegetation and non-native species;
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (also known as the Habitats Regulations); implement Council Directive 92/43/EEC on the conservation natural habitats and of wild flora and fauna, which includes provision for licensing of European Protected Species and requirements for threatened habitats and species;
- The Nature Conservation (Scotland) Act 2004 (as amended), places a duty on public bodies to further conservation of biodiversity, increases protection for Sites of Special Scientific Interest (SSSI)s and strengthens wildlife enforcement legislation;
- The Wildlife and Natural Environment (Scotland) Act 2011 relates to the way land is managed, principally affecting game shooting, species protection and new wildlife offences.

Policy

- Scottish Planning Policy, Paragraphs 193 – 214;
- PAN 60 Planning for Natural Heritage;
- Outer Hebrides Local Development Plan (2018), Policy NBH2 Natural Heritage;
- UK Post-2010 Biodiversity Framework (2010);
- Scottish Biodiversity Strategy: It's in Your Hands (2004/2020) Challenge for Scotland's biodiversity (2013);
- Western Isles Local Biodiversity Action Plan (2002).

Key Guidance and Advisory Documents

- CIEEM. 2018. Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, Chartered Institute of Ecology and Environmental Management, Winchester; and
- SEPA. 2017. Land Use Planning System: SEPA Guidance Note 31. Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependant Terrestrial Ecosystems. Version 3.

15.4 DATA GAPS AND UNCERTAINTIES

15.4.1 Survey Data

NVC Survey

As the NVC Survey was carried out towards the end of the main growing season (April to September), considered by NatureScot as the optimal period for NVC Survey[1], the presence of some early flowering species associated with NVC communities recorded (MC10, MC9, MC8 and H7) such as *Scilla verna* could not be confirmed. However, as none of these NVC communities will be impacted by the development (See Section 15.12), this is not considered to be a limitation to the baseline data collected or the robustness of the assessment.

[1] https://www.nature.scot/natures-calendar

Otter Surveys

The Survey Area was large and included extensive boulder fields with multiple shelter and resting opportunities for otter. Therefore, it was not possible to assess all of these potential areas in detail within the timescales of the survey. This has been accounted for in the assessment through the application of the precautionary principle. Targeted pre-construction otter surveys will be carried out post-consent, to ensure a detailed baseline is provided to inform sufficient safeguarding of the species and ensure legislative compliance. Therefore, survey inaccessibility is not considered to be a limitation to the baseline data collected and is not expected to detrimentally impact the robustness of the assessment. Further details of other minor potential limitations are detailed in Appendices 15.2 and 15.3.

15.5 METHODOLOGIES FOR SUPPORTING SURVEYS AND STUDIES

Approach to assessment

The methodology/approach used to assess the likely significant effects on terrestrial ecology has considered the principles outlined in the Guidelines for Ecological Assessment in the UK and Ireland (CIEEM, 2018), which provides an overall framework for the assessment process. Legislation and policy considered in the assessment are outlined in Section 15.3, above.

15.5.1 Desk Study

A Desk Study was undertaken to determine the presence of any designated nature conservation sites, and any recent (within 20 years) records of protected and/or notable species within the surrounding area. The search area for biodiversity information (as presented in Figure 15.1) was related to the conservation value of sites and species and the potential zones of influence, as follows:

- 5 km for statutory designated sites of international importance (European sites), e.g., Special Area of Conservation (SACs) and Ramsar sites;
- 3 km for statutory designated sites of national importance e.g., SSSI, Local Nature Reserves (LNR);
- 1 km for non-statutory designated sites;
- 2 km for records of species legally protected under the Conservation of Habitats and Species Regulations 1994 and the WCA (as amended) 1981; and
- 1 km for notable species such as those listed on the Scottish Biodiversity List (SBL), or Local Biodiversity Action Plan (LBAP) priority species.

15.5.2 Field Studies

Habitat and Botany Surveys

NVC Survey

An NVC survey was carried out 7 – 11 September 2020 in a range of weather conditions by Highland Ecology Ltd. The NVC survey involved mapping distinct areas of homogenous vegetation and recording detailed descriptions of the vegetation communities, with reference to published community descriptions. Full methods are presented in Appendix 15-1: Vegetation Survey.

A Phase 1 habitat survey of the Site was undertaken at the same time as the NVC surveys following standard Joint Nature Conservation Committee (JNCC, 2010) survey methods. Phase 1 habitat survey is a standard method for classifying and mapping British habitats.

During the NVC Survey, vegetation communities with potential groundwater dependency in accordance with Scottish Environment Protection Agency (SEPA) guidance were recorded. Target notes of key features, species, habitat condition, and NVC communities corresponding to potential GWDTEs were mapped on GIS with infrastructure buffers corresponding to excavation depths outlined in SEPA guidance. As per this guidance, for any proposed works involving excavations of over 1 m in depth, a buffer of 100 m should be maintained from any confirmed GWDTEs to avoid impacts. For excavations greater than 1 m in depth a 250 m buffer is advised.

Further details of the survey methods are presented in Appendix 15-1 Vegetation Survey.

Protected Species

Otter Survey

An Otter survey was carried out within 300 m of the development in August 2019 with reference to appropriate NatureScot guidance (2019), and Chanin (2003). However, to ensure baseline data was up-to-date and suitable to inform the EcIA, this survey was repeated in September 2021, following the same methodologies and approach. The surveys involved systematically searching for field signs within suitable habitats within the Survey Area, with a focus on coastal areas and freshwater bodies. Typical otter field signs, as described in Chanin (2003), which included spraints, footprints, holts, couches and slides were recorded as target notes and GPS.

Full details of the survey methods are presented in Appendix 15-2: Otter Survey Report (2019) and Appendix 15-3: Otter Survey Report (2021).

15.6 CONSULTATION

The key points raised by stakeholders during Scoping and pre-application consultations are presented in Table 15-1.

Table 15-1 Key issues raised by stakeholders during consultation

Statutory Stakeholder	Comment	Response/Action taken	Section cross-reference
NatureScot (SNH) Scoping opinion 3 Aug 2018	Proposal has potential to cause significant disturbance to otter. An otter survey is recommended in addition to an assessment to determine if a licence is required to disturb otter.	Otter surveys undertaken in November 2019 and September 2021. Impact assessment considers distance of effects in detail in addition to the requirement for a European Protected Species Licence.	Appendix 15-2, 15.3, Section 15.5.2 and Section 15.10
NatureScot Scoping opinion 3 Aug 2018	Reptiles have not been recorded on North Uist. Bats are not thought to be resident in North Uist. Both of these groups can be scoped out.	Scoped out of assessment.	N/A
SEPA Scoping Opinion 4 July 2018	A series of recommendations - including advice to undertake a NVC survey of the Site - to support the identification and risk assessment of groundwater dependant terrestrial ecosystems (GWDTE).	Phase 1 / NVC survey undertaken in September 2020 to identify potential GWDTEs. Assessment of GWDTE provided in chapter.	Appendix 15-1, Section 15.5.2 and Section 15.8.3

Statutory Stakeholder	Comment	Response/Action taken	Section cross-reference
SEPA Scoping Opinion 4 July 2018	The daily responsibilities of Ecological Clerk of Works (ECoW), how site inspections will be recorded and acted upon and any proposals to fund a planning monitoring enforcement officer.	The original development proposals issued at scoping have been substantially reduced. An ECoW is not considered appropriate for the scale of construction required, a Construction Environmental Manager will be appointed with responsibility for the implementation of proposed mitigation and environmental compliance. During operation an Environmental Manager will have ongoing responsibility for implementation of a Habitat and Amenity Management Plan.	Chapter 3: Site Selection and Alternatives Section 15.11 Appendix 7-2 Outline Habitat and Amenity Management Plan
SEPA Planning Response 8 July 2019	Reiterated the requirement to protect wetlands under the Water Framework Directive and requested that a Phase 1 habitat survey / NVC is provided.	Phase 1 / NVC survey undertaken in September 2020 to identify potential GWDTEs. Assessment of GWDTE is provided in this chapter.	Appendix 15-1 Section 15.5.2 and Section 15.8.3
SEPA Clarification of Issues 10 May 2021	Agreed with approach to scope out the inclusion of a mammal passage (otter ledge) in bridge designs.	Scoped out of Design Mitigation.	Section 15.12.1
SEPA Email correspondence 17 June 2021	Understand that the majority of development is likely to take place upon dune grassland on what appears to be agricultural land, but extent of impact on dune slack and dune slack/swamp communities and GWDTE should be clarified in any future submission with potential impacts and mitigation provided, as necessary.	Design has avoided Dune Slack and Dune Slack/Swamp mosaic. An ecological and hydrogeological assessment of potential GWDTEs identified during NVC surveys has been carried out.	Table 15.6 - 15.11 Section 15.8.3
SEPA Email Correspondence 25 June 21	Summary of wider habitat management measures linked to community grazing regime submitted following request from SEPA. No further comments from SEPA.	A summary of existing habitat management measures developed in consultation with RSPB to be delivered in conjunction with a short duration agricultural	Section 15.11

Statutory Stakeholder	Comment	Response/Action taken	Section cross-reference
NatureScot Meeting 12 November 2021	Upon consideration of the otter mitigation proposals, NatureScot stated that they are content with the approach for biannual otter monitoring, and that a licence was not required at this particular stage. NatureScot also agreed that the monitoring zone should be based on a 300 m buffer zone around the launch pad. NatureScot described reports of otter observations at MOD Hebrides, South Uist and otter response during firings, suggesting that otter respond to noise via avoidance behaviours but shortly returned to the same activities, and it did not impact the use of the Site.	Otter mitigation proposals have been agreed and incorporated into the development of the Otter Monitoring Area and the Otter Protection and Monitoring Plan (OPMP)	Section 15.11

15.6.1 Planning Application Representations

A planning application to develop a proposed Spaceport at Scolpaig Farm in North Uist was submitted to the Comhairle nan Eilean Siar on 26 June 2019 (Planning Reference 19/00311/PPD). The planning application attracted significant public attention and consequently, approximately 640 representations from the public were received. Comments raised from both the public and consultees highlight key issues and concerns of relevance to the EIA process. Given the relationship to the EIA process, an analysis was undertaken of the representations submitted. The complete analysis is provided in Appendix 5-1: Analysis of Planning Representations.

Table 15-2 Representations to planning application (19/00311/PPD) relevant to the ecological assessment.

Topic	Comment	Response/Action taken	Section Cross Reference
Wildlife (General)	Over half the representations cited a disturbance to local and migrant wildlife as grounds for their objection to the development proposal. The construction and operation of the Site is expected to have an adverse effect on the habitats and behaviour of wildlife, the extent to which is currently unknown.	A detailed assessment of the potential impacts on important ecological features has been carried out in this chapter, and measures have been recommended to safeguard these features and to ensure the legal compliance of the Development. Impacts on birds are assessed in Chapter 14: Ornithology. Impacts on marine ecology and wildlife are assessed in Chapter 16: Marine Ecology.	Section 15.12

Topic	Comment	Response/Action taken	Section Cross Reference
Vegetation	Over half of the representations expressed concern on the potential damage to areas of peatland, machair and coastline.	The majority of the Development is located on existing infrastructure, with 54.5% of habitat loss associated with widening and upgrading of the existing access track (0.24 ha). Habitat loss from the footprint of new access track and launchpad is 0.18 ha. The development does not impact peat deposits and is therefore scoped out of the EIA Report.	Section 15.12 Chapter 17: Hydrology, Hydrogeology and Geology.
Otter	Over a third of respondents outlined the protected status of otters as grounds for their objection to the proposed spaceport.	Detailed otter surveys were undertaken, based on the identification of signs and resting places. A detailed assessment of the potential impacts on otter has been carried out, and construction phase protection and post-consent monitoring measures have been recommended to safeguard the species and ensure legal compliance of development construction and operation.	Appendix 15-2 and 15.3: Otter Surveys Section 15.8.3 Section 15.12.1 and Section 15.12.2
Invertebrates	Diminishing species of insects and their already restricted habitats are cited by some respondents as grounds for their objections. Shore crickets/grasshoppers and banded beauty moths are among those species reported to be at risk of disruption. Butterflies were referenced in relation to loss of natural habitat. Over a third of respondents were concerned with the impacts on rare and threatened bumblebee species, some of which have protected status in the UK. Respondents are concerned that any disruption to breeding and nesting grounds could have a secondary impact on the pollination of crops and farming industry.	A Desk Study was carried out and identified an invertebrate assemblage largely comprising of common and widespread species. Although no protected species were recorded, three species listed as a priority on the SBL and one species also listed in Western Isles Local Biodiversity Action Plan were recorded. The Desk Study confirmed the presence of great yellow bumblebee (*Bombus distinguendus*), and although no species of bee are protected in the UK, this species is scarce, in decline and associated with habitats within the Site, and therefore is considered of sufficient importance to be scoped into the assessment.	Section 15.8.2 Section 15.8.2, Section 15.12.1 and Section 15.12.2

15.7 ASSESSMENT METHODOLOGY

15.7.1 Approach to assessment

The general EIA process and methodology is detailed in Chapter 6: Approach to EIA. The approach used to assess the likely significant effects on ecological receptors was carried out with reference to the Ecological Impact Assessment (EcIA) guidelines produced by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018) in conjunction with relevant legislation and planning and policy guidance as detailed in Section 15.3.

15.7.2 Assessment criteria

The following criteria have been utilised to inform the assessment of likely significant effects, including consideration of importance of ecological features (Table 15-3) and magnitude of impact on receptors (Table 15-4).

Determination of Importance

One of the key challenges in EcIA is to decide which ecological features are sufficiently important to justify a detailed assessment. In EcIA these features are determined as Important Ecological Features (IEFs). IEFs will be those considered to be the most important recorded within the baseline, and with the greatest potential to be affected by the Development. In accordance with CIEEM guidance, importance should be determined for all features present within the baseline and defined on a geographic scale to determine at which particular population scale a feature is considered important.

In this chapter, to determine importance, expert judgement was applied and contextual information such as the distribution and abundance of any given features, as well as and population trends and conservation status (identified through policies and legislation), was reviewed to determine the level of importance.

In this EcIA, only ecological features determined to be of regional importance and above (see Table 15-3, below) were considered sufficiently important to be determined as Important Ecological Features (IEFs), and in accordance with CIEEM guidance, only IEFs require assessment for potential significant effects. Additionally, in accordance with CIEEM guidance, where the presence of a legally protected species was considered to have the potential to result in a breach of legislation, such species were considered to be an IEF. This approach has recently been taken in other sites in the Highlands and Islands and has been supported by consultees.

A summary of the criteria used to determine ecological importance is detailed in Table 15-3, below. Table 15-3 presents Importance on a geographic scale, and for comparative purposes, the associated scale of importance used in other chapters, as defined in Chapter 6: Approach to EIA.

Table 15-3 Importance of Ecological Feature (defined in Geographic Context).

Importance	Criteria
International/High	The population has little or no ability to absorb change without fundamentally altering its present character (i.e., the population of a rare and sensitive species in significant decline). An internationally designated site (e.g., a SAC) or a site meeting criterion for international designations. Species present in internationally important numbers (>1% of international population).

Importance	Criteria
National/Medium (Scotland)	The population has low ability to absorb change without fundamentally altering its present character (i.e., the population of an uncommon or rare species in decline, or a common species in significant decline). A nationally designated site (e.g., a SSSI) or a site meeting criterion for national designation. Species present in nationally important numbers (>1% Scottish population). Large areas of priority habitats listed on Annex I of the Habitats Directive and smaller areas of such habitats that are essential to maintain the viability of that ecological resource.
Regional/Low (Western Isles)	The population has moderate capacity to absorb change without significantly altering its present character. (i.e., an uncommon or rare but stable species, or a common/widespread but declining species). Species present in regionally important numbers (>5% Western Isles population). Priorities within the Local Biodiversity Action Plans (LBAP), where they occur in sufficient abundance to maintain the local resource. Sites not meeting criteria for SSSI selection but of greater than the local criteria below.
Local/Very Low (North Uist)	The population is tolerant of change without detriment to its character (a common/widespread species that is stable, or an uncommon species is improving). A species or habitat of low conservation value, or of national or local conservation value, but with very limited presence. Priorities within the Local Biodiversity Action Plans (LBAP), where they occur in low abundance. Scottish Wildlife Trust (SWT) Reserves and Local Nature Reserves (LNRs). Areas of habitat or species considered to appreciably enrich the ecological resource within the area local to the Site.
Less than Local/Negligible (10 km of Site)	The population is resistant to change (any population that is improving its range and abundance). Population of little to no conservation value, or of local conservation value but with very limited presence. Usually widespread and common habitats and species. Loss of such a species from the Site would not be detrimental to the ecology of the local area.

Magnitude of impact

Sensitivity of receptors is an important consideration when determining the magnitude of impact. The sensitivity of receptors to potential impacts is based on their capacity to avoid, tolerate, recover from, or adapt to a particular impact. The following factors are considered when characterising the potential magnitude of a particular impact:

- **Extent**: the geographical area or size of population likely to be affected;
- **Scale**: the size, volume, amount and / or intensity;
- **Duration**: whether the impact is short, medium or long-term, permanent or temporary;
- **Frequency and timing**: the characterisation of when the impact will occur; and
- **Reversibility**: the characterisation of how easily / quickly the impact will be reversed if applicable.

The magnitude of an impact is defined by the following criteria, presented in Table 15-4.

Table 15-4 Magnitude of impact

Magnitude	Criteria
High	Major alteration to key elements / features of the baseline (pre-development) conditions such that post-development character / composition / attributes will be fundamentally changed.
Medium	Loss or alteration to one or more key elements / features of the baseline conditions such that post-development character / composition/ attributes of baseline will be partially changed.
Low	Minor shift away from baseline conditions. Change arising from the loss / alteration will be discernible but underlying character / composition / attributes of baseline condition will be similar to pre-development circumstances / patterns.
Very Low	Very slight change from baseline condition. Change barely distinguishable, approximating to the 'no change' situation.

Significance of effects

The significance of an effect results from the interaction between its magnitude and the importance of those receptors that might be affected. Professional judgement is used to determine the likely significance of effects.

In other chapters a matrix approach was used to support the identification of significant effects to ensure that the process is consistent and transparent. As CIEEM guidance recommends avoiding this approach for ecological assessment, the matrix approach was not used and the assessment was therefore based on professional judgement to determine the likely significance of effects.

15.8 BASELINE DESCRIPTION

15.8.1 Introduction

The methodology for the baseline assessment is provided in Section 15.5. This section describes the baseline ecological conditions at the site.

15.8.2 Desk Study

Designated Sites

No statutory or non-statutory designated sites lie within the Site, however one internationally statutory designated site and one nationally statutory designated site, were located within the Desk Study Area. A summary of these designated sites, including their proximity to the Site is presented in Table 15-5 below. No non-statutory sites designated for nature conservation were recorded within the Desk Study Area.

Figure 15-1 illustrates the range of ecological designations within 10 km of the Site. Designations classified for ornithological interests are considered in Chapter 14: Ornithology.

Table 15-5 Ecological Designated Sites Recorded within Desk Study Area

Site Name/Location	Designation	Description	Proximity to Site
North Uist Machair	SAC	Qualifying Features include: • Annual vegetation of drift lines; • Atlantic salt meadows; • Dune grassland; • Humid dune slacks; • Machairs; • Naturally nutrient-rich lakes or lochs which are often dominated by pondweed; • Shifting dunes with marram grass; and, • Slender naiad (*Najas flexilis*).	2.8 km to north-east/ 3.9 km to south-west
Vallay	SSSI	Site lies within the boundary of North Uist Machair SAC. Qualifying Features include; • Sand dunes; • Machair; and • Salt marsh.	2.8 km to north-east

Biological Records

Following a review of publicly available data resources (NBN Atlas Scotland, 2021), a small number of records of protected and notable species were found within the Desk Study Area, including otter.

It is known that the local invertebrate assemblage is relatively well covered by local biological recorders, and these features are relatively well represented in local biological records. The desk study uncovered a relatively broad assemblage of invertebrate species, largely comprising of common and widespread species, including; thirteen butterfly and moth species, six species of bee and six species of dragonfly and damselfly. However, of these species, three are listed a priority on the SBL; great yellow bumblebee, moss carder bee (*Bombus muscorum*) and rosy rustic moth (*Hydraecia micacea*), of which one species (great yellow bumblebee) is also listed in the Western Isles Local Biodiversity Action Plan.

No protected vascular plant, non-vascular plant species or fungi species were recorded in the Desk Study Area.

15.8.3 Field Surveys

Phase 1 habitats

Full results of Phase 1 habitats and NVC communities recorded within the Survey Area during habitats and botany surveys are provided in Technical Appendix 15-1: Vegetation Survey, however a summary of the Habitat and Botany baseline condition is presented in Table 15-6 and Table 15-7 below.

NVC data were cross-referenced to Phase 1 Habitat Survey Classification for a broader categorisation of habitats based on Averis (2013). Phase 1 habitat types recorded within the NVC study area as well as their associated NVC communities are summarised in Table 15-6 and in Figure 15.2.

Table 15-6 Summary of Phase 1 Habitats Recorded and Associated NVC Communities

Phase 1 Code	Phase 1 Description	Associated NVC Communities	Area (ha)	% of Survey Area
A2.1	Scrub - dense/continuous	W23	0.15	0.05
B1.2	Acid grassland - semi-improved	U4	1.81	0.63
B5	Marshy grassland	M25/M23	7.16	2.48
B6	Poor semi-improved grassland	MG6	6.00	2.08
D1.1	Dry dwarf shrub heath - acid	H10	19.35	6.71
D2	Wet dwarf shrub heath	M15	45.24	15.69
D2/D1.1	Wet heath / acid dry heath	M15/H10	19.01	6.60
D2/B6	Wet heath / poor semi-improved grassland	M15/MG6	7.69	2.67
E.1.6.1	blanket bog	M17/M1/M6/M29	50.22	17.42
E1.6.1/D2	Blanket bog / wet heath	M17/M15	50.82	17.63
E3	Fen	M28	*Too small to map*	
F1	Swamp	S4/S9	2.84	0.99
G1	Standing water	N/A	11.73	4.07
H1.1	Intertidal sand	N/A	1.40	0.49
H6.4	Dune slack	SD17	2.72	0.94
H6.5	Dune grassland	SD7/SD8	23.91	8.29
H6.4/F1	Dune slack/ swamp	SD17/SD4	1.10	0.38
H6.5/D2	Dune grassland / wet heath	SD8/M15	0.99	0.34
H8.2	Soft cliff	MC2/MC8/MC9/MC10	11.05	3.83
H8.5	Coastal heathland	H7/H10	9.70	3.36
H8.2/H8.5	Soft cliff / coastal heathland	MC10/H7	1.64	0.57
I1	Rock exposure	N/A	13.76	4.77
TOTAL			**288.31**	**100%**

NVC Communities

Table 15-7 summarises the composition of each NVC community recorded, with a description of conservation status, and corresponding ground water dependency classification, as per SEPA advice (SEPA, 2017), also illustrated on Figure 15.3. Further information is detailed in Appendix 15-1: Vegetation Survey.

Table 15-7 Summary of NVC Communities, Conservation Status and GWDTE Classification

NVC Code	Community	Sub-Community	Conservation Status	Potential GWDTE
H7	*Calluna vulgaris – Scilla verna* heath	H7c, H7e	SBL Priority Habitat EC Habitats 1230	No
H10a	*Calluna vulgaris–Erica cinerea* heath		SBL Priority Habitat	No

NVC Code	Community	Sub-Community	Conservation Status	Potential GWDTE
			EC Habitats 4030	
M1	*Sphagnum denticulatum* bog-pool community		SBL Priority Habitat EC Habitats 7130	No
M6	*Carex echinata - Sphagnum recurvum mire*		SBL Priority Habitat	High
M15	*Trichophorum cespitosum-Erica tetralix* wet heath	M15a, b, c & d	SBL Priority Habitat EC Habitats 4010	Moderate
M17	*Trichophorum cespitosum-Eriophorum vaginatum* blanket mire	M17a & b	SBL Priority Habitat EC Habitats 7130	No
M23a	*Juncus effusus/acutiflorus-Galium palustre* rush-pasture		SBL Priority Habitat	High
M25a	*Molinia caerulea-Potentilla erecta* mire		SBL Priority Habitat	Moderate
M28	*Iris pseudacorus-Filipendula ulmaria* mire		SBL Priority Habitat	High
M29	*Hypericum elodes-Potamogeton polygonifolus soakway*		SBL Priority Habitat	High
U4b	*Festuca ovina-Agrostis capillaris-Galium saxatile* grassland *Holcus lanatus-Trifolium repens*		SBL Priority Habitat	No
MC2	*Armeria maritima-Ligusticum scoticum* maritime rock crevice community		SBL Priority Habitat EC Habitats 1230	No
MC8	*Festuca rubra-Armeria maritima* maritime grassland	MC8a & e	SBL Priority Habitat EC Habitats 1230	No
MC9	*Festuca rubra-Holcus lanatus* maritime grassland		SBL Priority Habitat EC Habitats 1230	No
MC10	*Festuca rubra-Plantago* spp. maritime grassland	*MC10a, b & c*	SBL Priority Habitat EC Habitats 1230	No
SD6e	*Ammophila arenaria* mobile dune community *Festuca rubra*		SBL Priority Habitat EC Habitats 2120	No
SD7a	*Ammophila* arenaria-*Festuca rubra* semi-fixed dune community		SBL Priority Habitat EC Habitats 2130	No
SD8e	*Festuca rubra-Galium verum* fixed dune grassland *Primula vulgaris*		SBL Priority Habitat EC Habitats 2130	No
SD17	*Potentilla anserina-Carex nigra* dune-slack community	SD17a & b	SBL Priority Habitat EC Habitats 2190	High
S4	*Phragmites australis* swamp and reed beds	S4a & c	SBL Priority Habitat	No
S9b	*Carex rostrata* swamp *Menyanthes trifoliata-Equisetum fluviatile*		SBL Priority Habitat	No
MG6b	*Lolium perenne-Cynosurus cristatus* grassland *Anthoxanthum odoratum* sub-community		N/A	No

NVC Code	Community	Sub-Community	Conservation Status	Potential GWDTE
W23	*Ulex europaeus-Rubus fruticosus* scrub		N/A	No

In addition to the above, the following text summarises each of the NVC community and sub-community types recorded in the Survey Area. Text has been ordered by habitat association and sub-headed by each broad community under which is a brief description of the community and its distribution within the Survey Area has been provided, as described by Rodwell (1990, 91, 92, 94). Further descriptions of the NVC communities and sub-communities recorded in the Survey Area are detailed in Appendix 15-1: Vegetation Survey.

Heath Communities (Coastal Heathland and Dry Heathland Habitats)

H7 Calluna vulgaris – Scilla verna heath

H7 heath typically occurred as a constant band along the coastline of the Survey Area, with the exception of the south-western portion, which was adjacent to dune grassland rather than wet heath communities. H7e was also recorded occurring in a mosaic with MC10 along the northern coast.

H10 Calluna vulgaris – Erica cinerea heath

Stands of H10 heath, occurred on the southern slopes of Beinn Scolpaig, with further stands forming a mosaic with wet heath habitats (M15) on the eastern slopes. In addition, there were isolated stands over small knolls to the north-west. The grassier dry heath H10c with frequent, although fragmented, *Calluna vulgaris,* often appeared like a small-scale dry heath grassland mosaic.

Mire Communities (Blanket bog, wet heath and marsh grassland habitats)

M1 bog-pool

Bog pools, generally associated with areas of blanket bog, were generally small and occurred mainly over the higher flatter ground within areas of the *M17* blanket mire where peat accumulation was greatest. There were also localised occurrences of pools, and species poor hollows through the lower lying ground in the south-east of the survey area.

M6 mire

M6 communities were only recorded at one location in the Survey Area, as the M6ci sub-community, on the northern slopes of Beinn Scolpaig, within wider blanket bog.

M15 wet heath

Wet heath was recorded widely on thin acid peats which were kept wet. Sub-community M15a was recorded frequently throughout the Survey Area, mainly as linear stands which were too small to map. The most frequent sub-community encountered was the M15b typical sub-community which was found in mosaics with blanket peat and drier heath communities, often forming quite extensive stands. Also frequently recorded throughout the Survey Area was the M15c sub-community. Less frequently recorded was the sub-community M15d, which was mapped predominantly through the site buffer where grazing is higher, but also over the eastern slopes of Beinn Scolpaig.

M17 blanket mire

Variably sized stands of blanket mire occurred throughout the Survey Area, except the area immediately associated with the farm. It is likely that this habitat was more extensive in the past and may have been reduced through peat cutting and historical agricultural practices. The two sub-communities are fairly evenly represented, with the wetter M17a typically presenting a largely intact *Sphagnum* carpet where the blanket bog is in better condition. The drier M17b was

largely recorded in a mosaic with M17a along with wet heath communities (M15b/c). Areas of this community seem sometimes to be quite modified, and peat depth is generally quite shallow (0.5-0.7 m).

M25 mire

M25 was recorded infrequently over the Survey Area. M25a occurred largely in association with M17a blanket mire and M15 wet heath, such as on the southern slopes of Beinn Scolpaig, and as transitional vegetation between blanket bog and grassland in the south. Stands of M25a dominated *by Molinia caerulea* were often found where a transition between blanket mire and surrounding drier vegetation occurs.

M28 mire

This community was only recorded as two very small stands to the south and east of the Survey Area.

M29 Mire/Fen

M29 soakaways were recorded predominantly through areas of extensive blanket bog in the north of the Survey Area, as well as blanket bog/wet heath mosaics east of Loch Scolpaig.

Grassland Communities (Acid Grassland Habitat)

U4 grassland

This community was recorded in two locations in the south-east corner of the Survey Area where drier ridges occurred within wider blanket bog and wet heath mosaics. In both of these situations it formed a mosaic with grassy dry heath (H10c).

Maritime Cliff Communities (Soft Cliff Habitat)

MC2 maritime rock crevice community

Stands were small, fragmented and occur rather infrequently on coastal rocks/cliffs on ledges and in crevices, usually quite low down the cliff. It was seen in only three locations, on the north-west coast of the Scolpaig headland.

MC8 maritime grassland

This community was one of the most frequent along the coastline, being found on most of the coastal rock all the way around the headland but was rarely seen much further inland than the rock and cliff-tops, and is usually found as small to medium-sized stands. MC8a was quite species-poor and was usually fragmented between rocks and gravels. MC8e was also recorded in a similar frequency but was considered to be somewhat transitional to MC10.

MC9 maritime grassland

The community was characterised by a rank sward of predominantly *Festuca rubra* and *Holcus lanatus,* with a ground layer consisting of much litter and very few bryophytes and was generally quite species-poor.

MC10 maritime grassland

This community was very common along the majority of coastline present on the site, occupying a generally narrow zone, up to a hundred metres, above sea cliffs ranging from moderate cliffs down to fairly low outcrops by the sea. MC10b was recorded at low frequency and MC10c was more distinctive, but generally in much smaller stands.

Shingle, Strandline and Sand-Dune Communities (Dune Slack and Dune Grassland Habitats)

SD6 mobile dune community

This community occurred at the only location where sand dunes occur, to the north-west of Scolpaig farmhouse, in Bagh Scolpaig. It is the main colonising vegetation type of the mobile sand dunes closest to the high-tide line.

SD7 semi-fixed dune community

This community was only recorded at sand dunes to the north-west of Scolpaig farmhouse and forms a band between SD6 and the more widespread SD8. In parts, the vegetation was considered to be transitional to the adjacent SD8.

SD8 Festuca rubra-Galium verum fixed dune grassland

This community was found predominantly around the Scolpaig Farmhouse where there are extensive fixed dunes above the only sandy beach on the site. These extend some way inland and up the gentle, lower, south-west slopes of Beinn Scolpaig, forming quite large stands. Due to the absence of *Ammophila,* the vegetation was classified as the SD8e sub-community. Seed heads of orchids were also present but not identified to species level.

SD17 Potentilla anserina-Carex nigra dune-slack community

This community occurred immediately adjacent to SD8 at Scolpaig Farmhouse, or immediately adjacent to Loch Scolpaig, over lower lying wetter ground. Less frequent, species-poor, stands were defined as SD17a sub-community. More diverse, species-rich, sub-community were mapped as SD17b.

Swamp Communities (Swamp Habitat)

S4 swamp and reed-beds

Swamp communities were infrequent, and only recorded at the western ends of both parts of Loch Scolpaig and near the south-east of the survey area. Only one stand of S4a was recorded and elsewhere, S4c was recorded, usually in association with SD17b.

S9 swamp

S9b was only recorded as an open sward, mainly over standing water, to the north and west of the causeway which bisects Loch Scolpaig.

Woodland and Scrub Communities (Dense/Continuous Scrub Habitat)

W23 scrub

A single stand of dense *Ulex europaeus* was recorded near Loch Scolpaig and was mapped as W23.

Potential Groundwater Dependent Terrestrial Ecosystems

Appraisal of Site-Specific Groundwater Dependency

The NVC survey identified a number of botanical communities, which in accordance with SEPA advice (SEPA, 2017) have the potential to be supported by groundwater. Potential groundwater dependent ecosystems (GWDTEs) associated with NVC communities recorded within the Survey Area are detailed in Table 15-7 above. A map of the distribution of these features is provided in Figure 15.4. Further information in the form of target notes is provided in Appendix 15-1: Vegetation Survey.

As the access track works (the majority of which is minor upgrading of existing tracks), launch platform, tether pads and adjacent hardstanding works will all involve excavation depths of less than 1 m (see Chapter 4: Project Description and Drawing 0023) a 100 m buffer is therefore applicable, however the containment (liquid storage) tank will be

excavated to 1.09 m and exceeds the 1 m assessment threshold. The 250 m buffer applies in this case. A summary of the connectivity of potential GWDTEs to the Development, based on a maximum extent of 250 m is presented in Table 15-8, below. Figure 15.3 illustrates the prescribed buffers associated with excavation depths and potential GWDTE communities.

Table 15-8 Connectivity of potential GWDTEs to the Development

NVC Code	Potential Groundwater dependency (SEPA)	Within 250 m of the Development	Within 100 m of the Development?	Within footprint of Development?
M6	High	No	No	No
M15	Moderate	Yes, but existing track only.	Yes, existing track only.	Yes, existing track only.
M23a	High	No	No	No
M25a	Moderate	Yes, but existing track only.	Yes, existing track only.	Yes, existing track only.
M28	High	No	No	No
M29	High	No	No	No
SD17a/b	High	Yes, existing track and launch area.	Yes, existing track and launch area.	No

As is evident from

Table 15-8, the Development is outwith connectivity to the vast majority of potential GWTDEs. The majority of direct impacts are related to track upgrades, and thus only applicable to communities within 100 m of works. This is limited to M15 and M25a, both of which are potential GWDTEs of moderate groundwater dependency. Works related to the launch pad area are anticipated to be largely under 1 m, however, excavations associated with the containment tank have the potential to involve deeper excavation. However, the only communities that lie with 250 m of the launch area is SD17a/b which is a potential GWDTE of high groundwater dependency.

It is important to establish that the NVC data only allows for potential GWDTE to be identified, and as per SEPA advice, to establish the true groundwater dependency of NVC communities identified as potential GWDTEs, the geohydrological characteristics of these communities must also be assessed.

For example, across the Survey Area both M15 and M25 were recorded largely in close proximity or in mosaic with blanket bog habitats, which are ombrotrophic and thus formed via interaction between topographic features and precipitation/surface water, rather than groundwater interaction. This strongly suggests that these communities are surface water fed and not GWDTEs. Areas of M15 and M25 within connectivity to the Development are not as closely linked to blanket bog and other areas; however, they are located in close proximity to Loch Scolpaig, in direct connectivity of watercourses that feed the lochs, and therefore have a clear association with a number of surface water features.

Based on British Geological Survey (BGS) data (O'Dochartaih *et al.*, 2015), the underlying geology of North Uist is broadly defined as 'Precambrian south', which is characterised as a fracture dominant groundwater flow type of low to very low aquifer productivity. The bedrock types specifically associated with the Survey Area are igneous Lewisian complex gneiss, and an unnamed Palaeoproterozoic igneous intrusion, which are defined by the BGS as having low aquifer productivity, and rock with essentially no groundwater, respectively (BGS weblink).

In addition, both bedrock types are characterised by groundwater flow almost entirely limited to fractures and other discontinuities, where present at all. The only fracture in the local area is a minor fault located north-east of the Site, outwith the Survey Area.

In light of the above, as hydrogeological features below the Site are very unlikely to support groundwater, and all potential GWDTEs with potential connectivity to the Development are very likely to be supported by surface water features, GWDTEs have been **scoped out** further assessment.

Otter

As detailed in Section 15.5.2, Otter surveys were completed in 2019, and updated in 2021. As such, the baseline data for the species used to inform the assessment is based on the updated 2021 survey results, however reference is made to the 2019 survey results, as necessary.

The survey recorded extensive habitats of high value to otter within the coastal areas of the Survey Area, as well as terrestrial habitats in proximity to Loch Scolpaig and Loch Sgileabhat, in the south-west of the Survey Area and areas south of Bàgh Blasguidh. Evidence of otter presence was abundant and widespread and included extensive 'sprainting' (territorial marking), prints, feeding signs and numerous paths, likely associated with the species.

No active resting places were recorded; however, a single active holt (a below-ground resting place, and likely natal den) was recorded in 2019 surveys. This holt was not recorded to be active during 2021 surveys, however seasonal or occasional use cannot be ruled out. In addition, a flattened area of grass identified as being a potential/inactive couch (an above ground resting place) was recorded, however no spraints were recorded.

Paths, prints and spraints provided evidence of strong commuting connectivity between the Survey Area and extensive high value coastal and freshwater habitats in the wider local area. In addition, an incidental sighting of a mother otter and two cubs in 2019, strongly suggests that the area was likely to have been used by breeding otter in the past.

Key coastal habitats included rock pools, inlets and sandy shores, and each had the potential to support a range of suitable otter prey species, particularly in western coastline around Bàgh Scolpaig and Bàgh Blasguidh. In addition, the presence of extensive boulder fields on Bàgh Scolpaig beach, as well as scrub vegetation and grassy overhangs elsewhere provided a good range of shelter and resting opportunities.

Key terrestrial habitats were recorded around Loch Scolpaig, particularly at the southern loch, where a number of potential resting places were recorded; as well as grassland and freshwater habitats south of Bàgh Blasguidh, where an active holt was recorded in 2019 under a grassy overhang.

It was anecdotally noted that, following the transition from private to CnES ownership in June 2019, recreational use of the Site has increased considerably. However, as the 2021 Otter survey recorded broadly the same level of otter activity, this level of potential disturbance does not appear to have influenced otter use within the Site.

Appendix 15-2: Otter Survey Report (2019) and Appendix 15-3: Otter Survey Report (2021) detail the findings of the otter surveys and collates incidental observations of otter.

15.8.4 Future Baseline

The future baseline relates to consideration of how on-going change could affect conditions at the Site without the development of the project, including the potential for changes that may occur before the construction or operation of

the proposed project. CIEEM guidance (CIEEM, 2018) advises that baseline conditions need to be carefully defined and take into consideration potential changes to the baseline that could occur, for example between the undertaking of baseline surveys and a project proceeding.

Following the transition from private ownership to CnES ownership in 2019, changes have occurred at the Site (i.e., the Scolpaig Farm landholding as a whole) with potential to affect the Site's ecology. These changes are independent of the predicted effects of the Project that are assessed in this chapter. The two most substantial changes that have occurred (and are on-going) relate to public access and the livestock grazing regime. The potential implications for birds of these changes are discussed further in Chapter14: Ornithology, and have been integrated into the impact assessment where relevant.

Habitat change

Under private ownership, all parts of Scolpaig Farm were subject to grazing by sheep and cattle. This resulted in pasture habitats, especially around the farm buildings, developing a short-grass sward. In October 2019, shortly after ownership transition to CnES, all livestock were removed from the site. This resulted in negligible grazing pressure throughout the site following the removal of grazing, although substantial number of cattle (approximately 50 are thought to have breached fencing on numerous occasions). Following input from the RSPB, over summer 2021, CnES developed a programme of seasonal livestock grazing at Scolpaig Farm under a short-duration tenancy agreement, to be initiated in 2022. The tenancy agreement is based on traditional agricultural practices and aims to enhance the Scolpaig Farm habitats for wildlife. To promote sward heterogeneity, it is also planned that there will be a greater degree of compartmental (field to field) variation in grazing pressure, designed to recreate traditional management practices and provide the habitat requirements of the range of grassland bird species and other priority grassland wildlife present.

Public access

Under private ownership, public access to Scolpaig Farm was not facilitated despite existing footpath routes included in the Western Isles core path network. Under private ownership the gate at the east end of the Scolpaig track (the main access point to Scolpaig Farm) remained padlocked. Following the transition of ownership to CnES, a 'kissing gate' was installed at the end of the Scolpaig track, facilitating public (pedestrian) access to the site. The new access arrangements and the change of perception of the site as being under 'public ownership' is thought to have led to a marked increase in the number of islanders and tourists visiting the site for recreation. During the survey visits, recreational use by the public included walking, exercising dogs, swimming (in Scolpaig Bay), cycling, birdwatching and angling. Some recreational activities have potential to cause negative impacts on habitat (e.g., trampling and erosion) and wildlife (e.g., disturbance and trampling, and dog induced disturbance).

15.9 DETERMINATION OF ECOLOGICAL IMPORTANCE

Table 15-9 evaluates the importance of ecological features associated with the Development, and determines which ecological features, based on both their intrinsic value and their potential to be affected by development, are considered to be IEFs. Each ecological feature has been assigned a level of importance in accordance with the geographical scale outlined in Table 15-3.

Features of Local or Less than Local importance, and those to which likely significant effects can be categorically ruled out, including features considered absent for the Site, or potentially present in very low numbers, are scoped out of further assessment, however, will be sufficiently safeguarded through embedded mitigation and good practice measure detailed in Section 15.11, where present.

Table 15-9 Determination of Important Ecological Features

Ecological Feature	Determination Rationale	IEF/Action
Designated Sites		
North Uist Machair SAC	The Site is located within 1.7 km of the SAC. Qualifying Features of the SAC include the following Annex 1 habitats recorded within the Survey Area, 2130 Fixed dunes with herbaceous vegetation ('grey dunes') and 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') As an internationally designated site, this feature is considered of **international importance**.	**IEF** **Scoped into assessment**
Vallay SSSI	SSSI lies within the boundary of North Uist Machair SAC (above) and is designated for Annex 1 sand dunes habitats, which were recorded within the Survey Area. The feature is nationally designated, and therefore is considered of **national importance.**	**IEF** **Scoped into assessment**
Habitats and Botany		
A2.1: Scrub - dense/continuous	This habitat and its associated NVC community (W23) were very limited in extent (0.15 ha/0.05% of Survey Area) and is not listed on any relevant conservation priority lists. The feature is considered of Less than Local Importance.	Not an IEF Scoped out of assessment
B1.2: Acid Grassland - semi-improved	This habitat and its associated NVC community (U4) were limited in extent (1.81 ha/0.63% of Survey Area). The feature is listed on the SBL but is a very common a widespread habitat locally and nationally. The feature is considered of Less than Local Importance.	Not an IEF Scoped out of assessment
B5: Marshy grassland	This habitat and its associated NVC community (M25/M23) were relatively limited in extent (7.16 ha/2.48%). The feature is a very common and widespread habitat locally and nationally but is listed on the SBL. The feature is considered of Local Importance.	Not an IEF Scoped out of assessment
B6: Poor semi-improved grassland	This habitat and its associated NVC community (MG6) were limited in extent (6.00 ha/2.08% of Survey Area) and is not listed on any relevant conservation priority lists. The feature is considered of Less than Local Importance.	Not an IEF Scoped out of assessment
D1.1: Dry dwarf shrub heath - acid	This habitat and its associated NVC community (H10) were fairly limited in extent (19.35 ha/6.71% of Survey Area). Although a relatively widespread habitat locally and nationally, the feature is listed on the SBL. In addition, H10 heath is listed as Annex 1 habitat '4030 European Dry Heath' on the EC Habitats Directive. The feature is considered of **Regional Importance.**	**IEF** **Scoped into assessment**

Ecological Feature	Determination Rationale	IEF/Action
D2: Wet dwarf shrub heath	This habitat and its associated NVC community (M15) were fairly extensive (45.24 ha/15.69% of Survey Area). Although a relatively widespread habitat locally and nationally, the feature is listed on the SBL, and M15 heath is listed as Annex 1 habitat '4010 Northern Atlantic wet heaths with *Erica tetralix'* on the EC Habitats Directive. The feature is considered of **Regional Importance.**	**IEF** **Scoped into assessment**
D2/D1.1: Wet heath / acid dry heath mosaic	This mosaic habitat was moderately limited in its extent (19.01 ha/6.60% of Survey Area). Although a relatively widespread habitat locally and nationally, and not a feature of conservation priority, its associated NVC communities (M15/H10) are listed as Annex 1 habitat on the EC Habitats Directive. The feature is considered of Less than Local Importance.	Not an IEF Scoped out of assessment
D2/B6: Wet heath / poor semi-improved grassland mosaic	This mosaic habitat was limited in its extent (7.69 ha/2.67% of Survey Area). The feature is relatively widespread habitat locally and nationally, and not of conservation priority, however an associated NVC community (M15) is listed as Annex 1 habitat on the EC Habitats Directive. The feature is considered of Less than Local Importance.	Not an IEF Scoped out of assessment
E.1.6.1: Sphagnum blanket mire	This habitat and its associated NVC communities (M17/M1 /M6/M29) were relatively extensive (50.22 ha/17.42% of Survey Area) albeit largely localised. Although a relatively widespread habitat locally and nationally, the feature is listed on the SBL, and M17 mire is listed as Annex 1 habitat '7130 Blanket bogs' on the EC Habitats Directive. The feature is considered of **Regional Importance.**	**IEF** **Scoped into assessment**
E1.6.1/D2: Blanket bog / wet heath mosaic	This mosaic habitat was found to be relatively extensive (50.82 ha/17.63% of Survey Area) and comprises of communities associated with two Annex 1 habitats listed on the EC Habitats Directive; '7130 Blanket bogs' and '4010 Northern Atlantic wet heaths with *Erica tetralix'*. The feature is considered of **Regional Importance.**	**IEF** **Scoped into assessment**
E3: Fen	Only two very small stands of the associated NVC community (M28) were recorded with the Survey Area. M28 is listed on the SBL. The feature is considered of Less than Local Importance.	Not an IEF Scoped out of assessment
F1: Swamp	This habitat and its associated NVC community (S4/S9) were very limited in extent (2.84 ha/0.99% of Survey Area). The feature is a very common a widespread habitat locally and nationally, but is listed on the SBL. The feature is considered of Less than Local Importance.	Not an IEF Scoped out of assessment

Ecological Feature	Determination Rationale	IEF/Action
G1: Standing water	This habitat was relatively limited in extent (11.73 ha/4.07% of Survey Area) and is not listed on any relevant conservation priority lists however the feature has value in its potential to support local otter population. The feature is considered of Local Importance.	Not an IEF Scoped out of assessment
H1.1: Intertidal sand	This habitat was very limited in extent (1.40 ha/0.49% of Survey Area) and it is not listed on any relevant conservation priority lists. The feature is considered of Local Importance.	Not an IEF Scoped out of assessment
H6.4: Dune slack	This habitat and its associated NVC community (SD17) were very limited in extent (2.72 ha/0.94% of Survey Area), however, it is listed on the SBL, and as Annex 1 habitat '2190 Humid dune slacks' on the EC Habitats Directive. The feature is also present in mosaic with swamp habitats, albeit in an even more limited extent (1.10 ha/0.38% of the Survey Area). The feature is considered of Local Importance.	Not an IEF Scoped out of assessment
H6.5: Dune grassland	This habitat and its associated NVC communities (SD6/SD7/SD8) were moderately extensive (23.91 ha/8.29% of Survey Area). It is listed on the SBL, and as Annex 1 habitat 'SBL Priority Habitat/ EC Habitats '2130 Fixed dunes with herbaceous vegetation ('grey dunes')' and '2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")' on the EC Habitats Directive. The feature is also present in mosaic with wet heath habitats, albeit in a notably more limited extent (0.99 ha/0.34% of the Survey Area). The feature is considered of **Regional Importance.**	**IEF** **Scoped into assessment**
H8.2: Soft cliff	This habitat and its associated NVC communities (MC2/MC8/MC9/MC10) were relatively limited (11.05 ha/3.83% of Survey Area). It is listed on the SBL, and as Annex 1 habitat '1230 Vegetated Sea cliffs of the Atlantic and Baltic coasts' on the EC Habitats Directive. The feature is also present in mosaic with coastal heathland, albeit in a notably more limited extent (0.64 ha/0.57% of the Survey Area). The feature is considered of Local Importance.	Not an IEF Scoped out of assessment
H8.5: Coastal heathland	This habitat and its associated NVC communities (H7/H10) were relatively limited (9.70 ha/3.36% of Survey Area). It is listed on the SBL, and as Annex 1 habitat '1230 Vegetated sea cliffs of the Atlantic and Baltic coasts' on the EC Habitats Directive. The feature is considered of Local Importance.	Not an IEF Scoped out of assessment
I1: Rock exposure	This habitat was limited in extent (13.76 ha/4.77% of Survey Area) and is not listed on any relevant conservation priority lists. The feature is considered of Less than Local Importance.	Not an IEF Scoped out of assessment

Ecological Feature	Determination Rationale	IEF/Action
GWDTEs	Potential GWDTEs were recorded, however the bedrock types associated with the Survey Area have low aquifer productivity or no groundwater presence, which would be limited to fractures and other discontinuities located outwith the Survey Area. In addition, the topographical and geographical setting for potential GWDTEs, suggest strong surface water and ombrotrophic association. In light of the above, it is considered that GWDTEs are very likely to be absent from the Survey Area and thus the features are considered of Less than Local Importance.	Not an IEF Scoped out of assessment
Faunal Species		
Otter	The species is not associated with any local statutory designated sites; however, otter is a European protected species. This species is widespread on North Uist and the Hebrides and is of favourable conservation status in Scotland with an increasing range and population size UK wide (Mathews et al, 2018). Habitats within the Site are used by otter and development has the potential to result in disturbance, which is an offence under the Habitats Regulations. The feature is considered of **Regional Importance.**	**IEF** **Scoped into assessment**
Invertebrate species	The desk study uncovered a relatively broad assemblage of invertebrate species comprising of predominantly common and widespread species. No protected species, or species listed on the IUCN red list were recorded, but three species (moss carder bee, rosy rustic moth and great yellow bumble bee) are recorded on the SBL and one of these species (great yellow bumblebee) is also listed in the Western Isles Local Biodiversity Action Plan. The distribution of great yellow bumblebee reflects the distribution of flower-rich machair habitat, and the species is considered to be in declining status. Although suitable habitats to support this species are relatively widespread and abundant in the Western Isles, the species is absent from the majority of the UK, only being found in the northern Highlands and islands of Scotland. Moss carder bee is relatively scarce in abundance, but widespread across the UK, however they are particularly widespread and relatively abundant across the Western Isles. Rosy rustic moth is common and widespread across the UK and frequents waste ground, marshy areas, and other places where the foodplants such as Docks grow. In light of the above, all invertebrate species are considered to be of **less than local importance**, with the exception of great yellow bumblebee*, which is considered to be of **Regional Importance**.	***IEF** **Scoped into assessment**

15.9.1 Scoped Out of the Assessment of Potential Effects

Following the systematic evaluation of ecological importance outlined in Table 15-9, the following ecological features were determined to be of Local Importance or below, and thus not considered to be IEFs, and have therefore been scoped out of the assessment:

- A2.1: Scrub - dense/continuous;
- B1.2: Acid grassland - semi-improved;
- B5: Marshy grassland;
- B6: Poor semi-improved grassland;
- D2/D1.1: Wet heath / acid dry heath mosaic;
- D2/B6: Wet heath / poor semi-improved grassland mosaic;
- E3: Fen;
- F1: Swamp;
- G1: Standing water;
- H1.1: Intertidal sand;
- H6.4: Dune slack;
- H8.2: Soft cliff;
- H8.5: Coastal heathland;
- I1: Rock exposure;
- Invertebrates (with the exception of great yellow bumblebee); and
- GWDTEs.

Although the above IEFs have been scoped out of further assessment within this chapter, measures to mitigate or avoid potential effects on these IEFs have been included within design mitigation measures (Table 15-10) to help ensure adherence to accepted industry good practice.

15.9.2 Scoped into the Assessment of Potential Effects

Following the systematic evaluation of importance outlined in Table 15-9, the following ecological features are considered of Regional Importance or above, and thus are determined to be IEFs, and therefore have been scoped into the assessment:

- North Uist Machair SAC;
- Vallay SSSI;
- D1.1: Dry dwarf shrub heath - acid;
- D2: Wet dwarf shrub heath;
- E.1.6.1: Sphagnum blanket mire;
- E1.6.1/D2: Blanket bog / wet heath mosaic;
- H6.5: Dune grassland;
- Otter; and
- Great yellow bumblebee.

Furthermore, as North Uist Machair SAC is a European site, an assessment of whether there is the potential for any likely significant effects on qualifying features of this site as a result of the Development has been considered and information to inform an appropriate assessment is provided in Annex B: Information to Inform HRA.

15.10 POTENTIAL IMPACTS

The following potential impacts, which have been established through scoping, consultation with key stakeholders, and professional judgement are:

Construction Phase

- Permanent removal and potential temporary degradation of wet dwarf shrub heath habitat;
- Permanent removal and potential temporary degradation of dune grassland habitat;
- Permanent removal and potential temporary degradation of habitats used by otter;

- Disturbance and displacement of otter via construction-based noise and vibration, or visual disturbance;
- Otter mortality or injury via entrapment of otter in construction excavations;
- Otter mortality or injury via interaction with construction traffic and plant; and
- The permanent removal and potential temporary degradation of great yellow bumblebee habitat.

Operational Phase

- Contamination or degradation of wet dwarf shrub heath habitats;
- Contamination or degradation of dune grassland habitats by hazardous materials and pollutants;
- Contamination or degradation of habitats used by Otter by hazardous materials and pollutants;
- Noise related disturbance to otter by operational activities, including launch events; and
- Contamination or degradation of great yellow bumblebee habitats by hazardous materials and pollutants.

Decommissioning

- Impacts during the decommissioning phase are likely to be similar to, or less than those during the construction phase.

15.11 MITIGATION AND MANAGEMENT MEASURES

Application of the 'mitigation hierarchy' has been undertaken throughout the Development process. Measures to avoid or reduce potential ecological effects have been incorporated into the Development ('embedded mitigation') and include 'design mitigation' and 'mitigation by practise' or 'operational mitigation'.

Design mitigation is where aspects of the Development have been re-designed to avoid or reduce ecological effects. This type of mitigation is particularly beneficial for ecological resources as there is greater certainty that it will be delivered. Mitigation by practise is when good practice measures and contingency mitigation is actively implemented during the Development process to minimise impacts.

Embedded mitigation is taken into consideration when undertaking the assessment of significant effects, and if following this, significant effects are predicted, further specific mitigation is required to reduce residual effects. A summary of embedded mitigation measures is provided in Table 15-10 below.

Table 15-10 Summary of Mitigation Measures

Reference	Title	Description
GM01	Design Mitigation	• Reuse of existing infrastructure where possible: one existing farm building upgraded and the existing access road from the A865 will be used following minor upgraded and widening. • Substantial reduction of original project infrastructure (Figure 3.1) and footprint, to avoid peat, archaeological features and National Scenic Area. • Project revised to provide a venue for sub-orbital launch vehicles, substantially smaller than orbital launch vehicles proposed in the Scoping Report; • Key infrastructure (including the construction compound) has been located outwith a 50 m buffer of all surface watercourses; • No concrete batching proposed on site, with cement imported from local suppliers and pre-cast culvert installation for Scolpaig Loch crossing; • Launch pad designed to accommodate all potential fuelling and oxidiser storage requirements prior to a launch; • Pollution management infrastructure designed for three scenarios of operation (not in use, standard operation, non-standard operation / catastrophic events). • Space Launch Hazard Area boundaries are defined to avoid landmasses, St Kilda seabird colonies, and Northern Lighthouse Board assets.
GM02	Construction Mitigation Register and Construction Environmental Manager	A Construction Mitigation Register (CMR) will be collated detailing the mitigation commitments in the EIA and relevant planning conditions. A dedicated Construction Environmental Manager (CEM) will have responsibility to ensure all measures in the register are delivered during the construction period. The CMR will outline all required mitigation commitments and relevant planning conditions for ornithological, ecological, cultural heritage and hydrological receptors, providing details of key sensitivities present and timings. The CEM will contract necessary survey expertise, advise on, and monitor the implementation and compliance of works with construction phase environmental mitigation and good practice measures.
HHG01	Water Management (Construction)	• Construction mitigation for culvert installation, including the installation of coffer dams, dewatering and sediment management strategy, outlined in detail in Appendix 17-2 Water Management. • Sectioning and shuttering concrete pouring works will avoid the potential for slumping and reduces likelihood of concrete spillages and infiltration into surrounding machair. All concrete pouring works will be undertaken under appropriate dry weather conditions required for curing. • Materials storage will be in line with the requirements of legislation and good practice with materials safety data sheets. Emergency procedures and spill kits (including hydrocarbon sorbents, pads and booms) will be retained on site and spill kits will be on standby adjacent to operations.

Reference	Title	Description
HHG04	Hazardous Materials Management	A detailed hazardous material management plan will be developed for the transport, storage and use of hazardous substances, including protocols for unplanned or accidental events. An Outline Hazardous Materials Management Plan setting out the general principals, the maximum materials inventory and pollution control response to different operational and pollution control scenarios is provided in Appendix 17-1 and covers the following topics: • Regulatory context and legislative interactions; • Maximum materials inventory; • Management, Roles and Responsibilities; • Pre-launch appraisal / contract agreement; • Principals for the transport and storage of hazardous materials; • Spillage Management and Catastrophic Events; • Storage of residual materials post launch; and • Security
ECO01	Pre-construction Otter Survey	Pre-construction surveys for otter, will be undertaken to provide up-to-date information about the distribution and abundance of otter prior to construction work. The results of the surveys will inform the development of an Otter Protection and Monitoring Plan (OPMP), and associated mitigation and licensing requirements for construction and operation of the site, all of which will be developed in line with NatureScot guidance.
ECO02	Otter Protection and Monitoring Plan (OPMP)	Following the completion of a Pre-construction Otter Survey an OPMP will be developed and submitted to the CnES and NatureScot for approval. The OPMP will detail proposed good practice and mitigation measures required to safeguard the species during construction of the Development, and will inform and support any European Protected Species licence works required. The OPMP is likely to include the following: • Traffic speed restrictions to 10 mph and associated signage. • Operational hours restrictions; • Ramps and covering excavations / tanks to avoid entrapment; In addition to the above, the OPMP will also include details of the proposed operational otter monitoring surveys. Operational Monitoring will inform the need for, and requirement of, a European Protected Species licence. Operational Monitoring would be carried out twice per year and will take place within a 'Otter Monitoring Zone' (OMZ) defined as all land within 300 m of the launch pad. However, the OMZ may be reduced or increased, following review of monitoring data, which will be done annually, and submitted to the planning authority and NatureScot in the form of an Annual Monitoring Report. It is anticipated that Operational Monitoring would take place for the first three years of operations, however this will be revised as necessary, following a review of Annual Monitoring Reports.
ECO03	Ground Reinstatement	To facilitate site restoration, reinstatement of vegetation will be focused on natural regeneration utilising vegetated turves or soils stripped and stored with their intrinsic seed bank. To encourage stabilisation and early establishment of vegetation cover, where available, topsoil and vegetation turves in keeping with the surrounding vegetation type will be used to provide a dressing for the final surface.

Reference	Title	Description
COM01	Habitat and Amenity Management Plan (HAMP)	A formalised Habitat and Amenity Management plan will be developed post-consent to expand the current habitat enhancement proposals and integrate these with commitments arising from the EIA / planning process as part of a wider HAMP. Under CnES ownership, the site is currently being managed to allow access for recreational use, community grazing opportunities, and enhancement of habitats in consultation with the RSPB. An outline HAMP outlining key commitments and principals is provided in Appendix 7-2 and will be development post consent in conjunction with a consultative Advisory Group. Coordination and management of the HAMP will be delivered by an Environmental Manager contracted by Spaceport1. Commitments and development principals centre around the following: • Habitat enhancement for specific species and habitats; • Public (including users of limited mobility) access; • Community grazing opportunities; • Cultural heritage; and • Fisheries.

15.12 IMPACT ASSESSMENT

15.12.1 Construction Phase Effects

Permanent removal and potential temporary degradation of wet dwarf shrub heath habitat

Impact Overview (without mitigation)

Although a relatively widespread habitat locally and nationally, wet dwarf shrub heath habitats are listed on the SBL, and M15 heath is listed as Annex 1 habitat '4010 Northern Atlantic wet heaths with *Erica tetralix'* on the EC Habitats Directive (JNCC weblink). This habitat is assessed to be a regionally important ecological feature.

The construction of the Development will cause the permanent removal of wet heath habitats during construction, and the effects will be permanent. In addition, the Development has the potential to result in temporary degradation of wet dwarf shrub heath habitats through pollution and sedimentation during the construction phase.

Mitigation

Design Mitigation

The Development footprint has been substantially reduced following scoping, with 99.70% of the wet heath habitats recorded in the Survey Area having been avoided, and therefore will not be impacted by the Development. As detailed in Table 15-11 below, an estimated 0.14 ha of wet dwarf shrub heath habitat will be permanently lost from the development footprint. As wet dwarf shrub heath habitats were extensive and widespread across the Survey Area, the actual loss is very minor and equates to 0.30% of the total area of wet dwarf shrub heath, and 0.05% of all habitats, recorded within the Survey Area. Loss of this habitat comprises 20.31% of all habitat loss associated with the development.

Further details of permanent habitat loss for this habitat, and all other habitat removed as a result of the Development footprint, are presented in Table 15-11.

Table 15-11 Predicted Permanent Habitat Loss by Phase 1 Habitat Type and Infrastructure Type

Habitat Type	Infrastructure Type	Area Lost (Ha)	% of Feature Lost	% of Overall Habitat Loss
Wet dwarf shrub heath	Road plus widened sections	0.10		
	Car parking	0.02		
	Lay-by	0.02		
	Pedestrian access	0.00		
	Total	***0.14***	***0.30***	***20.31***
Dune grassland / wet heath	Road plus widened sections	0.03		
	Lay-by	0.00		
	Total	***0.03***	***2.82***	***4.22***
Dune slack/ swamp	Road plus widened sections	0.00		
	Total	***0.00***	***0.00***	***0.05***
Swamp	Road plus widened sections	0.01		
	Box culvert	0.00		
	Rock armour	0.00		
	Total	***0.01***	***0.71***	***3.05***
Standing water	Road plus widened sections	0.01		
	Box culvert	0.00		
	Rock armour	0.01		
	Total	***0.02***	***0.16***	***2.89***
Dune grassland	Below ground soakaway	0.02		
	Byre 1	0.01		
	Byre 2 - upgraded storage	0.01		
	Byre 3	0.01		
	Liquid storage tank	0.01		
	Scolpaig Farm	0.02		
	Water storage tank	0.00		
	Cut and fill excavation	0.05		
	Road plus widened sections	0.10		
	Cut and fill excavation	0.05		
	Launch parking	0.02		
	Lay-by	0.01		
	Rock armour	0.00		
	Tether points	0.00		
	Hardcore and Vehicle access	0.18		

Habitat Type	Infrastructure Type	Area Lost (Ha)	% of Feature Lost	% of Overall Habitat Loss
	Underground drain (110mm)	0.00		
	Underground drain (200mm)	0.00		
	Total	***0.46***	**1.92**	**69.48**
	Overall Total Loss	**0.66Ha**		**0.24%**

In addition to avoiding sensitive habitats, design mitigation (GM01) includes the use of the existing farm access road (following minor upgraded and widening) to avoid the habitat loss associated with the development of new access tracks. The southern portion of the existing farm track (south of Loch Scolpaig), which will be used as the development access track, is located within this habitat and its upgraded road widening represents the majority of the habitat loss presented in Table 15-11. Therefore, the majority of wet dwarf shrub heath habitat predicted to be directly impacted by the development, although mapped as wet dwarf shrub heath, is in fact bare ground (the existing farm road) and therefore the habitat loss values presented in Table 15-11 are likely to be an overestimate.

Construction Mitigation

Embedded mitigation and good practice measures such as the effective implementation of turf storage and restoration proposals will ensure the effects of construction phase habitat loss are minimised (ECO03). A designated construction compound will include a fuel storage area, which will also be used to ensure any pollutants do not contaminate wet heath habitats in proximity to the Development. A Construction Mitigation Register (GM03) will be collated and will include a water management plan for the culvert replacement in addition to other pollution control measures, including concrete management (HHG01) to be implemented during the construction phase to avoid impacts on watercourses and other sensitive habitats. A Construction Environmental Manager (GM03) will be appointed during the construction phase to advise on and monitor the implementation of environmental mitigation and good practice and compliance of works with the Mitigation Register. Further details of pollution protection measures and are presented in Chapter 17: Hydrology, Hydrogeology and Geology.

Assessment of Residual effects

Magnitude of Impact

Dwarf shrub wet heath habitat is abundant in the local area and much of the habitat impacted (i.e., where the existing farm track is located), is already in degraded condition. The nature and small scale of the works will result in a minor scale and spatial extent of habitat loss and potential degradation. In addition, good practice mitigation will be implemented. As a result, the impact on wet heath habitats is considered to be of **very low** magnitude.

Significance of Residual Effects

Dwarf shrub wet heath habitat is considered to be of **regional** importance and is abundant in the local area. With the implementation of embedded mitigation and management measures the magnitude of this impact is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

Permanent removal and potential temporary degradation of dune grassland habitat

Impact Overview (without mitigation)

Although a relatively widespread habitat locally, dune grassland habitats are listed on the SBL, and its associated NVC communities (SD6-SD8), are listed as Annex 1 habitats '2130 Fixed dunes with herbaceous vegetation ('grey dunes')' and '2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")' in the EC Habitats Directive

(JNCC weblink). This habitat is assessed to be a regionally important ecological feature. The construction of the Development will result in the permanent removal of dune grassland habitats during construction, and the effects may be permanent. In addition, the Development has the potential to result in temporary degradation of dune grassland habitats through pollution and sedimentation during the construction phase works.

Mitigation

Design Mitigation

The development footprint has been substantially reduced following scoping, with 98.08% of the dune grassland habitats recorded in the Survey Area avoided, and therefore will not be impacted by the Development. As detailed in Table 15-11, an estimated 0.46 ha of dune grassland habitat will be permanently lost from the Development footprint, equating to 1.92% of the total area of dune grassland recorded, and 0.16% of all habitats recorded within the Survey Area. Loss of this habitat comprises 69.48% of all habitat loss associated with the development. Further details of permanent habitat loss for this habitat, and all other habitat removed as a result of the Development footprint, are presented in Table 15-11.

In addition to avoiding sensitive habitats, design mitigation (GM02) includes the use of the existing access road (following minor upgraded and widening) to avoid the habitat loss associated with the development on new access tracks. The northern aspect of the existing farm track (north of Loch Scolpaig), which will be used as the Development access track is located within this habitat, and its upgrading represents the majority of the habitat loss presented in Table 15-11. Therefore, the majority of dune grassland habitat predicted to be directly impacted by the Development, although mapped as dune grassland, is in fact bare ground (the existing farm road) and therefore habitat loss values presented in Table 15-11 are likely to be an overestimate.

Construction Mitigation

Embedded mitigation and good practice measures such as the effective implementation of turf storage and restoration proposals will ensure the effects of construction phase habitat loss are minimised. A designated construction compound will include a fuel storage area, which will also be used to ensure any pollutants do not contaminate dune grassland habitats in proximity to the Development.

A Construction Mitigation Register (GM03) will be collated and will include a water management plan for the culvert replacement in addition to other pollution control measures, including concrete management (HHG01) to be implemented during the construction phase to avoid impacts on watercourses and other sensitive habitats. A Construction Environmental Manager (GM03) will be appointed during the construction phase to advise on and monitor the implementation of environmental mitigation and good practice and compliance of works with the Mitigation Register. Further details of pollution protection measures and are presented in Chapter 17: Hydrology, Hydrogeology and Geology.

Assessment of Residual effects

Magnitude of Impact

Dune grassland habitat is abundant in the local area and much of the habitat impacted (i.e. where the existing farm track is located), is already in degraded condition. The nature and small scale of the works will result in a minor scale and spatial extent of habitat loss and potential degradation. In addition, good practice mitigation will be implemented. As a result, the impact on wet heath habitats is considered to be of **very low** magnitude.

Significance of Residual Effects

Dune grassland habitat is considered to be of **regional** importance and is relatively abundant in the local area. With the implementation of embedded / design mitigation and management measures, the magnitude of this impact is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

Permanent removal and potential temporary degradation of habitats used by otter

Impact overview (without mitigation)

Otter is a European Protected Species, but they are not associated with any local statutory designated sites, are widespread on North Uist and the Hebrides, and are of favourable conservation status in Scotland. However, habitats within the Site were widely used by otter, including potential for breeding, and the Development has the potential to result in disturbance to otter which is an offence under the Conservation (Natural Habitats, &c.) Regulations 1994, and therefore the species is considered of **regional** importance.

During the construction phase there are potential impacts that may result from the occurrence of ground works in close proximity to watercourses, waterbodies and other habitats used by otter. These include the adverse impacts of habitat removal and degradation, including siltation, sedimentation and accidental pollution during the installation of the culvert. These impacts could adversely affect the local otter population indirectly by reducing habitat suitability for prey species, thus reducing prey availability, or by directly damaging habitats used by otter for resting and commuting. Both effects could result in the displacement of otter from the Site, reduction of connectivity to the wider local area, and a minor reduction of fitness in members of the otter population, due to decreased resources and the subsequent increase in competition for resources.

The majority of construction will take place in close proximity to Loch Scolpaig, which was identified as an important terrestrial habitat for otter within the Survey Area as extensive otter activity was recorded.

Mitigation

Design Mitigation

Design mitigation includes minimising additional habitat loss through the use of the existing farm access road following minor upgraded and widening (GM01). As a result, the nature, extent and scale of construction works is relatively small. One existing loch crossing will be upgraded during works as part of the access track upgrade, and the existing culvert will be replaced with a concrete box culvert and the causeway level will increase in width. A dedicated water management plant for the installation of the culvert has been developed (HHG01). Construction of the culvert would be in accordance with Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods (SEPA, 2009). Further details are provided in Chapter 17: Hydrology, Hydrogeology and Geology.

Given the minor nature and extent of construction works, the effects on habitats used by otter are considered likely to be minimal. However, due to the presence of a potential resting place within close proximity to the existing farm track, direct impacts on a protected resting place cannot be ruled out.

Construction Mitigation

Embedded / design mitigation and good practice measures will ensure the effects of construction works on habitats used by otter are minimised. To avoid or reduce the occurrence of pollution events that may adversely impact otter habitats, the temporary construction compound will include a designated fuel storage area which will also be used to ensure any pollutants do not contaminate otter habitats in proximity to the development. A Construction Environmental Manager will be appointed during the construction phase to advise on and monitor the implementation of environmental mitigation and good practice and compliance of works with the Mitigation Register (GMO2). Further details of pollution protection

measures and are presented in Chapter 17: Hydrology, Hydrogeology and Geology and Appendix 17-2: Water Management.

Otter Protection and Monitoring Plan

As outlined in Section 15.11, pre-construction Otter Surveys will be carried out as part of the OPMP, and these will update the baseline condition and inform the production of an Otter Protection and Monitoring Plan, which will be development and submitted to the CnES and NatureScot for approval. The OPMP will detail all good practice and mitigation measures required to safeguard the species during construction of the Development and will inform and support any European Protected Species licence works that may be subsequently required.

Assessment of Residual effects

Magnitude of Impact

Although otters are known to be present within close proximity to the Development footprint, no confirmed resting places will be impacted by constructions works and extensive high value coastal, marine and terrestrial otter habitats and resources are available in the wider local area. Therefore, given the nature and scale of construction works, and the implementation of good practice measures to safeguard the species via the OPMP, informed by pre-construction otter surveys, the impact is likely to be of **low** magnitude.

Significance of Residual Effects

Otter is considered to be a feature of **regional** importance and are known to be widespread in the local area. With the implementation of embedded mitigation and management measures, the magnitude of this impact is assessed to be **low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

Disturbance and displacement of otter via construction-based noise and vibration or visual disturbance

Impact overview (without mitigation)

Potential development-related disturbance and displacement could occur from an increase in noise, vibration, traffic and the presence of people, in close proximity to areas used by otter, in particular at resting places, where disturbance could constitute a legal offence.

It is an offence under the Conservation (Natural Habitats, &c.) Regulations 1994 to disturb an otter whilst it is occupying a resting place, or while it is rearing or otherwise caring for its young, or in any way that impairs its ability to survive or breed, or significantly affects the local distribution or abundance of otters. Therefore, disturbance effects are not limited to resting places. This is of particular relevance to coastal otters, which can be notably more active during the diurnal period than freshwater otters. In accordance with NatureScot guidance (NatureScot, 2021), any construction activity taking place within 30 m of holts and shelters where otter is not breeding, and up to 200 m for breeding holts are likely to constitute an offence.

Mitigation

Design Mitigation

The development footprint has been substantially reduced following scoping, as has the scale and nature of construction works through the use of existing infrastructure. Extensive otter activity was recorded across the Site, which included a holt which although inactive at the time of survey, is likely to have been recently used by breeding otter. This previously active holt was recorded in 2019 near Bàgh Blasguidh, and is located 1.1 km north-east of the Development.

Although construction will take place in close proximity to habitats used by the local otter population, including a potential resting place, no works will take place within 200 m of any confirmed resting places, or within close proximity to coastal foraging habitats.

Otter Protection and Monitoring Plan

As outlined in Section 15.11, pre-construction Otter surveys will be carried out (ECO01), and these will update the baseline condition, and inform the production of an OPMP (ECO02), which will be developed and submitted to NatureScot / CnES for approval. The OPMP will detail all good practice and mitigation measures required to safeguard the species during construction of the Development and will inform and support any European Protected Species licence works, or further mitigation required.

Assessment of residual effects

Magnitude of impact

Although otters are known to be present within close proximity to the Development footprint, no known otter resting places will be impacted by construction. Coastal otters are diurnal so will be active at times where works are taking place. However, as coastal otters primarily forage in coastal and marine habitats and have relatively small ranges, the effects of disturbance and displacement associated with breeding otter are likely to be minimal due to the distance between the Development footprint and these coastal habitats. It is important to consider however, that regardless of the abundance of coastal foraging habitats, coastal otters are still likely to utilise freshwater habitats on occasion to de-salt their pelts. This is reflected in the presence of otter in terrestrial and freshwater habitats within proximity to the Development. As a result, disturbance and displacement of otters from these occasionally-used terrestrial habitats cannot be ruled out.

Given the nature and scale of construction works, and the distance between the only previously active holt and high value coastal foraging habitats, as well as the extensive high value otter habitats and resources available in the wider local area, and the implementation of good practice measures to safeguard the species via the OPMP, informed by pre-construction otter surveys, the impact is likely to be of **low** magnitude.

Significance of residual effects

Otter is considered to be a feature of **regional** importance and are known to be widespread in the local area. With the implementation of embedded mitigation and management measures the magnitude of this impact is assessed to be **low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

Otter mortality or injury via entrapment of otter in construction excavations

Impact overview (without mitigation)

Construction phase excavations if left uncovered and unattended have the potential to injure or entrap wildlife including otters which could result in injury or mortality, however the risk is typically fairly low.

Mitigation

Construction Mitigation

Embedded mitigation and good practice measures, as outlined in Table 15-10, will ensure the impacts of construction works on otter are minimised. A Construction Environmental Manager will be appointed during the construction phase to advise on and monitor the implementation of environmental mitigation and good practice and compliance of works with the OPMP (GM02).

Otter Protection and Monitoring Plan

As outlined in Section 15.11, pre-construction Otter surveys will be carried out, and these will update the baseline condition and inform the production of an OPMP, which will be developed and submitted to the planning authority and NatureScot for approval. The OPMP will detail all good practice and mitigation measures required to safeguard the species during construction of the development and will inform and support any European Protected Species licence works required.

As part of the OPMP, all construction phase excavations left uncovered and unattended should have a means of escape in place for otter to use. For example, a stable ramp, or gentle slope exiting the excavation should be in place to allow any otter to easily remove itself from the excavation.

Assessment of Residual effects

Magnitude of Impact

Although otters are known to be present within close proximity to the Development footprint, given the nature and scale of construction works, which will not include any deep excavations, and the implementation of good practice measures to safeguard the species via the OPMP, informed by pre-construction otter surveys, the adverse impact is considered likely to be of **very low** magnitude.

Significance of Residual Effects

Otter is considered to be a feature of **regional** importance and are known to be widespread in the local area. With the implementation of embedded mitigation and management measures the magnitude of this impact is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

Otter mortality or injury via interaction with construction traffic and plant

Impact Overview (without mitigation)

In addition to causing construction phase disturbance (assessed separately above), the direct increase in traffic and plant movements during the construction phase of the Development has the potential to result in a temporary increase in the risk of accidental collisions leading to otter injury and fatality.

Mitigation

Construction Mitigation

Embedded mitigation and good practice measures will ensure the effects of construction works on otter are minimised. To minimise the potential impacts from interactions with traffic and plant, vehicle speeds will be restricted to 10 mph across the Site, signposting and additional temporarily speed limiting mechanisms (such as speed bumps or rumble-strips) may be implemented as necessary (EC02). A Construction Environmental Manager will be appointed during the construction phase to implement and monitor environmental mitigation in line with the Construction Mitigation Register (GMO2).

One existing loch crossing will be upgraded during works as part of the access track upgrade, and the existing culvert will be replaced with a concrete box culvert and the causeway level will be increased in width. Mammal crossings (such as otter ledges) can be integrated into river culvert designs to reduce the risk of traffic collisions, however the required culvert design, which is situated within a short causeway across the Loch rather than a river, does not allow for the integration of a mammal crossing.

As the culvert will not limit otter movements, the access road is private and gated, and vehicle access will be very limited and subject to site-specific speed restrictions, an otter ledge would be of little to no additional value as a mitigation measure. This approach to culvert design was agreed through consultation with SEPA (see Table 15-1).

Otter Protection and Monitoring Plan

As outlined in Section 15.11, pre-construction Otter surveys will be carried out (ECO01), and these will update the baseline condition and inform the production of an Otter Protection and Monitoring Plan (ECO02), which will be developed and submitted to the CnES and NatureScot for approval. The OPMP will detail necessary good practice and mitigation measures required to safeguard the species during construction of the Development, as well as requirements for any potential operational monitoring, and will inform and support any European Protected Species licence works required.

Assessment of residual effects

Magnitude of impact

Although otters are known to be present within close proximity to the development footprint, given the nature and scale of construction works, and the implementation of good practice measures to safeguard the species via the OPMP, the inclusion of vehicles speed restriction within the Site, the adverse impact is considered likely to be of **very low** magnitude.

Significance of residual effects

Otter is considered to be a feature of **regional** importance and are known to be widespread in the local area. With the implementation of embedded mitigation and management measures the magnitude of this impact is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

The permanent removal and potential temporary degradation of great yellow bumblebee habitat

Impact Overview (without mitigation)

Great yellow bumblebee is absent from the majority of the UK; however, it is relatively widespread and abundant in the Western Isles, due to its association with machair habitats.

Machair habitats recorded within the survey area are dune grassland, dune slack and their associated mosaics, however the only machair habitat to be lost to the Development footprint is dune grassland, which is a relatively widespread habitat locally. The construction of the Development will cause the permanent removal of dune grassland habitats potentially used by great yellow bumblebee, during construction and the effects may be permanent. In addition, the Development has the potential to result in temporary degradation of great yellow bumblebee habitat through pollution and sedimentation during the construction phase.

Mitigation

Design Mitigation

The development footprint has been substantially reduced following scoping (GM01), with 98.08% of the dune grassland habitats recorded in the survey area avoided and therefore will not be impacted by the development. As detailed in Table 15-11, an estimated 0.46 ha of dune grassland habitat will be permanently lost from the development footprint, with equates to a 1.92% reduction of the coverage of habitat. Further details of permanent habitat loss for this habitat, and all other habitat removed as a result of the Development footprint, are presented in Table 15-11.

In addition to avoiding sensitive habitats, design mitigation includes upgrading the existing access road (minor upgraded and widening) to reduce the habitat loss associated with the Development. The northern aspect of existing farm track (north of Loch Scolpaig) is located within dune grassland and its upgrading represents the majority of the habitat loss

presented in Table 15-11. Therefore, the majority of dune grassland habitat predicted to be directly impacted by the Development, although mapped as dune grassland, is in fact bare ground (the existing farm/farm road) and therefore access track and launch pad areas aren't located on high value bumblebee habitat.

Construction Mitigation

Embedded mitigation and good practice measures such as the effective implementation and monitoring of turf storage and restoration proposals will ensure the effects of construction phase habitat loss are minimised (ECO03). Environmental protection measures set out in GM02 (Construction Mitigation Register and Environmental Manager), HHG01 (Water Management) and HHG04 (Hazardous Materials Management Plan), as summarised in Table 15-10 are expected to help minimise the potential environmental impacts of construction.

Habitat Management

The site is currently being managed to provide public recreational access and CnES is in the process of allocating community grazing opportunities. In terms of grazing opportunities, the conditions of future grazing tenancies are currently being agreed in consultation with the RSPB who have provided a range of recommendations for the modification of the grazing regime of machair habitats to benefit sensitive species. Following consent, a formalised habitat management plan, integrating aspects of recreational use, and sensitively managed community grazing will be developed with ongoing input from the RSPB. It is considered that these measures are likely to benefit great yellow bumblebee by improving local habitats of value to the species.

Assessment of Residual effects

Magnitude of Impact

Great yellow bumblebee habitats recorded within the Survey Area include dune grassland, dune slack and their associated mosaics, and equate to a total area of 28.72 ha, or 9.61% of habitats recorded within the Survey Area. As only 0.52 ha of habitat suitable for the species (dune grassland habitat, dune grassland/wet heath and dune slack/swamp) is to be removed as a result of construction and 95.11% of great yellow bumblebee habitat recorded in the Survey Area will remain and will not be impacted.

Due to abundance of habitat suitable for this species present in the local area, the nature and small scale of the works, and the very minor scale and spatial extent of habitat loss and potential degradation, the impact on great yellow bumblebee is considered to be of **very low** magnitude.

Significance of Residual Effects

Great yellow bumblebee is considered to be of **regional** importance and are known to be present in the local area. With the implementation of embedded mitigation and management measures the magnitude of this impact is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

Permanent removal or degradation of dry dwarf shrub acid heath, sphagnum blanket mire and blanket bog/wet heath mosaic habitat to the development footprint

As all other habitat IEFs (dry dwarf shrub acid heath, blanket bog and blanket bog/wet heath mosaic), are listed on the SBL and as Annex 1 habitats on the EC Habitats Directive and are considered of **regional** importance. As none of these habitats will be lost to the footprint of the Development, the effects on these habitats are **not significant** and they have been scoped out of further assessment within this chapter.

Loss or Degradation of Vallay SSSI

Vallay SSSI designated to protect machair, saltmarsh and sand dune habitat features lies within the boundary of the North Uist Machair SAC and is located approximately 2.8 km to the north-east of the Development on Isle of Vallay. As such, there is no likely connectivity between the SSSI and the Development, and therefore **no significant effects** in terms of the EIA Regulations are predicted.

15.12.2 Operational Phase Effects

The operation of the Development will involve personnel and equipment movements, launch assembly activities and the launch event itself. Various hazardous materials and potential pollutants may be temporarily located on site. These materials have the potential to detrimentally, directly or indirectly, impact habitats and species, including IEFs.

Contamination or degradation of wet dwarf shrub heath habitats

Impact overview (without mitigation)

Although a relatively widespread habitat locally and nationally, wet dwarf shrub heath habitats are listed on the SBL, and M15 heath is listed as Annex 1 habitat '4010 Northern Atlantic wet heaths with Erica tetralix' on the EC Habitats Directive. This habitat is assessed to be a regionally important ecological feature.

The operation of the Development will involve the use and storage of various hazardous materials and potential pollutants within the Site. These materials have the potential to adversely directly or indirectly impact habitats, and therefore the Development has the potential to cause temporary degradation or contamination of wet dwarf shrub heath habitats during the operational phase.

Mitigation

Design mitigation

The Development footprint has been substantially reduced following scoping (GM01), with 99.70% of the wet heath habitats recorded in the Survey Area located outwith close proximity to the Site. Although effects are perceptible, they are likely to be very localised. As wet dwarf shrub heath habitats are extensive and widespread across the Survey Area, the potential extent of contamination represents a very small area when compared to the availability of habitat in the local area.

Mitigation by practise

To minimise the potential for contamination events, during storage, transportation and use of hazardous materials will be undertaken in line with a dedicated Hazardous Materials Management Plan (HHG04). An outline plan has been developed in consultation with Launch Operators and Safety Process Engineers, and is provided in Appendix 17-1. The plan details the maximum materials inventory expected on site, and sets out the proposed measures for storage, separation, handling and management of the materials inventory. The plan also outlines the measures for pollution control and other unplanned events, including launch pad drainage and system management protocols. The plan includes provision for worst case or 'catastrophic' events. Chapter 17: Hydrology, Hydrogeology and Geology sets out in detail the full range of mitigations and measures for protecting surface and groundwater. In addition, a detailed HAMP will be developed focusing on habitat enhancement measures in conjunction with traditional grazing practices, with input from an Advisory Group (COM01, Table 15-10) and will help compensate for minor losses associated with the development.

Assessment of residual effects

Magnitude of impact

Due to abundance of dwarf shrub wet heath habitat in the local area and the localised spatial extent of the impact, as well as the implementation of good practice mitigation measures, the impact on wet heath habitats is considered to be of **very low** magnitude.

Significance of residual effects

Dwarf shrub wet heath habitat is considered to be of **regional** importance and is abundant in the local area. With the implementation of embedded mitigation and management measures, the magnitude of this impact is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

Contamination or degradation of dune grassland habitats by hazardous materials and pollutants

Impact overview (without mitigation)

Although a relatively widespread habitat locally, dune grassland habitats are listed on the SBL, and its associated NVC communities SD6-SD8 are listed as Annex 1 habitats '2130 Fixed dunes with herbaceous vegetation ('grey dunes')' and '2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")' in the EC Habitats Directive. This habitat is assessed to be a regionally important ecological feature.

The operation of the Development will involve the use and storage of various hazardous materials and potential pollutants within the Site. These materials have the potential to adversely directly or indirectly impact habitats, and therefore the Development has the potential to cause temporary degradation or contamination of dune grassland habitats during the operational phase.

Mitigation

Design mitigation

The Development footprint has been substantially reduced following scoping, with 98.08% of the dune grassland habitats recorded in the Survey Area located outwith close proximity to the Site. Although effects are perceptible, they are likely to be very localised. As dune grassland habitats were relatively extensive across the Survey Area, the extent of potential contamination represents a very small area when compared to the availability of habitat in the local area.

Mitigation by practise

To minimise the potential for contamination events, during storage, transportation and use of hazardous materials will be undertaken in line with a dedicated Hazardous Materials Management Plan (HHG04). An outline plan has been developed in consultation with Launch Operators and Safety Process Engineers, and is provided in Appendix 17-1. The plan details the maximum materials inventory expected on site, and sets out the proposed measures for storage, separation, handling and management of the materials inventory. The plan also outlines the measures for pollution control and other unplanned events, including launch pad drainage and system management protocols. The plan includes provision for worst case or 'catastrophic' events. Chapter 17: Hydrology, Hydrogeology and Geology sets out in detail the full range of mitigations and measures for protecting surface and groundwaters. In addition, a detailed HAMP will be developed focusing on habitat enhancement measures in conjunction with traditional grazing practices, with input from an advisory Group (COM01, Table 15-10) and will help compensate for minor losses associated with the development.

Assessment of residual effects

Magnitude of impact

Due to the relative abundance of dune grassland habitat in the local area and the localised spatial extent of the effect, as well as the implementation of good practice mitigation measures, the impact on this habitat is considered to be of **very low** magnitude.

Significance of residual effects

Dune grassland habitat is considered to be of **regional** importance and is abundant in the local area. With the implementation of embedded mitigation and management measures, the magnitude of this impact is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

Contamination or degradation of habitats used by Otter by hazardous materials and pollutants

Impact overview (without mitigation)

Otter is a European Protected Species but they are not associated with any local statutory designated sites and are widespread on North Uist and the Hebrides, and are of favourable conservation status in Scotland. However, habitats within the Site are likely used by otter and development has the potential to result in a legal offence, and therefore the species is considered of **regional** importance.

The operation of the Development will involve the use and storage of various hazardous materials and potential pollutants within the Site. The materials have the potential to adversely directly impact habitats, and therefore could cause indirect effects on otter, through the degradation or contamination of habitats used by for resting, foraging and commuting. In addition, contamination has the potential to directly affect otter via contact with hazardous materials, via ingestion of contaminated prey items, or indirectly by reducing habitat suitability for prey species, thus reducing prey availability.

Mitigation

Design mitigation

The Development footprint has been substantially reduced following scoping, but the Development is located in close proximity to Loch Scolpaig, an area identified as an important terrestrial habitat for the species. Evidence of feeding and commuting in the area was recorded, and although no confirmed resting places have been identified in the Development footprint, the species could potentially have resting places in close proximity to the Development.

Mitigation by practise

To minimise the potential for contamination events, during storage, transportation and use of hazardous materials will be undertaken in line with a dedicated Hazardous Materials Management Plan (HHG04). An outline plan has been developed in consultation with Launch Operators and Safety Process Engineers, and is provided in Appendix 17-1. The plan details the maximum materials inventory expected on site, and sets out the proposed measures for storage, separation, handling and management of the materials inventory. The plan also outlines the measures for pollution control and other unplanned events, including launch pad drainage and system management protocols. The plan includes provision for worst case or 'catastrophic' events. Chapter 17: Hydrology, Hydrogeology and Geology sets out in detail the full range of mitigations and measures for protecting surface and groundwaters.

Otter Protection and Monitoring Plan

As outlined in Section 15.11, pre-construction Otter surveys will be carried out (ECO01), and these will update the baseline condition and inform the production of an OPMP (ECO02), which will be developed and submitted to the CnES and NatureScot for approval. The OPMP will detail all good practice and mitigation measures required to safeguard the species during the operation of the Development, as well as requirements for operational monitoring, and will inform and support the European Protected Species licensing requirements.

Assessment of residual effects

Magnitude of impact

Otter is known to be present within close proximity to the Development footprint, and with the high levels of otter activity recorded, direct impacts are feasible. However, given the nature and scale of Development and its operation, the absence of known otter resting sites within close proximity to the Development, the localised nature of the effect away from key coastal foraging habitats, the extensive availability of high value coastal, marine and terrestrial otter habitats in the wider local area, and the implementation of good practice measures to safeguard the species via the OPMP, the adverse impact is considered likely to be of **very low** magnitude.

Significance of residual effects

Otter is considered to be a feature of **regional** importance and are known to be widespread in the local area. With the implementation of embedded mitigation and management measures the magnitude of this impact is assessed to be **low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

Noise related disturbance to otter by operational activities including launch events

Impact overview (without mitigation)

The majority of operational activities will involve occasional vehicle movements and personnel presence throughout the operation of the Development; and this activity will be limited to the Development infrastructure, with no disturbance of the surrounding environment expected, aside from the movements of security personnel. A maximum of 10 launches are expected to take place every year, and operational working hours will be 0700 – 2100 between Monday to Friday and 0800 – 1900 on Saturday, with no Sunday working taking place.

The disturbance effects on otter even in close proximity to resting sites, are considered to be of low magnitude, and **not significant** in terms of the EIA Regulations. However, when LV launch events take place, there is a potential for a temporary disturbance effect to occur well beyond the vicinity of the launch pad and the immediate surrounding environment.

It is likely that LV launches would result in the disturbance of resident and breeding otter, due to sudden and considerable increases in noise. In addition, it is an offence to disturb an otter whilst it is occupying a resting place, while it is rearing or otherwise caring for its young, in any way that impairs its ability to survive or breed, or when it significantly affects the local distribution or abundance of otters.

It is important to note that this assessment discusses disturbance in the context of both the EIA Regulations, and the likelihood for an effect to result in an offence under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). These assessments are related but separate, and therefore an effect may be assessed to be likely to result in a legal offence, but not be determined to be significant in the context of EIA.

Mitigation

Design mitigation

The Development footprint has been substantially reduced following scoping (GM01), and no active holts are currently present in the Site. One previously active otter resting place (a likely natal holt) was recorded in 2019 (recorded to be inactive in 2021) and was located 1.1 km north of the launch pad.

Otter Protection and Monitoring Plan

As outlined in Section 15.11, pre-construction Otter surveys will be carried out (ECO01), and these will update the baseline condition and inform the production of an OPMP (ECP02), which will be developed and submitted to CnES and

NatureScot for approval. The OPMP will detail all good practice and mitigation measures required to safeguard the species during the operation of the Development, including the requirements of operational monitoring (see below), and will inform and support the European Protected Species licensing requirements.

Operational Monitoring

Operational monitoring will be carried out as part of the OPMP to validate the assessment presented in this chapter, and to update the baseline condition for the species. Operational Monitoring would be undertaken primarily to establish if there were any active holts / resting places within a pre-defined zone around the launch pad, and thus trigger the need for, and requirement of, a European Protected Species licence.

It is anticipated that operational monitoring would be carried out bi-annually (twice a year) and will take place within the Otter Monitoring Zone (OMZ), defined as, all land within 300 m of the launch pad. This buffer was established through consultation with NatureScot (Table 15-1), and broadly corresponds with the predicted noise level of 110 dB, the threshold for harm to human hearing. However, the OMZ may be reduced or increased, following review of monitoring data, which will be done annually, and submitted to the planning authority and NatureScot in the form of an Annual Monitoring Report. It is anticipated that Operational Monitoring would take place for the first three years of operations, however this will be revised as necessary, following a review of Annual Monitoring Reports.

Should operational monitoring determine a higher level of disturbance than predicted is likely to be occurring, contingency measures will be implemented as necessary. These may include but would not be limited to; increasing the extent and/or occurrence of Operation Monitoring, the implementation of Pre-Launch Otter Surveys, or creating artificial holts, or other forms of habitat improvement, to encourage otter to move away from the launch area.

Assessment of residual effects

Magnitude of impact

Based on noise modelling presented in Chapter 19: Noise and Vibration, at the previously active holt location at Bagh Blasgugh, noise levels will be 90 DB LA_{max} (decibels) during launch events, which based on guidance (Birgitta et al, 1999) is the equivalent of a Bulldozer at less than 10 m. Although there is no agreed definition on what constitutes disturbance to otter, and modelling was carried out to assess the effect of disturbance on human receptors, this level of noise almost certainly constitutes disturbance, albeit very temporary disturbance. Indeed, based on noise modelling it is highly feasible that any otter present within the otter Survey Area and beyond, will be disturbed during launch events, and therefore a European Protected Species licence is likely be required to allow launches to occur legally.

Although launches may result in disturbance to otter, and effects, should they occur, will be relatively spatially extensive, the frequency of occurrence will be very occasional and very temporary in nature, only occurring up to ten times annually. Noise modelling has been undertaken for the two proposed rocket specifications; and determined that the powered phase will last for either approximately 43 seconds, or 120 seconds, depending on the type of rocket used. However, the noise may not be audible for the full length of these powered phases, due to the altitude and distance covered. Based on the worst-case scenario, each rocket launch will produce significant levels of noise for 120 seconds, and with a total of 10 annual launches proposed, this equates to combined total of 20 minutes of noise annually. In addition, the noise may not be audible for the full length of this time, due to the altitude and distance covered. Furthermore, the mitigating effects of the habituation of resident otter populations can also not be ruled out.

As detailed above, illegal disturbance is not strictly limited to resting places, but may relate to disturbance that in any way impairs the ability of otter to survive or breed, or significantly affects the local distribution or abundance of otters. However, in light of the above, it is reasonable to assert that although the effect may influence local otter site use, the

effect would not be of sufficient magnitude to impair the local otter population in such a way, and thus, that legal offences will likely be limited to disturbance of active resting places should they be present at the time of launches.

In accordance with noise regulations (EU, 2013) 70 DB LA_{max} is the equivalent of a road motorcycle at 25 m. As NatureScot considers construction works within 30 m of a resting place to represent disturbance to otter, the 70 DB LA_{max} limited could be considered as a proxy for this minimum disturbance level. Based on noise modelling, 70 DB LA_{max} or more will occur up to approximately 5.5 km of the launch pad, and therefore this distance could be considered as the minimum launch disturbance distance. However, it is crucial to acknowledge that this distance is based on the assumption of long term, continuous or regular noise occurring during construction works, which is very different from the very occasional and very temporary noise that will occur as a result of launch events. As such, a disturbance distance of 5.5 km is likely to be a considerable overestimate of the minimum launch disturbance distance.

Otter is known to be present within close proximity to the Development footprint, and was previously recorded breeding in the wider local area, and therefore disturbance to otter is perceptible, and without a licence would constitute a legal offence. However, as outlined above, Operational Monitoring would be undertaken within the OMZ to inform the need for, and requirement of, a European Protected Species licence.

Although noise is likely to result in an immediate startle-like response in otters present, the very short term and very occasional occurrence of this impact is unlikely to result in disturbance that will impair the ability of the local otter population to survive or breed, or considerably impact the local otter distribution or abundance. In the unlikely event that otters are displaced as a result of launch activities, given the extensive suitable habitats available in the site and wider local area, the effect on the local otter population is likely to be minimal and very short term. As established via consultation discussions with NatureScot, this assessment is in line with described reports of otter behaviour at MOD Hebrides, South Uist, where otter appear to respond to noise via immediate avoidance behaviours, but shortly returned to the same activities unaffected (Table 15-1).

The extent of the disturbance is likely to be relatively large however it will occur very occasionally over a very short time period and affect extensive feeding and foraging habitats, as well as potential alternative resting sites, present in the wider local area. The disturbance impact on otter is considered to be of low magnitude.

Significance of residual effects

Otter is considered to be a feature of **regional** importance and are known to be widespread and breeding in the local area. With the implementation of specific mitigation and monitoring measures detailed above; the magnitude of this impact is assessed to be very **low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

Contamination or degradation of great yellow bumblebee habitats by hazardous materials and pollutants

Impact overview (without mitigation)

Great yellow bumblebee is absent from the majority of the UK; however, it is relatively widespread and abundant in the Western Isles, due to its association with machair habitats. Machair habitats recorded within the survey area are dune grassland, dune slack and their associated mosaics, however the only machair habitat to be lost to the Development footprint is dune grassland, which is a relatively widespread habitat locally.

The operation of the Development will involve the use and storage of various hazardous materials and potential pollutants within the site. These materials have the potential to adversely directly or indirectly impact habitats, and therefore the

Development has the potential to cause temporary degradation or contamination of habitats used by great yellow bumblebee during the operational phase.

Mitigation

Design mitigation

The Development footprint has been substantially reduced following scoping (GM01), with 98.08% of the dune grassland habitats recorded in the Survey Area located outwith the Development footprint. Although effects are perceptible, they are likely to be very localised. As dune grassland habitats are relatively extensive across the Survey Area, the extent of potential contamination represents a very small area when compared to the availability of habitat in the local area.

Mitigation by practise

To minimise the potential for contamination events, during storage, transportation and use of hazardous materials will be undertaken in line with a dedicated Hazardous Materials Management Plan (HHG04). An outline plan has been developed in consultation with Launch Operators and Safety Process Engineers, and is provided in Appendix 17-1. The plan details the maximum materials inventory expected on site, and sets out the proposed measures for storage, separation, handling and management of the materials inventory. The plan also outlines the measures for pollution control and other unplanned events, including launch pad drainage and system management protocols. The plan includes provision for worst case or 'catastrophic' events. Chapter 17: Hydrology, Hydrogeology and Geology sets out in detail the full range of mitigations and measures for protecting surface and groundwaters.

Assessment of residual effects

Magnitude of impact

Suitable habitat for this species is relatively abundant in the local area, and the vast majority of habitat will not be directly impacted, due to the localised spatial extent of potential contamination. Therefore, the operational impact on great yellow bumblebee is considered to be of **very low** magnitude.

Significance of residual effects

Great yellow bumblebee is considered to be of **regional** importance. The implementation of proposed mitigation and management measures will reduce the magnitude of the impact, and as a result, is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects which are **not significant**.

Contamination or degradation dry dwarf shrub acid heath, blanket bog and blanket bog/wet heath mosaic habitats by hazardous materials and pollutants

As all other habitat IEFs; dry dwarf shrub acid heath, blanket bog and blanket bog/wet heath mosaic, are listed on the SBL and as Annex 1 habitats on the EC Habitats Directive and are considered of **regional** importance.

As all of these habitats are considered sufficiently distant to avoid any operational effects, the magnitude of the impact of habitat loss will **very low**, and residual effects will be **negligible** and **not significant.**

15.12.3 Decommissioning

Habitats

Impacts to IEF habitats from decommissioning works are anticipated to be in the worst case of a similar nature to the construction phase impacts; however, effects are likely to be of notably lower magnitude. Therefore, decommissioning impacts on habitat will be temporary, reversible, of very low magnitude and residual effects will be **negligible** and **not significant.**

Otter

Impacts to otter from decommissioning works are anticipated to be in the worst case of a similar nature to the construction phase impacts; however, effects are likely to be of notably lower magnitude. Therefore, decommissioning impacts will on otter be temporary, reversible, of very low magnitude and residual effects will be **negligible** and **not significant**.

15.13 CUMULATIVE EFFECTS

No other proposed or recently consented projects subject to EIA have been identified within the Study Area. Cumulative effects have been scoped out of the assessment for this topic.

15.14 SUMMARY OF ASSESSMENT AND CONCLUSIONS

The Site is located within a low-lying area formerly used for the rough grazing of sheep and cattle and comprises of predominately wet dwarf shrub heath, dune grassland and swamp habitats, as well as an existing farm track upon which the majority of the Development footprint lies.

A range of baseline ecology surveys were undertaken to determine the ecological character of the site and included; a Phase 1 habitat survey, a National Vegetation Classification survey and Otter survey (2019 and 2021). Baseline surveys were carried out to inform the assessment of effects of all phases of the Development on important habitat features, and protected and notable species, as well as the determination of groundwater dependency of the vegetation communities present. Baseline survey data was complimented by a desk-based assessment, and consultation also informed the baseline characterisation of the site.

A number of Important Ecological Features (IEFs) were identified, including statutory designated sites: North Uist Machair SAC and Vallay SSSI; Annex 1 habitats, wet dwarf shrub heath and dune grassland; protected species, otter; and a local biodiversity priority, great yellow bumblebee.

Potentially significant effects on IEFs were identified for the construction of the development, and included the degradation and removal of habitats, including Annex 1 habitats, and those of potential value to IEF species, as well as disturbance to IEF species, and injury and mortality via interaction with traffic and plant or entrapment in excavations. The total predicted habitat loss is 0.66 ha. Construction will avoid the vast majority of habitats available in the local area, much of the habitats directly impacted are already degraded, no resting areas used by otter will be directly lost to the footprint, and good practice construction mitigation will be implemented and monitored to minimise adverse impacts. Therefore, all residual effects on IEFs from construction phase impacts are expected to be **negligible** and are **not significant**.

Although significant effects are not predicted, construction has the potential to result in an offence through direct or indirect impacts on otters, however an Otter Protection and Monitoring Plan, which will include pre-construction otter surveys, will be implemented to ensure the legal compliance of works with European Protected Species legislation.

Potentially significant effects on IEFs were identified for the operation of the development, and included the degradation of habitats, including Annex 1 habitats, and those of potential value to IEF species, as well as disturbance to protected species, including from LV launch events. As operational activity will generally be very localised in extent, occasional and small in scale, and will be operated in compliance with good practice to minimise adverse impacts, all residual effects on IEFs from operational phase impacts are expected to be **negligible** and **not significant**. Although no significant

effects on otter are predicted, as launches have the potential to result is disturbance to otter, an Otter Protection and Monitoring Plan has been developed to ensure the legal compliance of launches with European Protected Species legislation.

Impacts to IEF from decommissioning works are anticipated to be in the worst case of a similar nature to the construction phase impacts; however, are likely to be of notably lower magnitude. Therefore, residual effects of decommissioning activities on habitat will be temporary, reversible, and **negligible** and therefore **not significant.**

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16 MARINE ECOLOGY

CONTENTS

16 MARINE ECOLOGY

16.1 INTRODUCTION

This chapter of the EIA Report describes the potential impacts of the Project on marine ecological receptors including benthic species and habitats, fish (protected deep sea species, basking shark *Cetorhinus maximus*, Atlantic bluefin tuna *Thunnus thynnus*, and fish spawning and nursery habitats) and marine mammals (cetaceans and seals).

Potential impacts are identified and where relevant, mitigation measures are proposed to avoid, reduce, or offset any identified adverse effects. Effects during construction and decommissioning will be limited to the terrestrial environment with no anticipated likely significant effects on marine ecological receptors, therefore, these are scoped out of this assessment. This chapter considers the effects on marine ecological receptors from the operation of the Project. All effects on marine ecological receptors from impacts arising from launch activities and returning launch vehicles (LVs) entering the marine environment are considered including the effects of any non-recovered debris.

Reference should be made to Chapter 14: Ornithology for impacts on avian species, including those present in the marine environment and Chapter 19: Noise and Vibration.

This chapter is supported by the following supporting documents:

- Annex B: Information to Inform HRA
- Appendix 19-1: Noise Technical Report

16.2 STUDY AREA

The geographical focus for the assessment (the study area) is the area within which marine ecological features may be affected by the Project (the zone of influence) (Figure 16.1). The study area incorporates the Project's Space Launch Hazard Area (SLHA), which covers the launch vehicle trajectories and the corresponding pre-designated splashdown zones within which jettisoned stages of the LVs would be deposited (see Chapter 4: Project Description). The study area also covers a wider area to the north, south and west of the Western Isles; including the area between and to the outer edges of the SLHA, which are recognised to contain relevant features of marine ecological importance such as St Kilda, the Monach Islands and Small Seal Islands which may be affected by impacts such as noise.

The key area for marine ecological features within the assessment is within the SLHA. The launch vehicle trajectories will be limited to orientations to the west and northwest of the launch site and will extend to a distance of up to 250 km, depending on the nature of the LV. The splashdown areas have been determined using worst-case flight termination scenarios, therefore the study area is an extensive area encompassing the worst-case scenario in which impacts on marine ecological receptors could occur.

The exact trajectories and splashdown zones of the LVs will vary depending on the requirements of the launch providers utilising the launch site. Although the study area includes several island land masses, it should be noted that at no time will a launch vehicle overfly or land on these islands upon leaving the launch pad at Scolpaig Bay. The actual splashdown zone(s) for an individual launch would be significantly smaller than those indicative areas shown as the atmospheric conditions on the day would be more accurately known, and therefore the accuracy of the predicted drop zone(s) would be greatly refined. An example flight path and representative zones are illustrated in Figure 4.5. Splashdown areas will remain within UK Exclusive Economic Zone (EEZ) and no transboundary impacts are expected in relation to the marine environment.

16.3 LEGISLATIVE FRAMEWORK AND POLICY CONTEXT

The following legislation and policies are considered relevant to the marine ecology assessment:

Legislation

- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), also referred to as the Habitats Regulations, implement the species protection requirements of the Habitats Directive (92/43/EEC) in Scotland on land and inshore waters (0-12 nautical miles). Part II of the Habitats Regulations outlines protection for Special Areas of Conservation (SACs), designated for habitats listed under Annex I or species listed under Annex II of the Habitats Directive. Species listed in Annex IV(a) of the Habitats Directive, are also listed in Schedule 2 of the Habitats Regulations as European Protected Species (EPS) which prohibits the deliberate and reckless capture, injury, killing and disturbance of an EPS. All cetacean species (whales, dolphins and porpoises), marine turtles and Atlantic sturgeon occurring in Scottish waters are EPS.
- The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017 provides protection for cetaceans in waters more than 12 nautical miles from land.
- The Marine (Scotland) Act 2010 and The UK Marine and Coastal Access Act (2009) provide provisions to designate new Nature Conservation Marine Protected Areas (MPAs) within territorial and offshore waters respectively, to build on the existing network of marine Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs) and Ramsar sites.
- The Marine (Scotland) Act 2010 is the main legislation that protects seals (grey seal *Halichoerus grypus* and harbour seal *Phoca vitulina)* in Scottish waters. Seals are also listed in Annex II of the EU Habitats Directive (92/43/EEC), which requires that member states designate important habitat as SACs to maintain populations in a "favourable conservation status". The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 provides additional protection for seals at 194 designated haul-out sites: locations on land where seals come ashore to rest, moult or breed. This Order makes it an offence to intentionally or recklessly harass seals at designated haul-out sites.
- In the UK, the Wildlife and Countryside Act 1981 (as amended) and in Scotland, the Nature Conservation (Scotland) Act 2004 provides full protection to basking shark, which is listed under Schedule 5 of the WCA. It is an offence to intentionally or recklessly, kill, injure, disturb or harass basking shark. Globally, basking shark is considered endangered on the International Union for Conservation of Nature (IUCN)'s Red List of Threatened Species.
- The 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic ('OSPAR Convention'): Under Annex V of the convention, OSPAR developed a Strategy on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area. This strategy sets out that the OSPAR Commission will assess which species and habitats need to be protected, therefore the OSPAR List of Threatened and/or Declining Species & Habitats (Ref 2008-6) was developed to fulfil this commitment.
- Water Framework Directive (WFD; Council Directive 2000/60/EC): Primary focus is to achieve 'Good Ecological Status' by 2027 for all inland and coastal waters within river basin districts. The WFD impacts on the management of water quality and water resources, and affects conservation, fisheries, flood defence, planning and environmental monitoring. The Water Environment and Water Services Act (Scotland) 2003: transposes the WFD (2000/60/EC) and protects the water environment by preventing deterioration and enhancing aquatic ecosystems. Key water bodies are monitored under river basin management plans.

Policy

- Several protected MPA features are also Scottish Priority Marine Features (PMFs). PMFs constitute a list of marine species and habitats of conservation importance, adopted by Scottish Ministers in 2014, developed by NatureScot

and the Joint Nature Conservation Committee (JNCC), as an action to deliver Marine Scotland's vision for conservation as outlined in the Strategy for Marine Nature Conservation in Scotland's Seas (Marine Scotland, 2011).

- Scotland's National Marine Plan (Scottish Government, 2015): General Policy 9(b) states that development and use of the marine environment must not result in significant impact on the national status of Priority Marine Features. All PMFs have protection under this policy. Harbour porpoise, harbour seal, grey seal and basking shark are all Scottish PMFs.

Key Guidance and Advisory Documents

- CIEEM, (2019). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, Chartered Institute of Ecology and Environmental Management, Winchester.

16.4 DATA GAPS AND UNCERTAINTIES

Data gathered for the desk-based study from the references listed in Section 16.5.1 provide information to estimate the abundance and distribution of populations of marine ecological receptors in the study area. Broadscale predictive datasets were used to characterise marine habitats and species throughout the study area, therefore localised spatial and temporal distribution of important ecological features is difficult to establish. However, a precautionary approach which assumes the presence of all species is taken regarding the impact assessment and mitigation is in place to reduce and where possible avoid risk. This approach allows for a robust assessment which ensures that the worst-case impacts are considered.

16.5 METHODOLOGIES FOR SUPPORTING SURVEYS AND STUDIES

Approach to assessment

The methodology/approach used to assess the likely significant effects on terrestrial ecology has considered the principles outlined in the Guidelines for Ecological Assessment in the UK and Ireland (CIEEM, 2019), which provides an overall framework for the assessment process. Legislation and policy considered in the assessment are outlined in Section 16.3, above.

16.5.1 Desk Study

A desk-based review of published and other available data sources has been undertaken to determine the presence of any nature conservation designations relevant to the assessment and to identify species likely to be present within the study area. Baseline information on the spatial and temporal distribution, frequency of occurrence and any information on behaviour of species within the study area has been collated. A number of key data sources have been reviewed:

Benthic ecology

- UKSeaMap 2018 (JNCC, 2019) and EUSeaMap 2019 (EMODnet, 2021) broad-scale predictive seabed habitat maps.
- NatureScot SiteLink, for the identification of nature conservation designations relevant to benthic interests (Table 16.5) and to access supporting information on protected habitats and species.
- NatureScot Geodatabase of Marine Features in Scotland (GeMS) point and polygon datasets were reviewed via Marine Scotland National Marine Planning Interactive (NMPI, 2021) for the distribution of benthic PMFs (as described in Tyler-Walters *et al.*, 2016).
- The OSPAR List of Threatened and/or Declining Species and Habitats.
- International Council for the Exploration of the Sea (ICES) Vulnerable Marine Ecosystems (VMS) data portal (ICES, n.d.).

Fish

- Fisheries sensitivity maps showing the distribution of spawning and nursery grounds (Coull *et al*., 1998; Ellis *et al*., 2012) and the probability of presence of high abundances of 0-group fish (defined as juvenile fish in the first year of their life) in Scottish waters (Aires *et al*., 2014).
- Marine Scotland amalgamated 2009-2013 VMS fishing intensity data, to understand the likely distribution of commercial species and habitats based on known fishing vessel grounds (Marine Scotland, 2015).
- Marine Scotland Deep Water Trawl Survey 1998-2013 datasets were viewed via Marine Scotland NMPI (2021) for the distribution of protected Leafscale gulper shark and Portuguese dogfish in the study area.
- West of Scotland Deep-Sea Marine Reserve Ecological Overview (JNCC, 2020b): for information surrounding relevant protected fish species.

Marine mammals and basking shark

- Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters (Hague *et al*, 2020).
- SCANS-III survey data (Hammond *et al*, 2017). A large-scale international survey of cetaceans in European Atlantic waters (SCANS-III) undertaken in the summer of 2016 provides estimates of cetacean abundance. Design-based estimates of abundance are available for those cetacean species for which sufficient data were obtained during SCANS-III: harbour porpoise, bottlenose dolphin, Risso's dolphin, white-beaked dolphin, Atlantic white-sided dolphin, common dolphin, striped dolphin, long-finned pilot whale, all beaked whale species combined, sperm whale, minke whale and fin whale. The study area boundary overlaps quite closely with block J which was surveyed by air.
- Predicted distribution maps at monthly and 10-km scales for 12 cetacean species in the northeast Atlantic by Waggitt *et al*, (2020) which provide a general illustration of relative densities and broad-scale distribution over several decades.
- Hebridean Whale and Dolphin Trust (HWDT) sightings database (HWDT, 2021a) and species accounts (HWDT, 2021b).
- JNCC's Atlas of Cetacean Distribution in North-West European Waters (Reid *et al*, 2003).

16.6 CONSULTATION

The key points raised by stakeholders during Scoping and pre-application consultation regarding marine ecological receptors are presented in Table 16.1.

Table 16.1 Key issues raised by stakeholders during consultation

Stakeholder	Comment	Response/Action taken	Section cross-reference
NatureScot Teleconference 15/07/2021	Advised to consider potential impact on spawning grounds for herring, particularly within the Seas off St Kilda SPA, a designated foraging ground for birds associated with St Kilda SPA.	Potential impacts on spawning grounds for herring, including within the footprint of Seas off St Kilda SPA have been considered in the assessment. The assessment concludes that there will be negligible adverse residual effects on fish which are not significant. The EIA and HRA includes consideration of potential indirect impacts on seabird receptors from impacts on fish populations. It follows that any knock-on indirect impacts on SPA seabirds due to changes in fish prey abundance and availability would also be negligible and therefore not significant.	Section 16.12. Chapter 14: Ornithology and Annex B: Information to Inform HRA.
	Provide further details on retrieval of jettisoned stages.	Technical and launch-specific procedural process in place for retrieval of stages to ensure no floating debris left in water. Any stage not intended for recovery will be designed to sink.	Appendix 13-1. Maritime Management Procedures, Chapter 4: Project Description.
	Noted existing MOD range activities and agreed that these activities are likely to form part of baseline.	Noted. MOD activities long-established and baseline data reflects any existing disturbance. Addressed further in baseline (also note further reference below).	Section 16.8.5, 16.10.1
Meeting with Marine Scotland Licensing Operations Team (MS-LOT) 15/06/2021	Reference to Marine Scotland's initial briefing note response (18/12/2020). Noted noise from jettisoned stage splashdown not likely to be of concern for marine mammals due to there being no explosion, impulsive or persistent noise, such as associated with piling activities. However, advised to seek further consultation with NatureScot on marine ecology.	Noted. Acoustic disturbance (including underwater noise) arising from the impact of the jettisoned stages hitting the sea surface is scoped out of the assessment. Briefing note on marine ecology issued to NatureScot 15/06/2021 and follow-up call 15/07/2021.	Section 16.10.1

Stakeholder	Comment	Response/Action taken	Section cross-reference
Marine Scotland Licensing Operations Team (MS-LOT) Response to Scoping report and accompanying briefing note 18/12/2020	In the EIA report, we would expect a full assessment of the impacts upon marine mammals with, at a minimum, the following species considered in the assessment: •Harbour porpoise (*Phocoena phocoena*) •Common dolphin (*Delphinus delphis*) •Bottlenose dolphin (*Tursiops truncatus*) •Atlantic White-sided dolphin (*Lagenorhynchus acutus*) •White-beaked dolphin (*Lagenorhynchus albirostris*) •Risso's dolphin (*Grampus griseus*) •Killer whale (*Orcinus orca*) •Long-finned pilot whale (*Globicephala melas*) •Minke whale (*Balaenoptra acutorostrata*) •Harbour seal (*Phoca vitulina*) •Grey seal (*Halichoerus grypus*)	A detailed assessment of potential impacts on the listed cetacean and pinniped species has been carried out, including additional species identified during the data gathering process.	Section 16.12
	We would also like to see an assessment of the effects of any debris on benthic interests within the launch areas, and the effects that any non-recovered debris within the marine environment is likely to have upon any benthic species. This should include an assessment of any potential smothering of the benthic interests as well as the effects of floating debris above any benthic species.	The potential impacts of non-recovered debris and effects on benthic interests have been addressed in the assessment.	Section 16.12

Stakeholder	Comment	Response/Action taken	Section cross-reference
	Assessment of all of these factors should include a cumulative assessment that considers the number of launches intended to be sent out from the Uist site as well as from other launch sites that are launching into the same area as the Uist site.	The maximum number of launches at site are considered as part of impact assessment. No cumulative or in-combination effects have been identified for this Project. There are no other relevant proposed or consented developments within the zone of influence of the Project. The long-established MOD training activities that occur in the area from the existing MOD Hebrides Range are considered to form part of the baseline conditions in the area (see Section 16.8.5). The MOD implements environmental protocols for activities carried out in the area (Royal Navy, 2020). Several MPAs and SPAs have recently been designated in the area for marine ecological receptors, and the grey seal population in the Western Isles seal management unit area has increased in recent years which suggests that the MOD's existing military activities do not appear to have adversely affected the populations of marine species occurring in the area.	Sections 16.8.5, 16.10.1 and 16.13.

16.6.1 Planning Application Representations

A planning application to develop a proposed Spaceport at Scolpaig Farm in North Uist was submitted to the Comhairle nan Eilean Siar on 26 June 2019 (Planning Reference 19/00311/PPD). The planning application attracted significant public attention and consequently, approximately 640 representations from the public were received. Comments raised from both the public and consultees highlight key issues and concerns of relevance to the EIA process. Given the relationship to the EIA process, an analysis was undertaken of the representations submitted. The complete analysis is provided in Appendix 5-1: Review of Planning Representations.

Table 16.2 Representations to planning application (19/00311/PPD) relevant to the marine ecology assessment

Topic	Comment	Response/Action taken	Section cross-reference
Wildlife (General)	Over half the representations cited a disturbance to local and migrant wildlife as grounds for their objection to the development proposal. The construction and operation of the site is expected to have an adverse effect on the habitats and behaviour of wildlife, the extent to which is currently unknown.	A detailed assessment of the potential impacts on important ecological features has been carried out in this chapter, and measures have been recommended to safeguard these features and to ensure the legal compliance of the Development. Impacts on birds are assessed in Chapter 14: Ornithology. Impacts on terrestrial ecology and wildlife are assessed in Chapter 15: Terrestrial Ecology.	Section 16.12
Marine ecology	A significant number of respondents are concerned that noise and water pollution caused by the proposed development will disrupt marine animals and damage their natural habitat. Respondents are concerned that sonic disruption will reduce opportunities to sight whales and dolphins, and reference is made to the whale watching trail.	Acoustic disturbance to seal species during the operational phase has been covered in the assessment. Acoustic disturbance (including underwater noise) from jettisoned stages has been scoped out of the assessment due to the nature of the acoustic noise generated and the spatial and temporal spreading of launch events such that any noise will be temporary and very unlikely to repeat in the same area or lead to disturbance effects. The potential release of toxic contaminants from jettisoned deposits has been addressed. The amount of residual fuel is likely to be very low as each LV is designed for maximum and efficient fuel use.	Sections 16.10 and 16.12

16.7 ASSESSMENT METHODOLOGY

16.7.1 Approach to assessment

The general EIA process and methodology is detailed in Chapter 6: Approach to EIA. The approach used to assess the likely significant effects on marine ecological receptors was carried out with reference to the Ecological Impact Assessment (EcIA) guidelines produced by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2019) in conjunction with relevant legislation and planning and policy guidance as detailed in Section 15.3.

16.7.2 Assessment criteria

The following criteria have been utilised to inform the assessment of likely significant effects, including consideration of importance of marine ecological features (Table 16.3) and magnitude of impact on receptors (Table 16.4).

Determination of Importance

One of the key challenges in EcIA is to decide which ecological features are sufficiently important to justify a detailed assessment. In EcIA these features are determined as Important Ecological Features (IEFs). IEFs will be those considered to be the most important recorded within the baseline, and with the greatest potential to be affected by the Development. In accordance with CIEEM guidance, importance should be determined for all features present within the baseline and defined on a geographic scale to determine at which particular population scale a feature is considered important.

In this chapter, to determine importance, expert judgement was applied and contextual information such as distribution and abundance of any given features as well as population trends and conservation status (identified through policies and legislation) was reviewed to determine the level of importance.

In this EcIA, only ecological features determined to be of regional importance and above (see Table 16.3, below) were considered sufficiently important to be determined as IEFs, and in accordance with CIEEM guidance, only IEFs require assessment for potential significant effects. Additionally, in accordance with CIEEM guidance, where the presence of a legally protected species was considered to have the potential to result in a breach of legislation, such species were considered to be an IEF.

A summary of the criteria used to determine ecological importance is detailed below. Table 16.3 presents importance on a geographic scale, and for comparative purposes, the associated scale of importance used in other chapters, as defined in Chapter 6: Approach to EIA.

Table 16.3 Importance of Ecological Feature (defined in geographic context)

Importance	Criteria
International (European)/ High	The population has little or no ability to absorb change without fundamentally altering its present character (i.e., the population of a rare and sensitive species in significant decline). An internationally designated site (e.g. SAC) or qualifying features with potential connectivity to a SAC. Species present in internationally important numbers (>1% of international population). Rare species or habitats of international or national importance with very restricted distribution, limited range or threatened populations.
National (Scotland)/ Medium	The population has low ability to absorb change without fundamentally altering its present character (i.e., the population of an uncommon or rare species in decline, or a common species in significant decline). A nationally designated site (e.g. MPA, SSSI). A regularly occurring substantial population of a nationally important species e.g. listed species protected under the Marine Scotland Act, as EPS under the Habitats Directive and/or Scottish Priority Marine Features (PMF).[1] Species present in nationally important numbers (>1% Scottish population).

Importance	Criteria
Regional (Western Isles)/Low	The population has moderate capacity to absorb change without significantly altering its present character. (i.e., an uncommon or rare but stable species, or a common/widespread but declining species). Species present in regionally important numbers (>5% Western Isles population). Species present which may be of national or local importance, but which are only present very infrequently or in very low numbers within the study area.
Local (North Uist)/North Uist/Very Low	The population is tolerant of change without detriment to its character (a common/widespread species that is stable, or an uncommon species is improving). A species or habitat of low conservation value, or of national or local conservation value, but with very limited presence. Areas of habitat or species considered to appreciably enrich the ecological resource within the area local to the Site.
Less than Local (10 km of site)/Negligible	The population is resistant to change (any population that is improving its range and abundance). Population of little to no conservation value, or of local conservation value but with very limited presence. Usually widespread and common habitats and species. Loss of such a species from the Site would not be detrimental to the ecology of the local area. Scottish Biodiversity List species (if not covered above).

[1] Priority Marine Features supersede the Scottish Biodiversity List for marine habitats and species (CIEEM, 2019).

Magnitude of impact

Sensitivity of receptors is an important consideration when determining the magnitude of impact. The sensitivity of marine ecological receptors to potential impacts of the Project is based on their capacity to avoid, tolerate, recover from, or adapt to a particular impact. The following factors are also considered when characterising the potential magnitude of a particular impact:

- **Extent**: the geographical area or size of population likely to be affected;
- **Scale**: the size, volume, amount and / or intensity;
- **Duration**: whether the impact is short, medium or long-term, permanent or temporary;
- **Frequency and timing**: the characterisation of when the impact will occur; and
- **Reversibility**: the characterisation of how easily / quickly the impact will be reversed if applicable.

The magnitude of an impact is defined by the following criteria presented in Table 16.4.

Table 16.4 Magnitude of impact

Magnitude	Criteria
High	Major alteration to key elements / features of the baseline (pre-development) conditions such that post-development character / composition / attributes will be fundamentally changed.
Medium	Loss or alteration to one or more key elements / features of the baseline conditions such that post-development character / composition/ attributes of baseline will be partially changed.

Magnitude	Criteria
Low	Minor shift away from baseline conditions. Change arising from the loss / alteration will be discernible but underlying character / composition / attributes of baseline condition will be similar to pre-development circumstances / patterns.
Very Low	Very slight change from baseline condition. Change barely distinguishable, approximating to the 'no change' situation.

Significance of effects

The significance of an effect results from the interaction between its magnitude and the importance of those receptors that might be affected. Professional judgement is used to determine the likely significance of effects.

In other chapters a matrix approach was used to support the identification of significant effects to ensure that the process is consistent and transparent. As CIEEM (2019) guidance recommends avoiding this approach for ecological assessment, the matrix approach was not used and the assessment was therefore based on professional judgement to determine the likely significance of effects.

16.8 BASELINE DESCRIPTION

16.8.1 Nature conservation designations

There are a number of sites with marine ecological interests that require consideration in the assessment. The study area overlaps with, or is in proximity to, a number of sites designated for marine ecological interests at European or national levels. Those sites with qualifying interests relevant to the Project are listed in Table 16.5 and shown in Figure 16.1. Designated seal haul-outs are shown in Figure 16.2.

Table 16.5 Nature conservation designations within or in proximity to the study area with qualifying interests relevant to the marine environment (only those qualifying interests relevant to the Project are listed)

Site name	Distance from study area (km)	Relevant qualifying features
West of Scotland MPA	0 km	**Habitat features:** Burrowed mud (including Sea-pens) Coral gardens Cold-water coral reefs (including *Lophelia pertusa* reefs) Deep-sea sponge aggregations Offshore deep-sea muds Offshore sands and gravels Seamount communities **Species features:** Blue Ling (*Molva dypterygia*) Leafscale gulper shark (*Centrophorus squamosus*)/Gulper shark (*Centrophorus granulosus*) Orange roughy (*Hoplostethus atlanticus*) Portuguese dogfish (*Centroscymnus coelolepis*) Round-nose grenadier (*Coryphaenoides rupestris*)

Site name	Distance from study area (km)	Relevant qualifying features
Geikie Slide and Hebridean Slope MPA	0 km	**Habitat features:** Burrowed mud Offshore sub-tidal sands and gravels Offshore deep-sea muds
Sea of the Hebrides MPA	6 km	Basking shark (*Cetorhinus maximus*) Minke whale (*Balaenoptera acutorostrata*)
Northeast Lewis MPA	60 km	Risso's dolphin (*Grampus griseus*)
St Kilda SAC	0 km	Reefs
Monach Islands SAC/Designated seal haul-out site	0 km	Grey seal (*Halichoerus grypus*)/Grey seal breeding colony haul-out
Sound of Barra SAC	3 km	Harbour seal (*Phoca vitulina*)
Anton Dohrn Seamount SAC	0 km	Reefs
Small Seal Islands SSSI	0 km	Grey seal
Causamul Designated seal haul-out site	0 km	Grey seal breeding colony haul-out
Haskeir Designated seal haul-out site	0 km	Grey seal breeding colony haul-out
Oronsay Designated seal haul-out site	6 km	Harbour seal breeding colony haul-out

16.8.2 Benthic ecology

This section focuses on benthic communities which includes marine species living on or in the seabed, and the habitats in which they live. It therefore includes shellfish, however all fish are covered in Section 16.8.3.

Deep-sea and continental slope habitats

The study area overlies an extensive area of seabed to the west and northwest of the Western Isles, from shallow rocky reefs off North Uist to the deep sediment plains of the Rockall Trough. Much of the SLHA overlaps with part of the West of Scotland MPA, a deep-sea marine reserve which protects a vast marine landscape ranging from 400 – 2,500 metres depth below sea level (JNCC, 2020c). The deep-sea marine reserve is characterised by its various geological and geomorphological forms including isolated seamounts Anton Dohrn and Rosemary Bank, and slide deposits along the continental slope. The Geikie Slide and Hebridean Slope MPA protects a section of the continental slope which features a submarine landslide that follows the descent of the seabed from the continental shelf edge at around 200 m depth to the deep-sea (JNCC, 2014). The northwest orientation of the SLHA (north of St Kilda) almost fully overlies the Geikie Slide and Hebridean Slope MPA.

Examples of all protected habitat features of the West of Scotland MPA and the Geikie Slide and Hebridean Slope MPA (Table 16.5) are located within the boundary of the study area and SLHA (note, protected mobile species are separately addressed within Section 16.8.3). All are Scottish PMFs and, with the exception of offshore deep-sea muds and offshore subtidal sands and gravels, are listed on the OSPAR List of Threatened and/or Declining Species and Habitats. Burrowed

mud, coral gardens, cold-water coral reefs, deep-sea sponge aggregations and seamount communities are additionally classified as Vulnerable Marine Ecosystems (VMEs) by the Joint ICES / North-west Atlantic Fisheries Organisation (NAFO) Working Group on Deep-Water Ecology (WGDEC) for the North-east Atlantic (JNCC, 2020b; ICES, n.d.).

The conservation objectives of the West of Scotland MPA and Geikie Slide and Hebridean Slope MPA are that the protected features of each respective site remain in or reach favourable condition (where the extent of the feature is stable or increasing) and that its structure and functions, its quality and the composition of its characteristic biological communities are such as to ensure that it is in a condition which is healthy and not deteriorating (JNCC, 2020a). The distribution of deep-sea habitat PMFs protected under MPA designations are presented in Figure 16.3.

Offshore deep-sea muds and offshore subtidal sands and gravels PMFs represent deep-sea sedimentary habitats in the Northeast Atlantic region (Atlantic bathyal and upper abyssal zones). Broad-scale seabed habitat maps predict offshore deep-sea muds to occur across the extent of the Rockall Trough and onto the continental slope within the study area. Offshore subtidal sands and gravels are the most common subtidal habitat around the British Isles (Tyler-Walters *et al*., 2016), and within the study area are distributed around elevated features such as seamounts and the continental slope, extending onto the continental shelf edge. Biological communities within deep-sea sedimentary habitats vary with depth from 800 - >2000 m and broadly consist of polychaetes, echinoderms (brittlestars, sea urchins and sea cucumbers), bivalves and crustaceans (Davies *et al*., 2006; Tyler-Walters *et al*., 2016). Many fish species of commercial importance are linked to deep-sea sedimentary habitats, which may be used as feeding, reproductive or nursery grounds (Doggett *et al*., 2019); (see Section 16.8.3 for further detail).

Vulnerable Marine Ecosystems

Burrowed mud is a particular type of soft-sediment habitat that supports burrowing crustaceans such as mud shrimps *Calocaris macandreae* and *Callianassa subterranea*. Burrowed muds may also support aggregations of sea pens, which are a key characterising species of the burrowed muds PMF and an important structural component of soft-sediment habitats, providing refuge for other species in often featureless environments, and therefore classified as a VME. Within the boundary of the study area, available GeMS data for burrowed muds indicate their distribution is mainly along the continental slope, and with a cluster of data points indicating their presence northeast of the Geikie Slide and Hebridean Slope MPA, corresponding with survey areas reported by Hughes *et al*. (2014) and Doggett *et al*., (2019). ICES VME data points indicate the presence of sea pens situated east of the Anton Dohrn seamount (ICES, n.d.), with their wider distribution throughout the study area presented in Figure 16.3.

Anton Dohrn and Rosemary Bank are the two protected large-scale seamount features of the West of Scotland MPA and are both situated within the radius of each splashdown zone, respectively approximately 185 km west of the launch site and 195 km northwest of the launch site (from the nearest edges). The seabed around Anton Dohrn and Rosemary Bank seamounts is predominantly characterised by deep-sea rock and mixed substrata (JNCC, 2019; EMODnet, 2021). Seamounts are large, biodiverse topographic features often characterised by a dynamic hydrodynamic regime where ocean currents are intensified (Davies *et al*., 2015). This creates ideal conditions for faunal colonisation through increased food availability and exposure of hard substrate for attachment, mainly by suspension feeders which form the basis of seamount communities. Seamount communities typically comprise cold-water corals (*Lophelia pertusa*), coral garden species (such as black corals, lace corals and bamboo corals) and deep-water sponges (Tyler-Walters *et al*., 2016). Sea pens are additionally known to occur on the flanks of Anton Dohrn seamount (Davies *et al*., 2015) and Rosemary Bank seamount (JNCC, 2020b). Many fish species are attracted to seamounts for feeding or spawning which subsequently draws larger predators such as sharks and cetaceans to these features (Tyler-Walters *et al*., 2016) (see Section 16.8.3).

Within the study area, GeMS point data indicates coral gardens, cold-water coral reefs and deep-sea sponge aggregations are mainly distributed around the Anton Dohrn and Rosemary Bank seamounts within the West of Scotland MPA (Figure 16.3). Among other VME indicator species and communities, the structural complexity of corals and sponges provide habitat and refuge for other species, creating hotspots of increased faunal diversity and abundance (Doggett *et al*., 2019; JNCC, 2020b). However, such habitat-forming species are fragile and slow growing, therefore are vulnerable to physical damage from any activity that comes into contact with the seafloor, particularly bottom contact fishing gears (JNCC, 2020b).

Intertidal and continental shelf habitats and species

Broad-scale predictive habitat maps indicate that offshore subtidal sands and gravels occur across the extent of the continental shelf edge (JNCC, 2019; EMODnet, 2021). Shallow circalittoral rock is predicted within an approximate 9 km radius west to north of the launch site at North Uist (Brown *et al*., 2017; EMODnet, 2021).

Within the study area and relative to the launch site at North Uist, St Kilda Special Area of Conservation (SAC) is the nearest designated site for the protection of seabed interests, situated approximately 58 km northwest of North Uist. St Kilda SAC is selected for the presence of Annex I reefs which are steep and extremely wave-exposed around the archipelago. The following habitat and invertebrate species PMFs have been recorded around St Kilda (but are not qualifying features of any relevant designations within the study area):

Habitats

- Dense *Laminaria hyperborea* kelp beds surround the archipelago and may occur as deep as 35 m;
- A single record indicates the presence of kelp and seaweed communities on sublittoral sediment, which may occur as deep as 12 m;

Low or limited mobility species

- Pink sea fingers (*Alcyonium hibernicum*);
- White cluster anemone (*Parazoanthus anguicomus*);
- Northern feather star (*Leptometra celtica*);
- Ocean quahog (*Arctica islandica*) – single record; and
- Burrowing sea anemone (*Arachnanthus sarsi*) – single record.

Nearer to the coastline, *Laminaria hyperborea* kelp beds have been recorded off the uninhabited Haskeir Island and the Monach Islands, approximately 13 km northwest and 14 km southwest respectively, of the proposed launch site (NMPI, 2021). In the wider offshore waters within the study area and approximately 39 km west of the Uists, video tow surveys identified scattered deep sponge communities (a component biotope of Northern Sea fan and sponge communities PMF) on bedrock reefs with white cluster anemone and rare occurrences of burrowing sea anemone (Mitchell, 2009). Further records indicate the presence of Northern feather star within the same survey sites (NMPI, 2021).

Commercial shellfish

Inshore waters to the west of the Western Isles provide the main grounds for lobster, edible crab, and crawfish (also known as the European spiny lobster *Palinurus elephas*, which is a PMF in Scottish waters). Lobster and edible crab represents respectively the second and fourth most important fishery to the Western Isles (Outer Hebrides Inshore Fishery Group, n.d.). *Nephrops norvegicus* is the most valuable species landed in the Western Isles, however they are targeted within the Minches to the east of the Western Isles and outwith the study area. Amalgamated 2009-2013 VMS fishing intensity data from Marine Scotland (Marine Scotland, 2015) indicates high fishing activity for lobsters offshore within the study area, with lower intensity fishing for crabs (increasing in intensity towards the north of the Western

Isles). A small fishery exists for the European spiny lobster, which has reported distribution around St Kilda (NMPI, 2021), however the status of the stock is unknown and reported landings are lower than historical levels (OHIFG, n.d.).

16.8.3 Fish

This section presents a high-level baseline description of fish of commercial and/or conservation importance within the study area, specifically focusing on the distribution of sensitive areas relating to life histories and protected features of nature conservation designations.

Deep-sea fish

Six species of deep-water fish are protected features of the West of Scotland MPA (listed in Table 16.5). All are designated as mobile species PMFs and, apart from blue ling (*Molva dypterygia*) and roundnose grenadier (*Coryphaenoides rupestris*), are listed on the OSPAR List of Threatened and/or Declining Species and Habitats. The International Union for the Conservation of Nature (IUCN) classifies blue ling and orange roughy as Vulnerable in Europe, roundnose grenadier and leafscale gulper shark as Endangered in Europe, gulper shark as globally Endangered and the Portuguese dogfish as globally Near Threatened.

The MPA supports resident populations of roundnose grenadier and is one of 17 locations globally where gulper shark (*Centrophorus granulosus*) has been reported. The Rockall Trough is considered important to the life history of Portuguese dogfish (*Centroscymnus coelolepis*), however current scientific understanding is unclear on whether this is for the full life cycle of the species or if this species migrates south along the continental slope of Europe to give birth, before returning to northern feeding areas. It is also unknown where specifically within the MPA may be of importance to the life history of this species (JNCC, 2020b). Important spawning aggregations of blue ling have been identified along the continental slope and on the northwest bank of Rosemary Bank (Large *et al*., 2010), within the study area. Orange roughy (*Hoplostethus atlanticus*) form large spawning aggregations around seabed features such as seamounts. Spawning aggregations had not been identified at the Anton Dohrn or Rosemary Bank seamounts prior to the cessation of the orange roughy fishery, however, such habitats are similar to those where spawning aggregations had been recorded such as the Hebrides Terrace seamount (JNCC, 2020b), southeast of the Anton Dohrn seamount and outwith the boundary of the study area. Other (non-MPA) fish species known to aggregate around seamounts include black scabbard (*Aphanopus carbo*), and mesopelagic species that spawn over Anton Dohrn seamount including Mueller's pearlside (*Maurolicus muelleri*), glacier lanternfish (*Benthosema glaciale*) and other lanternfish (JNCC, 2020b).

Basking shark (Cetorhinus maximus)

Basking shark (*Cetorhinus maximus*) is listed on Annex V of the OSPAR Convention and the OSPAR list of Threatened and Declining species. It is classed as globally Endangered by IUCN. The population size of basking sharks within the northeast Atlantic is unknown however basking sharks have been recorded all around Scotland but are most frequently recorded during the summer months in the Sea of the Hebrides to the east of the study area (Witt *et al*, 2012). Within the study area, the area to the west of the Outer Hebrides and around St Kilda and the Flannan Isles are areas of modelled high persistence of basking shark (areas predicted to hold higher than average densities of basking shark) however there is some uncertainty in these findings as these areas have had relatively low survey effort (Paxton *et al*, 2014). The HWDT sightings database shows that since July 2017 there have been fifteen records of basking shark within the study area, with 13 sightings around St Kilda between June and August in 2018; 2019 and 2021, one sighting at the continental shelf edge to the northwest of St Kilda in August 2019 and one sighting to the southeast of St Kilda in August 2018 (HWDT, 2021a). The majority of sightings were of single animals with one sighting of two animals together.

Outwith the study area, the Sea of the Hebrides is a particular hotspot for basking shark and this area has been designated as a Marine Protected Area (MPA) for this species as individuals return to this area year after year due to its importance not only as an area used for feeding, but also for behaviours previously attributed to courtship display (Witt

et al, 2016) (Figure 16.1). A tagging study of basking sharks within the Sea of the Hebrides MPA has shown that between July and September, basking sharks occupy shallow coastal waters where they feed in the surface waters but from autumn onwards a change in depth use was observed with individuals spending much greater time at increased depths of 900 – 1,000m (Witt et al, 2016). Their seasonal surface distribution is related to prey availability, and large numbers of basking sharks are frequently seen feeding on zooplankton at tidal fronts on the continental shelf and shelf edge as these areas of ocean mixing can hold high concentrations of zooplankton (Paxton *et al*, 2014).

During the summer months, some longer-range movements of tagged basking sharks were observed with individuals moving between the MPA and the Outer Hebrides, in particular to the area around South Uist and Barra, to the southeast of the study area (Witt *et al*, 2016). This tagging study also showed that basking sharks disperse widely during autumn with some individuals moving south throughout the Irish and Celtic Seas as far afield as Madeira and the Canary Islands, however some basking sharks remain relatively close to Scottish waters throughout the year with the coastal and offshore waters to the west of the UK and Ireland of particular importance, including those within the study area (Witt *et al*, 2016).

Atlantic bluefin tuna

Atlantic bluefin tuna (*Thunnus thynnus*) is listed on the OSPAR list of Threatened and Declining species and is classed as globally Endangered by IUCN. The migratory species, which is of high commercial value, is becoming increasingly reported off the western English Channel since 2014, seasonally between August and December, after a period of prolonged absence (Horton *et al*., 2019). The waters off the Western Isles are part of a traditional migratory route that extends from the Mediterranean to Norway. Opportunistic sightings of surface-feeding shoals of Atlantic bluefin tuna have been made off the Western Isles (Horton *et al*., 2019), and in 2014 three individuals were tagged off St Kilda as part of a project understanding their appearance in Scottish waters (Horton, 2015). A Western Isles-based tagging programme was established in 2019 as part of the THUNNUS UK collaborative research project between the University of Exeter, The Centre for Environment, Fisheries and Aquaculture Science (Cefas) and the Tuna Research and Conservation Centre of Stanford University, USA.

Fish spawning and nursery grounds

Like most of the continental shelf edge, the Seas off St Kilda SPA is an area of high productivity of fish which provides important foraging grounds for seabirds breeding on St Kilda (see Chapter 14: Ornithology for an assessment of potential impacts on the Seas off St Kilda SPA). Mackerel (*Scomber scombrus*) and herring (*Clupea harengus*) are two mobile PMF species that form part of the diet of various seabirds including Northern gannet *Morus bassanus*, and which have extensive spawning and nursery grounds (mackerel) and spawning grounds (herring) within the footprint of the Seas off St Kilda SPA. Mackerel and herring are also Scotland's two most commercially valuable pelagic species. Amalgamated 2009-2013 VMS fishing intensity data from Marine Scotland (2015) indicates areas of high mackerel and herring fishing intensity within the study area, which suggests important foraging grounds for these species. High intensity fishing with demersal mobile and static fishing gear occurs along the continental shelf edge and slope (Marine Scotland, 2015).

The wider continental shelf and slope represent areas important to the life history of many species of commercially important fish, in addition to mackerel and herring. Collated information of the importance of the continental shelf and slope to commercial species from Coull *et al*. 1998, Ellis *et al*. 2012, and Aires *et al*. 2014 are listed in Table 16.6.

Table 16.6 Known uses of the continental shelf and slope by commercially important fish species in sensitive life stages (based on data from Coull *et al*., 1998; Ellis *et al*., 2012; Aires *et al*., 2014)

Species	PMF	Known use (spawning/nursery grounds/ presence of 0-group aggregation areas[1])
Anglerfish (*Lophius piscatorius*)	✓	Nursery grounds; 0-group aggregations
Blue whiting (*Micromesistius poutassou*)	✓	Spawning and nursery grounds; 0-group aggregations
[2]Common skate (*Dipturus batis*-complex)	✓	Nursery grounds
Haddock (*Melanogrammus aeglefinus*)		Spawning and nursery grounds; 0-group aggregations
Hake (*Merluccius merluccius*)		Nursery grounds; 0-group aggregations
Herring (*Clupea harengus*)	✓	Spawning and nursery grounds; 0-group aggregations
Horse Mackerel (*Trachurus trachurus*)	✓	Nursery grounds; 0-group aggregations
Lemon sole (*Microstomus kitt*)		Nursery grounds
Ling (*Molva molva*)	✓	Nursery grounds
Mackerel (*Scomber scombrus*)	✓	Spawning and nursery grounds; 0-group aggregations
Norway Pout (*Trisopterus esmarkii*)	✓	Spawning and nursery grounds; 0-group aggregations
Saithe (*Pollachius virens*)	✓	Spawning grounds
Sprat (*Sprattus sprattus*)		Spawning grounds
[3]Spurdog/spiny dogfish (*Squalus acanthias*)	✓	Nursery grounds
Whiting (*Merlangius merlangus*)	✓	Nursery grounds; 0-group aggregations

[1] 0-group aggregation areas are distinguished from "nursery grounds" by Aires *et al*., (2014) as habitat which support significantly higher juvenile densities than other areas.

[2, 3] Common skate and spurdog are included in assessments by Ellis *et al*. (2012) as species of conservation importance. Both species are listed on the OSPAR List of Threatened and/or Declining Species and Habitats.

16.8.4 Marine mammals

Cetaceans

Cetacean species that are resident or those seen regularly in Scottish waters in significant numbers that have been recorded in the study area include harbour porpoise (*Phocoena phocoena)*, common dolphin (*Delphinus delphis*), bottlenose dolphin (*Tursiops truncatus*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), white-beaked dolphin (*Lagenorhynchus albirostris*), Risso's dolphin (*Grampus griseus*), killer whale (*Orcinus orca*) and minke whale (*Balaenoptra acutorostrata*) One other species, long-finned pilot whale (*Globicephala melas*) has been recorded occasionally within the study area. This species is present year-round in Scottish waters however not in significant numbers and usually only in deeper offshore waters. Several other cetacean species are relatively uncommon in Scottish waters with rare sightings within the study area these include humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*) and fin whale (*Balaenoptera physalus*).

Harbour porpoise

The harbour porpoise is the most numerous marine mammal in north-western European shelf waters (Reid *et al*, 2003). Harbour porpoise is resident and abundant all year round in Scottish waters (Hague *et al*, 2020) and the number present in Hebridean waters is amongst the highest in Europe (HWDT, 2021b).

The study area is located in the West Scotland management unit (MU) which has an estimated abundance of 24,370 harbour porpoise (CV=0.23; 95% CI=15,074-37,858) (Hammond *et al*, 2017). There is also an interchange of animals between this area and the neighbouring Celtic and Irish Seas and North Sea MU populations. The abundance of harbour porpoise within block J of the SCANS-III survey is estimated as 2,045 animals (CV=0.72; 95% CI=0–5,313) which is a density of 0.058 animals/km^2 (Hammond *et al*, 2017). Harbour porpoise typically occur in small groups of one to three animals (Reid *et al*, 2003). When feeding, they commonly surface to breathe about four times every 10 to 20 seconds before diving for up to six minutes (HWDT, 2021b).

The predicted distribution maps for harbour porpoise show that this species is confined to the continental shelf (i.e. waters <200 m depth) (Figure 16.4). Harbour porpoise is present within the study area in all months of the year with highest densities present in the inshore areas throughout the study area between July and November (Waggitt *et al*, 2020). The HWDT sightings database shows 11 records of harbour porpoise recorded within the study area since July 2017 (HWDT, 2021a). Five records of 2-3 harbour porpoises close inshore off the coast of North Uist were sighted between the months of July and September. Five records of groups of 1 – 3 animals were sighted between North Uist and St Kilda in June 2018 and 2019 with one record of a group of ten far offshore to the north of St Kilda in September 2019.

Common dolphin

The study area is located within the Celtic and Greater North Seas (CGNS) management unit, a single MU which covers all UK waters (IAMMWG, 2015). A single MU is considered appropriate for this species as there is little evidence of separate sub-populations of common dolphin in the north-east Atlantic (IAMMWG, 2015). The abundance of common dolphin in the CGNS is 56,556 animals (CV=0.28; 95% CI=33,014-96,920). The abundance of common dolphin within block J of the SCANS-III survey is estimated as 4,679 (CV=0.95; 95% CI=0–16,108) which is a density of 0.133 animals/km^2 (Hammond *et al*, 2017). The mean group size recorded during the SCANS-III surveys was 20 animals (Hammond *et al*, 2017). Common dolphin are fast swimmers, reaching speeds in excess of 15 mph and are capable of travelling vast distances in a short time.

The predicted distribution maps for common dolphin show that this species is present at relatively low densities within the study area throughout the year with a large seasonal variation in distribution (Figure 16.5). Between June and November common dolphins are present throughout the study area with the highest densities found along the continental shelf edge between June and October when food is most abundant. During the winter months from December to May, this species is confined to deeper offshore waters beyond the continental shelf (Waggitt *et al*, 2020). In recent years there has been an increase in common dolphin numbers in the Hebrides with sightings reported in every month of the year since 2014 (HWDT, 2021b). The HWDT sightings database shows over 60 records of short-beaked common dolphin recorded within the study area since July 2017 (HWDT, 2021a). All sightings were from between April and September with most sightings of groups of less than 30 animals with two sightings of pods of 100 animals recorded around St Kilda in 2021.

Bottlenose dolphin

The study area is located within two management units for bottlenose dolphin; the Coastal West Scotland and the Hebrides (CWSH) management unit covers waters out to 12 nm and the Oceanic Waters (OW) MU which covers the waters beyond 12 nm (IAMMWG, 2015). These two MUs represent separate populations with limited interchange of animals between these sub-groups. The abundance of bottlenose dolphin in CWSH is 45 animals (95% CI=33-66) and in Oceanic Waters is 11,923 animals (CV=0.21; 95% CI=7,935-17,915). There were no sightings of bottlenose dolphin in block J during the SCANS-III surveys (Hammond *et al*, 2017). The HWDT sightings database has only three records of bottlenose dolphin recorded within the study area since July 2017: a group of 22 were recorded at the southern edge of the study area in August 2021; three were recorded offshore to the southwest of St Kilda in April 2020 and two were

sighted to the west of Barra in April 2019 (HWDT, 2021a). This is a social species, commonly forming groups of 2 – 25 (Reid *et al*, 2003). These dolphins are usually fairly slow swimmers, travelling at about 2 mph, but can reach speeds of over 30 mph for brief periods (HWDT, 2021b).

The predicted distribution maps for the offshore bottlenose dolphin population show that relatively low densities are present within the study area throughout the year, confined to the waters along the continental shelf edge and the deeper waters beyond, with the patterns of distribution and abundance remaining consistent throughout the year Waggitt *et al*, (2020) (Figure 16.6). The inshore bottlenose dolphin population is most frequently seen close to the coastline around headlands and bays and research by HWDT has identified a distinct group of about 12 bottlenose dolphin that are present in and around the Sound of Barra (HWDT, 2021b).

Atlantic white-sided dolphin

Atlantic white-sided dolphins are present in low numbers in Scottish waters, with distribution mainly in deeper offshore waters during the summer months (Hague *et al*, 2020). The population of Atlantic white-sided dolphin in the eastern North Atlantic is covered by a single management unit, the Celtic and Greater North Seas (CGNS) management unit which covers all UK waters (IAMMWG, 2015). The abundance of Atlantic white-sided dolphins in the CGNS management unit is 69,293 animals (CV=0.37; 95% CI=34,339-139,828). There were no Atlantic white-sided dolphin sightings in block J during the SCANS-III surveys (Hammond *et al*, 2017). The HWDT sightings database shows only two records of Atlantic white-sided dolphins recorded within the study area, with a group of 13 sighted off South Uist in April 2019 and a group of three around St Kilda in May 2021 (HWDT, 2021a).

The predicted distribution maps for Atlantic white-sided dolphin show that this species is present in the study area all year round with the highest densities present in the deeper offshore waters beyond the continental shelf with numbers at their peak between June to October (Waggitt *et al*, 2020) (Figure 16.7). Lower densities can be found over the continental shelf within the study area between June to October however this species is not predicted to be present close inshore to the west of Lewis, Harris or the Uists at any time of year. This species is rarely seen within the continental shelf in the Hebrides (HWDT, 2021b). This is a gregarious species with observed group sizes in the study area typically numbering 2 – 30 animals, with larger aggregations of hundreds seen elsewhere particularly offshore (Reid *et al*, 2003). These dolphins are fast swimmers.

White-beaked dolphin

The study area is located within the CGNS management unit which is a single MU for this species that covers all UK waters (IAMMWG, 2015). The abundance of white-beaked dolphin in the CGNS management unit is 15,895 animals (CV=0.29; 95% CI=9,107-27,743). The abundance of white-beaked dolphin within block J of the SCANS-III survey is estimated as 1,871 animals (CV=0.91; 95% CI=0–5,856) which is a density of 0.053 animals/km^2 (Hammond *et al*, 2017). The HWDT sightings database shows that there have been eight records of white-beaked dolphins within the study area since July 2017 (HWDT, 2021a). All records are of small groups of 2-4 animals recorded in June or July between North Uist and St Kilda.

This species is usually found over the continental shelf in waters of 50 – 100m depth (Reid *et al*, 2003). The predicted distribution maps show that white-beaked dolphin is present throughout the study area in all months of the year however the greatest predicted densities are present from June to November (Waggitt *et al*, 2020) (Figure 16.8). This species is usually found in small groups of less than ten individuals (Reid *et al*, 2003). White-beaked dolphins are fast, powerful swimmers that frequently jump clear of the water when travelling at speed (HWDT, 2021b). Some research suggests that white-beaked dolphin numbers have declined in recent years, whilst common dolphin abundance has increased, which could mean the species are competing for habitat or food (HWDT, 2021b).

Risso's dolphin

Risso's dolphins are resident year-round in Scottish waters but present at higher densities during the summer months (Hague *et al*, 2020). There is no current abundance estimate available for Risso's dolphin for the single CGNS management unit covering all UK waters (Hague *et al*, 2020; IAMMWG, 2015). The abundance of Risso's dolphin within block J of the SCANS-III survey is estimated as 6,750 animals (CV=0.80; 95% CI=0–19,557) which is a density of 0.192 animals/km^2 (Hammond *et al*, 2017).

The predicted distribution maps show that Risso's dolphin is present within the study area throughout the year with the highest predicted densities occurring along the continental shelf edge between July and October (Waggitt *et al*, 2020) (Figure 16.9). This deeper water is home to their preferred prey of squid, octopus and cuttlefish. Risso's dolphin can occasionally be seen in coastal areas particularly where there is deeper water close to land such as around Lewis; lower densities of Risso's dolphin are recorded over the continental shelf from June to November however during the winter months from December to April, the predicted distribution of Risso's dolphin is confined to the deeper offshore waters beyond the continental shelf (Waggitt *et al*, 2020) (Figure 16.9). Risso's dolphin is a gregarious species, typically found in groups of 2 – 50 animals (Reid *et al*, 2003). The mean group size recorded during the SCANS-III surveys was 11.33 animals (Hammond *et al*, 2017). The HWDT sightings database shows nine records of Risso's dolphins recorded within the study area since 2017(HWDT, 2021a). A group of five was recorded off the coast near Scolpaig in July 2021. A group of 26 was sighted near St Kilda in July 2018 with all other records of between 1 – 12 animals recorded between North Uist and St Kilda between the months of April and July.

Outwith the study area, the Northeast Lewis Marine Protected Area (MPA) located off the northeast coast of Lewis is designated for Risso's dolphin (Figure 16.1). This area has been shown to hold Risso's dolphins year-round over several decades, with photo-identification studies indicating that there is site fidelity of individual animals to the area over several years (Weir *et al*, 2019). This area is likely to be an important foraging area for this species and the presence of small calves in the area, peaking between June and October suggests that this may also be an important nursery area for this species (Weir *et al*, 2019).

Killer whale

In UK waters, killer whales are most commonly recorded off northern and western Scotland (Reid *et al*, 2003). There is a small resident population of killer whales present off the west coast of Scotland; this group of eight individuals (four males and four females) is known as the West Coast Community (HWDT, 2021b). This group may be present throughout the study area however sightings hotspots are within the Sea of the Hebrides and around Barra, Skye and Mull (HWDT, 2021b). This population is known to forage on other marine mammals including harbour porpoise. In the Hebrides, killer whales tend to show lower levels of surface activity, compared to elsewhere in the world (HWDT, 2021b). Killer whales are powerful swimmers capable of speeds of 35 mph, which enables them to travel vast distances in a short space of time.

The predicted distribution maps for killer whale show that this species is present throughout the study area throughout the year (Figure 16.10). Overall, the predicted densities present in the study area are relatively low with slightly higher densities present from June to October (Waggitt *et al*, 2020). There was insufficient data from the SCANS-III surveys to be able to produce an abundance estimate for this species. The HWDT sightings database shows seven records of killer whales recorded within the study area since July 2017, six of which were from 2021 when between 2 – 7 animals were recorded between North Uist and St Kilda between April and July (HWDT, 2021a). Prior to that, there is only one record of two seen off St Kilda in April 2019.

Minke whale

Minke whales are present in Scottish waters year-round with a peak of sightings in the summer months. In autumn there appears to be a shift offshore, potentially associated with breeding (Evans *et al*. 2011). A single management unit is considered appropriate for minke whale in European waters (IAMMWG, 2015). The abundance of minke whale in the Celtic and Greater North Seas (CGNS) management unit is 23,528 animals (CV=0.27; 95% CI=13,989-39,572). The abundance of minke whale within block J of the SCANS-III survey is estimated as 647 animals (CV=1.04; 95% CI=0–2,994) which is a density of 0.018 animals/km^2 (Hammond *et al*, 2017).

The predicted distribution maps for minke whale show that this species is present at relatively low densities within the study area throughout the year however there is seasonal variation with highest densities present from June to October (Waggitt *et al*, 2020) (Figure 16.11). Minke whales are sighted most frequently in coastal and inshore waters around the Hebrides from April to October (HWDT, 2021b). This species occurs mainly on the continental shelf in water depths of <200m (Reid *et al*, 2003). A study by Paxton *et al,* (2014) indicates that minke whale presence is associated with sea surface temperature and chlorophyll concentrations, both of which are dynamic variables with annual variations, suggesting that their distribution will change annually.

Minke whales are usually seen singly or in pairs although larger aggregations may form when feeding (Reid *et al*, 2003). They are capable of swimming at speeds of up to 13 mph and their typical dive sequence is five to eight blows at intervals of less than a minute, followed by a dive which usually lasts three to eight minutes (HWDT, 2021b). As minke whales conduct long, deep dives, they therefore spend less time at the surface. The HWDT sightings database shows over 60 records of minke whale within the study area recorded since July 2017 (HWDT, 2021a). Most of these records were around St Kilda during the summer months.

Outwith the study area, The Sea of the Hebrides MPA is designated for minke whale due to its importance as a feeding ground for this species (Figure 16.1). It holds relatively high densities of minke whale compared to other areas in Scottish territorial waters particularly from April to October (NatureScot, 2020).

Long-finned pilot whale

Long-finned pilot whales primarily occur in deep waters of 200 – 3,000 m (Reid *et al*, 2003). The abundance of long-finned pilot whale within block J of the SCANS-III survey is estimated as 79 animals (CV=1.16; 95% CI=10–641) which is a density of 0.002 animals/km^2 (Hammond *et al*, 2017). Long-finned pilot whales mostly occur in large pods of around 20 animals however the mean group size recorded during the SCANS-III surveys was one. The HWDT sightings database shows that since July 2017 there have been three records of long-finned pilot whale within the study area, a group of four sighted on two occasions in July 2018 and a group of three seen in August 2019 (HWDT, 2021a). All records were relatively far offshore, with only one sighting to the east of St Kilda.

The predicted distribution maps for long-finned pilot whale show that this species is present within the study area throughout the year at relatively low densities however it is confined to the deeper offshore waters beyond the continental shelf edge (Waggitt *et al*, 2020) (Figure 16.12). The abundance and distribution of this species remains relatively consistent throughout the year. Long-finned pilot whales are often encountered resting motionless at the surface, which is known as logging (HWDT, 2021b).

Uncommon cetaceans (humpback whale, sperm whale and fin whale)

Humpback whale is likely present resident year-round in Scottish waters but in extremely low numbers (Hague *et al*, 2020). HWDT sightings records show only three records within the study area since July 2017, all records of single animals seen in June or July (HWDT, 2021a). Two other species, sperm whale (*Physeter macrocephalus)* and fin whale (*Balaenoptera physalus*) are also recorded year-round in Scottish waters however their predicted distributions are

predominantly in the deeper offshore waters west of the continental shelf edge at very low densities (Waggitt *et al*, 2020). The HWDT sightings records show only two records of sperm whale in the study area since July 2017, likely the same animal sighted on two separate occasions very close to shore around the coast of Harris in November 2019. There are no records of fin whale in the study area within the HWDT sightings database however there are several records off the northeast coast of Lewis.

Pinnipeds

The study area is located within the Western Isles Seal Management Unit (SMU) (SCOS, 2019) (Figure 16.2).

Harbour seal (Phoca vitulina)

Harbour seals are resident year-round in Scottish waters where their distribution is primarily coastal, with most harbour seals staying within 30 – 50 km of the coastline in waters <50 m deep (Jones *et al*, 2015). The UK abundance estimate for harbour seal is 45,100 which is based on the most recent UK wide count (2008-2017) (SCOS, 2019). The harbour seal abundance estimate for the Western Isles SMU is 4,907 (95 % CI=1,015-6,543) based on the August haul-out count data scaled to correct for the proportion of seals hauled out at the time of the count (SCOS, 2019). The harbour seal population has remained relatively stable in the Western Isles, with a slight increase in numbers in recent years however in many other Scottish SMUs, the population has undergone significant declines (SCOS, 2019). The most recent count data for the Western Isles from August 2017 recorded the highest count of 1,547 harbour seals for Lewis and Harris which was more than double the previous count (700 in 2011) (Duck and Morris, 2019). The count for North Uist was 284 harbour seals which was less than half the previous count (602 in 2011) (Duck and Morris, 2019).

There are no designated harbour seal haul-out sites within the study area, however outwith the study area, the nearest designated harbour seal haul-out site is located on the isle of Oronsay 9 km to the east of the proposed launch site (Figure 16.2). There are several other designated harbour seal haul-out sites located around the coasts of the Uists and Benbecula (Figure 16.2). There are no SACs with harbour seal as a qualifying feature located with the study area. The nearest SAC with harbour seal as a qualifying feature is Sound of Barra SAC which is located 60 km to the south of the proposed launch site (Figure 16.1).

Harbour seals spend a considerable proportion of their time hauled out on land at haul-out sites where they rest, breed and moult. Female harbour seals haul-out to breed in June and July after which they continue to feed and tend to their pups for approximately three weeks before weaning occurs (Thompson and Wheeler, 2008). During this time, the females will continue to forage at sea though the requirement to regularly return to their pup may mean that the distance that they travel to forage during this time may be limited to nearer the breeding sites. Harbour seals undergo an annual moult in August during which time they spend an increased amount of time hauled out on land to conserve heat and avoid excess energy loss in the cold seawater. Harbour seals are most vulnerable to disturbance during the pupping and moulting periods as disturbance may cause pups or moulting animals to flee into the water which results in increased energy costs and may reduce survivability of young pups.

Recently published maps of the mean predicted relative density of harbour seals at-sea show that within the study area, the area of highest harbour seal density at-sea is predicted to occur within the nearshore area within approximately 30 – 50 km of the coastline (Carter *et al*, 2020) (Figure 16.13). Harbour seals are not predicted to occur across the vast extent of the SLHA with their distribution tightly concentrated around the coastline adjacent to haul-outs (Figure 16.13).

Grey seal (Halichoerus grypus)

Grey seals are resident year-round in Scottish waters. The most recent (2018) estimate of UK grey seal population size is 152,800 (95 % CI 135,300 – 173,800) with 88 % of these in Scotland (SCOS, 2019). The Western Isles holds one of the main regional groups of breeding grey seals in Scotland with 21 % of the Scottish count (SCOS, 2019). The grey seal abundance estimate for the Western Isles SMU is 16,976 (95 % CI=15,600-19,240) based on the August haul-out counts, with data scaled to correct for the proportion of seals hauled-out at the time of the count (SCOS, 2019). The most recent count data for the Western Isles SMU from August 2017 indicates the population is increasing with a count of 5,772 grey seals which was the highest recorded, compared with 4,085 counted in 2014 and 4,144 in 2011 (Duck and Morris, 2019). The 2017 count of 2,761 grey seals was the highest ever count for the Monach Islands which was almost double the previous count (1,468 in 2014) (Duck and Morris, 2019). The count for North Uist was 252 grey seals which was 40 % less than the previous count (401 in 2011) (Duck and Morris, 2019).

Grey seals spend much of their time at sea but haul out on land to rest, breed and moult. Grey seals come ashore in the autumn to form breeding colonies mostly on isolated coasts and remote, uninhabited islands. The breeding period for grey seals in Scotland is from late September to December, when the females haul out to give birth and suckle their pups for 17-23 days before weaning (SCOS, 2019).

Within the study area, the Monach Islands located 14 km to the southwest of the proposed launch site are designated as an SAC for grey seals and as a designated seal haul-out for breeding grey seals (Figures 16.1 and 16.2). The Monach Islands hold the largest grey seal breeding colony in the UK, contributing over 20% of annual UK pup production (JNCC, n.d.). Seals from the Monach Islands SAC are likely to forage extensively within the study area with highest densities present in the waters surrounding the breeding colony. The islands of Causamul and Haskeir, located off the west coast of North Uist, 8km and 13km, respectively from the proposed launch site are designated along with the islands of Gasker, Coppay, Shillay and Flodday as part of the Small Seal Islands SSSI, a group of six islands that collectively support one of the largest grey seal pupping sites in the Western Isles (Figure 16.1). These islands are also designated seal haul-out sites used by grey seals during the breeding season (Figure 16.2).

The annual moult occurs between December and April. Grey seals disperse from their haul-out sites to forage at sea, where they travel considerable distances from the haul-out site, with most foraging activity within 100 km of a haul-out, with foraging trips lasting between one and 30 days (SCOS, 2019). Grey seals utilise both coastal and offshore habitat. Grey seals are distributed further offshore than harbour seals and are known to travel much greater distances between haul-out sites, with studies of tagged seals showing movements between the North Sea and the Outer Hebrides (SCOS, 2019).

Recently published maps of the mean predicted density of grey seals at-sea show that there is a relatively high at-sea density of grey seals within the study area within approximately 120 km of the launch site, indicating the presence of areas of important habitat adjacent to the larger haul-out sites located at the Monach Islands and Small Seal Islands SSSI (Carter *et al*, 2020) (Figure 16.14). This includes the area along the shelf edge to the west of the Western Isles indicating the importance of this area as a foraging site. Grey seals are not predicted to occur beyond approximately 120 km from the launch site, therefore within a vast extent of the sea area covered by the SLHA.

Marine turtles

Marine turtles are occasional visitors to Scottish waters. Marine turtles that occur in Scottish waters include leatherback turtle (*Dermochelys coriacea)*, loggerhead turtle (*Caretta caretta)*, Kemp's ridley turtle (*Lepidochelys kempii)* and green turtle (*Chelonia mydas)*. All four of these species are European Protected Species (EPS). Leatherback turtles are the most frequently recorded in Scottish waters however all of the other species usually arrive by accident carried by ocean

currents from warmer waters. Their occurrence is so infrequent in the study area that there is no potential for likely significant effects therefore marine turtles are not considered further in this assessment.

16.8.5 Ministry of Defence (MOD) activities

The Ministry of Defence (MOD) Hebrides Range is a weapons Test and Evaluation Range which has sites located on the islands of South Uist, Benbecula and St Kilda in the Western Isles. The Hebrides Range occupies 115,000 km^2 of airspace, which overlaps with the study area. Trial and test operations at the MOD Hebrides Range include ground launched aerial target and missile firing, small arms firings and explosive disposals. Information regarding the frequency and exact type of activities is not publicly available. These activities are not subject to EIA requirements and are exempt from requiring a Marine Licence under the Marine Licensing (Exempted Activities) Order 2011.

The Missile Testing Range is long-established, having been built in 1957-58. The populations of marine ecological receptors present within the Hebrides Range area are likely to be subject to acoustic disturbance and other effects from the MOD activities however these activities are so long-established that they are considered to form part of the baseline conditions in the study area. Several MPAs and SPAs have recently been designated in the area for marine ecological receptors. The Royal Navy implements environmental protection guidelines for marine activities operating within or adjacent to MPAs including restricted activities and control measures in relation to marine mammals (whales, dolphins and seals), basking sharks and benthic seabed features (Royal Navy, 2020).

16.9 DETERMINATION OF ECOLOGICAL IMPORTANCE

Table 16.7 evaluates the importance of ecological features associated with the Development, and determines which ecological features, based on both their intrinsic value and their potential to be affected by the Project, are considered to be IEFs. Each ecological feature has been assigned a level of importance in accordance with the relevant geographical scale as outlined in Table 16.3.

Features of Local or Less than Local importance, and those to which impacts can be categorically ruled out, including features considered absent for the study area, or potentially present in very low numbers, are scoped out of further assessment, however, will be sufficiently safeguarded through embedded mitigation and good practice measures detailed in Section 16.11 where present.

Table 16.7 Determination of Important Ecological Features

Ecological Feature	Determination Rationale	IEF/Action
Designated sites		
West of Scotland MPA	Site is located within the boundary of the study area. This feature is considered of **National importance**	**IEF** **Scoped into assessment**
Geikie Slide and Hebridean Slope MPA	Site is located within the boundary of the study area. This feature is considered of **National importance**	**IEF** **Scoped into assessment**
Sea of the Hebrides MPA	Site is outwith the study area boundary, located approximately 22 km to the southeast of the SLHA boundary. At this distance there is no potential for likely significant effects.	Not an IEF Scoped out of assessment

Ecological Feature	Determination Rationale	IEF/Action
Northeast Lewis MPA	Site is outwith the study area boundary, located approximately 73 km to the east of the SLHA boundary. At this distance there is no potential for likely significant effects.	Not an IEF Scoped out of assessment
St Kilda SAC	Site is located within the boundary of the study area. This feature is considered of **International importance**	**IEF** **Scoped into assessment**
Monach Islands SAC	Site is located within the study area boundary. This feature is considered of **International importance**	**IEF** **Scoped into assessment**
Sound of Barra SAC	Site is outwith the study area boundary, located approximately 52 km to the east of the SLHA boundary. At this distance there is no potential for likely significant effects.	Not an IEF Scoped out of assessment
Anton Dohrn Seamount SAC	Site is located within the boundary of the study area. This feature is considered of **International importance**	**IEF** **Scoped into assessment**
Small Seal Islands SSSI	The SSSI is a group of six islands that support one of the largest grey seal pupping sites in the Western Isles. The islands of Haskeir and Causamul are part of the SSSI and are located within the boundary of the study area. This feature is considered of **National importance**	**IEF** **Scoped into assessment**
Causamul Designated seal haul-out site	All Scottish seal species are protected under the Marine (Scotland) Act 2010. In addition, it is an offence to intentionally or recklessly harass seals under the Protection of Seals (Designation of Haul-out Sites) (Scotland) Order 2014. This feature is considered of **Regional importance** The Development has the potential to affect this site therefore it is also included as an IEF due to its **legislative importance.**	**IEF** **Scoped into assessment**
Haskeir Designated seal haul-out site	All Scottish seal species are protected under the Marine (Scotland) Act 2010. In addition, it is an offence to intentionally or recklessly harass seals under the Protection of Seals (Designation of Haul-out Sites) (Scotland) Order 2014. This feature is considered of **Regional importance** The Development has the potential to affect this site therefore it is also included as an IEF due to its **legislative importance.**	**IEF** **Scoped into assessment**

Ecological Feature	Determination Rationale	IEF/Action
Monach Islands Designated seal haul-out site	All Scottish seal species are protected under the Marine (Scotland) Act 2010. In addition, it is an offence to intentionally or recklessly harass seals under the Protection of Seals (Designation of Haul-out Sites) (Scotland) Order 2014. This feature is considered of **Regional importance** The Development has the potential to affect this site therefore it is also included as an IEF due to its **legislative importance.**	**IEF** **Scoped into assessment**
Oronsay Designated seal haul-out site	All Scottish seal species are protected under the Marine (Scotland) Act 2010. In addition, it is an offence to intentionally or recklessly harass seals under the Protection of Seals (Designation of Haul-out Sites) (Scotland) Order 2014. This feature is considered of **Local importance** The Development has the potential to affect this site therefore it is included as an IEF due to its **legislative importance.**	**IEF** **Scoped into assessment**
Benthic		
Offshore deep-sea muds	Offshore deep-sea muds are a PMF and qualifying feature of the West of Scotland MPA and the Geikie Slide and Hebridean Slope MPA. The habitat is widespread throughout the deepest waters of the study area. This feature is considered of **National Importance**.	**IEF** **Scoped into assessment**
Offshore subtidal sands and gravels	Offshore subtidal sands and gravels are a PMF and qualifying feature of the West of Scotland MPA and the Geikie Slide, and the Hebridean Slope MPA. The habitat is widespread throughout the study area and supports many commercial fish species as areas for feeding, spawning and nursery grounds. This feature is considered of **National Importance**.	**IEF** **Scoped into assessment**
Burrowed mud (including sea pens)	Burrowed mud is a PMF and qualifying feature of the West of Scotland MPA and the Geikie Slide and Hebridean Slope MPA. It is also listed on the international OSPAR list of Threatened and Declining species. Component sea pen aggregations are classed as ICES VMEs. This habitat is mainly distributed along the continental slope, with some aggregations of sea pens to the west of Anton Dohrn seamount on the slope. This feature is considered of **International Importance**.	**IEF** **Scoped into assessment**
Coral gardens	Coral gardens are a PMF and qualifying feature of the West of Scotland MPA. They are also listed on the international OSPAR list of Threatened and Declining species and classified as VMEs. Representative examples of this habitat are found within the study area around seamounts. This feature is considered of **International Importance**.	**IEF** **Scoped into assessment**

Ecological Feature	Determination Rationale	IEF/Action
Cold-water coral reefs	Cold-water coral reefs are a PMF and qualifying feature of the West of Scotland MPA. They are also listed on the international OSPAR list of Threatened and Declining species and classified as VMEs. Representative examples of this habitat are found within the study area around seamounts. This feature is considered of **International Importance**	**IEF** **Scoped into assessment**
Deep-sea sponge aggregations	Deep-sea sponge aggregations are a PMF and qualifying feature of the West of Scotland MPA. They are also listed on the international OSPAR list of Threatened and Declining species and classified as VMEs. Representative examples of this habitat are found within the study area around seamounts. This feature is considered of **International Importance**	**IEF** **Scoped into assessment**
Seamount communities	Seamount communities are a PMF and qualifying feature of the West of Scotland MPA. They are also listed on the international OSPAR list of Threatened and Declining species and classified as VMEs. Seamounts are important hotspots for biodiversity and two are situated within the furthest extents of the study area. This feature is considered of **International Importance**	**IEF** **Scoped into assessment**
Laminaria kelp beds	Laminaria kelp beds are a PMF but not a qualifying feature of any designation within the study area. Within the study area its distribution is limited to the shallow waters around the St Kilda archipelago and other offshore islands which no flight path will cross. This feature is considered of **Local Importance.**	Not an IEF Scoped out of assessment
Kelp and seaweed communities	Kelp and seaweed communities are a PMF but not a qualifying feature of any designation within the study area. This habitat is widely distributed along the Western Isles coastline and usually only found in shallow waters less up to 20 m depth. However, the study area does not represent an important location for this habitat, with limited offshore presence at St Kilda. This feature is considered of **Local Importance.**	Not an IEF Scoped out of assessment
Northern sea fan and sponge communities	Northern sea fan and sponge communities are a PMF but not a qualifying feature of any designation within the study area. Records of this habitat are situated outwith the boundary of the study area, to the west of the Uists. This feature is considered of **Local Importance**.	Not an IEF Scoped out of assessment
Pink sea fingers	Pink sea fingers are a PMF but not a qualifying feature of any designation within the study area. Low records of this species are limited to around St Kilda. This feature is considered of **Local Importance**.	Not an IEF Scoped out of assessment

Ecological Feature	Determination Rationale	IEF/Action
White cluster anemone	White cluster anemone is a PMF but is not a qualifying feature of any designations within the study area. Records of this species are limited to around St Kilda and outwith the boundary of the study area to the west of the Uists, in association with northern sea fan and sponge communities. This feature is considered of **Local Importance**.	Not an IEF Scoped out of assessment
Northern feather star	Northern feather star is a PMF but is not a qualifying feature of any designations within the study area. There are low records of its presence around St Kilda, and outwith the boundary of the study area to the west of the Uists. This feature is considered of **Local Importance**.	Not an IEF Scoped out of assessment
Ocean quahog	Ocean quahog is listed on the international OSPAR list of Threatened and Declining species and is a PMF in Scotland but is not a qualifying feature of any designations within the study area. However, there is a single record of its presence at St Kilda and therefore due to its rarity within the study area, this feature is considered **of Local Importance.**	Not an IEF Scoped out of assessment
Burrowing sea anemone	This species is a PMF in Scotland but is not a qualifying feature of any designations within the study area. Very low records of its presence are limited to St Kilda and outwith the boundary of the study area to the west of the Uists. This feature is considered of **Local Importance**.	Not an IEF Scoped out of assessment
Commercial shellfish	Within the study area there are fishing grounds for lobster, edible crab, and to a lesser extent, the European spiny lobster (a PMF but not linked to nearby designations). These species are important fishery targets to the Western Isles in particular. This feature is considered of **Regional Importance**.	**IEF** **Scoped into assessment**
Fish		
Blue ling	Blue ling is a PMF and qualifying feature of the West of Scotland MPA. It is classified as Vulnerable in Europe by IUCN. The study area includes important habitats for feeding and spawning. This feature is considered of **International Importance**.	**IEF** **Scoped into assessment**
Gulper shark	Gulper shark is a PMF and qualifying feature of the West of Scotland MPA. It is classified as globally Endangered by IUCN. The study area includes important habitats for feeding and spawning. This feature is considered of **International Importance**.	**IEF** **Scoped into assessment**
Leafscale gulper shark	Leafscale gulper shark is a PMF and qualifying feature of the West of Scotland MPA. It is classified as Endangered in Europe by IUCN. The study area includes important habitats for feeding and spawning. This feature is considered of **International Importance**.	**IEF** **Scoped into assessment**

Ecological Feature	Determination Rationale	IEF/Action
Orange roughy	Orange roughy is a PMF and qualifying feature of the West of Scotland MPA. It is classified as Vulnerable in Europe by IUCN. The study area includes important habitats for feeding and spawning. This feature is considered of **International Importance**.	**IEF** **Scoped into assessment**
Portuguese dogfish	Portuguese dogfish is a PMF and qualifying feature of the West of Scotland MPA. It is classified as globally Near Threatened. The study area includes important habitats for feeding and spawning. This feature is considered of **International Importance**.	**IEF** **Scoped into assessment**
Roundnose grenadier	Roundnose grenadier is a PMF and qualifying feature of the West of Scotland MPA. It is classified as Endangered in Europe by IUCN. The study area includes important habitats for feeding and spawning. This feature is considered of **International Importance**.	**IEF** **Scoped into assessment**
Basking Shark	Basking shark is a legally protected species under the Nature Conservation (Scotland) Act 2004 and Schedule 5 of Wildlife and Countryside Act 1981. The species is listed on Annex V of the OSPAR Convention and the OSPAR list of Threatened and Declining species and is classed as globally Endangered by the International Union for the Conservation of Nature (IUCN). Basking shark occurs in relatively low numbers during the summer months only, and the study area does not appear to be an area of key importance for this species. This feature is considered of **Regional Importance**. Basking shark is also included as an IEF due to its **Legislative Importance**.	**IEF** **Scoped into assessment**
Atlantic Bluefin Tuna	Atlantic Bluefin Tuna is listed on the OSPAR list of Threatened and Declining species and is classed as is globally Endangered. Sightings are increasing off the British Isles, however due to their seasonality and occasionally reported presence within the study area, this feature is considered of **Regional Importance**.	**IEF** **Scoped into assessment**
Fish spawning and nursery grounds	Within the study area, the continental shelf and slope is used by a number of commercially important fish in sensitive life stages (i.e. spawning and nursery grounds). This includes mackerel and herring which have extensive spawning and nursery grounds within the Seas off St Kilda SPA which is designated for seabird foraging grounds, and which represent two of Scotland's most commercially valuable pelagic species. This feature is considered of **National Importance**.	**IEF** **Scoped into assessment**

Ecological Feature	Determination Rationale	IEF/Action
Cetaceans		
Harbour porpoise	Harbour porpoise is a European Protected Species (EPS) that regularly occurs within the study area. This feature is considered of **National Importance**. Harbour porpoise is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**
Common dolphin	Common dolphin is a European protected species that regularly occurs within the study area. This feature is considered of **National Importance**. Common dolphin is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**
Bottlenose dolphin	Bottlenose dolphin is a European protected species that regularly occurs within the study area. This feature is considered of **Regional Importance**. Bottlenose dolphin is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**
Atlantic white-sided dolphin	Atlantic white-sided dolphin is a European protected species that regularly occurs within the study area. This feature is considered of **Regional Importance**. Atlantic white-sided dolphin is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**
White-beaked dolphin	White-beaked dolphin is a European protected species that regularly occurs within the study area. This feature is considered of **National Importance**. White-beaked dolphin is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**
Risso's dolphin	Risso's dolphin is a European protected species that regularly occurs within the study area. This feature is considered of **National Importance**. Risso's dolphin is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**
Killer whale	Killer whale is a European protected species that regularly occurs within the study area. This feature is considered of **National Importance**. Killer whale is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**
Minke whale	Minke whale is a European protected species that regularly occurs within the study area. This feature is considered of **National Importance**. Minke whale is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**

Ecological Feature	Determination Rationale	IEF/Action
Long-finned pilot whale	Long-finned pilot whale is a European protected species that regularly occurs within the study area. This feature is considered of **National Importance**. Long-finned pilot whale is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**
Humpback whale	Humpback whale is a European protected species, that is uncommon within the study area. This feature is considered of **Regional Importance**. Humpback whale is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**
Sperm whale	Sperm whale is a European protected species that is uncommon within the study area. This feature is considered of **Regional Importance**. Sperm whale is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**
Fin whale	Fin whale is a European protected species that is uncommon within the study area. This feature is considered of **Regional Importance**. Fin whale is also included as an IEF due to its **Legislative Importance.**	**IEF** **Scoped into assessment**
Pinnipeds		
Harbour seal	Harbour seals are not predicted to occur across the vast extent of the study area with the distribution of this species limited to the nearshore areas adjacent to haul-out sites, the nearest of which is on the island of Oronsay, 9 km to the east of the launch site. Harbour seal is considered of **Regional Importance**.	**IEF** **Scoped into assessment**
Grey seal	The study area holds an internationally important breeding colony of grey seals located at the Monach Islands. This SAC supports the largest breeding colony of grey seals in the UK. The waters surrounding these breeding colonies are utilised by foraging grey seals and there is a relatively high at-sea density of grey seals within the study area within approximately 120 km of the launch site. The vast extent of the study area that lies beyond 120 km from the launch site is not predicted to hold any grey seals. This feature is considered of **International Importance**.	**IEF** **Scoped into assessment**

16.9.1 Scoped Out of the Assessment of Potential Effects

Following the systematic evaluation of ecological importance outlined in Table 16.7, the following ecological features were determined to be of Local Importance or below, and thus not considered to be IEFs, and have therefore been scoped out of the assessment:

- Laminaria kelp beds
- Kelp and seaweed communities

- Northern sea fan and sponge communities
- Pink sea fingers
- White cluster anemone
- Northern feather star
- Ocean quahog; and
- Burrowing sea anemone.

No flight paths of launch vehicles are intended to cross or pass within close proximity to land masses including St Kilda, Boreray, Monach Islands, Haskeir and Causamul upon leaving the launch pad at Scolpaig Bay, therefore recorded PMFs clustered around these isles are unlikely to be impacted by the Project.

16.9.2 Scoped into the Assessment of Potential Effects

Following the systematic evaluation of importance outlined in Table 16.7, the following ecological features are considered of Regional Importance or above, and thus are determined to be IEFs, and therefore have been scoped into the assessment:

- **Designated sites:** West of Scotland MPA, Geikie Slide and Hebridean Slope MPA, St Kilda SAC, Monach Islands SAC, Anton Dohrn Seamount SAC, Small Seal Islands SSSI and Monach Islands, Causamul, Haskeir and Oronsay Designated seal haul-out sites.
- **Benthic habitats and species:** Offshore deep-sea muds, offshore subtidal sands and gravels, burrowed mud (including seapens), coral gardens, cold-water coral reefs, deep-sea sponge aggregations, seamount communities, and commercial shellfish.
- **Fish:** blue ling, gulper shark, leafscale gulper shark, orange roughy, Portuguese dogfish, roundnose grenadier, basking shark, Atlantic bluefin tuna, and fish spawning and nursery grounds.
- **Cetaceans:** harbour porpoise, common dolphin, bottlenose dolphin, Atlantic white-sided dolphin, white-beaked dolphin, Risso's dolphin, killer whale, minke whale, long-finned pilot whale, humpback whale, sperm whale, and fin whale.
- **Pinnipeds:** harbour seal and grey seal.

Furthermore, an assessment of whether there is the potential for any likely significant effects on qualifying features of any SACs as a result of the Development has been considered and information to inform an appropriate assessment is provided in Annex B: Information to Inform HRA.

16.10 POTENTIAL IMPACTS

The following potential impacts, including any with potential positive or negative and direct, indirect or secondary effects have been established through consultation with key stakeholders (see Section 16.6) and professional judgment. The potential impacts of the Project on marine ecological receptors, without mitigation, which have been identified as relevant for the Project are:

Construction Phase

No impacts during the construction phase have been identified that could affect marine ecological receptors.

Operational Phase

- Acoustic disturbance to seal species from launch activities and LV flight paths passing overhead.

- Direct strike from jettisoned stages causing mortality.
- Direct ingestion/absorption of jettisoned components or toxic contaminants by marine ecological receptors.
- Deposition of jettisoned stages on the seabed resulting in smothering of benthic organisms (preventing normal feeding or respiration) and bottom-dwelling fish.

Decommissioning Phase

- Impacts during the decommissioning phase are likely to be similar to or less than those during the construction phase.

16.10.1 Impacts scoped out of the assessment

Impacts scoped out of the assessment are shown in Table 16.8.

Table 16.8 Impacts scoped out of the assessment

Impact	Justification
Construction	
Disturbance and displacement of seal species via construction activities (noise and visual disturbance)	The nearest seal grey seal haul-out is on the island of Causamul 8 km to the west of the proposed launch site and the nearest harbour seal haul-out is on the island of Oronsay, 9 km to the east of the proposed launch site. At these distances from the proposed launch site there is no potential for any disturbance effects (noise or visual) due to construction activities.
Operation	
Acoustic disturbance (including underwater noise) arising from the impact of the jettisoned stages hitting the sea surface	The jettisoned stages entering the sea as deposits will be relatively small in size. Any acoustic disturbance resulting from the stage hitting the sea surface would be localised in extent and of short duration with no continuous, repetitive or impulsive noise. No explosions are anticipated. Many of the LV stages will deploy a parachute recovery system to slow the pace of descent therefore reducing the force of impact and therefore the level of acoustic disturbance generated. Launch trajectories and flight paths will be specific to each LV and will be spread spatially over an extensive sea area and temporally over the operational phase of the Project, such that the likelihood of any one area being subject to repeated splashdown events would be extremely low. Marine animals likely to be present at the sea surface are highly mobile, transitory animals (e.g. cetaceans) and are generally found within the study area in relatively low densities. No flight paths of LVs will pass directly overhead of any land mass upon leaving the site at Scolpaig therefore jettisoned stages would not land in the sea within close proximity to any islands holding seal haul-outs. The level of acoustic disturbance arising from the impact of the jettisoned stages hitting the sea surface is not considered to result in any likely significant effects for any marine ecological receptors therefore this impact is scoped out of further assessment.

Cumulative and in-combination

No cumulative or in-combination effects have been identified for this Project. There are no other relevant proposed or consented developments within the zone of influence of the Project. The long-established MOD training activities that occur in the area from the existing MOD Hebrides Range are considered to form part of the baseline conditions in the area (see Section 16.8.5). The MOD implements environmental protocols for activities carried out in the area (Royal

Navy, 2020). Several MPAs and SPAs have recently been designated in the area for marine ecological receptors, and the grey seal population in the Western Isles seal management unit area has increased in recent years which suggests that the MOD's existing military activities do not appear to have adversely affected the populations of marine species occurring in the area.

16.11 MITIGATION AND MANAGEMENT MEASURES

Application of the 'mitigation hierarchy' has been undertaken throughout the Development process. Measures to avoid or reduce potential ecological effects have been incorporated into the Development and include 'design mitigation' and 'mitigation by practise' or operational mitigation.

Design mitigation is where aspects of the Development have been re-designed to avoid or reduce ecological effects. This type of mitigation is particularly beneficial for ecological resources as there is greater certainty that it will be delivered. Mitigation by practise is when good practice measures and contingency mitigation is actively implemented during the Development process to minimise impacts.

Design mitigation is taken into consideration when undertaking the assessment of significant effects, and if following this, significant effects are predicted, further specific mitigation is required to reduce residual effects. A summary of mitigation measures is provided in Table 16.9 below.

Table 16.9 Summary of Mitigation Measures

Reference	Title	Description
R02	Regulatory Mitigation (Launch Vehicles and Launch Events)	Each launch will be licensed and regulated under: • The Space Industry Act 2018 and the Space Industry Regulations 2021; or • Permission under the Air Navigation Order 2016 (Air Navigation (Amendment) Order 2021); and • Marine (Scotland) Act 2010 for launches that involve deposits in the marine environment. The launch operator is required to submit a detailed Safety Case which includes both a ground safety analysis and a flight safety analysis to the regulator (UK Civil Aviation Authority, CAA). The ground safety analysis covers the transport, handling and storing of any hazardous material in relation to the launch vehicle and testing payloads amongst a range of other activities. A flight safety analysis covers must cover potential blast and fragmentation impacts, releases of toxic chemicals, and any major accidents or hazards resulting from collision or separation of LV components.
GM01	Design Mitigation	• Project revised to provide a venue for sub-orbital launch vehicles, substantially smaller than orbital launch vehicles proposed in the Scoping Report; • Space Launch Hazard Area boundaries are defined to avoid landmasses, St Kilda seabird colonies, marine transboundary interactions and marine assets.
ME01	Safety / Recovery Vessel Protocols	The safety/recovery vessel will adhere to the 'Scottish Marine Wildlife Watching Code (SMWWC), within practical feasibility. Any components from 1-stage or 2-stage LVs which are intended to be recovered will incorporate a parachute recovery system for safe landing and be designed to float to facilitate their recovery. Parachute systems will be recovered as part of the jettisoned stage recovery process

16.12 IMPACT ASSESSMENT

Operational Phase

16.12.1 Acoustic disturbance to seal species from launch activities and flight paths passing overhead

Impact overview (without mitigation)

Rocket launches will generate noise due to the combustion of propellants and the rocket plume interacting with the atmosphere. The levels of noise generated by launch activities has been predicted for two types of rockets, a single-stage rocket and a two-stage rocket (see Appendix 19-1: Noise Technical Report). For two-stage rockets, in addition to launch noise, for some specifications of LV, it is possible that the second stage would reach supersonic speeds during descent therefore generating an audible sonic boom.

The Monach Islands SAC which holds the UK's largest grey seal breeding colony is located within the study area, approximately 14 km to the southwest of the launch site. Two islands, Causamul and Haskeir, designated as part of the Small Seal Islands SSSI and as designated seal haul-out sites for breeding grey seals, are located within the study area approximately 8 km and 13 km, respectively to the west of the launch site. There are no harbour seal designated seal haul-outs located within the study area, the nearest is Oronsay located off the north coast of North Uist, 9 km to the east of the launch site. No flight paths of launch vehicles are intended to cross any land mass upon leaving the launch pad at Scolpaig, therefore flight paths would not pass directly over any of these islands. There is the potential for noise from sonic booms generated by returning stages to be heard by seals at haul-outs within audible range of the sonic boom.

Grey seals at haul-out sites are most sensitive to disturbance during the pupping and moulting periods. The grey seal pupping period is from September to December and the annual moult occurs between December and April. During the pupping and moulting periods, grey seals are most vulnerable to disturbance which may cause pups or moulting animals to flee into the water and could result in increased energy costs, reduced nursing times or could lead to the separation of pups from mothers, which may reduce survivability of young pups.

Section 117 of the Marine (Scotland) Act 2010 (the Act) makes it an offence to intentionally or recklessly cause harassment to seals at a designated seal haul-out. Marine Scotland provides guidance on what might constitute "harassment" in relation to seals on haul-out sites and states that "harassment would involve an activity that pesters, torments, troubles or attacks a seal on a designated haul-out site" (Marine Scotland, 2014). In particular, it would include any action that causes a significant proportion of seals on a haul-out site to leave that site either more than once or repeatedly or, in the worst cases, to abandon it permanently.

Mitigation

Due to the nature of the noise source, there is no physical mitigation measures available to reduce the level of noise.

Assessment of residual effects

Magnitude of impact

There would be a maximum of ten launches per year throughout the Project lifetime. Noise from a launch event would be of very short duration (powered phase of Rocket A will last for approximately 120 seconds, and powered phase of Rocket B will last for a total of 43 seconds) however, the noise may not be audible for the full length of these powered phases due to the altitude and distance covered (see Appendix 19-1: Noise Technical Report). Flight paths of rockets would not pass directly overhead or within the nearby vicinity of any of the islands within the SLHA or wider study area.

The predicted noise level from rocket launches audible at Causamul and Haskeir grey seal haul-outs would be <60 dB which is below the threshold of sleep disturbance for humans (see Appendix 19-1: Noise Technical Report). The predicted noise level at the Monach Islands SAC/designated seal haul-out and at Oronsay designated seal haul-out would also be <60 dB. These noise levels would have no effect on human receptors and are not anticipated to cause any disturbance to seals or result in large numbers of animals being flushed into the water.

Causamul, Haskeir, Oronsay and the Monach Islands are all relatively remote, uninhabited islands therefore the level of acoustic disturbance from human activity on these islands is likely to be very low. However, the MOD's training activities at the MOD Hebrides Range is likely to generate noise levels comparable in character to the Project, as a regular occurrence, therefore it is possible that seals in the area may already be habituated to occasional loud noises and as a result, seals hauled out in the area may be more tolerant of acoustic disturbance of this nature.

Noise from sonic booms, generated by returning components would only occur for particular specifications of LVs so this is likely to be a relatively infrequent occurrence. Any sonic boom generated by a returning LV stage would be audible over a relatively large area however, based on the rocket dimensions and trajectories of the worst-case scenarios, the predicted sonic boom footprints indicate that sonic boom noise would not be expected to overlap with any of the grey seal haul-out locations within the study area or at the nearby Oronsay harbour seal designated seal haul-out. The perceived noise level of any sonic boom noise audible at these seal haul-outs would be at levels far lower than the 75 PLdB limit, which is considered as the threshold of acceptability (see Chapter 19: Noise and Vibration).

The very short duration and relatively infrequent occurrence of the launch activities and any sonic booms generated by returning components is unlikely to result in levels of disturbance that would lead to any long-term effects in the use of any of the haul-out sites or result in any population-level effects on the grey seals using the haul-out sites. Any disturbance effects due to launch activities and flight paths passing overhead would be temporary, of very short duration and transient, with no lasting effects anticipated. The levels of noise experienced by seals at designated seal haul-out sites from launch activities and sonic booms would not constitute intentional or reckless harassment, therefore there would be no offence under Section 117 of the Marine (Scotland) Act 2010 as a result of these activities.

The magnitude of impact of acoustic disturbance from launch activities and flight paths passing overhead is considered **very low** for grey seal and harbour seal.

Significance of residual effects

Grey seal is considered to be a feature of **international** importance and harbour seal is a feature of **regional** importance. The magnitude of impact of acoustic disturbance from launch activities and flight paths passing overhead is considered **very low** for grey seal and harbour seal. It is anticipated that there will be **negligible** adverse residual effects on grey seals and harbour seals which are **not significant**.

16.12.2 Direct strike from jettisoned stages causing mortality

Impact overview (without mitigation)

Jettisoned stages falling and entering the sea may cause mortality through direct strike of a cetacean, seal, basking shark or other fish at or near the sea surface. Jettisoned stages would fall into the Atlantic within pre-designated splashdown zones within the SLHA, ranging up to 250 km west or northwest of the launch site. The number of jettisoned stages and the exact location within the splashdown zone in which the jettisoned stages would fall will vary with each launch vehicle. Typically, there would be two deposits per launch vehicle. A representative project envelope for the deposited components of a 1-stage LV would comprise the booster and payload (measuring approximately 9.7 m x 0.7 m, weighting 787 kg) which would have an estimated speed at the point of impact of 23 mph. The payload fairing

cone would be jettisoned separately, a smaller object with dimensions of approximately 1.1 m x 0.5 m – 0.1 m with an estimated speed at the point of impact of 120 mph. For the 2-stage LV, a representative project envelope for the deposits would comprise a booster measuring approximately 2.65 m x 0.20 m and weighing approximately 30 kg with an estimated speed at the point of impact of 475 mph. The sustainer and payload is a larger deposit with dimensions 3.62 m x 0.15 m, also weighing approximately 30 kg with an estimated speed at the point of impact of 40 mph.

Given the speeds of the falling objects, it is unlikely that any animal in the area would have time to take any avoidance action to move away from the falling objects. Although a parachute will be deployed to allow recovery of those deposits containing the payloads, which significantly reduces the speed of descent of these falling objects, the speed at the point of impact of all of the deposited components is still great enough that that any animal directly struck is likely to be killed or mortally wounded. A localised area around the point of impact would also be affected by the displacement of seawater due to the force of the impact.

Mitigation

No other specific mitigation measures have been identified however it should be noted that for each launch event, the Launch operator (LO) will be required to apply for a Marine Licence to Marine Scotland's Licensing and Operations Team (MS-LOT) which will detail the LV-specific components, deposits and any design or management measures required to minimise environmental impact (R02). The safety/recovery vessel will follow good practice by adhering to the 'Scottish Marine Wildlife Watching Code (SMWWC) (NatureScot, 2017) (within practical feasibility) if any cetaceans or basking sharks are encountered during the area clearance procedures and recovery operations (ME01).

Assessment of residual effects

Magnitude of impact

The frequency of occurrence of launch events is relatively low (10 launches per year, with typically two jettisoned stages per launch). The number and location of the actual splashdown areas will vary for each individual launch and will be dependent on the type of LV and the number of stages to be deposited in the sea. The actual splashdown area(s) would vary according to each launch vehicle so there is a low likelihood of the same area being repeatedly affected by splashdown events. The flight paths of the LVs would not pass directly overhead or within the nearby vicinity of any of the islands within the SLHA or wider study area.

Cetaceans

There are no designated sites with cetaceans as qualifying features located within the splashdown zones and there are no particularly sensitive areas (such as areas regularly used for breeding) for any cetacean species known to occur within the study area. Cetaceans are mobile, transitory animals with higher densities occurring in nearshore or far offshore areas depending on the species and time of year. The unpredictable nature of cetacean distribution and abundance is such that it is not possible to accurately predict exactly where within the SLHA cetaceans are likely to be present. Some species such as harbour porpoise and white-beaked dolphin occur only in nearshore waters with numbers highest during the summer months. Other species such as common dolphin, bottlenose dolphin and Risso's dolphin are found at higher densities at the continental shelf edge or in the deeper offshore waters beyond the shelf edge and in some cases the distribution varies temporally throughout the year whereas for others, abundance and distribution remains relatively constant throughout the year. Species such as white-sided dolphin and long-finned pilot whale are rarely found in nearshore waters, favouring the deeper waters far offshore.

Cetacean species that spend more time foraging at or near the sea surface would be at higher risk of direct strike from jettisoned objects compared to those that forage at greater depths during prolonged deep dives however, all the cetacean species found within the study area are present at relatively low densities (often much less than 1 per square kilometre,

even in the areas of highest densities). For many species, vast areas within the study area are predicted to hold very low densities of cetaceans. The splashdown zones would be spread out both temporally and spatially therefore any one area is not anticipated to be repeatedly affected by splashdown events to the extent that would lead to any noticeable change in the distribution or abundance of animals using an area. All cetacean species are considered highly sensitive to direct strike as there is no capacity for an individual to avoid, tolerate, recover from or adapt to mortality as a result of a direct strike from a jettisoned stage. However, the relatively low frequency of occurrence of the launch events which may occur at any time throughout the year, the very localised extent of the area affected by a splashdown event and the relatively low density of species present in the area combine to result in a very low likelihood of an individual cetacean being present at the exact point of impact, resulting in direct strike from a jettisoned stage causing mortality. The magnitude of impact of mortality from direct strike by a jettisoned deposit hitting the sea surface is considered to be **very low** for cetaceans.

All cetacean species are EPS and as such it is an offence to deliberately or recklessly capture, injure, kill or disturb an EPS. The assessment concludes that as there is a very low likelihood of a direct strike of a cetacean from a jettisoned stage resulting in mortality, therefore would be no offence under The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) or the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017 as any strike would neither be considered deliberate or reckless.

Seals

There are no designated sites with seals as qualifying features located within the SLHA however grey seals from the nearby Monach Islands SAC, located outwith the SLHA could be present in the area. The designated grey seal haul-outs on the islands of Haskeir and Causamul are located within the SLHA however they are at distances of 1.5 km and 2.1 km, respectively, from the edge of the splashdown zones. All three of these sites are important for breeding grey seals. The population of grey seals in the Western Isles seal management unit area has been increasing in recent years and the harbour seal population within the Western Isles seal management unit area is stable, with a slight increase in numbers recorded in recent years. There are no designated haul-out sites for harbour seals within the SLHA.

Seals are considered highly sensitive to direct strike as there is no capacity for an individual to avoid, tolerate, recover from or adapt to mortality as a result of a direct strike from a jettisoned stage. There is a relatively low frequency of occurrence of the launch events which may occur at any time throughout the year. Harbour seal at-sea density is very low within the SLHA and the distribution of harbour seals is limited to the nearshore areas only, within approximately 30-50 km of the coastline. Only deposits falling within this relatively small area within the entire SLHA could potentially affect harbour seals. Grey seal at-sea density is confined to the area within approximately 100 km of the coastline and is highest within the area immediately surrounding the breeding sites. Grey seal at-sea density in this area is likely to be highest around the breeding season, which is from September to December, although the density of grey seals in this area would be relatively high all year round. Any deposits falling beyond 100 km from the coastline (approximately 120 km from the launch site) would be extremely unlikely to directly strike a grey seal.

Seals spend a considerable amount of time at or near the sea surface so would be at a higher risk of direct strike from jettisoned stages, compared to those species that spend longer at greater depths. The area affected by a splashdown event would be very localised in extent and the likelihood of an individual seal being present at the exact point of impact is low for grey seal and very low for harbour seal given their at-sea densities. Only those jettisoned stages that fall within the areas within which seals occur could potentially result in a direct strike however vast areas within the splashdown zones are predicted to hold very low densities of seals. The level of mortality that would result from direct strike would be at such low levels that it is not anticipated to result in any population-level effects for either species. The magnitude of impact of mortality from direct strike by a jettisoned deposit hitting the sea surface is considered to be **very low** for seals.

Fish

The splashdown zones overlap with the West of Scotland MPA, which has a number of fish species as qualifying interests all considered of International Importance. However, all West of Scotland MPA-protected species are deep-sea fish whose depth distribution within the study area generally range from the continental slope at an approximate depth of 200 m to the deep floor of the Rockall Trough. Though seamounts are large topographical features of the MPA that attract large aggregations of fish for feeding and spawning, the highest point of Rosemary Bank and Anton Dohrn occur in water depths of 300 - 400 m and 530 - 1,100 m depth, respectively, from the surface. It is considered unlikely for deep-sea or demersal fish species to be at risk of direct strike at the sea surface by jettisoned stages.
Pelagic fish species such as Atlantic mackerel and herring form vast shoals in waters near the surface. Mackerel is a fast-swimming fish that can change depth rapidly within a shoal, while herring shoals tend to reside in deeper waters during the day and swim upwards at night to feed. Launches are expected to be carried out during daylight hours only, with the airspace window likely to be in the morning for all launches (see Chapter 4: Project Description). Atlantic mackerel are broadcast pelagic spawners which spawn near the surface and produce large numbers of buoyant eggs which are widely dispersed with ocean currents. Benthic spawners are considered unlikely to be at risk of direct strike at the sea surface by jettisoned stages.

Larger fish species that frequently occupy the sea surface, such as basking shark and Atlantic bluefin tuna, are at higher risk of direct strike by jettisoned stages compared to smaller species distributed near the surface. Basking sharks spend a lot of time at the sea surface whilst feeding, however the study area is not located in an area of particular importance for this species with key foraging and possible courtship activities occurring in the Sea of the Hebrides outwith the study area. There is limited information around the nature of the relatively recently re-established Atlantic bluefin tuna migration routes off the Western Isles, however anecdotal reports suggest that at this point of migration tuna feed further offshore and in deeper waters (G. Fulton, *pers comm*). Populations of Atlantic bluefin tuna spawn in the Gulf of Mexico and the Mediterranean Sea in May – July (OSPAR, 2014) and will temporarily be present off the Western Isles on their subsequent northern migration.

Considering the low frequency of occurrence of launch events throughout the Project's operational phase and the highly localised area affected by a splashdown event, it is anticipated the likelihood of larger individuals, sub-surface shoal or sensitive fish larvae being present at the exact point of impact is very low. The level of mortality that would result from direct strike is not anticipated to result in any population-level effects. Overall, the magnitude of this impact on fish species present within the study area is considered to be **very low**.

Basking sharks are protected under Schedule 5 of the Wildlife and Countryside Act 1981 which makes it is an offence to deliberately or recklessly take, injure, kill or disturb a basking shark. The assessment concludes that due to the very low likelihood of a basking shark being directly struck by a jettisoned stage, any strike would neither be considered deliberate or reckless.

Significance of residual effects

The cetacean species that are present with the study area are of **National** or **Regional Importance**. The magnitude of this impact is assessed as **very low**. It is anticipated that there will be **negligible** adverse residual effects which are **not significant**.

Harbour seals and grey seals within the study area are considered to be of **National** and **International Importance**, respectively. The magnitude of this impact is assessed as **very low**. It is anticipated that there will be **negligible** adverse residual effects which are **not significant**.

Fish species present within the study area are considered to be of **International**, **National**, and **Regional Importance**. The magnitude of this impact is assessed as **very low**. It is anticipated that there will be **negligible** adverse residual effects which are **not significant**.

Furthermore, the assessment determines that the project will not significantly hinder the aim to achieve favourable condition of qualifying features within overlapping or nearby designated sites.

16.12.3 Direct ingestion/absorption of jettisoned components or toxic contaminants by marine ecological receptors

Impact overview (without mitigation)

Jettisoned stages of the LV may contain residual fuels and other consumables that may be released to the marine environment. There is a risk of harmful effects to benthos, fish and marine mammals through direct ingestion of small parts from the jettisoned stage, or through exposure to fuels or other toxic contaminants released from sinking components.

Typically, there would be two deposits per launch vehicle and in most cases, these will be retrieved. Those components not intended for recovery from the sea will be designed to sink. At the point of jettison, each stage should have consumed all the fuel located within tanks however, the representative worst-case scenario for the deposited components of a 1-stage LV would include a combined booster and payload which would contain calculated likely residual quantities of up to 18 kg kerosene fuel and up to 12.1 kg hydrogen peroxide oxidiser. A smaller separate payload fairing cone would not contain any residual contaminants. The representative worst-case scenario for the deposits of a 2-stage LV would include a booster which would contain calculated likely residual quantities up to 5 kg residual hydroxyl terminated polybutadiene fuel (HTPB) fuel and up to 4 kg hydrogen peroxide oxidiser. The combined sustainer and payload would contain up to 4 kg residual HTPB fuel and up to 3 kg residual hydrogen peroxide oxidiser. In addition to these potential contaminants, each LV will have small metal and plastic components associated with the motor and fuelling system, systems control and telemetry systems. The typical structural materials for the LV stages likely to be deposited in the sea include aluminium, polymers, epoxy, vinyl ester, polyester resins and fibres, carbon and aramid fibres (see Chapter 4: Project Description for further detail on material composition).

Mitigation

No specific mitigation measures have been identified however it should be noted that for each launch event, the Launch operator (LO) will be required to apply for a Marine Licence to Marine Scotland's Licensing and Operations Team (MS-LOT) which will detail the LV-specific components, deposits and any design or management measures required to minimise environmental impacts (R02).

Assessment of residual effects

Magnitude of impact

Jettisoned stages would fall into the Atlantic within pre-designated splashdown zones within the SLHA, ranging up to 250 km west or northwest of the launch site. The number of jettisoned stages, and the exact location within the SLHA in which the jettisoned stages would fall will vary with each launch vehicle, therefore reducing the likelihood of any one area being repeatedly affected by LV stage deposits. There will be a low frequency of deposits with up to 10 launches per year, with typically two jettisoned stages per launch of which at least one per launch would be planned for retrieval from the sea.

The amount of residual fuel is likely to be very low as each LV is designed for maximum and efficient fuel use. Any components from 1-stage or 2-stage LVs that are intended to be recovered will incorporate a parachute recovery system for safe landing and be designed to float to facilitate their recovery.

The potential loss of small amounts of residual fuel and oxidiser is not anticipated to result in adverse toxicological effects to marine ecological receptors as hydrogen peroxide is water soluble and will decompose into water and oxygen. Though hydrogen peroxide is mobile in the marine environment, it is expected that any residual hydrogen peroxide oxidiser released from the deposited LV component will naturally degrade and cause no adverse effects. HTPB is a liquid rubber used as a binder in solid rocket propellant, binding the oxidising agent, fuel and other ingredients into a solid but elastic mass. It is expected that any residual hydrocarbons within a sunken deposit will degrade over time with continual dilution such that the risk of toxicological effects to local benthic communities, fish and marine mammals is considered to be very low. Any residual hydrocarbons from a floating jettisoned stage at the sea surface would be widely dispersed with the motion of the sea such that no toxicological impacts to species in the water column are anticipated. The potential loss of small amounts of residual fuel and oxidiser from jettisoned stages on the seabed will be spread out spatially and temporally and in small amounts per component, such that exposure to any contaminants will be highly localised and limited in duration.

It is not possible to predict the exact location where sunken components will deposit on the seabed, however due to the relatively small size of the components not intended for recovery (approximate payload fairing dimensions: 1.1 m x 0.5 m - 0.1 m, booster dimensions: 2.65 m x 0.2 m), it is anticipated any effects of the sunken components on the seabed will be highly localised to the site of deposition.

The magnitude of impact of direct ingestion/absorption of jettisoned components or toxic contaminants by marine ecological receptors is considered to be **very low** for benthic communities, fish and marine mammals.

Significance of residual effects

Benthic habitats and species within the study area are considered to be of **International, National** and **Regional Importance**. The magnitude of this impact is assessed as **very low**. It is anticipated that there will be **negligible** adverse residual effects which are **not significant**.

Fish species present within the study area are considered to be of **International, National** and **Regional Importance** within the study area. The magnitude of this impact is assessed as **very low**. It is anticipated that there will be **negligible** adverse residual effects which are **not significant**.

Marine mammals present within the study area are considered to be of **International, National** and **Regional Importance**. The magnitude of this impact is assessed as **very low**. It is anticipated that there will be **negligible** adverse residual effects which are **not significant**.

Furthermore, the assessment determines that the project will not significantly hinder the aim to achieve favourable condition of qualifying features within overlapping or nearby designated sites.

16.12.4 Deposition of jettisoned stages on the seabed resulting in smothering of benthic organisms (preventing normal feeding or respiration) and bottom-dwelling fish

Impact overview (without mitigation)

Deposited components on the seabed may result in harmful effects to benthic species and bottom-dwelling fish which may be at sensitive life stages. Fragile habitat-building species may be structurally damaged by a sunken component, and low or limited mobility species may be affected by smothering or impaired feeding.

Typically, there would be two deposits per launch vehicle and in most cases, these will be retrieved from the marine environment. Those components not intended for recovery from the sea will be designed to sink. LV components which are intended for recovery are designed to float and include the 1-stage booster and payload and the 2-stage sustainer and payload, therefore neither component will cause physical damage or smothering effects on the seabed. The components that are not intended for recovery include the 1-stage payload fairing and the 2-stage booster, the latter of which is the largest, weighing around 30 kg and is designed to sink.

Mitigation

No flight paths of launch vehicles are intended to cross any land mass upon leaving the launch pad at Scolpaig.

No other specific mitigation measures have been identified however it should be noted that for each launch event, the Launch operator (LO) will be required to apply for a Marine Licence to Marine Scotland's Licensing and Operations Team (MS-LOT) which will detail the LV-specific components, deposits and any design or management measures required to minimise environmental impact (R02).

Assessment of residual effects

Magnitude of impact

Jettisoned stages would fall into the Atlantic within the SLHA, within a radius of up to 250 km west or northwest of the launch site at Scolpaig. The number of jettisoned stages and the exact location within the splashdown zone in which the jettisoned stages would deposit will vary with each launch vehicle, therefore reducing the likelihood of an area being repeatedly affected by LV deposits. There will be a low frequency of deposits with up to 10 launches per year, with typically two jettisoned stages per launch of which at least one per launch would be planned for retrieval from the sea.

Benthic species and habitats

The 1-stage LV payload fairing cone and the 2-stage LV booster are not planned to be recovered from the marine environment following deposition. It is not possible to predict the exact location where sunken components will deposit on the seabed, however due to the relatively small size of the components not intended for recovery (approximate payload fairing dimensions: 1.1 m x 0.5 m/0.1 m, booster dimensions: 2.65 m x 0.2 m), it is anticipated any effects of the sunken components on the seabed will be highly localised to the site of deposition. No flight paths of launch vehicles are intended to cross any land masses upon leaving the launch pad at Scolpaig Bay, including St Kilda, Boreray, Monach Islands, Haskeir and Causamul therefore avoiding any sensitive shallow water PMFs clustered within close proximity around these isles.

Should a component become deposited in the widespread sedimentary habitat of the Rockall Trough then there may be a small amount of resuspension of sediments surrounding the component, however this effect will be temporary and not anticipated to adversely affect burrowed muds which are not sensitive to smothering and siltation rate changes (Hill *et al.*, 2020). There may be a risk of lethal structural damage should a component settle on a fragile VME such as sea-pens, corals, sponges or seamount communities. However, due to the relatively small sizes of the deposited components,

this is anticipated to affect a limited surface area of habitat. Components are likely to slowly sink to the seabed such that there is a low likelihood of physical damage, any of which is likely to be small in scale. The spatial variation of launch trajectories within the SLHA will further reduce the risk of accumulation of deposits within a single area of habitat.

Mobile species such as crustaceans are unlikely to become smothered or experience impaired feeding unless they become directly trapped by the deposit. There is the potential for species colonisation on the hard surface of the deposit and growth of a small community which may increase food availability for various species, however this effect would be limited and small in scale throughout the study area, and unlikely to result in any population-level effects.

The magnitude of this impact on benthic species and habitats is considered to be **very low**.

Fish

Bottom-dwelling fish and their wider spawning and nursery grounds are unlikely to be affected due to their widespread distribution across the continental shelf and slope, and the spatial distribution and limited scale of the non-recovered components. Furthermore, settling of individual deposits is not anticipated to result in any population-level effects on bottom-dwelling fish, therefore key areas for high fish productivity, such as the Seas off St Kilda SPA feeding grounds are unlikely to be indirectly affected.

The magnitude of this impact on fish is considered to be **very low**.

Significance of residual effects

Benthic habitats and species are considered to be of **International, National** and **Regional Importance** within the study area. The magnitude of this impact is assessed as **very low**. It is anticipated that there will be **negligible** adverse residual effects which are **not significant**.

Bottom-dwelling fish species present within the study area are considered to be of **International** and **National Importance**. The magnitude of this impact is assessed as **very low**. It is anticipated that there will be **negligible** adverse residual effects which are **not significant**.

Furthermore, the assessment determines that the project will not significantly hinder the aim to achieve favourable condition of qualifying features within overlapping or nearby designated sites.

16.13 CUMULATIVE AND IN-COMBINATION EFFECTS

No other proposed or recently consented projects subject to EIA have been identified within the study area. Cumulative effects have been scoped out of the assessment for this topic.

16.14 ASSESSMENT SUMMARY AND CONCLUSIONS

The study area encompasses the vast offshore area to the west and northwest of the launch site, within which marine ecological features may be affected by the Project. Key areas for marine ecological features are the LV trajectories and the corresponding pre-designated splashdown zones where jettisoned stages of the LVs would be deposited (termed the "Space Launch Hazard Area").

A detailed desk-based assessment was undertaken to inform the baseline characterisation of the study area, which covered a vast marine landscape from the continental shelf edge to the deep sea and features two isolated seamounts. Several Important Ecological Features (IEFs) were identified including designated sites (MPAs, SACs, SSSIs and Designated Seal Haul-out Sites), benthic habitats and species, fish (including basking shark and Atlantic bluefin tuna), cetaceans and seals.

The marine ecology assessment predicts no impacts for construction or decommissioning phases of the Project. Disturbance and displacement of seals via construction activities was scoped out of the impact assessment due to the distance of the nearest seal haul-out sites, which are several kilometres away from the proposed launch site. Potential impacts were identified for the operational phase of the Project and included acoustic disturbance to seals from launch activities and LV flight paths passing overhead, as well as impacts associated with jettisoned stages including direct strike, ingestion or absorption of component parts or released toxic contaminants, and deposition on the seabed resulting in smothering of benthic organisms and bottom-dwelling fish.

Any noise and disturbance effects due to launch events and flight paths passing overhead would be transient and, with up to 10 launches per year, spread temporally such that any adverse residual effects on seals and associated designated site IEFs will be **negligible** and **not significant**. Jettisoned stages entering the sea as deposits will be relatively small in size, and many of the LV stages will deploy a parachute system which will reduce the force of impact with the sea surface and facilitate their intended recovery. The area affected by a splashdown event would be very localised in extent and the likelihood of direct strike to mobile, transitory animals such as cetaceans, basking shark and Atlantic blue fin tuna, or seals given their at-sea densities, is considered very low. The safety/recovery vessel will follow good practice by adhering to the SMWWC if any cetaceans or basking sharks are encountered during operations. The assessment therefore concludes that adverse residual effects on fish and marine mammals and associated designated site IEFs will be **negligible** and **not significant.**

Potential impacts from non-recovered LV components that may deposit on the seabed will be highly localised and limited in scale due to the small sizes of the components. Each LV is designed for maximum and efficient fuel use; therefore, the potential loss of small amounts of residual fuel and oxidiser is not anticipated to result in toxicological effects to nearby marine ecological receptors. Launches will be spread spatially and temporally throughout the year which will greatly reduce the likelihood of an area being repeatedly affected by LV deposits. Therefore, the assessment concludes that any adverse residual effects from non-recovered jettisoned deposits on benthic habitats and species, fish, marine mammals and associated designated site IEFs will be **negligible** and **not significant**.

No cumulative or in-combination effects have been identified for this Project. There are no proposed or recently consented project subject to EIA that have been identified within the study. The long-established MOD Hebrides range is considered to form part of the baseline, where Royal Navy environmental protocols are implemented for certain activities conducted within the area.

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17 HYDROLOGY, HYDROGEOLOGY AND GEOLOGY

CONTENTS

17 HYDROLOGY, HYDROGEOLOGY AND GEOLOGY

17.1 INTRODUCTION

This chapter of the EIA Report describes the potential impacts of the Project on the water environment. The chapter was collated by Western Isles Marine and Environment Ltd. The chapter is accompanied by the following appendices:

- Appendix 17.1: Outline Hazardous Materials Management Plan;
- Appendix 17.2: Water Management (Flood Risk Assessment and Culvert Installation Method Statement); and
- Appendix 17.3: Test Excavations and Soil Profiles.

Reference should also be made to Chapter 15: Terrestrial Ecology for impacts on flora, fauna and groundwater dependent terrestrial ecosystems (GWDTE). Catastrophic events have the potential to impact the water environment, these are outwith the scope of this chapter, but are considered in a separate Risk Register provided in Appendix 20.1.

17.2 STUDY AREA

The study area is located in a wider coastal catchment; however, the development is broadly located within three sub-catchments comprising upper and lower loch Scolpaig and the coastal area. An arbitrary study area comprising the site ownership boundary and the sub catchments has been defined (Figure 17.1).

17.3 LEGISLATIVE FRAMEWORK AND POLICY CONTEXT

The following legislation, policies and advice are considered relevant to the assessment of hydrology, hydrogeology and geology. Legislation, guidance and good practice relating to the management of hazardous substances are referenced separately in Appendix 17.1: Outline Hazardous Materials Management Plan.

Legislation

- Water Environment and Water Services Act (Scotland) 2003; transposes the Water Framework Directive (WFD) (2000/60/EC) and protects the water environment by preventing deterioration and enhancing aquatic ecosystems. Key water bodies are monitored under river basin management plans;
- The Water Environment (River Basin Management Planning: Further Provision) (Scotland) Regulations 2013, elaborates on provisions of Water Environment and Water Services Act 2003 to further transpose provisions of the WFD;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) requires activities that may affect the water environment to be authorised by SEPA;
- The Water Environment (Drinking Water Protected Areas) (Scotland) 2013 identified water bodies used for the abstraction of drinking water and subsequently Drinking Water Protection Areas;
- Flood Risk Management (Scotland) Act 2009 provides for more comprehensive management of flood risk to reduce flood risk and develop flood risk responsibilities;
- Private Water Supplies (Scotland) Regulations 2006 are Scotland's main regulations governing the quality of water supplied by private water supplies;

Planning Policy and Advice

- Scottish Planning Policy (June 2014) provides further guidance on requirements to protect the environment including special provision for the water environment (Paragraph 194);

- Flood Risk Management (Scotland) Act 2009 includes measures for conditions and cooperation between organisations involved in flood management, it also requires SEPA to provide an assessment of flood risk.
- Outer Hebrides Local Development Plan. Adopted Plan (November 2018). Comhairle nan Eilean Siar, Policy EI 1 Flooding, Policy EI2 Water and Waste Water, Policy EI 3 Water Environment;
- Outer Hebrides Local Development Plan, Policy EI: Soils; the plan sets out to ensure that developments minimise adverse impacts on soils caused by ground disturbance, compaction or excavation; and
- Pollution Prevention Guidelines PPGs and Guidance for Pollution Prevention (GPPs); provides advice on good environmental practice to minimise pollution with reference to environmental legal obligations.

A range of specific guidance and good practice documents relating to specific impacts e.g., water crossings, flooding are referenced individually in the relevant sections.

17.4 SUPPORTING SURVEYS AND STUDIES

The following supporting surveys and studies have been used to inform the assessment:

- **Groundwater Dependent Terrestrial Ecosystems (GWDTE)** - a National Vegetation Classification (NVC) Survey was carried out based on the methodology by Rodwell (1991). The NVC survey results are reported and interpreted in Chapter 15: Terrestrial Ecology. The NVC survey was carried out beyond the site boundary up to 100 m, where possible. Potential GWDTE were highlighted based on the list of NVC communities that may depend on groundwater, listed in Appendix 4 of SEPA Guidance (SEPA, 2017).
- **Topographic Assessment** - a partial topographic assessment was undertaken by CnES during two site visits on 23 January 2020 and 06 February 2020. The surveys were completed using Leica CS20 3.75G Basic Field Controller and GS16 3.75G&UHF Performance rover setup, using the OSGB36(15) Coordinate system and OSGM15GB Geoid model. Surveys are also completed with the RTK fixed network on the Hexagon Smartnet licence which allows real time conversion of raw GPS survey data to ordnance survey coordinate system. The results of the topographic surveys are illustrated in Figure 17.2.
- **Trial Pit Surveys** - six trial/test pits were excavated by Robert Fraser Architecture LLP on 26 September 2019 to confirm the nature of soils underlain by the proposed development. The locations and the results of the test pits are provided in Figure 17.2 and Appendix 17.3: Test Excavation Photographs and Profiles;
- **Safety Compliance Appraisal** - a third-party Safety Compliance Appraisal was undertaken by Mabbett & Associates Ltd to provide independent process safety support and appraise the proposed design arrangements against relevant legislation and industry best practice. The actions and recommendations of the report have been integrated into the project design and management arrangements for the Spaceport, including Appendix 17.1: Outline Hazardous Materials Management Plan.
- **Flood Risk Assessment (FRA)** - a FRA was undertaken by CnES to assess the impact on the flood response of Loch Scolpaig to the proposed widening of the causeway and associated box culvert installation. As there is no distinct main watercourse feeding the loch system, a simplistic approach of quantifying inflow was taken from the HR Wallingford web tool 'estimation of greenfield run-off rates' (UKSUDS, 2021). The methodology and results of the FRA are reported in Appendix 17.2: Water Management;
- **Loch Scolpaig Water Quality Report** – a water sample from Loch Scolpaig was taken on 1 August 2019 by CnES and analysed by Scottish Water. The sample was tested for a range of physical attributes, chemical parameters and faecal coliforms (Section 17.5.4).

17.5 DATA GAPS AND UNCERTAINTIES

17.5.1 Operational Activities

The proposed Project will provide generic infrastructure for the use of individual operators to launch a range of launch vehicles (LV) within a defined range of specifications (Chapter 4: Project Description). Within the defined operational activities there is some variability across the nature and type of activities. The EIA Report has set definitive boundaries across the nature and type of activities, however, key areas of variance exist in relation to fuelling activities.

LV fuelling methods (and propellants) are proprietary to individual launch operators (LO) and the precise details of each methodology will vary depending on the nature of the LV. There are three basic options for fuelling an LV that will impact the pollution control and management strategies for a launch. Firstly, a LV may arrive on site fully preloaded with fuel and will not require any further site fuelling requirements. Secondly, an LV may arrive partially fuelled with the oxidiser component added on site. Finally, an LV may require the loading of both fuel and oxidiser on site.

The infrastructure and management protocols for hazardous materials have been designed based on a review of typical propellant mixtures to generate a maximum 'worst-case scenario' materials inventory. Each launch is also regulated under the Space Industry Act 2018, Space Industry Regulations 2021 and the Marine (Scotland) Act 2010 (for launches that involve deposits in the marine environment) and will require a dedicated licence issued by the Civil Aviation Authority (CAA), which by law requires a detailed Safety Case, including a 'ground safety analysis'[1]. The Spaceport Operator (SO) will also review materials management protocols as part of the pre-launch appraisal process (Chapter 4: Project Description) and will form part of the site contractual agreement to ensure alignment with existing operational protocols and drainage arrangements, also required under a dedicated Spaceport licence.

There is potential for a specific model of LV to use up to 1.4 tonnes of High-Test Peroxide (HTP, highly concentrated hydrogen peroxide) as the oxidiser component of the propellant mix. A dedicated management system, including processes in place for management of a catastrophic events involving the rapid loss of 1.4 tonnes of HTP has been developed. Further proposals for pollution management will be presented to the Western Isles Emergency Planning & Coordinating Group (WIEPCG) and further consultation undertaken with SEPA for any launches of this nature.

17.5.2 GWDTE

The complete vegetation survey area, including site buffer, is approximately 278 ha, a relatively large site. Some of the habitat features recorded during the survey are small and have been target-noted. There remains a possibility that other small flush features or individual rare species could have been overlooked and not recorded. As the NVC Survey was carried out towards the end of the main flower season (April to September), considered by NatureScot as the optimal period for NVC Survey[2], the presence of some early flowering species associated with NVC communities recorded (MC10, MC9, MC8 and H7) such as *Scilla verna* could not be confirmed. However, as none of these NVC communities will be impacted by the development, this is not considered to be a limitation to the baseline data collected or the robustness of the assessment.

[1] The ground safety analysis content is prescribed in the Space Industry Act Regulations 2021, however in summary it will include an assessment for the transport, handling and storing of any hazardous material in relation to the launch vehicle, with a focus on the potential for a catastrophic event.

[2] https://www.nature.scot/natures-calendar

17.5.3 Flood Risk Assessment

The methodology adopted for the FRA was adapted to account for the absence of a main watercourse feeding the loch system. A simplistic approach of quantifying inflow was taken using HR Wallingford "estimation of greenfield runoff rates" (UK SUDS, 2021). Inflow rates were then applied using an assumed 2-hour rain event (falling on saturated ground) allowing a calculation of water volumes entering each 'sub' loch system from each catchment. The assumptions and simplifications are acknowledged to result in a slight overestimate of water level rise, which is assessed to be an appropriate worst-case scenario for the assessment.

17.5.4 Water Quality Monitoring

Water quality sampling was undertaken on the 1 August 2019, however a number of the parameters analysed (faecal coliforms) were analysed outside the stability time and results may not be fully representative of the sample. The results of water quality monitoring are summarised in Table 17-1.

Table 17-1 Summary of water quality monitoring results at Loch Scolpaig for faecal coliforms. Extracted from Laboratory Test Report No 928331 issued by Scottish Water.

Determinant	Result Value	Threshold Value[3]
Colony count at 22 C	>300 CFU[4]/ml	TLV <=100
Colony Count at 37 C	>156 CFU/Ml	TLV<=50
Presumptive *Clostridium perfringens*	1 CFU in 100 ml	PCV <=0
Clostridium perfringens (inc. spores)	1 CFU In 100 ml	PCV <=0
Coliform bacteria	201 MPN[5] / 100 ml	PCV <=0
Escherichia coli	201 MPN / 100 ml	PCV <=0

Results indicate exceedance of threshold values for all faecal coliform determinants at either the Threshold Limit Value (TLV) or Prescribed Concentration Value (PCV)[3]. Other physical and chemical parameters were analysed, with colour and iron both also exceeding the PCV. The exceedance relating to colour is likely to be related to naturally high occurrence of dissolved organic carbon often found in peat runoff. The exceedance relating to iron is also likely to be related to the natural occurrence of iron-rich rich minerals found in the darker bands of Lewisian gneiss, typical of the geology of the region (Section 17.8.7).

17.6 CONSULTATIONS

The key points raised by stakeholders during Scoping and pre-application consultation regarding the hydrological environment are presented in Table 17-2.

[3] PCV – Prescribed Concentration Value represents values taken from the Public Water Supplies (Scotland) Regulations 2014. TLV - Threshold Limit Value is an internal estimate of Scottish Water specification which is usually set at 50% of the PCV Value.

[4] CFU – Colony Forming Units

[5] MPN – Most Probable Number

Table 17-2 Key issues raised by stakeholders during consultation

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Scoping Opinion 04/07/2018	Supporting map information must detail all proposed upgraded, temporary and permanent site infrastructure. This includes all paths, fences, tracks, excavations, buildings, the launch pads, borrow pits, pipelines, cabling, site compounds and laydown areas, storage areas and any other built elements.	Infrastructure plans outlining: • Proposed temporary and permanent infrastructure; • Tracks, excavations, buildings, launch pad and fencing; • Cable ducts, compound and laydown area; and • Fuel storage areas. No borrow pits are proposed as part of the development.	Figure 17.3 and Figure 17.4
Scoping Opinion 04/07/2018	Existing built infrastructure should be re-used or upgraded wherever possible to minimise the extent of new works in previously undisturbed ground.	New access road infrastructure will be limited to 130 m and the following: • Recreational parking at the site entrance • Reinforced concrete launch pad of 13.1 m X 10.1 m with an integrated sump; • Surrounding pad loading area of 452 m^2; • Twelve tether pads (1 m X 1 mx 0.75 m) set into proposed new hardstanding area and surrounding land; • A turning area 855.6 m^2 located within existing farm building complex; • A water storage tank, containment tank, deluge system and associated infrastructure for pollution control and management. The road upgrades on the existing track will integrate three additional laybys, and ten new parking spaces.	Chapter 4: Project Description. Appendix 17.1: Outline Hazardous Materials Management Plan
Scoping Opinion 04/07/2018	Confirmation should be provided of the extent of works required to upgrade the track to Scolpaig from the main road. There is a tight crossing between the two sections of Loch Scolpaig and it is not clear how this pinch point will be managed.	Full details of the road upgrades are provided in Chapter 4: Project Description. Approximately 685 m of road will be upgraded / widened, three new laybys installed and entrance widened to facilitate access. Ten additional car park spaces will be provided at the entrance, including an accessible space. A detailed description of culvert upgrade is provided in Chapter 4: Project Description.	Chapter 4: Project Description

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Scoping Opinion 04/07/2018	Details should be provided on significant public road improvements, particularly those involving bridge proposals and related flood risk and construction issues.	No public road improvements anticipated. The developer has committed to the provision of a contribution to road repairs should an increase of pressure on the surfaces from repeated heavy loads impact road surface integrity.	Chapter 11: Traffic and Transport
Scoping Opinion 04/07/2018	It appears that flood risk has been avoided through appropriate site design. It is likely that we would have no concerns regarding the principle of development in terms of flood risk. A Flood Risk Assessment is proposed to be carried out for the development which we would be happy to review and could provide more detailed comments.	Flood Risk Assessment (FRA) undertaken by CnES.	Appendix 17.2: Water Management
Scoping Opinion 04/07/2018	There is a well indicated on the OS map which may indicate a high-water table. There may however be small areas of poorly draining land which could exacerbate any existing surface water issues and we recommend that this is investigated further with appropriate Drainage Impact Assessments.	Development infrastructure has been substantially scaled down following the proposals submitted at scoping (Chapter 3: Site Selection and Alternatives), and a Drainage Impact Assessment is no longer proportionate to the project. Specific details relating to drainage are provided in this Chapter and set out on Figure 17.5.	Section 17.8.2, 17.8.6, 17.11.1, 17.11.6
Scoping Opinion 04/07/2018	It is noted that the fuel storage area is proposed close to a small watercourse on a relatively steep gradient. There are potential pollution concerns with overland flow from Beinn Scolpaig during heavy rainfall which would drain into Loch Scolpaig.	Fuel storage (pre fuelling) now located within the launch pad, which incorporates integrated pollution control management systems and located 120 m from the nearest surface waters (Scolpaig Bay). Post fuelling storage at dedicated zone within turning area.	Figure 17.6 Pollution Control and Management Areas
Scoping Opinion 04/07/2018	Crossings should be sized to convey the 1 in 200 flow. Further information on the watercourse crossing over Loch Scolpaig should be provided. An assessment should also be made of the existing crossing to ensure any new crossing is appropriately sized, and flood risk is not increased elsewhere.	Culvert sized to convey 1:200 flow with sufficient freeboard to minimise risk of future overtopping (Appendix 17.2: Water Management). Crossing details and information on track upgrades are provided.	Appendix 17.2: Water Management and Section 17.11.6

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Scoping Opinion 04/07/2018	Any proposed engineering works within the water environment will require authorisation under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).	A CAR licence application for the upgrade of the existing culvert will be made to SEPA should planning consent be granted. A CAR registration or licence may be required for the soakaway system.	Section 17.11.6
Scoping Opinion 04/07/2018	The development will result in the need for a number of new watercourse crossings. SEPA outlined recommendations for crossings for a range of watercourse types.	Design substantially revised since proposals submitted at Scoping (Chapter 3. Site Selection and Alternatives). The proposed culvert replacement design has been submitted and reviewed by SEPA (2 June 2020).	Chapter 3: Site Selection and Alternatives Culvert installation design and methodology in Appendix 17.2 Water Management
Scoping Opinion 04/07/2018	Any upgrade works to new tracks should be carried out on the opposite side of the track to a watercourse. Similarly, cable-laying should be carried out on the opposite side of the track to any watercourses.	Proposed ducting to the layby is adjacent to Scolpaig Loch on the north side of causeway (upstream).	Figure 17.3c Permanent Infrastructure (Ducts)
Scoping Opinion 04/07/2018	Other infrastructure should be located more than 50 m from watercourses.	Illustration of surface waterbodies with 50 m buffer against permanent infrastructure proposals. Infrastructure within 50 m buffer is limited to existing road upgrades, a layby and temporary construction area for managing sedimentation arising from culvert replacement operations.	Figure 17.3a – 17.3c.
Scoping Opinion 04/07/2018	Scottish Planning Policy (SPP) states (Paragraph 205) that where peat and other carbon rich soils are present, applicants should assess the likely effects of development on carbon dioxide (CO_2) emissions. SEPA outlined a number of requirements to consider where impacts on peatlands are expected.	Design substantially revised since proposals submitted at Scoping. No part of the development is located on significant peat deposits. Surveys (trial pit report and vegetation survey) indicate the development is located on fixed dune systems. Trial pit excavations indicated that there is an area adjacent to proposed track upgrades which is located on discrete shallow peat deposits <0.5 m, this depth of peat is not formally classified as peat soils (SEPA, 2017). Impacts on peat are assessed to be negligible and are scoped out of the EIA Report.	Appendix 17.3: Test Excavations and Soil Profiles

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Scoping Opinion 04/07/2018	GWDTE are protected under the Water Framework Directive and therefore the layout and design of the development must avoid impact on such areas. Information to be provided confirming location of GWDTE within construction buffers, if buffers cannot be achieved, a risk assessment with mitigation required. Information should also be provided on how emissions deposition will impact on GWDTE habitats. This should include how impacts will be monitored and potential mitigation measures proposed.	An NVC survey was carried out in September 2020, identifying potential GWDTE within the threshold buffer of development excavations. Further assessment on GWDTE undertaken and findings reported in Chapter 15: Terrestrial Ecology.	Chapter 15: Terrestrial Ecology Section 17.8.10
Scoping Opinion 04/07/2018	If rock and building material is to be brought in from elsewhere then it needs to be shown to be of a similar chemical composition to that found on the site; this is to ensure it does not have an effect on local vegetation and habitats. Significant volumes of rock and building material are anticipated. Source of rockfill to be considered.	Aggregate will be sourced from one of the Uist and Benbecula quarries as identified in the CnES Outer Hebrides Local Development Plan, Development Strategy Maps.	Chapter 4: Project Description
Scoping Opinion 04/07/2018	A site map showing the location of pollution prevention measures such as spill kits, oil interceptors, any drainage associated with welfare facilities, recycling and bin storage and vehicle washing areas.	Figure 17.6 outlines the location of key pollution control areas: • Launch pad pollution control system; • Pre fuelling storage (launch pad) and post fuelling storage; • Upgraded byre providing storage for general storage, workshop area and launch specific spill kits. Welfare facilities will be portable / self-contained units which will be based at the hardstanding area or layby.	Appendix 17.1: Outline Hazardous Materials Management Plan Figure 17.6 Pollution Control and Management

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Scoping Opinion 04/07/2018	A site map showing where any overburden will be stored including details of the heights and dimensions of each store, how long the material will be stored for and how it will be kept fit for restoration purposes. Sections and plans should detail how restoration will be progressed including the phasing, profiles, depths and types of material to be used;	Project substantially reduced since issue of Scoping Report. No significant restoration anticipated, descriptions of proposals for sand and turf provided in project description. Excavation profiles (site sections) for relevant areas of the development provided in Drawing 0023.	Chapter 4: Project Description Chapter 3: Site Selection and Alternatives
Scoping Opinion 04/07/2018	A site log sheet detailing how often the pollution prevention and drainage measures will be checked and maintained which will be kept on site ready for inspection at any time.	Infrastructure substantially scaled down from original proposal. General site maintenance proposals for site drainage system set out Chapter 4: Project Description	Chapter 3: Site Selection and Alternatives Appendix 17.1 Outline Hazardous Materials Management Plan. Table 17-7 Mitigation Measures
Scoping Opinion 04/07/2018	SEPA identified potential flooding issues in the vicinity of the proposed fuel storage area, highlighting that this may impact the location of the fuel storage areas, but it will also impact how surface water during construction is managed.	FRA undertaken; all storage areas are above 4.73 AoD.	Appendix 17.2: Water Management
Scoping Opinion 04/07/2018	One of our key interests in relation to developments is pollution prevention measures during the periods of construction, operation, maintenance, demolition and restoration.	Dedicated infrastructure for pollution prevention measures set out in Figure 17.6 and described Outline Proposals for managing hazardous materials provided in Appendix 17.1. Site infrastructure will be left in place to facilitate activities of future grazing lease holders, habitat and site management activities.	Figure 17.6 Pollution Control and Management Appendix 17.1 Outline Hazardous Materials Management Plan.

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Scoping Opinion 04/07/2018	There is a risk of pollution/sedimentation affecting three designated sites during construction and operation. How these affects will be avoided and mitigated should be clearly addressed in the schedule of mitigation.	Impacts on designated sites are assessed in Chapter 15: Terrestrial Ecology and Chapter 14: Ornithology. Dedicated infrastructure for pollution prevention measures set out in Figure 17.6 and described Outline Proposals for managing hazardous materials provided in Appendix 17.1. Measures include planning for unplanned events / accidents. No significant effects are anticipated on three designated sites.	Chapter 15: Ecology Chapter 14: Ornithology Figure 17.6 Pollution Control and Management Appendix 17.1 Outline Hazardous Materials Management Plan.
Scoping Opinion 04/07/2018	A schedule of mitigation supported by site specific maps and plans must be submitted and include reference to best practice pollution prevention and construction techniques, regulatory requirements, the daily responsibilities of Ecological Clerk of Works, how site inspections will be recorded and acted upon and any proposals to fund a planning monitoring enforcement officer. Please refer to the Pollution prevention guidelines.	Development substantially revised following scoping opinion. Construction Environmental Manager to be in place during construction works. During the operational period an Environmental Manager will be dedicated to managing the site for community grazing opportunities, environment, conservation and amenity.	Chapter 4: Project Description Schedule of Mitigation provided in Annex C. Chapter 21: Environmental Management

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Scoping Opinion 04/07/2018	It is anticipated that the site will require Health & Safety Executive (HSE) licencing for the storage and processing of explosives, and because of the quantities the site will be a COMAH top tier site (under the Control of Major Accident Hazards Regulations). It is also noted that the port of entry (Lochmaddy) will also require licencing to facilitate passage of materials to the site.	Proposed site has been substantially reduced and will provide infrastructure for sub-orbital launches instead of orbital launches. An appraisal of the site against regulatory requirements, including Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) and Control of Major Accident Hazards (COMAH), has been completed. The site does not fall within COMAH. A full description of the nature and maximum quantities of materials is provided in Appendix 17.1, included an assessment under the aggregation rule. A separate protocol for managing hazardous substances has been developed from a third-party review of operations. Transport will be the responsibility of individual launch operators; and will form part of the safety case required for each launch licence. Transport proposals will be assessed by the Spaceport during the appraisal process to comply with relevant legislation and guidance.	Appendix 17.1: Outline Hazardous Materials Management Plan Mitigation and Management Table 17-7 (RO2)
Scoping Opinion 04/07/2018	Information should specifically be provided on the types and volumes of fuel to be stored on the site, the risks involved with their storage and use, the location of the storage units, detailed plans of the bunding arrangements (for stores, fuelling areas and launch pads) and contingency plans should there be an accident, including a fire. Information should be provided on how the satellites are fuelled and the environmental risks involved. Mitigation measures should be outlined.	Information on the types and maximum quantities of fuels / oxidisers have been derived based on an analysis of representative launch vehicles to determine adequate pollution prevention measures. A maximum materials inventory has been collated based on this review. Hazards and outline management measures associated with each of the potential materials stored on site are provided in Appendix 17.1. Contingency plans for 'catastrophic events' are also included based on the worst-case scenario of 1.4 tonnes HTP spillage and / or fire. A general site risk register is provided in Appendix 21.1.	Chapter 4: Project Description Appendix 17.1: Outline Hazardous Materials Management Plan Appendix 21.1; Risk Register

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Scoping Opinion 04/07/2018	The application should quantify the impact of exhaust emissions and heat. The scheme layout should be designed to ensure that there are no direct pollution impacts on local watercourses or sensitive habitats such as GWDTE.	Assessment of nature and quantities of emissions and heat provided in Chapter 18: Air Quality and Heat and accompanying technical reports. The scheme layout has been designed to: • Maximise use of existing infrastructure / routes; • Avoid impacts on peat; • Ensure an adequate buffer between surface watercourses and high-risk activities; • Incorporates substantial pollution management and containment infrastructure for both standard and nonstandard (high volumes of HTP) propellants, in addition to catastrophic events.	Chapter 18: Air Quality and Heat Appendix 17.1: Outline Hazardous Materials Management Plan
Scoping Opinion 04/07/2018	SEPA highlighted the location of fuel storage areas appears to be within 50 m of a watercourse draining to Loch Scolpaig, and pollution risks associated with surface water runoff. This site plan will need to be amended to demonstrate an appropriate buffer from the water environment and clearly demonstrate how the surrounding water environment will be safeguarded.	Design revised to ensure no fuel storage areas are located within 50 m of a water body.	Figure 17.3a and 17.6 illustrate the proposed 50 m buffer against proposed infrastructure.
Scoping Opinion 04/07/2018	We suggest that the developer considers initiating local water quality monitoring as soon as possible so that a suitable baseline is established from which any impacts can be measures. The components recorded should be informed by likely emissions from site activities.	Further consultation with SEPA confirmed that water quality monitoring is not required as part of the application following revision of the Project proposals (2 June 2020). However, water samples were taken on 1 August 2019 and analysed by Scottish Water. High levels of faecal coliforms considered to relate to high levels of diffuse pollution from grazing.	Surface water quality (Section 17.8.5)

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Scoping Opinion 04/07/2018	Excavations and other construction works can disrupt groundwater flow and impact on existing groundwater abstractions. The submission must include: a) A map demonstrating that all existing groundwater abstractions are outwith a 100m radius of all excavations shallower than 1m and outwith 250m of all excavations deeper than 1m and proposed groundwater abstractions.	No licensed groundwater extractions have been identified in the vicinity of the site.	Section 17.8.4
Scoping Opinion 04/07/2018	It is unclear whether significant volumes of water may be required for the launch process or clean up, or for firefighting. If a new water abstraction is proposed SEPA requires additional information to determine if the abstraction is feasible in this location.	The launch pad will be cleaned following every launch and the water contained within the integrated launch pad sump will be removed via a specialist contractor. During periods when the launch pad is not in use, runoff from the launch pad will be directed to the soakaway.	Appendix 17.1: Outline Hazardous Materials Management Plan Figure 17.5 Drainage Plan
Scoping Opinion 04/07/2018	If other development projects are present or proposed within the same water catchment then we advise that the applicant considers whether the cumulative impact upon the water environment needs to be assessed. The EIAR should also contain a justification for the approach taken.	No significant development projects are located within the same catchment.	N/A
Scoping Opinion 04/07/2018	Proposals for surface and foul water drainage should be outlined. If there are going to be large buildings on site then we would encourage rainwater harvesting.	Surface water drainage from the launch pad when not in use will be redirected to a soakaway. When the launch pad is in use, an integrated sump system will contain spills and residues from launch vehicles exhausts. No additional buildings are proposed, one existing byre will be upgraded for storage / communications purposes. No dedicated foul water facilities are required. Mobile welfare facilities will be provided to support launch preparations and events.	Appendix 17.1: Outline Hazardous Materials Management Plan Figure 17.5 Drainage Plan Chapter 4: Project Description

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Scoping Opinion 04/07/2018	SEPA highlighted the wider impact to the surrounding environment, and recommends a series of measures for restoration, enhancement or compensation.	An interim Habitat Management Plan has been prepared in conjunction with the RSPB to support habitat enhancement for wetland birds, corncrake and machair habitats with traditional crofting practices. Mitigation includes a commitment to develop a 'Habitat and Amenity Management Plan' integrating the range of recreational, agricultural, environmental and heritage elements. The plan will be consultative and will be prepared post consent in consultation with the relevant stakeholders.	Chapter 15: Terrestrial Ecology Appendix 7.2 Outline Habitat and Amenity Management Plan
Scoping Opinion 04/07/2018	Information on proposed decommissioning should be provided. Any proposal to discard materials that are likely to be classed as waste would be unacceptable under current waste management licensing, and under waste management licensing at time of decommissioning if a similar regulatory framework exists at that time.	Site infrastructure to remain *in situ* following to support ongoing access and management of the site for community grazing opportunities, habitat and site management.	Chapter 4: Project Description
Scoping Opinion 04/07/2018	The application process should take a waste regulatory position, and the need to demonstrate waste minimisation, into account from the outset in designing the layout and in developing the general principles for the site of decommissioning or repowering.	Waste management principals are addressed in Chapter 22: Environmental Management. Specific processes in relation to pollution management and hazardous materials are set out in Appendix 17.1.	Chapter 21: Environmental Management Appendix 17.1 Outline Hazardous Materials Management Plan

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Scoping Opinion 04/07/2018	For reference, please utilise SEPA Guidance on the life extension and decommissioning of onshore wind farms. Table 1 of the guidance provides a hierarchical framework of environmental impact based upon the principles of sustainable resource use, effective mitigation of environmental risk (including climate change) and optimisation of long-term ecological restoration. The submission must demonstrate how the hierarchy of environmental impact has been applied, within the context of latest knowledge and best practice, including justification for not selecting lower impact options when life extension is not proposed.	Site infrastructure substantially reduced. Rationale for the design and design changes are provided in Chapter 3: Site Selection, Rationale and Alternatives.	Chapter 3: Site Selection and Alternatives.
Scoping Opinion 04/07/2018	A Controlled Activities Regulations (CAR) construction site licence will be required for management of surface water run-off from a construction site.	Site does not fall within the threshold requirements for a Construction Site Licence.	N/A
Letter from SEPA 02/06/2020	Note the previous proposals for a stock proof fence, to confirm there is no requirement for physically marking any form of exclusion zone for this development.	A stock proof fence is proposed around the infrastructure to secure the farmstead for the protection / management of launch pad infrastructure from livestock. Safety clear zones (SCZ), DSEAR Areas and / or other exclusion areas may be temporarily implemented around hazardous storage areas and the launch pad during launch events and/or launch days. These may be marked by flags, tape or temporary fencing, and patrolled by dedicated security personnel.	Chapter 4: Project Description
Letter from SEPA 02/06/2020	The existing and proposed ground levels at the site should be confirmed when a formal consultation is submitted. SEPA recommend all development on the site is limited to land higher than 4.73mAOD. SEPA recommend this is used to inform the site layout and plans are supported with topographic information demonstrating this.	A partial topographic survey was undertaken across two site visits on 23 January 2020 and 06 February 2020. All site infrastructure lies above 4.73 AOD in line with recommendations (Figure 17.2).	Figure 17.2: Topographic Survey and Trial Pit Locations Section 17.4: Supporting Surveys and Studies

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Letter from SEPA 02/06/2020	Note that the design of the replacement watercourse crossing has been changed from two 600 mm culverts to a 1200 mm single span box culvert. We understand that the final design will include mammal passages, and if that is the case then we are content with the design, subject to the flood risk comments below.	Agreement to scope out mammal passage following consultation with SEPA due to technical limitations (27 May 2021), the low risk of traffic mortality arising from low traffic levels, and design implications of installation.	Section 17.11.6
Letter from SEPA 02/06/2020	The culvert design has been informed by an assessment of flows into the Loch. The FRA states that the upgraded culvert will remove the current restriction and overtopping, so the loch will act as one waterbody. It has been estimated that in a 200-year event, water level in the loch would rise by 0.35m. We recommend that this is also factored into the design levels for the site, and set 600mm above the flood level at the loch (or the coastal flood level plus climate change and freeboard, whichever is higher).	The Flood Risk Assessment sets out the calculations informing the culvert design; a 470 mm freeboard is above normal loch level and modelled 350 mm loch rise due to 1:200-year event, and culvert should not overtop.	Appendix 17.2: Water Management
Letter from SEPA 02/06/2020	The FRA states that the upgraded culvert will have 470mm freeboard, however it is unclear if this above the normal loch level or the 200-year flood level at the loch.		
Letter from SEPA 02/06/2020	We ask that when the design has been finalised to include mammal passages, the flood risk calculations are revisited to ensure there is still sufficient capacity to convey the flow without overtopping.	Agreement to scope out mammal passage following consultation with SEPA due to technical limitations (27/05/21), the low risk of traffic mortality arising from low traffic levels, and design implications of installation.	Section 17.11.6 Appendix 17.2: Water Management
Letter from SEPA 02/06/2020	Confirmed that the main site area is on machair rather than peat, and that there is shallow peat near the Loch Scolpaig crossing. No further assessment of peat and application should include trial pit report and statement on how impacts on peat minimised.	Impacts on peat are scoped out due to no evidence (desk based or from trial pit excavations) of peat depths greater than 0.5 m.	Section 17.8.7

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Letter from SEPA 02/06/2020	SEPA await the results of the habitats survey work and will provide further advice on GWDTE once this has been provided to us.	Phase 1 / NVC survey completed in September 2020. GWDTE identified within buffer area and assessed within Chapter 15. No impacts on GWDTE concluded.	Chapter 15: Terrestrial Ecology
Letter from SEPA 02/06/2020	Propellant fuels will include hydroxyl terminated polybutadiene and hydrogen peroxide (H2O2). Clarification is required as to the maximum numbers of drums of H2O2 that will be stored on site at any one time and how and where they will be stored. The spillage containment system should meet the standards set out in CIRIA c736. This guidance would apply not only to storage areas but also to areas where it is being handled (e.g., rocket fuelling area). It may be necessary to dilute the spilt material to enable it to be safely transferred to a road tanker but this should be done in a contained manner. Any spillage of concentrated hydrogen peroxide could have significant effect on any nearby watercourses and so would need to be contained and disposed of by a contractor.	A full maximum materials inventory expected on site summarised in the Project Description and set out in detail within the Appendix 17.1: Outline Hazardous Materials Management Plan, which includes maximum quantities / volumes associated with each substance. A maximum volume of 1.4 tonnes of HTP will be stored in a dedicated containerised fuelling system, which will be placed within the hardstanding area of the launch pad, designed to manage *in situ* catastrophic spillage events of hydrogen peroxide. Storage, handling and management of materials have been assessed against CIRIA c736 (CIRIA, 2014) and outlined in Appendix 17.1.	Appendix 17.1: Outline Hazardous Materials Management Plan
Letter from SEPA 02/06/2020	Information on the maximum volume/weight of hydroxyl terminated polybutadiene and storage proposals for it is also required. Dilution with water is not advised for HTPB as it could increase the risk of a fire spreading so information on fire-fighting proposals would also be welcome.	A maximum volume of 0.1 tonne of HTPB is anticipated on site as a solid fuel[6] and no spillages are anticipated.	Appendix 17.1: Outline Hazardous Materials Management Plan

[6] HTPB binds the oxidising agent, fuel and other ingredients into a solid but elastic mass which is used in many composite propellant systems.

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Letter from SEPA 02/06/2020	SEPA require clarification as to what other fuels, hazardous materials or gases will be stored on the site. E.g. helium, will diesel be stored on site for any back-up generator.	Maximum materials inventory summarised in Table 17-8 and described in detail in Appendix 17.1: Outline Hazardous Materials Management Plan.	Table 17-8 Appendix 17.1: Outline Hazardous Materials Management Plan
Letter from SEPA 02/06/2020	The Emissions document provides helpful information on the launch process and arising pollutants; it should form part of the application. We note the submitted water quality results; there is not a clear link between the parameters tested and likely emissions. However, in view of the further information now provided on emissions then we do not consider that water quality monitoring is now required as part of the new application.	Air quality modelling has been updated and based on two phases of analysis, and on a full suite or representative propellants.	Chapter 18: Air Quality and Heat, and accompanying technical reports
Letter from SEPA 02/06/2020	If it is the case that all water needs (including fire-fighting water and any launch suppression water) will be met by tankering on to site then the application needs to confirm this. If there is a requirement for any form of new water abstraction on site then please consult us further and we will provide advice on our information requirements.	System redesigned for *in situ* launch pad containment of up to 1 m^3 (2.4 m^3 including falls) of liquid spillages. A secondary containment system to contain catastrophic hydrogen peroxide spillages has been designed. Following degradation / dilution to <2% HTP the discharge will be disposed of via soakaway or specialist waste contractor and with the appropriate registrations / licence in place with SEPA. The regulatory process (including licensing requirements) for each launch will assess the management and control measures in place, including catastrophic events. Consultation with the WIEPCG - which includes local SEPA officers - will be carried out in advance of each launch event.	Appendix 17.1 Outline Hazardous Materials Management Plan Chapter 4: Project Description Table 17-7: Mitigation R02 Table 17-7: Mitigation HHG05
Letter from SEPA 02/06/2020	Clear information is still required on how surface water drainage will be dealt with for each part of the development. We refer you to our previous responses for advice on the best practice guidance which should be followed and general information required.	Surface water drainage proposals are provided for: • Launch pad / soakaway system; • Access and Roads.	Section 17.11.6 Chapter 4: Project Description

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Letter from SEPA 02/06/2020	We note that the pad is a concrete rectangle; it will need to be demonstrated that the concrete pad has been sized to contain any run-off during normal and abnormal launches.	The concrete pad has been redesigned to ensure all fuelling infrastructure is contained within the pollution management system (sump and drainage infrastructure) as well as meeting the physical size requirements for a range of LV specifications, launch rail / tower installation systems, ancillary fuelling infrastructure and blast deflection requirements. Drainage conveyance system will undergo third party verification from specialist engineers to refine design.	Chapter 3: Site Selection and Alternatives
Letter from SEPA 02/06/2020	The perimeter drainage channel is directed to a manhole with diverter valve; it states "value to direct all liquid from launch pad to underground storage tank during launch and fuel transfer operations." We welcome the proposal to contain surface water runoff during launch and fuelling. However, if the surface water is going to be diverted elsewhere for discharge at other times, then the pad will need to be cleaned before this diversion occurs and that water also needs to go to the underground storage tank.	The pollution control system has been further revised and updated to account for catastrophic events and spillages of HTP. Following each launch event, the pad will be cleaned using pumped stored water from the water storage tank. Water will be contained within the sump and will be removed by specialist waste contractors for disposal. Pollution control system redesigned for an above ground storage tank to facilitate inspections and maintenance.	Appendix 17.1 Outline Hazardous Materials Management Plan Figure 17.6 Pollution Control and Management
Letter from SEPA 02/06/2020	Clear information is needed on where surface water from the pad will be directed when it is not in use.	Surface water running off a clean unused launch pad will be directed to a soakaway.	Appendix 17.1 Outline Hazardous Materials Management Plan Figure 17.5 Drainage Plan

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Letter from SEPA 02/06/2020	Clarification is required on the fate of water once it is contained in the underground storage tank.	The pollution containment system has been further revised: Small liquid spillages < 1 m^3 volume will be contained within the integrated launch pad sump and cambered area falling to the sump. Should a catastrophic event associated with hydrogen peroxide occur, spillages would be directed to a large (63,500 litres) containment tank to provide adequate dilution and time for decomposition to water and oxygen to a minimum <2% concentration. Once degraded effluent will be disposed to soakaway (under registration or licence from SEPA), agreed in principle (email exchange 2/9/21 – 26/10/21).	Appendix 17.1 Outline Hazardous Materials Management Plan
Letter from SEPA 02/06/2020	Surface water from general areas of upgraded roads/tracks, carparks and any modular buildings needs to be treated with a simple form of Sustainable Drainage System (SUDS). For tracks for example, grass verges could be designed as swales or could shed water into filter drains.	Roadside drainage will comprise a Type 1 verge allowing sheet flow of surface water from the road. Under normal weather conditions this will allow initial separation of particulates within the verge. Ditching/swales will follow the same gradient as the access road. Check dams will be used to control the flow rate within the drainage channel as well as providing some attenuation capacity. The natural topography either side of the access will be used to identify appropriate outfall points along the route for roadside drainage to allow overland flow and filtration of surface water between outfall points and the receiving loch.	Chapter 4: Project Description
Letter from SEPA 02/06/2020	Clarification is required regarding whether there are any outside areas when fuels or chemicals will be stored or where the launch vehicles will be assembled on site (if this is what happens). This would be a higher risk area which would need to have an impermeable surface and then suitable SUDS treatment in line with the requirement of The CIRA SUDS Manual. Bunding may also be required.	Fuelling / propellant storage and infrastructure will be stored on the launch pad prior to launch. Launch infrastructure will also be contained on the launch pad area, which has been enlarged to accommodate additional requirements.	Appendix 17.1 Outline Hazardous Materials Management Plan

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
Letter from SEPA 02/06/2020	A simple statement explaining proposals would be acceptable. In simple terms, all materials should be removed from the site unless it is clearly demonstrated that the removal would have a significant detriment to the local environment.	The Project infrastructure is proposed to remain in place permanently to facilitate access to the site as a common grazing resource and any ongoing habitat / cultural heritage management requirements. Removal of the infrastructure is expected to create further disturbance.	N/A
SEPA Discussion Document Response 27/05/2021	Request for NVC / Phase 1 Habitat Survey. Clarification that all infrastructure above 4.7 AOD Clarification that the mammal pass is not required for the culvert.	Survey issued 3 June 2021. N/A N/A	N/A
SEPA Discussion Document Response 27/05/2021	Request for detailed site plans showing exactly where all storage containers will be located and the mitigation provided – as well areas between storage and fuelling will be managed (i.e., what if there is a spill from point a to point b).	Fuel storage containment and integrated pollution control system illustrated in Figure 17.6.	Figure 17.6 Pollution Control and Management and described in Appendix 17.1: Outline Hazardous Materials Management Plan
SEPA Discussion Document Response 27/05/2021	Requested further detail on the drainage plan provided. SEPA expect a full site plan (excluding access track) to demonstrate operational SUDS on site. Also require information on how water will be diverted during launches vs non-launch periods, what is the size of the catchment area for this, where the storage tank be located, where the soakaway be located. To be provided in one comprehensive drainage site plan.	Drainage site plan illustrating: • Launch pad drainage to soakaway; • Runoff management when launch pad is not in use; • The water storage tank will be located adjacent to 'byre 2' in the farmstead area.	Figure 17.5 Drainage Plan.

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
SEPA Discussion Document Response 27/05/2021	Awaiting further details to understand the rationale behind the sizing of the concrete pad	The concrete pad has been sized to accommodate: • All fuelling containers and associated infrastructure within the extent of the perimeter drainage channel (and contain any subsequent spillages). • To provide adequate surface area for the dissipation of large, rapid spillages of HTP, or firewater. • To accommodate potentially taller launch tower infrastructure iterations / heights. • To accommodate associated blast defection equipment.	Chapter 4: Project Description
SEPA Discussion Document Response 27/05/2021	Further information requested in relation to the containment tank: to confirm if the tank will be emptied following or prior to every launch, maintenance plan preparation to ensure this, sizing of the tank should include clear justification. Confirmation of how liquid will be disposed of. Plans demonstrating bunding, and what mitigation will be provided between storage and fuelling areas? (i.e., spills while handling outside of the bunded containers).	Pollution infrastructure and management proposals modified to accommodate for catastrophic events. Tank to remain empty unless large volumes of HTP will be used as a propellant. Under circumstances where HTP used as a propellant, tank partially filled to provide further dilution as a precautionary measure and emptied to soakaway as normal if not used. Under circumstances of a spillage of HTP, contents of tank to be retained to allow degradation. Fuelling infrastructure to be contained within launch pad perimeter drain, which includes the supporting containment measures for spills. Following fuelling, containerised systems stored at the secondary storage location by the farmstead.	Appendix 17.1 Outline Hazardous Materials Management Plan
SEPA / CnES Email 15/12/2020	Confirmation that that the development does not fall under PPC regulations	Confirmation from SEPA 15/12/20. No further action.	N/A

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
SEPA / CnES Email 15/12/2020	Reiterated that the launch pad is sized appropriately to protect surrounding habitats and soils from heat and capturing any run-off produced as part of the launch.	The concrete pad has been sized to accommodate: • All fuelling containers and associated infrastructure within the extent of the perimeter drainage channel (and contain any subsequent spillages). • To provide adequate surface area for the dissipation of large, rapid spillages of HTP, or firewater. • To accommodate potentially taller launch tower infrastructure iterations / heights. • To accommodate associated blast defection equipment.	Chapter 3: Site Selection and Alternatives
SEPA Email 11/06/2021	Review of proposed materials inventory against COMAH Regulations, and indicated that they will require calculations to demonstrate this will apply when the aggregation rule is applied.	Maximum materials inventory assessed against COMAH regulations. No exceedance of lower tier threshold, nor under aggregation rule.	Appendix 17.1 Outline Hazardous Materials Management Plan
SEPA Email 17/06/2021	Requested that infrastructure is overlaid on potential GWDTE / NVC maps for future submissions.	Full impact assessment on GWDTE and accompanying maps in Terrestrial Ecology Chapter.	Chapter 15: Terrestrial Ecology
SEPA Email 17/06/2021	Query on proposed habitat enhancements.	Clarified that interim grazing exclusions had been developed between CnES and RSPB over species rich, and wader grazed grassland, stock exclusion on wetlands, management processes for machair crop areas, and a grazing regime to develop and enhance corncrake habitat. Further measures to be integrated as part of a wider 'Habitat and Amenity Plan', covering habitat, access, natural heritage and cultural heritage.	Chapter 15: Terrestrial Ecology Appendix 17.2: Outline Habitat and Amenity Management Plan

Stakeholder / Date	Consultee's Comment	Response / Action	Section Cross - reference
SEPA Email exchange between 02/09/2021 – 26/10/2021	Following a request for advice on discharging a very dilute mix of HTP (H_2O_2) to a soakaway. One of the potential operators will use H_2O_2 at a high concentration. Dilute H_2O_2 will be collected and will run to a storage tank where it will be dilutes and degrade in the ventilated storage tank of 63,500 l. SEPA confirmed that 2% dilution would be acceptable in principle as the discharge would be to sea rather than groundwater.	The Spaceport will secure a registration if discharge rate < 10 m^3 / day further details on the soakaway area, dilution factor and how it would be tested to ensure adequate dilution to be provided under further consultation with SEPA.	Section 17.11.4
SEPA Email 10/12/12	Confirmed that given the close proximity of the sea and the low permeability of the bedrock there is likely to be limited impact from any discharge from a soakaway to land at the proposed location. A controlled release of 2% H2O2 would be acceptable. A registration would be required as a trade effluent discharge.	The necessary registrations will be secured in line with the Water Environment (Controlled Activities) Regulations 2011	N/A

17.6.1 Planning Application Representations

A planning application to develop a proposed Spaceport at Scolpaig Farm in North Uist was submitted to the Comhairle nan Eilean Siar on 26 June 2019 (Planning Reference 19/00311/PPD). The planning application attracted significant public attention and consequently, approximately 640 representations from the public were received. Comments raised from both the public and consultees highlight key issues and concerns of relevance to the EIA process. Given the relationship to the EIA process, an analysis was undertaken of the representations submitted. The complete analysis is provided in Appendix 5.1: Review of Planning Representations.

Over a third of the representations (221/ 35 %) expressed concern that the water quality of Loch Scolpaig would be jeopardised by the proposed development, and that the shoreline and sea will be subject to waste disposal. Marine animals such as dolphins and whales were also thought to affected by water pollution.

17.7 ASSESSMENT METHODOLOGY

17.7.1 Approach to assessment

There are limited resources for predicting impacts on the hydrological, geological and hydrogeological environment. The methodologies have been modified from guidelines produced by Mustow and Burgess (2005) and general EIA guidance published by SNH and Historic Scotland (2018).

17.7.2 Assessment criteria

The following criteria have been utilised to inform the assessment of likely significant effects, including consideration of importance of the water environment features (Table 17-3) and magnitude of impact on receptors (Table 17-4).

Importance

Receptor importance is considered in relation to any particular designations or other formally recognised value. Defining criteria are detailed below in Table 17-3:

Table 17-3 Importance of hydrological, hydrogeological and geological (including soils) receptors

Importance of receptor	Criteria
High	• Chemical and biological water quality 'high' based on SEPA Water Body Classification. • Surface waters protected under EU or UK habitat legislation (SAC, Ramsar). Geology rare or of national importance as defined by SSSI or Geological Conservation Review Site (GCRS). • River abstractions for private water use classified as Type A within development catchment. • River industrial abstractions within 2 km downstream > 1000 m^3 / day. • Nationally or internationally designated sites where hydrology / hydrogeology is a key factor in designation. • Groundwater within development zone of influence supporting significant industrial abstractions (> 1000 m^3) or public water supply. • Actual groundwater dependent terrestrial ecosystems present. • Groundwater vulnerability classification of 5 (BGS *et al*, 2011). • High likelihood (1:10 probability in a year) of fluvial and tidal flooding within sub catchment. • Designated flood wash land with significant storage and conveyance properties; • Average peat depth ≥2 m. • Qualifying characteristics for class 1 priority peatland habitat – all vegetation cover indicates priority peatland habitat; all soils are carbon rich soils and deep peat. • Soil type and associated land use are highly sensitive (e.g., peat/blanket bog). • Receptor contains areas of regionally important economic mineral deposits.
Medium	• Chemical and / or biological water quality 'good' based on SEPA Water Body Classification. • Surface water abstractions for private water use classified as Type B. • Surface water industrial abstractions within 2 km downstream 500-1000 m^3 / day. • Moderately productive aquifers and groundwaters in peat deposits. • Watercourses with designated features. • Groundwater within development zone of influence supporting significant industrial abstractions (50-1000 m^3 / day) or private drinking water abstractions. • Medium likelihood (1:200 probability/ yr) of fluvial / tidal flooding. • Groundwater vulnerability classification of 3 or 4 (BGS *et al*, 2011). • Active floodplain. • Qualifying characteristics for class 2 peatland habitat – most vegetation cover indicates priority peatland habitat; all soils are carbon rich soil and deep peat. • Average peat depth ≥1m and <2m.

Importance of receptor	Criteria
Low	• Chemical and / or biological water quality moderate based on SEPA Water Body Classification. • Undesignated surface water drinking abstractions. • Less than 50 m^3 / day industrial or agricultural abstractions within 2 km downstream or abstractions for industrial use e.g., dust suppression, machinery washing. • Groundwater vulnerability classification of 2 (BGS *et al*, 2011). • Low productivity or minor aquifer. • Low flooding potential. • Qualifying characteristics for class 3, 4 or 5 habitat – vegetation cover does not indicate priority peatland habitat (as defined by SNH, 2016). • Average peat depth ≥0.5 m and <1 m.
Very Low	• Chemical and biological water quality poor to bad based on SEPA Water Body Classification. • Undesignated or informal drinking water supply. • Minor or non-aquifer. • Groundwater vulnerability classification of 1 (BGS *et al*, 2011). • Limited floodplain / Associated habitats less than local importance. • Average peat depth <0.5m. • Geology not designated under a SSSI or GCRS or protected by specific guidance. • Does not flood.

Magnitude of impact

Sensitivity of receptors is an important consideration when determining the magnitude of impact. The sensitivity of hydrological and geological receptors to potential impacts of the Project is based on the capacity of the receptor to avoid, tolerate, recover from, or adapt to a particular impact.

The following factors are also considered when characterising the potential magnitude of a particular impact:

- **Extent**: the geographical area or size of features likely to be affected;
- **Scale**: the size, volume, amount and / or intensity;
- **Duration**: whether the impact is short, medium or long-term, permanent or temporary;
- **Frequency and timing**: the characterisation of when the impact will occur; and
- **Reversibility**: the characterisation of how easily / quickly the impact will be reversed if applicable.

The magnitude of an impact is defined by the following criteria presented in Table 17-4.

Table 17-4 Magnitude of impact

Magnitude	Criteria
High	Major alteration to key elements / features of the baseline (pre-development) conditions such that post-development character / composition / attributes will be fundamentally changed.
Medium	Loss or alteration to one or more key elements / features of the baseline conditions such that post-development character / composition/ attributes of baseline will be partially changed.
Low	Minor shift away from baseline conditions. Change arising from the loss / alteration will be discernible but underlying character / composition / attributes of baseline condition will be similar to pre-development circumstances / patterns.
Very Low	Very slight change from baseline condition. Change barely distinguishable, approximating to the 'no change' situation.

Significance of effects

The definition of a significant effect that has been adopted in this assessment is one which, in isolation or in combination with others, is material to the environment and should be taken into account in the decision-making process. The significance of an effect results from the interaction between an impact's magnitude and the importance of those receptors that might be affected. Professional expert judgement is used to determine the likely significance of effects.

Table 17-5 is used to support the identification of significant effects to ensure that the process is transparent. The table provides a guide for the assessor and is not intended to be prescriptive. An impact assessed as having a *moderate* or *major* effect on a receptor is considered to be a *likely significant effect*.

Table 17-5 Significance of effect

	Magnitude			
Importance	**High**	**Medium**	**Low**	**Very Low**
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible
Very Low	Negligible	Negligible	Negligible	Negligible

17.8 BASELINE DESCRIPTION

17.8.1 Introduction

The Project occupies a low-lying area formerly used for the rough grazing of sheep and cattle, with the lowest point within the planning boundary approximately 2 m (at the crossing point between upper and loch Scolpaig) (Figure 17.1) and the highest point just under 20 m AOD at the access point to the site. The surrounding topography is dominated by the Beinn Scolpaig hillock to the northeast (88 m AOD) and Beinn Riabhach (177 AOD) to the southeast. Following the transition from private ownership to CnES ownership on 6 June 2019, the area has largely remained un-grazed since October 2019, although a herd of cattle (40 – 50 heads) have been frequently observed on the site since this period, thought to have breached fencing from a neighbouring farm. The site will be leased to an agricultural tenant, on the basis of managing the grassland areas in line with traditional crofting processes based on recommendations from the RSBP (Chapter 15: Terrestrial Ecology). The current access track accesses the site from the A865 and runs over rough moorland before reaching a culverted causeway over Scolpaig Loch. The existing track continues over moorland to unused farm buildings. The area to the northwest of the farm buildings comprises fixed dune systems or fertile machair land typical of the area.

17.8.2 Surface Hydrology and Drainage

The study area is located within the North Uist coastal catchment, with localised drainage dominated by Beinn Scolpaig which feeds the main waterbody on the site, Scolpaig Loch, via a series of linear drainage channels. Runoff to the study area is also generated by Beinn Riabhach (Appendix 17.2: Water Management).

Modifications to the loch structure have altered the response of the loch to flooding events. A short causeway crosses the loch, and the drainage underneath the crossing comprises a small traditional stone culvert (0.3 m x 0.4 m). The small size of the stone culvert restricts the throughflow from the 'upper' body to the 'lower' body of the loch. As a result, the two bodies of Loch Scolpaig have distinctive sub catchments, also delineated by the track. A schematic of the two catchments is illustrated in Appendix 17.2: Water Management and the sub catchments are illustrated on Figure 17.1.

The complete loch system eventually drains to Port na Copa to the west of the planning boundary via a corrugated steel pipe of approximately 600 mm in diameter, which subsequently discharges to a grated concrete structure on the upper shoreline. This drainage arrangement can exacerbate sea flooding on site when the outfall from the Loch can become partially blocked with seaweed and other marine debris. Anecdotal evidence suggests there are also significant rises in the loch during winter after severe storms, in addition to sea flooding from storm surges. During a site visit 6 November 2019, marine debris was observed in the channel and also to the north of the 'lower' loch suggesting some inundation of seawater to the loch system.

17.8.3 Designated Sites

There are no statutory designated sites for hydrological or hydrogeological interest within the Project area. However, there are a number of other designations within, or adjacent to the site:

- North Uist Coastal Geological Conservation Review Site (GCRS) is located adjacent to the study area boundary to the north, and 26 m from the planning boundary. Impacts relating to the water environment are unlikely to affect this designation and this site has been scoped out of the assessment.
- West Coast of the Outer Hebrides Special Protection Area (SPA), located adjacent to the study area boundary along the coastline;

Other designated sites in the wider area (within 5 km) include North Uist Machair and Islands SPA and North Uist Machair SAC (incorporating Vallay SSSI Balranald Bog and Loch nam Feithan SSSI) – located 2.8 km to the northeast of the development and 3.9 km to the south of the development, respectively.

17.8.4 Water Use

Private and Public Abstractions

There is a well located north of lower Loch Scolpaig (72900, 875200), illustrated on Figure 17.3a. Consultation with CnES Environmental Health Officer indicated that the well appears to feed into a tank halfway between the farmhouse and farm buildings (CnES Environmental Health, *pers comm*. 25/02/21). Feedback also indicated that the well is likely to be backed up with water and salt following a prolonged period of non-occupancy at the house and expressed that it would be unlikely that this could be made into a potable water supply. CnES has no records of any private water supply at the property, despite existence of a well. There are reports of a further private water supply 'up the hill', (R. Fraser, *Pers. Comm*.), however the location of this supply is currently unverified and there are no records of this as a private water supply (PWS)[7]. The current water supply arrangements to the property are thought to comprise a private pipe from a connection point in Balmartin. Consultation with a local historian also suggested the presence of another potential well 'up the hill', possibly for agricultural use (Local Historian, 08 November 2021), however no records of any other abstraction features have been identified.

A search of SEPA licensed sites within the study area and within the two sub catchments of Loch Scolpaig indicate that there are no licensed abstractions on site.

Licensed Sites

There are no registrations or licenses issued under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) within the study area (SEPA, 2014). The closest licensed site relates to a CAR licence held by An Ataireachd Ard approximately 680 m from the proposed infrastructure.

17.8.5 Surface Water Quality

Loch Scolpaig is not classified under the River Basin Management Plan (RBMP). No other watercourses on site or within the catchment are classified under the RBMP. However, the sea around the study area is a coastal water body (North Uist North) and the classification of the sea around study area is 'high' (SEPA, 2018).

Water quality monitoring carried out on 1 August 2019, and analysed by Scottish Water, indicated that the loch had levels of faecal coliforms (*Colstridium perfringens*, coliform bacteria and *E. coli*) which exceeded prescribed threshold values. In the absence of any outfall discharging to the loch, and long-term absence of occupancy of the associated household, it is assumed that the origin of the is from diffuse pollution from a relatively intense grazing regime of both sheep and cattle. The sensitivity or importance of the water body is likely to be **medium** based on criteria set out in Table 17-3. However, following the transition of ownership of the site to CnES in June 2019, and subsequent removal of grazing shortly after (October 2019), the quality of the loch is likely to have improved and a **high** sensitivity is assumed. It is acknowledged that the area has been subject to uncontrolled grazing from cattle breaching the surrounding fencing since the formal removal of grazing from the site. Since the baseline assessment the site is planned to be leased under a Short Duration Tenancy Agreement to be managed in line with an interim habitat management plan developed by the RSPB (Chapter 15: Terrestrial Ecology).

[7] The farmhouse is reported to have been served by a private pipe, installed approximately 20 years previously (R. Fraser, Fraser Architects, *Pers. Comm*.)

17.8.6 Flood Risk

SEPA's Indicative River and Coastal Flood Map of Scotland was consulted to identify those areas potentially at risk of flooding (SEPA, 2020). The flood map illustrates a narrow band of 'high' surface water flood risk, around the northern boundary of both the upper and lower bodies of Loch Scolpaig (Image 17-1). A wider area of flooding is associated with the causeway location and slightly north of this causeway, corresponding with a low-lying stand of *Phragmites sp.* reedbed in this area. There is a small 'medium' area of flooding recorded, which appears to be associated with the existing farm building complex, in addition to a discrete area of flooding associated with the lochan near the summit of Beinn Scolpaig. The coastal flood risk is assessed as 'high' and the entire area of Scolpaig is classified as a 'potentially vulnerable area'.

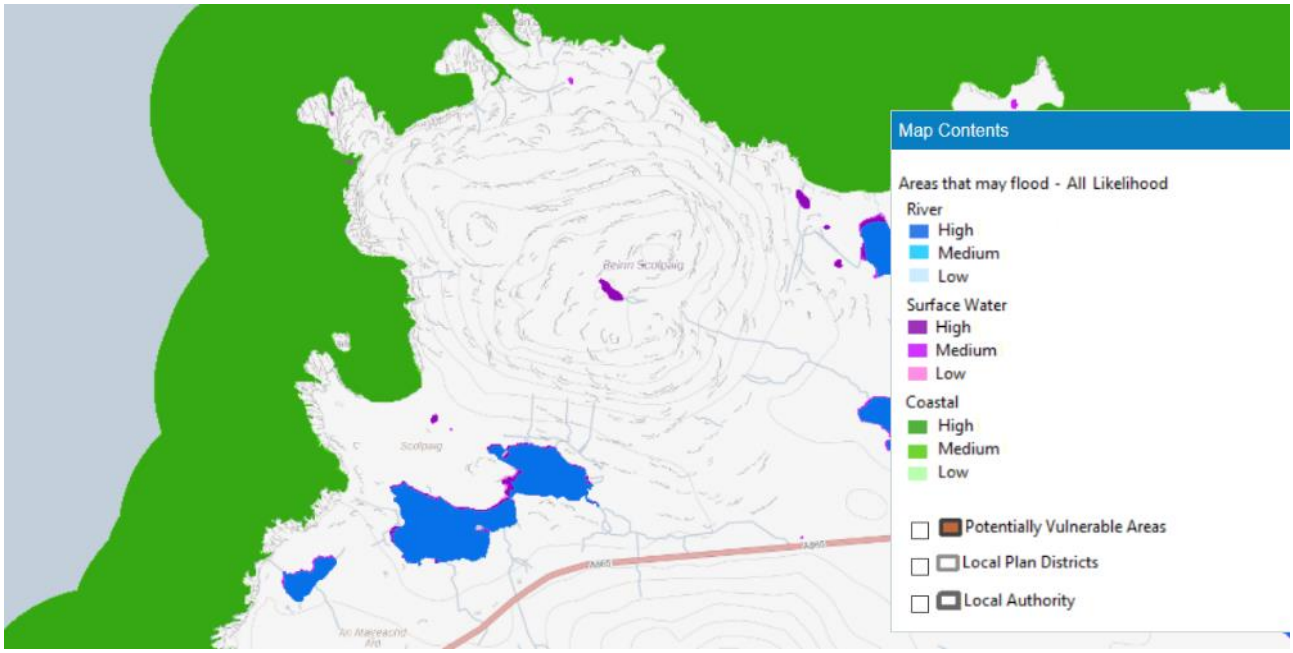

Image 17-1 Extract of SEPA's Indicative River and Coastal Flood Map of Scotland, centred on Scolpaig site. Last updated 5 November 2020 (Accessed 17 March 2021).

Section 17.8.2 summarises the impact of the stone culvert on the flow between the upper and lower bodies of Loch Scolpaig. There is anecdotal evidence to suggest flood events in the upper loch overtop the causeway by 100 – 200 mm (Appendix 17.2: Water Management). The analysis presented in the FRA also predicts a water level rise, although these are slightly above these observations (Table 17-6), however this may be a factor of the calculation methodology (Section 17.5).

Table 17-6 Estimated water level rise following a 2-hour rainfall event on saturated ground for the upper and lower Loch Scolpaig (Extracted from Appendix 17.3, Water Management).

	Volume Increase (m^3)		Water Level Rise	
	Q_{BAR}	$Q_{1:200YR}$	Q_{BAR}	$Q_{1:200YR}$
Upper Loch	8,964	26,571	0.199	0.590
Lower Loch	4,773	17,831	0.060	0.226

Observations of seawater inundation was evident from the presence of marine debris around the margins of the lower loch during a site visit, suggesting that seawater may have previously surged up the drainage channel and into the lower loch. The extent and frequency of this flooding is currently unknown.

17.8.7 Soils and Geology

Bedrock Geology

The BGS 1:50,000 Digital Geological Maps indicate that the Site is underlain by Lewisian gneiss, a metamorphic rock characteristic of the region. No fault features were mapped within the planning boundary or wider Scolpaig Farm. The solid geology is representative of the region and there are no designations for geology features within the site boundary.

Superficial Geology and Peat

BGS superficial geology mapping (1:50,000) indicates that the majority of the site is underlain by windblown sand, confirmed by vegetation surveys (Appendix 15.1: National Vegetation Classification Survey), which describe a series of grassland / machair communities typical of fixed dune systems. Within the study area the vegetation survey identified extensive swathes of blanket bog to the north and eastern flanks of Beinn Scolpaig. A series of trial pits were excavated to confirm ground conditions within the planning application boundary, these confirm that soils under the site comprise typical machair profile. However, two trial pits excavated adjacent to the causeway recorded shallow peat deposits < 0.5 m, within the soil profile (Figure 17.2 and Appendix 17.3: Test Excavations and Soil Profiles). The depth of the deposits does not meet the classification of peat soils (SEPA, 2017) and peat has been scoped out of the assessment following consultation with SEPA (Table 17-2).

17.8.8 Hydrogeology and Groundwater

Aquifer Characteristics

The aquifer classification for the study area is characterised as a 'low productivity aquifer', class 2c where flow is virtually all through fractures and other discontinuities (Scotland's Environment, 2021). Hydrogeological mapping of Scotland describes the bedrock in the area as mainly underlain by impermeable rock, generally without groundwater except at shallow depth, and of Precambrian origin (BGS, 1988). The crystalline basement offers little potential for groundwater storage and transport other than in cracks and joints which may be associate with tectonic features or near surface weathering.

A small area to the north of the study area is classified as a locally important aquifer of recent (blown sand) origin. Coastal sand dunes can provide limited supplies (up to 10 l/s) from boreholes and galleries. The groundwater composition can be bicarbonate and chloride rich depending on the nature of the shells and exposure to the sea (BGS, 1988).

Groundwater Vulnerability

Groundwater vulnerability is the tendency and likelihood for general contaminants to move vertically through the unsaturated zone and reach the water table. Groundwater vulnerability is classified between 1 (low vulnerability) to 5 (high vulnerability) (Dochartaigh *et al*, 2011). Groundwater vulnerability across the site is mainly categorised as vulnerability class 5, indicating the highest level of vulnerability (Dochartaigh *et al*, 2011) or "vulnerable to most pollutants, with rapid impact in many scenarios". The high classification is due to the permeability of the superficial sand dune lithology.

17.8.9 Fisheries

North Uist Angling Club have the rights to fish on Loch Scolpaig, which holds a resident brown trout population (North Uist Angling Club, 2021). The nature of the outflow and drainage system is impassable for migratory fish; the existing artificial outlet sits high on the intertidal zone and is not suitable for the passage of migratory fish (Image 17-2).

Image 17-2 Discharge outlet of Loch Scolpaig and associated drainage channel.

17.8.10 Groundwater Dependent Terrestrial Ecosystems

The NVC survey (Appendix 15.1) identified a number of botanical communities, which in accordance with SEPA advice, have the potential to be supported by groundwater. Potential groundwater dependent ecosystems (GWDTEs) associated with NVC communities recorded within the Survey Area are detailed in Chapter 15: Terrestrial Ecology and a map of the distribution of these features with target notes is provided in Figure 15.3.

The majority of construction works, including minor upgrading of existing access tracks, hardstanding and installation of tether pads, will involve excavation depths of less than 1 m (see Chapter 5; Project Description). However, some of the infrastructure proposed includes excavations exceeding this threshold (containment tank). A full assessment of GWDTE is provided in Chapter 15: Terrestrial Ecology. In summary, as hydrogeological features below the site are very unlikely to support groundwater, and all potential GWDTEs with potential connectivity to the Project site are very likely to be supported by surface water features, GWDTEs have been **scoped out** of the assessment.

17.8.11 Summary

The baseline assessment has identified a range of receptors that have potential to be significantly impacted by the development, summarised as follows:

- **Hydrology** - Loch Scolpaig is the main water body; however, the loch is bisected by a short causeway above a very small stone culvert, which significantly restricts the movement of water between the two sides of the loch. Each loch system (termed 'upper' and 'lower') behaves semi independently of each other and have been treated as two separate catchments.
- **Geology -** no sites are designated for hydrological interest within the site; however, the North Uist Coastal Geological Conservation Review Site (GCRS) is located adjacent to the study area boundary to the north. Impacts relating to the water environment are unlikely to affect this designation and this site has been **scoped out** of the assessment. Bedrock geology comprises Lewisian gneiss, a metamorphic rock typical of the region and is assessed as **low** sensitivity.
- **Flooding –** high likelihood of localised flooding at the causeway location and margins of the Scolpaig Loch, exacerbated by poorly performing culvert. Potential inundation of the sea into the loch during storm surges may occur. As a precautionary assessment potential flood risk on site is considered **high** sensitivity. The site is located within a coastal catchment with no downstream infrastructure. Impacts on downstream infrastructure are **scoped out** of the assessment.

- **Soils and Peat -** although the wider area has large areas of blanket bog, the majority of the Project site comprises machair soils, confirmed by vegetation surveys and trial pit excavations. Two areas with shallow peat (<0.5 m) layers were identified adjacent to the causeway, however these deposits are not classified as peat soils and are not considered to be representative of the site. Impacts on peat are **scoped out** following consultation with SEPA.
- **Surface Water Morphology** - the loch is currently bisected by an undersized stone culvert as part of a causeway which can restrict flow between the two loch systems. The outfall of the loch has been canalised, and partially piped to an artificial concrete outfall above MHWS, which requires periodic maintenance. Some erosion of the north banks of the loch were evident from grazing. Surface water morphology is evaluated to be of **medium** sensitivity.
- **Surface Water Quality** - the site is wholly located in the North Uist North coastal catchment, the overall status of this coastal water body is 'high'. Loch Scolpaig is not classified under the RBMP, however water quality monitoring undertaken on 1 August 2019 suggested that the loch was degraded in quality with levels of faecal coliforms exceeding prescribed threshold values. Faecal coliforms in this context are likely to be derived from grazing pressure. Grazing ceased at the site in October 2019, following transferal of ownership to CnES and water quality is assumed to be **high** sensitivity.
- **Groundwater** - the overall aquifer classification for the study area is characterised as a 'low productivity', where flow is virtually all through fractures and other discontinuities. However, a small area to the north of the study area is classified as a locally important aquifer of recent (blown sand) origin. Groundwater at the site was assessed to have low importance in terms of its value as an aquifer but is sensitive to pollution and spillages due to the nature of flow paths (fractured as opposed to intragranular) and Groundwater Vulnerability Classification and is assessed as overall **high** sensitivity.
- **Private and Public Water Supplies**: one well was identified north of lower Loch Scolpaig on OS maps. Reports of another private water supply (PWS) although there are no records of the location of this feature. Consultation with the EHO indicated that although this well identified at lower Loch Scolpaig may have been used in the past, there were no records of this supply as a formal PWS, and the condition of the well indicated it was not suitable for as a potable water supply. Impacts on private water supplies are **scoped out**.
- **Other Water Users**: there are no sites licensed under the Water Environment (Controlled Activities Scotland) Regulations, including abstractions within the study area. Impacts on other water users are **scoped out**.
- **Flood Risk**: the development is located in flood zones 1 and 2 indicating low risk. The site does not have any specific role in mitigating downstream flooding. Some localised flood issues were identified particularly relating to downstream surface water obstructions in a drainage channel contribute to localised flooding at a distinct area adjacent (west) of the A859. The importance of the receptor is considered **medium**.
- **GWDTES**: an analysis of GWDTE indicated that although potential GWDTE were identified on site via NVC survey, these were not concluded to be groundwater fed. Impacts on GWDTE has been **scoped out** of the assessment.

17.9 POTENTIAL IMPACTS

The following potential impacts, including any with potential positive or negative and direct, indirect or secondary effects have been established through scoping and consultation with key stakeholders (Section 17.6).

The potential impacts of the Project, without mitigation, which have been identified as relevant for the assessment are:

Construction

- Sedimentation of surface waters resulting in siltation of Loch Scolpaig and drainage channels, impacting surface water quality during construction;

- Chemical pollution of surface or groundwaters impacting water quality and dependent receptors during construction.

Operation

- Chemical pollution of ground and surface waters arising from standard launch activities, impacting water quality and dependent receptors;
- Chemical pollution of ground and surface waters arising from non-standard launch activities and catastrophic events impacting water quality and dependent receptors;
- Chemical pollution of ground and surface waters arising from accidental spillages associated with the post launch storage of hazardous materials; and
- Increased occurrence or severity of flooding from presence of project infrastructure.

Decommissioning

The impacts arising during decommissioning are anticipated to be similar to, but not exceeding, those generated during the construction phase. No major excavations or concrete pouring will be required.

Scoped Out

Impacts arising from surface water abstractions have been **scoped out** following the commitment to source deluge water from existing water supply.

Impacts on GWDTE are assessed in Chapter 15: Terrestrial Ecology and are **scoped out** following a detailed analysis of potential GWDTE vegetation communities within the advised buffer area that were subsequently assessed to not be groundwater fed.

17.10 MITIGATION AND MANAGEMENT MEASURES

The following mitigation and management measures are proposed to remove, avoid, reduce and, where possible, offset any impacts which could, either by themselves or in combination with others, have a significant adverse effect. These measures are considered in the assessment of residual effects in Section 17.11.

Table 17-7 Mitigation measures

Ref.	Title	Description
R01	Regulatory Mitigation (Spaceport)	The Spaceport will be licensed and regulated under the Space Industry Act 2018 and Space Industry Regulations 2021. The Safety Case is the main way in which an applicant for a Spaceport Licence demonstrates compliance. The focus of the Safety Case is in managing potentially catastrophic events and is based on hazard identification /incident scenarios with corresponding measures to prevent or limit the consequences of an accident of incident to demonstrate that the risk is as low as reasonably practical (ALARP). An Assessment of Environmental Effects (AEE) also forms part of the licence application for the Spaceport and is taken into account by the Regulator (Civil Aviation Authority in terms of deciding whether or not to grant a licence. Once the licence is granted, the Safety Case is used as the basis for ongoing monitoring, review and assessment. Reviews can also be triggered by a range of events including a change to the operations or infrastructure, or if new information relating to safety matters arises.
R02	Regulatory Mitigation (Launch Vehicles and Launch Events)	Each launch will be licensed and regulated under: • The Space Industry Act 2018 and the Space Industry Regulations 2021; or • Permission under the Air Navigation Order 2016 (Air Navigation (Amendment) Order 2021); and • Marine (Scotland) Act 2010 for launches that involve deposits in the marine environment. The launch operator is required to submit a detailed Safety Case which includes both a ground safety analysis and a flight safety analysis to the regulator (UK Civil Aviation Authority, CAA). The ground safety analysis covers the transport, handling and storing of any hazardous material in relation to the launch vehicle and testing payloads amongst a range of other activities. A flight safety analysis covers must cover potential blast and fragmentation impacts, releases of toxic chemicals, and any major accidents or hazards resulting from collision or separation of LV components.

Ref.	Title	Description
GM01	Design Mitigation	• Reuse of existing infrastructure where possible: one existing farm building upgraded and the existing access road from the A865 will be used following minor upgraded and widening. • Substantial reduction of original project infrastructure (Figure 3.1) and footprint, to avoid peat, archaeological features and National Scenic Area. • Project revised to provide a venue for sub-orbital launch vehicles, substantially smaller than orbital launch vehicles proposed in the Scoping Report; • Key infrastructure (including the construction compound) has been located outwith a 50 m buffer of all surface watercourses and on land higher than 4.73 m AOD to avoid potential flooding impacts; • No concrete batching proposed on site, with cement imported from local suppliers and pre-cast culvert installation for Scolpaig Loch crossing; • Launch pad designed to accommodate all potential fuelling and oxidiser storage requirements prior to a launch; • Pollution management infrastructure designed for three scenarios of operation (not in use, standard operation, non-standard operation / catastrophic events).
GM02	Construction Mitigation Register & Construction Environmental Manager	A Construction Mitigation Register (CMR) will be collated detailing the mitigation commitments in the EIA and relevant planning conditions. A dedicated Construction Environmental Manager (CEM) will have responsibility to ensure all measures in the register are delivered during the construction period. The CMR will outline all required mitigation commitments and relevant planning conditions for ornithological, ecological, cultural heritage and hydrological receptors, providing details of key sensitivities present and timings. The CEM will contract necessary survey expertise, advise on, and monitor the implementation and compliance of works with construction phase environmental mitigation and good practice measures.
HHG01	Water Management (Construction)	• Construction mitigation for culvert installation, including the installation of coffer dams, dewatering and sediment management strategy, outlined in detail in Appendix 17.2 Water Management. • Sectioning and shuttering concrete pouring works will avoid the potential for slumping and reduces likelihood of concrete spillages and infiltration into surrounding machair. All concrete pouring works will be undertaken under appropriate dry weather conditions required for curing. • Materials storage will be in line with the requirements of legislation and good practice with materials safety data sheets. Emergency procedures and spill kits (including hydrocarbon sorbents, pads and booms) will be retained on site and spill kits will be on standby adjacent to operations.
HHG02	Flood Risk	Culvert replacement of Loch Scolpaig causeway, to remove the existing structure which impedes flow between upper and lower Loch Scolpaig.

Ref.	Title	Description
HHG03	Rock Aggregate	Rock used to upgrade existing tracks and create new tacks will comprise of a sublayer of blasted rock overlain with a shallow layer of Type 1 crushed rock, reducing potential for siltation arising from aggregate. Aggregate will be sourced from local quarries to ensure similar chemical composition.
HHG04	Hazardous Materials Management Plan	A detailed hazardous material management plan will be developed for the transport, storage and use of hazardous substances, including protocols for unplanned or accidental events. An Outline Hazardous Materials Management Plan setting out the general principals, the maximum materials inventory and pollution control response to different operational and pollution control scenarios, is provided in Appendix 17-1 and covers the following topics: • Regulatory context and legislative interactions; • Maximum materials inventory; • Management, Roles and Responsibilities; • Pre-launch appraisal / contract agreement; • Principals for the transport and storage of hazardous materials; • Spillage Management and Catastrophic Events; • Storage of residual materials post launch; and • Security.
HHG05	Western Isles Emergency Planning & Coordinating Group (WIEPCG) Meeting	The WIEPCG comprises representatives of regional emergency services, including SEPA. Standard consultation with the group will outline the nature, and type of hazardous substances to be used on site, and accompanying pollution control systems during pre-launch discussions. WIEPCG stakeholders may participate in prelaunch rehearsals and incident simulations, including accident and pollution incident simulations.
HHG6	Inspection and Maintenance Schedule	The launch pad will be cleaned following each launch with the effluent collected in the sump system and removed by a specialist contractor, or absorbent materials and disposed of as special waste. An inspection, cleaning and maintenance programme for the launch pad and pollution control infrastructure will be developed including, removal of windblown sand and other debris, valve security and operation and operational checks of water deluge system. Inspection and maintenance programme will cover outflow from lower Loch Scolpaig to ensure debris does not accumulate and contribute to localised flooding. The inspection programme will also include periodic inspections of the culvert at Loch Scolpaig, to ensure that flow is not obstructed by blockages or debris.

17.11 IMPACT ASSESSMENT

Construction phase

17.11.1 Sedimentation of surface waters resulting in siltation of Loch Scolpaig and drainage channels, impacting surface water quality during construction

Impact overview (without mitigation)

Increased sediment loads generated during construction can reduce water quality and result in the siltation of watercourses, impacting a range of receptors including the existing fisheries resources (Section 17.8.9), ecological and ornithological receptors (Chapter 15: Terrestrial Ecology and Chapter 14: Ornithology). The proposal to remove, and replace the existing stone culvert, forming part of the causeway bisecting Loch Scolpaig, has potential to increase sediment into both the upper and lower loch systems without mitigation. Similarly, the use of some types of aggregate can result in high initial loads of sediment into water bodies.

Mitigation

Design Mitigation

Design mitigation has maximised the use of existing infrastructure (GM01). New infrastructure comprises 130 m of new access track, an extension of the existing hardstanding area within the farm complex, and an area of hardstanding surrounding a launch pad, pollution control infrastructure with smaller concrete tether pads. With exception of the ducting, the upgrade to the crossing (culvert replacement) over Loch Scolpaig and associated temporary construction area to manage the construction process associated with the replacement - none of the new infrastructure components are within 50 m of surface waters (Figure 17.3a – 17.3c).

Culvert Replacement

Replacement of the culvert between the upper and lower Loch Scolpaig has potential to generate significant impacts on water quality. A plan of the proposed management process for culvert replacement is set out in Appendix 17.2: Water Management. The proposed measures are summarised below (HHG01):

- Temporary Dam Structure – the water depths around the culvert are relatively shallow and a temporary dam structure, likely to be a filled or frame dam[8], will be installed to enable the culvert to be replaced under dry conditions. A full schematic is provided in Appendix 17.2 showing a potential dam and over-pumping arrangement;
- Dewatering and Management - dewatering of the working area will be achieved through the deployment of sump pumps to discharge water to the proposed temporary construction area outlined on Figure 17.4. A zone within the temporary construction area will be contained with silt fencing to ensure suspended sediments are filtered out by existing vegetation and fencing. A second pump will be deployed to control water level of the upper loch. This water would be discharged directly into the lower loch, or alternatively, should the pump intake be located close to the bed sediment, this water would also be discharged to the silt management area.
- Culvert and Causeway Construction – following dewatering of the working area, the box culvert will be installed with ongoing pumping to the silt management area continued as necessary. On completion, the temporary dam and silt management measures will be removed.

Construction of the culvert would be in accordance with Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods (SEPA, 2009).

[8] Aqua Dam, Water Gate, Murlac Frame Dam etc.

Aggregate

Rock used to upgrade existing tracks and create new tacks will comprise of a sublayer of blasted rock overlain with a shallow layer of Type 1 crushed rock, reducing potential for siltation arising from aggregate (HHG03).

Assessment of residual effects

Magnitude of impact

The proposed mitigation measures provide a mechanism for contractors to work 'in the dry' during the construction process, with the dewatering / sediment management measures to reduce sediment loading in pumped removal. The removal and installation of the culvert is a single event, expected to be short in duration (three weeks), and limited in extent to the lower loch system. A small, temporary increase in sedimentation is likely following the removal of the coffer dam system; however, this is anticipated to be in the bounds of natural variability and is expected to quickly return to baseline levels. The magnitude of the impact is expected to be **low**.

Significance of residual effects

The water quality of Loch Scolpaig in the study area is considered to be of **high** importance. With the implementation of proposed mitigation and management measures the magnitude of the impact is assessed to be **low**. It is anticipated that there will be **minor** residual effects, which are **not significant.**

17.11.2 Chemical pollution of surface or groundwaters impacting water quality and dependent receptors during construction

Impact overview (without mitigation)

During construction, chemical pollution of surface and groundwaters may arise from the following activities:

- Concrete pouring operations (launch pad, and the reinforced concrete support pads for the containment tank and water tank) which may result in spillages directly into the surface waters or infiltration into groundwater; and
- Pollution arising from both spillages and poor management of materials can result in direct runoff into watercourses and infiltration into groundwater.

Infiltration or runoff to ground or surface waters can reduce water quality, impacting a range of receptors dependent on freshwater ecosystems, including recreational fisheries resource and ecological receptors (otter, fish, birds and invertebrates).

Mitigation

Design Mitigation

Concrete pouring works are limited to the launch pad, the containment tank support and the water tank support. Concrete pouring operations are outwith a 50 m buffer of all surface waters (GM01). Concrete will be imported from existing batching plants in tankers which have their own dedicated rewashing facilities at the quarry, avoiding the need for on-site concrete batching and washout bays on site (GM01). The culvert will be precast and imported to site, avoiding the need for concrete pouring operations adjacent to Loch Scolpaig.

Concrete Management

Sectioning and shuttering concrete pouring works will avoid the potential for slumping and reduces likelihood of concrete spillages and infiltration into surrounding machair. All concrete pouring works will be undertaken under appropriate dry weather conditions required for curing.

Materials Storage

The temporary construction compound will be located either at the parking area adjacent to the main road or the existing farm complex depending on the preference of the contractor. Materials storage will be in line with the requirements of legislation and good practice with materials safety data sheets. Emergency procedures and spill kits (including hydrocarbon sorbents, pads and booms) will be retained on site and spill kits will be on standby adjacent to operations (HHG04).

Assessment of residual effects

Magnitude of impact

Limited concrete pouring works are required on site and will be greater than 50 m from the nearest surface water body, proposed construction laydown areas are also located at distances greater than 50 m from surface waters (Figure 17.4). Where possible, activities have been moved offsite (concrete will be sourced from an existing batching facility, and a pre-cast box culvert will be imported) to reduce the potential of pollution and spillages. With mitigation, the extent of the impact is small both spatially and temporally, with the principal impacts arising from pouring operations limited to one area over a short duration of approximately one day. The magnitude of impacts is assessed to be **very low**.

Significance of residual effects

The water quality of Loch Scolpaig in the study area is considered to be of **high** importance. Groundwater is considered to be low productivity but vulnerable to pollution and is also assessed as **high** importance. With the implementation of proposed mitigation and management measures the magnitude of the impact is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects which are **not significant.**

Operation phase

17.11.3 Chemical pollution of ground and surface waters arising from standard launch activities, impacting water quality and dependent receptors

Impact overview (without mitigation)

During operation, launch vehicles (LV) have potential to arrive on site, fully pre-loaded with both fuel and oxidiser components. However, some LVs may require on-site loading of an oxidiser component or both a fuel and oxidiser, which can include a range of both liquid and solid hazardous materials. Solid fuel components may also be brought to the launch pad and connected separately. Chemical pollution of surface waters, which support a range of ecological receptors and groundwater, has potential to occur from spillages during the launch vehicle fuelling procedure.

A review of representative propellant mixtures was undertaken to determine the types of propellants and typical volumes with the range of potentially hazardous materials that may be present on site at one time. The maximum volumes anticipated for all propellant mixtures are set out in Table 17-8. The individual requirements of each LO are expected to fall within the range of materials described and only a small number of the materials outlined in Table 17-8 are likely to be on site during any launch event.

The maximum volume of high-test peroxide (HTP) expected on site is approximately 1.4 tonnes and is representative of one particular launch vehicle specification. Launch activities requiring high volumes of HTP are considered to be a 'non-standard' activity and the impact associated with this particular fuel volume is assessed in: *Chemical pollution of ground and surface waters arising from non-standard launch vehicle fuelling activities, impacting water quality and dependent receptors,* below. This impact addresses 'standard' launch events, i.e., where the highest volume of material (kerosene) anticipated at the site is 191 Kg.

Table 17-8 Representative materials to be handled on site during launch activities and against relevant COMAH Dangerous Substances thresholds

Material	Max Expected on Site (tonne)
Hydroxyl Terminated Polybutadiene (HTPB)	0.01
High Test peroxide 90%	1.44
Kerosene	0.191
Powdered aluminium	0.08
Ammonium perchlorate	0.085
Sorbitol	0.058
Paraffin (need state, oil or wax)	TBC
Nitrous oxide	0.174
High Density Polyethylene (HDPE)	0.09
Oxygen	1
Helium	1
Nitrogen	1
Diesel	0.0425 (50L)

Mitigation

The proposals for managing hazardous materials, including pollution events have been reviewed by process safety engineers (Mabbett and Associates Ltd) to ensure compliance with relevant legislation and best practice. A detailed hazardous management plan for the transport, storage and use of hazardous substances will be developed (HHG04) setting out the detailed operational plans for the management of hazardous materials, including unplanned events. An Outline Hazardous Materials Management Plan is provided in Appendix 17.1, which provides the full suite of hazards associated with each substance and COMAH threshold, and sets outs the general principals, maximum materials inventory and pollution control response to different scenarios. Figure 17.6 illustrates the key pollution control and management locations within the development.

Management of potential pollution events will be addressed through the following processes, described in further detail below:

- Regulatory Compliance
- Client Appraisal / Contractual Agreement;
- Testing and Maintenance Schedule;
- Transport and Storage;
- Launch Preparations;
- Pollution Management; and
- Post-Launch Protocols.

Regulatory Compliance

Both the Spaceport and each launch event will be regulated by the CAA (R01 and R02). The regulatory system requires both SO and LO to maintain a Safety Case based on representative LV's and launch events. Each launch event must also secure a licence from the CAA. The regulatory requirements of the licence submission specify a full ground safety analysis the transport, handling and storing of any hazardous material in relation to the launch vehicle, preparing or testing a payload that will be integrated with the launch vehicle, integration of a payload with the launch vehicle, amongst a range of other activities. The regulatory system provides a launch specific evaluation of the detailed safety measures associated with each launch, and the provisions in place for managing these between the spaceport and the LO.

Client Appraisal / Contractual Agreement

Pre-launch activities include an appraisal process of the launch process developed by the LO, including the inventory of materials that is proposed to be held on site. The review will inform aspects relating to the segregation, containment and management for each material, including requirements for pollution control (i.e., spill kits). LOs will be responsible for LV fuelling operations and provision of accompanying fuelling infrastructure. An appraisal will be made by the SO of any specific pollution control requirements for each launch at contract discussion to identify specific requirements, alternative considerations may be required for solid fuels and water-reactive materials.

The following arrangements will be in place (HHG04):

- LVs will always be fuelled on the launchpad (not elsewhere at the Spaceport);
- All LVs will have non-return valves (NRVs) and any loss of containment during filling would be detected and the filling operation would be ceased immediately (many LOs automate this system to ensure flow stops);
- Fuelling activities are expected to always be manual / supervised activities, where any losses of containment would be detected, and action taken by the LO;
- The Spaceport will provide adequate spill kits and pollution control measures for the fuel mix adopted by the LO.

Testing and Maintenance Schedule

Regular maintenance and functioning testing of the drainage system will be undertaken to ensure any semi-automatic or automatic functions operate as expected, and on demand (HHG06). The schedule will include cleaning of the launch pad sump and surrounding falls.

Transport and Storage

Materials will be transported to site in the original packaging as provided by the material supplier, with appropriate labelling. Appendix 17.1 Outline Hazardous Materials Management Plan (HHG04) provides a full description of the storage and management criteria that will be met, summarised below:

- Separation – appropriate separation of flammable liquids and incompatible materials;
- Designated container type and identification – measures to ensure materials brought on site will be in original packaging, with appropriate labelling, and shipping containers marked with intended function through signage, including any DSEAR Hazardous Zones;
- Ventilation – adequate ventilation openings for containers maintaining combustible liquids, with specific mechanical ventilation arrangements for hydrogen peroxide;
- Environmental controls – any further environmental controls (for example temperature) will be considered on reviewing the proposed storage inventory. Aluminium packages, for example, will be retained in watertight containers;
- Explosion relief – special storage requirements for hydrogen peroxide;

- Security – security personnel will be present at all times during the launch preparations and launch event, with access to the site controlled at all times. Storage containers will be locked and access to containers may be restricted to authorised personnel only depending on the nature of the contained substances; and
- Spill containment – provision of a bunded area within the shipping container, and adequate flooring that are compatible with the materials proposed for storage. Should any spillages occur, these would be removed by appropriate spill kits.

Launch Preparations

- The nature, and type of hazardous substances to be used on site and accompanying pollution control systems will be presented to WIEPCG during pre-launch discussions (HHG05). WIEPCG includes representatives of the emergency services and SEPA, to determine any additional arrangements and emergency response;
- WIEPCG stakeholders will participate in prelaunch rehearsals, and incident simulations;
- All LV fuelling equipment will be directed to the launch pad area and stored within the perimeter channel of the launch pad concrete pad (HHG04); and
- Protocols will be put in place to ensure the correct drainage arrangements are in place (valve to containment tank open, containment tank valve to soakaway closed) and the relevant pollution control materials are prepared to address any spillages (HHG04).

Pollution Management

These include the automatic stop of fueling system under loss of containment monitoring systems and manual shut down. The LO will have in-house / proprietary systems for managing pollution control of the selected propellant mix specific to the LV and LO fuelling strategy. The fuelling system and the LV system typically integrate a 'loss of containment' monitoring system which has automatic and manual provision for safely terminating the fuelling process (HHG04).

It is anticipated that any small spills will be managed by immediate application of appropriate inert absorbent materials or contained within drip trays under valves /hose fittings. The maximum liquid fuel load identified in the review of propellants (excluding HTP) and included in the materials inventory is kerosene (at a maximum volume of 191 kg) and does not exceed 1 m^3. A 1 m^3 sump, with graded falls has been integrated into the launch pad design to ensure spillages are directed via gravity to the sump system (Appendix 17.1).

Should a spillage of sufficient volume occur, the sump will collect liquid material, which will either be absorbed via the appropriate inert materials or removed by a specialist waste contractor. This process will also be undertaken following cleaning of the launch pad after a launch event (Scenario 2, presented in Appendix 17.1).

Post Launch Protocols

- Post launch – following a launch event, the launch pad will be cleaned and effluent removed and disposed of at the trade effluent point to ensure any residues from exhaust gases are removed from the pad. When the launch site is not in use, rainwater which collected in the drainage channels will be diverted to a soakaway (Figure 17.5).
- Disposal - the SO will be responsible for the emptying and disposal of any spillages contained in the sump.

Assessment of residual effects

Magnitude of impact

During operation, LVs have potential to arrive on site, fully pre-loaded with both fuel and oxidiser components or require partial / complete fuelling on site. Mitigation has been outlined to incorporate pollution control arising from initial analysis

of fuelling procedures proposed by the LO as part of site contract. The licensing requirement for the spaceport and each launch event, in addition to the standard meetings with WIEPCG will provide a regulated mechanism for assessing, reviewing and monitoring compliance for pollution events. The volumes of most of the materials expected on site are very low and will be stored for very short periods of time for a maximum of 10 launches / year. Materials may also be stored at the QinetiQ facility in South Uist to reduce the period of time expected for pre-launch storage.

During standard fuelling operations, systems will be in place to monitor any loss of containment at the fuel source. Spillage volumes are likely to be low under the automatic monitoring systems and manual standby systems in place. The proposed collection and disposal proposals remove the potential for spillages to enter the surrounding habitats, and subsequent groundwater. The magnitude of impact of a spillage, with mitigation measures is anticipated to be **very low**.

Significance of residual effects

The hydrogeology and groundwater vulnerability of the area surrounding the launch pad is assessed of **high** importance. With the implementation of proposed mitigation and management measures the magnitude of the impact is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects, which are **not significant.**

17.11.4 Chemical pollution of ground and surface waters arising from non-standard launch activities and catastrophic events impacting water quality and dependent receptors

Impact overview (without mitigation)

The maximum volume of high-test peroxide (HTP) expected on site is approximately 1.4 tonnes and is representative of one particular launch vehicle specification. HTP has a number of hazardous properties, including detonation and fire when in contact with organics and has a range of ecotoxicological effects on aquatic life (PeroxyChem, 2015). Spillages of HTP may either generate explosion, fire or dilute HTP may enter groundwater and surface water bodies.

Mitigation

Management of potential pollution events will be addressed through the following processes described in the impact above *"Chemical pollution of ground and surface waters arising from standard materials use during launch activities, impacting water quality and dependent receptors".* Figure 17.6 illustrates the key pollution control and management locations within the development. Measures include (as described above):

- Regulatory Compliance;
- Client Appraisal / Contractual Agreement;
- Testing and Maintenance Schedule;
- Transport and Storage
- Launch Preparations;
- Pollution Management; and
- Post-Launch Protocols.

Additional Pollution Control Measures

Appendix 17.1 Outline Hazardous Materials Management Plan (HHG04) describes the approach to storing and managing HTP. In addition to the measures specified for standard launch activities, the containment tank will be partially filled with water from the water storage tank adjacent to the byre within the farmstead complex. The launch pad sump and soakaway will be isolated and a sprinkler-based water deluge system surrounding the launch pad will also be connected to the pumped water storage tank after the containment tank is partially filled and tested prior to the launch.

The sizing of the containment tank is based on the requirements to dilute approximately 1.4 tonnes of HTP to less than 2% i.e., approximately 47.5 m^3 (47,480 litres) of water. The containment tank has been sized to have a maximum of 63.5 m^3 (63,500 litres) to provide an adequate safety factor for dilution requirements.

Should large quantities of HTP be spilled during fuelling operations, the deluge sprinkler system will be remotely operated to drench the pad with water and remove the risk of explosion / fire. Effluent will be conveyed to the (isolated) sump and the perimeter drainage channel, where dilute HTP will be conveyed to the pre-filled containment tank for further dilution and storage. The same operation will apply to any firefighting water applied to the site under circumstances of an explosion or fire, with fire deluge water contained within the pad structure and directed to the sump / channel.

Post Launch Protocols

Under circumstances where the spillage has comprised dilute HTP only, the discharge will be captured in the containment tank system and will be allowed to degrade naturally to water and oxygen via the covered, but ventilated tank system over time until the appropriate dilution factor is reached (likely to be < 2%). A monitoring system will provide feedback on concentration of hydrogen peroxide and volume of the tank until it reaches an acceptable threshold to discharge to soakaway and will be subject to controlled discharge over defined period of time. The appropriate route for either a registration or licence for the soakaway will be agreed with SEPA, and in line with the Water Environment (Controlled Activities) (Scotland) Regulations 2011. A contingency option for disposal – should additional contaminants be present in the stored effluent – will be tanked removal by a specialist waste contractor. The SO will be responsible for the emptying and disposal of any fuel/water mix contained in the underground storage tank (HHG04).

Assessment of residual effects

Magnitude of impact

During operation, launch vehicles (LV) have potential to arrive on site, fully pre-loaded with both fuel and oxidiser components or require partial / complete fuelling on site. Mitigation has been outlined to incorporate pollution control arising from initial analysis of fuelling procedures proposed by the LO as part of site contract. The licensing requirement for the spaceport and each launch event, in addition to the standard meetings with WIEPCG will provide a regulated mechanism for assessing, reviewing and monitoring compliance for pollution events.

During standard fuelling operations, systems will be in place to monitor any loss of containment at the fuel source. Spillage volumes are likely to be low under the automatic monitoring systems and manual standby systems in place. The collection and disposal proposals remove the potential for spillages to enter the surrounding habitats, and subsequent groundwater. The magnitude of impact of a spillage, with mitigation measures is anticipated to be **very low**.

Significance of residual effects

The hydrogeology and groundwater vulnerability of the area surrounding the launch pad is assessed of **high** importance. With the implementation of proposed mitigation and management measures the magnitude of the impact is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects, which are **not significant.**

17.11.5 Chemical pollution of ground and surface waters arising from accidental spillages associated with the post launch storage of hazardous materials

Impact overview (without mitigation)

Residual infrastructure and materials (including fuels and oxidisers) may remain following the fuelling of a LV. These will require removal from the launch pad prior to a launch event. Residual materials are expected to be in significantly smaller quantities or absent from the containerised fuelling system. However potential impacts on surface waters, which

support a range of ecological receptors and groundwater still have potential to occur from the post launch storage of fuelling infrastructure.

Mitigation

Regulatory obligations (R02) require consideration of all stages of fuel management, storage and handling to enable a licence to be issued for a launch.

A dedicated post launch fuel storage area for up to two containers is proposed adjacent to the vehicle turning area adjacent to the farm building complex, this site will only be used following a launch (Figure 17.6). The area is located approximately 200 m from the nearest surface waterbody. Materials will be enclosed within the container systems as outlined in Appendix 17.1: Outline Hazardous Materials Management Plan (HHG04).

Assessment of Residual Effects

Magnitude of Impact

Residual materials will be at significantly lower volumes, or absent following fuelling. Residual materials will be contained within the existing containerised fuelling infrastructure, which incorporate controlled containment of leaks, spills and volume sensors. Relevant safety measures, should any hazardous materials remain, will be effective (e.g., DSEAR, Safety Clear Zone and associated security). The magnitude of impact of a spillage of residual fuels, with mitigation measures is anticipated to be **very low**.

Significance of Residual Effects

The hydrogeology and groundwater vulnerability of the area is assessed of **high** importance. With the implementation of proposed mitigation and management measures the magnitude of the impact is assessed to be **very low**. It is anticipated that there will be **negligible** residual effects, which are **not significant.**

17.11.6 Increased occurrence or severity of flooding from presence of project infrastructure

Impact overview (without mitigation)

An increase in hardstanding area associated with the development may exacerbate existing localised fluvial flooding, which currently impacts the main access road within the site. The road functions as the main access route for the public for recreational use of the site and is also part of a wider path network (contributing to the Outer Hebrides core path network) (Chapter 7: Community, Recreation and Tourism), in addition to an agricultural tenancy. Increased vehicular traffic across the causeway may contribute to the degradation or continued collapse of the existing culvert system, further restricting flow and increasing contributing of the upper loch to flooding. Site observations suggest that the site may be sensitive to storm surges and seawater inundation, although no records have been secured to validate these observations.

Mitigation

Design Mitigation

SEPA recommends that infrastructure is located on land higher than 4.73 m AOD[9]. Figure 17.2 illustrates the topographic survey outputs, confirming that infrastructure is located at an appropriate elevation to avoid potential coastal flooding impacts on infrastructure (GM01).

Culvert Design

Appendix 17.2 Water Management describes the existing status of the culvert at the causeway, which is currently restricted, causing the loch to act as two separate waterbodies. The assessment also identifies the potential for intermittent overtopping of the culvert, resulting in localised flooding of the road. Reports of flooding are supported by anecdotal evidence, and also validated conservatively by the analysis presented in Appendix 17.2. The development proposals will result in the replacement of the existing culvert (HHG02) with a pre-cast concrete box culvert (opening 2.1 m wide and 1.2 m high), significantly larger than the existing culvert (opening 0.3 m wide and 0.4 m high). The upgraded culvert will allow for a 470 mm freeboard above approximately loch level. During a 1:200 flood event, the loch levels are predicted to rise 350 mm, well within the 470 mm freeboard of the proposed culvert. A plan of the proposed culvert installation and diagram of the proposed installed culvert scheme against approximate water level is provided in Appendix 17.2 Water Management. The upgraded culvert will remove the current flow restriction and potential for overtopping and enable the loch to function as one hydrological unit. The appropriate authorisation under the Water Environment (Controlled Activities) (Scotland) 2011 Regulations will be secured from SEPA.

Drainage

A drainage plan is provided in Figure 17.5. Drainage from the pre-cleaned launch pad will be directed to the main soakaway[10] (10 m x 18 m x 1 m) when not in use (Appendix 17.1: Outline Hazardous Materials Management Plan, HHG04). Surface water from access road will be routed toward natural overland drainage via roadside ditches/swales. The proposed road drainage system will comprise a Type 1 verge allowing sheet flow of surface water from the road. Ditching/swales are proposed to follow the access road gradient. Check dams may be used to control the flow rate within the drainage channel as well as providing some attenuation capacity. The natural topography either side of the access will be used to identify appropriate outfall points along the route for roadside drainage to allow overland flow and filtration of surface water between outfall points and Loch Scolpaig. A smaller soakaway (1 m x 2 m x 0.3 m) will provide a drainage function for roof drainage from the upgraded byre.

Maintenance Regime

A maintenance regime managed by the SO will ensure period cleaning (removal of debris and blockages) from the Loch Scolpaig outfall channel and pipe to retain flow rates from the loch (HHG06). Periodic inspection of the culvert would also be undertaken to identify and remove any potential debris restricting flow.

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[9] This threshold is based on feedback from SEPA (2 June 2020), who calculated the approximate 1 in 200-year flood level for the area as 3.2 m AOD based on extreme still water level analysis using the Coastal Flood Boundary method. This does not take into account the potential effects of wave action, climate change or local bathymetry at this location. The expected sea level rise for the area is 0.93 m by 2100 based on the latest UK climate change predictions published in 2018. This allowance, plus a minimum freeboard of 0.6 m to account for uncertainties and the effects of wave action generates the level of 4.73 AOD.

[10] Sizing of the soakaway is based on a discharge period of 14 days, a tank capacity of 50,000 litres and the typical soakaway size for a 6-person house in sand.

Assessment of Residual Effects

Magnitude of Impact

The proposed installation of an adequately sized culvert will enable both loch systems to operate as one waterbody and reduce / remove the existing localised flooding issue, resulting in a permanent improvement to the hydrological function of the loch and reduction of localised flooding. The impact is assessed to be a **medium** magnitude of beneficial change to the current hydrological character of the loch system. Access to the site will be maintained for recreational users, grazing tenants and clients of spaceport infrastructure.

Assessment of Significance

The flood risk on site is classified as **low** importance (flooding issues localised around Scolpaig Loch). The impact is assessed to be a **medium** magnitude of change to the current hydrological character of the loch system. It is anticipated that there will be **minor** residual effects which are expected to be **not significant (beneficial).**

17.12 CUMULATIVE EFFECTS

No other proposed or recently consented projects subject to EIA have been identified within the study area. Cumulative effects have been scoped out of the assessment for this topic.

17.13 ASSESSMENT SUMMARY AND CONCLUSIONS

The Project is located within a low-lying area formerly used for the rough grazing of sheep and cattle. The surrounding topography is dominated by the Beinn Scolpaig hillock to the northeast (88 m AOD), Beinn Riabhach (177 AOD) to the south east. The study area is located within the North Uist coastal catchment, with localised drainage dominated by Beinn Scolpaig which feeds the main waterbody on the site, Scolpaig Loch, via a series of linear drainage channels. Runoff to the study area is also generated by Beinn Riabhach.

A range of supporting surveys were undertaken to determine the hydrological, geological and hydrogeological character of the site, including an assessment of GWDTE based on an NVC survey, topographical assessment, trial pit excavations, a flood risk assessment and a third-party review of the hazardous materials management to identify further pollution control and management measures. Desk based assessment and consultation also informs the baseline characterisation of the site.

Potentially significant effects on surface waters (Loch Scolpaig) have been identified in relation to construction, and a number of operational aspects of the development. During construction, the existing culvert forming part of the causeway will be replaced by a pre-cast box concrete culvert. The replacement of the culvert has potential to increase sedimentation of the loch system, classified as high importance in terms of water quality. An outline method statement has been provided outlining the pollution control measures to reduce sedimentation to the loch during the culvert replacement. No concrete batching will be undertaken on site, with cement pouring operations limited to the launch pad, containment tank and water tank. A pre-cast box culvert will remove any concrete pouring operations adjacent to the loch. Sedimentation associated with the installation of the culvert is expected to have a **minor (adverse)** impact on loch water quality and is **not significant**.

The structure of the existing causeway and culvert system across Loch Scolpaig currently restricts the movement of water between the two sides of the loch. Subsequently each loch ('upper' and 'lower' systems) behave semi independently of each other and are assessed to represent two different sub catchments, in addition to exacerbating localised flooding at the road. The replacement of the culvert is anticipated to remove periodic flooding of the road and

unite the two lochs into one hydrological system. Site infrastructure and storage locations are located above threshold height contours for flooding. The replacement of the culvert is expected to have a **minor (beneficial)** impact on loch hydrology and site flood risk and is **not significant**.

A range of materials may be stored temporarily at the site, some with hazardous properties. The material requirements will vary substantially between each LV. A full materials inventory of every likely material and the maximum volumes expected has been collated to determine the worst-case scenario. An Outline Hazardous Materials Management Plan has been collated to describe the general storage and pollution control proposals for materials. Pollution from the storage and on-site movement of materials on site are concluded to be **negligible (adverse)** and **not significant,** with proposed mitigation.

The importance of groundwater is classified as high. Potentially significant impacts on both groundwater and surface waters were identified in relation to spillages or leaks during storage of materials and LV fuelling operations. Each launch will require a license from the regulator (UK Civil Aviation Authority) based on a comprehensive safety case, including a 'ground safety analysis' which covers the transport, use and storage of hazardous materials, with a focus on managing catastrophic events. Each LO will also have in house / proprietary systems for managing pollution control of the selected propellant mix specific to the LV and LO fuelling strategy. Proposals for pollution management will be presented to the WIEPCG and further consultation with SEPA will be undertaken, if necessary for each launch.

A dedicated pollution containment system and associated management arrangements have been designed into the infrastructure to accommodate typical / standard spillages arising from the site. A drainage and containment tank system has also been developed for non-standard launch activities involving high quantities of HTP, and to contain firefighting water runoff should there be a fire / explosion. With the proposed pollution control measures, impacts on surface water and groundwater are concluded to be **negligible (adverse)** and **not significant,** with proposed mitigation.

No abstractions were recorded within the catchment of the development, nor any other licenses under the Water Environment (Controlled Activities) Regulations 2011. One well was identified north of lower Loch Scolpaig, consultation with the CnES EHO indicated that although this may have been used in the past, there were no formal records of the well as a private water supply and is unlikely to be suitable for as a potable water supply. There are unconfirmed reports of a historic (unused and unrecorded) private water supply although the location of this is unverified. Other water users, licences and PWS are scoped out of the assessment.

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18 AIR QUALITY AND HEAT

CONTENTS

18 AIR QUALITY AND HEAT

18.1 INTRODUCTION

This chapter of the EIA Report describes the potential impacts that may arise from changes in air quality and heat emissions associated with up to ten sub-orbital launch events introduced as a result of the Project. The assessment includes a summary of relevant air quality legislation and policy drivers, baseline air quality conditions, and the potential impact from foreseeable launch scenarios.

The scope of this chapter is limited to potential impacts on off-site human health and ecological receptors. This reflects normal good practice in air quality impact assessment and reflects the protections provided by legislation in respect of air quality, as set out in Section 18.3.

The assessment considers the impacts of emissions of exhaust gases and heat from rocket launches. No other sources of pollution, such as localised, short-term construction plant emissions and dust during construction and from road traffic associated with the operation of the Project are considered, on the basis that the impacts associated with these other sources are considered negligible, and not significant in term of the EIA Regulations.

An assessment of potential cumulative impacts of the proposed Project with other proposed and existing developments within the study area has been scoped out, as no other substantial sources of emissions of pollutants within 5 km of the Project site have been identified.

The potential impacts from rocket exhaust emissions are based on detailed dispersion modelling undertaken by Cambridge Environmental Research Consultants (CERC). The full report associated with this assessment is provided as Appendix 18-1: Detailed Dispersion Modelling. This EIA chapter was undertaken by Mabbett & Associates Ltd and Arcus and summarises the key findings from the analysis, and reference should be made to Appendix 18-1 for further details on methodology and analysis.

18.2 SITE LOCATION AND SURROUNDING AREA

The site is located at Scolpaig Farm on North Uist in the Outer Hebrides. There are several designated sites within a few kilometres of the site, including Special Protections Areas (SPAs), Special Areas of Conservation (SACs) and Sites of Special Scientific Interest (SSSIs). The location of the site, the site boundary, and the location of the launch site, is shown in Figure 18.1, including nearby SPAs, SACs and SSSIs, respectively.

Note that there is a further designated site, West Coast of the Outer Hebrides SPA, immediately adjacent to the launch site. The habitat of this site is entirely marine, with no terrestrial features, vegetation or freshwater habitats, and has therefore not been considered further in this assessment.

The potential impact on human health considered within this assessment focuses on identifying the maximum impact off site (i.e., outwith the ownership boundary of Scolpaig Farm), and this is taken as the worst-case impact at any human health receptor – specific receptors (e.g., residential properties) have not been included in the assessment. In order to undertake the assessment, a modelled grid was created around the site. The extent of this grid (study area) was defined during dispersion modelling to ensure that the worst-case impacts off-site were captured/assessed. The air quality standards being used to undertake the assessment (see Section 18.9.1) do not apply within the CnES ownership boundary (Scolpaig Farm boundary), hence their omission from the assessment.

Assessing the potential impact on designed sites followed a similar approach. The dispersion model was used to predict the area of maximum impact within each designated site boundary, and it was this area which was assessed. The air quality standards being used to undertake the assessment (see Section 18.9.2 and Section 18.9.3) do not apply outwith the boundary of these designated sites, hence their omission from the assessment. The baseline in these areas is discussed in Section 18.10.

18.3 LEGISLATIVE FRAMEWORK AND POLICY CONTEXT

Legislation and policies relevant to this assessment are set out below.

18.3.1 Air Quality

Guidance and Standards

The Space Industry Act 2018, which creates the legal framework for spaceflight activities to be carried out from the UK, requires launch or spaceport licence applicants to submit an assessment of environmental effects (AEE) as part of their application, and air quality is one of the key aspects of the AEE. The Department for Transport and UK Space Agency have prepared various guidance documents related to the act, to include:

- Guidance to the regulator on environmental objectives relating to the exercise of its functions under the Space Industry Act 2018; and
- Guidance for the assessment of environmental effects.

These set out a framework for the assessment of emissions to air from proposed spaceports. The framework is generally consistent with other UK air quality assessment guidance, such as that of the Institute of Air Quality Management (IAQM) (2017), "Guidance on land-use planning and development control: Planning for air quality 2017 v1.2" and the Department for Environment Food & Rural Affairs (Defra) (2018) Local Air Quality Management Technical Guidance (Tg16).

The aim of the AEE with regard to air quality should be to demonstrate that emissions associated with spaceflight activities, and their contributions to local air quality, do not result in statutory air quality standards set both nationally and locally, being exceeded.

The objectives adopted in Scotland for the purpose of Local Air Quality Management are set out in the Air Quality (Scotland) Regulations 2000, the Air Quality (Scotland) Amendment Regulations 2002 and the Air Quality (Scotland) Amendment Regulations 2016. Similar targets are set at EU level, where they are called limit or target values. These are set out in the European 2008 Ambient Air Quality Directive (2008/50/EC) and transposed into Scottish legislation by the Air Quality Standards (Scotland) Regulations 2010 (as amended in 2016). They form part of The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.

On 29 July 2021, the Space Industry Regulations 2021 also came into force. There is no mention of air quality or environmental effects within. There is some limited mention of heat (thermal radiation), discussed further below.

Scottish Planning Policy

On a national level, air quality is a material consideration in planning decisions.

National Planning Framework 3

The National Planning Framework 3 (NPF3) (Scottish Government, 2014) is a long-term strategy for Scotland; designed to support sustainable economic growth and support plans for infrastructure investment across the country. The NPF3

states that it "*brings together plans and strategies in economic development, regeneration, energy, environment, climate change, transport and digital infrastructure to provide a coherent vision of how Scotland should evolve over the next 20 to 30 years. In turn, this vision will help to inform future policies and prioritise investment decisions*." The NPF3 is accompanied by an Action Programme, which keeps up-to-date information and data on the implementation of the NPF3.

Scottish Planning Policy

Scottish Planning Policy (SPP) (Scottish Government, 2020); the NPF3 works in conjunction with the SPP, which is designed to consolidate separate policies on sustainable development, community engagement, and the natural environment, into one policy document, but did not materially change policy. The SPP includes guiding principles on how planning can take into account the impacts of a new development on air quality by "avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality." The SPP states that the potential impact of a new development on air quality is to be taken into account. The SPP states that "*plans should set out the factors that specific proposals will need to address, including disturbance, disruption and noise, blasting and vibration, and potential pollution of land, air and water.*"

Comhairle nan Eilean Siar Policy

There are currently no Air Quality Management Areas (AQMAs) identified in the Western Isles and there is no Air Quality Strategy in place. CnES propose to have an air quality strategy in place by 2022.

18.3.2 Heat

The Space Industry Regulations 2021 include some limited reference to heat (as thermal radiation only) within Clause 37 as reproduced below:

> ***37***.
> *(1) An applicant must, unless paragraph (2) applies, show that it will be able to put in place an appropriate safety clear zone to ensure that the risk to any person from blast overpressure, fragmentation debris,* ***thermal radiation*** *or toxic release will be as low as reasonably practicable during any hazardous pre-flight and post-flight operations.*
> *(2) Paragraph (1) does not apply if the safety case demonstrates that a safety clear zone will not be required for the hazardous pre-flight or post-flight operations.*
> *(3) For the purposes of paragraph (1), an appropriate safety clear zone is one that is determined by the assessment made in the applicant's safety case under regulation 36(7).*

Clause 36(7) is reproduced below:

> ***36.***
> *(7) Taking into account the findings of the assessment required under paragraph (5), the applicant's safety case must, except where regulation 37(2) applies*
> *(a) identify that a safety clear zone is required,*
> *(b) define the area that will comprise the safety clear zone,*
> *(c) stipulate the times that the safety clear zone will be in place,*
> *(d) set out the measures the applicant will take to ensure that a safety clear zone is put in place and is monitored, and*
> *(e) set out the arrangements the applicant will have in place to ensure that no person, other than a person permitted to be present under regulation 157(3)(d), is inside a safety clear zone.*

Other than this limited comment on safety clear zones with regard to thermal radiation, there is little reference to heat emissions within the current legislation or associated guidance associated with the UK space industry for developments of this type and size. Given this gap, this assessment references guidance developed by the United States Department of Transportation (DoT), Federal Aviation Administration (FAA and DoT, 2016 & FAA, 2011) and Department of Defence (DoD, 2012) where appropriate, in accordance with other documentation to ensure good practice is maintained:

- Federal Aviation Authority (FAA) (2011) Calculation of Safety Clear Zones for Experimental Permits: guidance on calculation of safety clear zones for hazardous pre-flight and post launch operations; and
- FAA (2016) Appendix E, Aeronautics and Space: FAA guidance on the appropriate separation between launch sites and public infrastructure in relation to commercial space transportation.

18.4 SUPPORTING SURVEYS, STUDIES AND LITERATURE

Cambridge Environmental Research Consultants Ltd (CERC) were commissioned to carry out a dispersion modelling assessment of a range of typical rocket exhaust emissions based on representative propellant mixes. The analysis comprised of the following stages:

- **Review of Representative Propellants** - a review of actual propellant mixtures and an initial examination of the different rocket types that are expected to be launched at the site, and their different fuel/oxidiser mixes, to determine the range of worst-case scenario propellants;
- **Phase 1 Screening Assessment** - a literature survey was carried out to determine the relevant pollutants and to quantify the emissions. A screening-level dispersion modelling assessment of the emissions were carried out using the ADMS 5 model (version 5.2.4.0). This determined the scope and methodology of a full, detailed dispersion modelling assessment; and
- **Phase 2 Detailed Dispersion Modelling** - detailed dispersion modelling was carried out using hourly-sequential meteorological data from a suitable meteorological station and included a full assessment of impacts on relevant sensitive receptors. An assessment of the significance of the impacts using methodology outlined in guidance from the Institute of Air Quality Assessment (IAQM), was undertaken, including both human health[1] and ecological[2] impacts, including impact descriptors for individual receptors. The source term, including the initial temperature and dimensions of the exhaust cloud, were refined based on the specific temperatures and density of the exhaust gases of the two key rockets at the point of the nozzle exit.

The outputs and results of the screening and detailed dispersion modelling process are combined and set out in Appendix 18-1: Detailed Dispersion Modelling.

18.5 CONSULTATION

The key points raised by stakeholders during scoping and pre-application consultation regarding air quality and heat are presented in Table 18-1.

[1] https://iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

[2] https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

Table 18-1 Key issues raised by stakeholders during consultation

Stakeholder	Comment	Response/Action Taken	Section cross-reference
Environmental Health, CnES, Scoping Report Response, 2018	It is accepted that assessment of construction dust may be 'scoped out' of the EIA as being unlikely to have a significant impact on the environment, but the advice of Comhairle Environmental Health should be sought regarding control and mitigation measures that may be required.	The Project has been substantially reduced in footprint and scope to accommodate sub-orbital launches (as opposed to orbital launches). Standard dust suppression measures are anticipated for construction.	Chapter 3: Site Selection and Alternatives
Environmental Health, CnES	It is accepted that assessment of construction and operational phase traffic emissions may be 'scoped out' of the EIA as being unlikely to have a significant impact on the environment, but the advice of Comhairle Environmental Health should be sought regarding control and mitigation measures that may be required.	Traffic and transport have been scoped out as an EIA topic following consultation with CnES. Given traffic movements during the construction and operational phases are assessed as not significant, the emissions arising from traffic are also not assessed to be significant.	Chapter 11: Traffic and Transport
Environmental Health, CnES Response to Planning Submission (19 August 2020)	Indicated that normal noise and dust conditions would be applied and that assessments of the impacts of these could be scoped out of the EIA.	A dust management plan for the construction phase is anticipated, and this is likely to be required via a planning condition.	N/A
Environmental Health, CnES, 10/12/2020	Initial review of the Air Quality Report was undertaken and it was indicated that overall volumes of emissions should be set out in addition to the percentages.	The overall volume of emissions has been included in this chapter.	Section 18.11 (below)
SEPA, 15/12/2020	Confirmation that PPC regulations do not apply to rocket launches and SEPA will not control any aspect of noise / air quality for this assessment.	None required	N/A
SEPA, 15/12/2020	Reiterated that it should be demonstrated that the launch pad is appropriately sized to protect surrounding soils and habitats from heat.	Mitigation for potential heat impacts is provided by distance from the heat source, and in particular the hot rocket exhaust gas. The blast deflectors (AQH04) are effective mitigation for potential heat effects on surrounding vegetation and vegetation monitoring (AQH01) would allow adaptive mitigation should any effects be observed.	N/A

Stakeholder	Comment	Response/Action Taken	Section cross-reference
Public Representations to 2019 Planning Application	(Summarised and collated from responses to the previous application): Concern over the potential impact of emissions from rocket launches on ecological receptors including birds and areas designated for birds and other wildlife.	This chapter (and the associated detailed assessment that has been undertaken) assesses the potential impact at relevant ecological receptors.	Sections 0 and 18.14 (below)

18.6 DATA GAPS AND UNCERTAINTIES

The propellant/oxidiser combinations set out in Table 18-5 are based on real launch vehicles (albeit some are still in development) and reflect the scope of vehicles most likely to be used at the Project site, however other potential propellants mixtures may be adopted by individual clients. Should additional vehicles be proposed for use in the future which are notably different from those used within this assessment (and are considered sufficiently high risk), further assessment (detailed modelling) will be undertaken in advance of any launches to confirm the impact at receptors is acceptable. This will be captured via mitigation measure R01 (see Section 18.12 for further information).

From those currently considered, no single vehicle is the worst case. The maximum emission rate (mass) for each pollutant of concern has been estimated for each, and this confirmed that two of four vehicles considered provide the maximum emission rate for the five pollutants of most concern. It is these maximum emission rates which were progressed to full modelling and therefore the assessment aims to represent the (currently understood) worst-case scenario in terms of emissions.

Whilst the heat emission profile of vehicles launched during the operational phase of the Project will vary from rocket to rocket, they will typically exhibit heat emissions characteristics of rockets using fuel/oxidant mixtures. The operational schedule of 10 launches per year has been assessed and is expected to be a worst-case scenario.

The dispersion model prepared does not account for the blast deflector or (where deemed necessary) the launch pad protection which will be installed to direct exhaust gases (and heat) from the surrounding gravel area and wider vegetation to facilitate dispersion (see mitigation measure AQH01 in Section 18.12 for further information). Given these measures are taken to aid dispersion, their exclusion is viewed as a conservative approach.

There are no specific criteria for the assessment of significance of impacts of heat emissions, conclusions are drawn based on the professional judgement of the author, based on a review of the relevant literature and the expected heat emission profiles for launches.

Actual impacts from any given launch will depend on many factors specific to the time of launch, and these cannot be precisely predicted in advance. Generally, a worst-case approach to these has been taken in this chapter. This includes assumptions with regard to the mass of emissions (using maximum pollutant emission rate from any scenario in each instance), meteorological conditions (three years of hourly data have been used) and the location of human health receptors (assumed to be present at the location of maximum impact outwith the site boundary).

18.7 MODELLING METHODOLOGY

Screening and dispersion modelling of a range of typical rocket exhaust emissions based on representative propellant mixes was undertaken and reported in full in Appendix 18-1: Detailed Dispersion Modelling. The assessment utilised

ADMS 5 model (version 5.2.4.0) and considered four fuel/oxidiser mixes following a review of a range of typical fuel / oxidiser combinations.

Propellant Analysis and Modelling Approaches

A literature review based on actual propellant mixes examined the main exhaust pollutants from the propellant mixes and the nature of the likely impacts. From available technical information and the literature review, the following have been identified as the main emissions of concern:

- Hydrogen chloride (HCl);
- Aluminium oxide (Al_2O_3);
- Particulate matter (PM);
- Carbon monoxide (CO); and
- Oxides of nitrogen (NOx).

The literature review also considered several models that have been used to simulate the initial behaviour of rocket exhausts based on this approach, including methodologies used by NASA to assess the impact of rocket exhaust clouds. A key aspect of these methodologies are robust calculations of the initial plume rise. This initial plume rise effectively determines the stabilisation height of the exhaust cloud. ADMS includes a sophisticated, iterative plume rise module that can simulate these important plume buoyancy effects.

Modelling Methodology

The maximum (100^{th} percentile) values of hourly average concentrations and deposition rates were output from ADMS, which essentially means that the release of pollutants is assumed to take place during the hour with the worst-case meteorological conditions. The dispersion of rocket exhaust plumes close to ground level is often described in terms of the concept of a 'stabilised cloud'. This is essentially the point after which the initially hot emissions have risen in the atmosphere, mixed with air, cooled, and reached a stabilised height.

Modelling was carried out using hourly sequential meteorological data obtained from the Met Office South Uist Range site, for the three years 2018 to 2020 inclusive. South Uist Range is located approximately 32 km to the south of the proposed facility, in a similar location with respect to the coast.

The release was modelled in ADMS as a single, large point source, close to ground level, with the initial temperature of the exhaust input, to allow the plume rise module to determine the initial rise of the cloud. The model predicted the maximum Process Contribution (PC)[3] to the ground level concentrations of each relevant pollutant from the launch site. The PCs represent the calculated Time-Weighted Average (TWA) concentration values. In determining the location of the maximum impact, only off-site areas were included; that is, concentrations within the boundary of Scolpaig Farm were excluded.

18.8 ASSESSMENT METHODOLOGY

18.8.1 Approach to Assessment

The general EIA process and methodology is detailed in Chapter 6: Approach to EIA. Criteria specific to this chapter are set out below, based on the approach to assessing significance for human health and ecological receptors:

[3] The Process Contribution, PC, is the contribution to impact at an area/location from the site/development (process) being assessed. It does not account for the existing baseline/ambient air quality.

- Air Quality (Concentrations in Air);
- Air Quality (Depositions to Ground); and
- Heat.

Air Quality (Concentrations in Air)

The concentrations in air are mostly used for impact at human health receptors, however, the concentration of NO_x is also used to assess the impact at ecological receptors.

Various guidance was used to support the air quality assessment. As well as the Defra and Institute of Air Quality Management (IAQM) guidance which is commonly used for air quality assessments within the UK. The following was also referenced:

- AQTAG 06, Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air, Environment Agency, March 2014

The significance of each emission release was assessed by comparing the PC to the relevant air quality objective. The maximum concentration of these emissions is predicted at the boundary of Scolpaig Farm, and compared to applicable air quality standards, to allow the potential impact of rocket exhaust emissions to be better understood. The impact at ecological receptors was also assessed. The applicable air quality standards are as outlined in Section 18.9 below.

For long-term objectives, the release was screened out from further assessment if the PC is less than 1 % of the air quality objective. For short-term objectives, including percentiles, the release is screened out from further assessment if the PC is less than 10 % of the air quality objective. This is in line with commonly accepted air quality assessment good practice[4].

Where a release is not screened out, the Predicted Environmental Concentration (PEC) for that substance was calculated. For long-term objectives, the PEC was calculated by adding the PC to the estimated background concentration of the emission. For short-term objectives, including percentiles, the PEC was calculated by adding the PC to twice the estimated background concentration of the emission. The inclusion of background concentration data in these instances is to allow the prediction of the total combined impact (i.e., PC + background) for comparison against relevant air quality standards.

Further details of the methodology used can be found within Appendix 18-1: Detailed Dispersion Modelling.

Air Quality (Deposition to Ground)

The levels of deposition to ground are used to assess impact at ecological receptors only.

Material from a plume can be lost to the ground, at the surface of the ground (dry deposition), and through washout and rainout with precipitation (wet deposition). Deposition of pollutants may lead to adverse effects at conservation areas due to acidification and nitrogen eutrophication.

[4] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

Modelling was carried out to predict the PC of nitrogen and acid deposition rates at designated sites. For nutrient nitrogen impacts, the relevant emission is NO_2; for acidification, the relevant pollutants are NO_2 and HCl. The PCs represent the calculated TWA concentration values.

The significance of the total pollutant release was assessed by comparing the PC to the relevant critical loads[5]. For long-term impacts, as in the case of deposition, NatureScot considers the release to be insignificant (i.e., screened out) if the PC is less than 1 % of the critical loads. Site relevant critical loads (CL) are derived from:

- Scottish Natural Heritage (SNH) Considering air pollution impacts in development management casework. Guidance. April 2017.

If the PEC of a pollutant does not exceed the CL for a feature, then the additional pollution predicted to arise from the development is unlikely to have an impact on a feature and can be screened out the assessment.

Heat

There are no specific criteria for the assessment of significance in terms of impacts of heat emissions, conclusions are drawn based on the professional judgement of the author, based on a review of the relevant literature and the expected heat emission profile of the launch.

18.9 AIR QUALITY STANDARDS

18.9.1 Human Health (Concentrations in Air)

A list of relevant air quality standards for air emissions is available on the UK Government Air Quality Objectives and Air Quality in Scotland's Standards web page. Table 18-1 shows the Ambient Air Directive (AAD) Limit Values (Air Quality Objectives, AQOs) for relevant pollutants, and
Table 18-2 shows the Environmental Assessment Levels (EAL) for relevant pollutants.

There are no AAD or EAL values for aluminium oxide (Al_2O_3). An 8-hour average Workplace Exposure Limit (WEL) value of 4 mg/m^3 (4,000 µg/m^3) for Al_2O_3 in the form of inhalable dust has been used here to derive an indicative threshold of 400 µg/m^3 for environmental assessment screening, by using the commonly used approach of reducing the WEL by a factor of ten.

Table 18-1 AAD limits values for relevant pollutants

Substance	Reference period and allowed exceedances	Value (µg/m^3)
NO_2	Annual mean	40
	Hourly mean not to be exceeded more than 18 times per year	200
PM10	Annual mean	18
	Daily mean not to be exceeded more than 7 times per year	50

[5] A Critical Load is the minimum rate of deposition of a pollutant at which a habitat may be affected (kg/ha/yr). Critical Loads are key to screening the impacts of nitrogen and acid deposition, and vary depending on the sensitivity of the habitat affected (SNH, 2017)

Substance	Reference period and allowed exceedances	Value (µg/m³)
PM2.5	Annual mean	10
CO	8-hour running average across a 24-hour period	10,000

Table 18-2 EALs for relevant pollutants

Substance	Reference period	Value (µg/m³)
HCl	Annual limit	N/A
	Hourly limit	750

18.9.2 Ecological Impacts (Concentration in Air)

Critical levels are used for the protection of vegetation and ecosystems. These concentration standards are applicable at sensitive habitats, such as those described in Section 18-3. Values for relevant emissions are summarised in Table 18-3.

Table 18-3 Critical levels for the protection of vegetation and ecosystems

Substance	Reference period	Critical level (µg/m³)
NOx	Annual mean	30
	Daily mean	75

Potential impacts on ecological receptors are also considered within Chapter 14: Ornithology and Chapter 15: Terrestrial Ecology.

18.9.3 Ecological (Deposition to Ground)

The Air Pollution Information System (APIS) website gives critical load values and other information for specific SPAs, SACs and SSSIs.

Nitrogen: applicable habitat types, critical loads and total nitrogen deposition values at the local designated sites outlined in Section 18-3 have been identified. A wide variety of habitat types/critical load classes are present. Nitrogen critical load ranges vary between 3 – 10 and 20 – 30 kg N $ha^{-1}yr^{-1}$. Total nitrogen deposition varies between 3.7 – 5.1 kg N $ha^{-1}yr^{-1}$. Further details – to include MaxCLminN, MaxCLmaxN, MaxCLmaxS, MinCLminN, MinCLmaxN, MinCLmaxS and total acid deposition values for 11 different habitat types - can be found within Appendix 18-1: Detailed Dispersion Modelling.

Acid: applicable habitat types, critical loads and total acid deposition values at the local designated sites outlined in Section 18-3 have been identified. A wide variety of habitat types/critical load classes are present. Acid critical load ranges and total acid deposition vary considerably. Further details can be found within the full dispersion modelling report (Appendix 18-1).

18.10 BASELINE DESCRIPTION

The Project site is part of the former Scolpaig Farm, which was purchased by CnES on 6th June 2019, having formerly been under private ownership. The total land area of Scolpaig Farm is approximately 276 ha and the total application site area is 1.8 ha.

18.10.1 Land Use

The proposed Project is situated in the north-west corner of North Uist and is bounded to the north and west by the Atlantic Ocean and to the south by the A865 road. The site is located approximately 20 km from the ferry port of Lochmaddy and 18 km from Benbecula Airport. The north-west corner of North Uist consists of rugged coastline with steep cliffs and occasional white sandy bays. The land is dominated by three small hills; Beinn Scolpaig (88 m), to the north of the A865, and Beinn Riabhach (117 m) and Carra-crom (120 m), to the south. The area consists of a mix of rough grazing land, mainly used for open grazing of sheep and cattle, machair, peat bog and sandy shoreline.

The site is unoccupied; however, the area is popular with walkers, both visitors and locals, throughout the year, with recreational use increasing following transferal of ownership to CnES. A path network (contributing to the Wider Path network) follows the coastal perimeter of the site with connections south to the A865 via Scolpaig Farm (following the farm access track) and also Griminish to the east (following the access track). The latter routes are also connected via a path that traverses Beinn Scolpaig (see Chapter 7: Community, Tourism and Recreation and Figure 7-1). The A865 forms part of National Cycle Network Route 780 (The Hebridean Way). The closest residential property is An Ataireachd Ard approximately 670 m south of the planning boundary. There are no commercial properties in close proximity to the site.

18.10.2 Air Quality Management Areas

Where exceedances of air quality standards are considered likely, the Local Authority must declare an Air Quality Management Area (AQMA) and prepare an action plan setting out the measures and objectives to address air quality. CnES currently has declared no Air Quality Management Areas (AQMAs), and monitoring of any kind was ceased first in 2007 and again in 2016 when data collected in 2015/16 showed there was no potential for exceedances of standards within the Council's jurisdiction and there was no need to restart monitoring (CnES, 2017).

18.10.3 Ambient Pollutant Levels

Background concentrations of NO_2 and PM10 are available from the Air Quality in Scotland's Data for Local Authority Review and Assessment purposes website and are shown in Table 18-4 for the location of the maximum human health impacts (as described in Table 18-9).

Gaseous HCl measurements are measured as part of the UK Eutrophying & Acidifying Network (UKEAP): Acid Gas and Aerosol Network. The nearest HCl monitoring location to the Scolpaig site is Polloch, approximately 150 km to the south-east of Scolpaig. The average value of the available measurement values is 0.135 µg/m^3.

There is no local CO background data available on either the Scottish or UK sites.

For habitats assessment (i.e., the existing level of deposition on habitats), the background data is taken from the APIS website and is included as required in Sections 18.9.3 and 18.14 (and in full in Appendix 18-1).

Background concentrations of Al_2O_3 are assumed negligible.

Table 18-4 Background concentrations from background maps

Location (x,y) of grid square centre	NO_2 (µg/m^3)	PM10 (µg/m^3)
72500, 875500	1.2	4.9

18.11 SUMMARY OF AIR AND HEAT EMISSIONS

18.11.1 Fuel Mixtures

The purpose of the Project is to facilitate the launch, up to 10 times per year, of sub-orbital launch vehicles. Following a review of the range of propellant mixtures expected on site, four representative fuel/oxidiser propellant mixes are evaluated:

- Hydroxyl Terminated Polybutadiene (HTPB) / High Test Peroxide (HTP);
- High Test Peroxide (HTP) / Kerosene;
- HTPB and powdered ammonium perchlorate (AP), and powdered aluminium metal; and
- High Density Polyethylene (HDPE) / nitrous oxide (N_2O).

The process of oxidation coverts these compounds into hot exhaust gases in a small space and time period. The hot gases are initially at very high pressure, and these are free to mix with atmospheric gases in a downward direction at the base of the rocket. The pressures equalise very quickly by the exhaust gases moving downwards, creating an upward force on the rocket.

Table 18-5 summarises the total mass of propellent mix which is expected for each vehicle being considered.

Table 18-5 Fuel mixture summary

Vehicle	Propellant	Mass of Each Component	Total Mass (kg)
1	Kerosene	191	1,622
	HTP	1,431	
2	HTPB	10	70
	HTP	60	
3	N_2O	4	4.9
	HDPE	0.9	
4	Ammonium Perchlorate	-	100
	Aluminium Powder	-	
	HTPB	-	

Note that the total mass of the propellant is conserved during combustion, as the oxidant is part of the propellant itself, with no ambient air involved. Therefore, for the purposes of the following calculations, the total mass of exhaust is taken to be the total mass of the propellant.

18.11.2 Pollutants Summary

Table 18-6 summarises the key emissions of concern which have been identified from each of the fuel / oxidiser mixes. Table 18-7 shows a summary of the relevant air quality impacts to be considered for each of these pollutants.

Table 18-6 Pollutants to be considered for assessment, for each propellent

Propellant mix	Direct pollutants	Indirect Pollutants
HTPB / HTP	CO	NO_x

Propellant mix	Direct pollutants	Indirect Pollutants
HTP / Kerosene	CO	
AP / Al / HTPB	HCl, Al_2O_3, CO, PM	
HDPE / N_2O	CO	

Table 18-7 Air quality impacts to be considered, for each pollutant

Pollutant	Human health	Ecological	
		Concentrations	Deposition
HCl	Yes	No	Yes
Al_2O_3	Yes	No	No
PM	Yes	No	No
NO_x	Yes	Yes	Yes

The propellant with the likely worst-case total emission of each pollutant was selected. These are listed in Table 18-8, along with the highest estimated total emissions for each. Note that the total emissions represent the emissions over the whole trajectory of the rocket, not just at the initial stages close to ground level.

Table 18-8 Summary of worst-case total estimated emissions

Pollutant	Vehicle	Estimated Total Pollutant Emitted (kg)
HCl	1	21.4
Al_2O_3		28.4
PM		28.4
CO	2	87.6
NO_x		124

18.11.3 Heat

When the fuel/oxidiser propellant react, the reaction leads to the exothermic production of gases, with the resulting emissions being hot exhaust gas. Measured data about heat emissions from the specific rockets that are likely to be used at the Project are not currently available; however, in their report "Comparing Hydroxyl Terminated Polybutadiene and Acrylonitrile Butadiene Styrene as Hybrid Rocket Fuels", Whitmore, Peterson and Eilers (2013) have published data on exhaust plume exit temperature. The report describes both modelled and sensed temperatures. For the fuel mix used by a rocket typical of those proposed for the Project, the paper reports temperatures of 2,000 K to 2,600 K for the main reaction period, and lower temperatures outside these times. These higher temperatures are considered when assessing potential heat impact, noting that a lower temperature (1,429 ºC, or 1,702 K) was used as the source term (temperature at nozzle exit) during dispersion modelling.

18.12 MITIGATION

Ref.	Title	Description
R01	Regulatory Mitigation (Spaceport)	The Spaceport will be licensed and regulated under the Space Industry Act 2018 and Space Industry Regulations 2021. The Safety Case is the main way in which an applicant for a Spaceport Licence demonstrates compliance. The focus of the Safety Case is in managing potentially catastrophic events and is based on hazard identification /incident scenarios with corresponding measures to prevent or limit the consequences of an accident of incident to demonstrate that the risk is as low as reasonably practical (ALARP). An Assessment of Environmental Effects (AEE) also forms part of the licence application for the Spaceport and is taken into account by the Regulator (UK Civil Aviation Authority, UK CAA) in terms of deciding whether or not to grant a licence. Once the licence is granted, the Safety Case is used as the basis for ongoing monitoring, review and assessment. Reviews can also be triggered by a range of events including a change to the operations or infrastructure, or if new information relating to safety matters arises
AQH01	Blast deflection and pad protection	A temporary blast deflector and if necessary, launch pad protection will be installed around the launch pad to direct exhaust gases (and heat) from surrounding gravel area and wider vegetation.

18.13 IMPACT ASSESSMENT (HUMAN HEALTH)

The predicted impact for each pollutant is summarised below. The location of the maximum concentration is the same for all pollutants and is shown in Table 18-9 and presented in Figure 18-2 for each year of meteorological data.

Table 18-9 Location of the maximum PCs for each modelled year

Year	x	y
2018	72711	875119
2019	72673	875119
2020	72805	875065

18.13.1 Hydrogen Chloride

The maximum offsite hourly average HCl PC is 134 µg/m^3, 18 % of the air quality objective of 750 µg/m^3, calculated using meteorological data for the year 2020. Including the background concentration of 0.27 µg/m^3 (twice the annual average value), the maximum predicted PECs are well below the air quality objective of 750 µg/m^3.

Table 18-10 shows the maximum predicted PC to the ground level concentrations of hydrogen chloride (HCl), using meteorological data for all three years.

Note that there is no long-term standard for HCl.

18.13.2 Nitrogen Dioxide

As the short-term human health standard for NO_2 allows the hourly mean to be exceeded 18 times per year, then, provided there are fewer than 18 launch events per year, this standard cannot realistically be breached and was therefore not considered in this assessment. The maximum annual average offsite NO_2 PCs are **screened out** for all years.

Note that, as a conservative assumption, 100 % of the NO_x emissions were assumed to be in the form of NO_2. In addition, the location of this predicted concentration (which is adjacent to the site boundary) does not represent relevant exposure for the annual average standards, so this is also a conservative estimate of the impact.

Table 18-11 shows the maximum predicted PC to the ground level concentrations of NO_2 using meteorological data for all three years.

18.13.3 Particulates / Al_2O_3

The short-term human health standard for PM10 allows the daily mean to be exceeded 7 times per year; this standard, therefore, cannot be breached if there are fewer than 7 launch events per year. If there are more than 7 launch events, the daily standard could be relevant, and was included in the assessment.

The maximum offsite PM10 PC is 7.3 µg/m^3, 15 % of the daily average PM10 air quality objective of 50 µg/m^3, calculated using meteorological data for all modelled years. Including the background concentration of 9.8 µg/m^3, maximum predicted offsite PECs are well below the air quality objective of 50 µg/m^3.

The offsite PCs are **screened out** for the annual average PM10 and PM2.5 standards, and for the 8-hour average Al_2O_3 standard, for all years.

For a conservative assessment of PM10 and PM2.5 impacts, 100 % of the total particle emissions were assumed to be PM10 and PM2.5 in each case. The location of this PC (which is adjacent to the site boundary) does not represent relevant exposure for either the daily or annual average standards, so this is also a conservative estimate of the impact. Table 18-12 and Table 18-13 show the maximum predicted PC to the ground level concentrations of particulates and Al_2O_3, respectively, using meteorological data for all three years.

18.13.4 Carbon Monoxide

The maximum offsite concentrations are **screened out** for all years. Note that many sources suggest that CO would be rapidly converted to CO_2 under the high exhaust temperatures. The modelling assumption that the CO is not converted to CO_2, but that the CO emitted at the nozzle exit is conserved, is considered highly conservative.

Table 18-14 shows the maximum predicted PC to the ground level concentrations of carbon monoxide using meteorological data for all three years.

18.13.5 Summary Result Tables

The summary results for each assessment which was undertaken are provided below, for each meteorological year.

Table 18-10 Maximum predicted offsite HCl concentrations (µg/m³)

Year	Standard	Measured as	Threshold value	PC	PC % of objective	Screened in?	Background concentration	PEC	PEC % of objective
2018	Short-term EAL	Maximum hourly average	750	133	18	Yes	0.27	133	18
2019				132	18	Yes	0.27	132	18
2020				134	18	Yes	0.27	134	18

Table 18-11 Maximum predicted offsite NO_2 concentrations (µg/m³)

Year	Standard	Measured as	Objective value	PC	PC % of objective	Screened in?
2018	Long-term AQO	Annual average	40	0.09	0.2	No
2019				0.09	0.2	No
2020				0.09	0.2	No

Table 18-12 Maximum predicted offsite PM10 and PM2.5 concentrations (µg/m^3)

Year	Standard	Measured as	Objective value	PC	% PC of objective	Screened in?	Background concentration	PEC	PEC % of objective
2018	Short-term PM_{10} AQO	Daily mean not to be exceeded more than 7 times per year	50	7.3	15	Yes	9.8	17	34
	Long-term PM_{10} AQO	Annual average	18	0.02	0.1	No	-	-	-
	Long-term $PM_{2.5}$ AQO		10		0.2	No		-	-
2019	Short-term PM_{10} AQO	Daily mean not to be exceeded more than 7 times per year	50	7.3	15	Yes	9.8	17	34
	Long-term PM_{10} AQO	Annual average	18	0.02	0.1	No	-	-	-
	Long-term $PM_{2.5}$ AQO		10		0.2	No		-	-
2020	Short-term PM_{10} AQO	Daily mean not to be exceeded more than 7 times per year	50	7.3	15	Yes	9.8	17	34
	Long-term PM_{10} AQO	Annual average	18	0.02	0.1	No	-	-	-
	Long-term $PM_{2.5}$ AQO		10		0.2	No		-	-

Table 18-13 Maximum predicted offsite Al_2O_3 concentrations (µg/m³)

Year	Objective	Measured as	Objective value	PC	PC % of objective	Screened in?
2018	Short-term AQO	Maximum 8-hour average	400	22	5.5	No
2019				22	5.5	No
2020				22	5.5	No

Table 18-14 Maximum predicted offsite CO concentrations (µg/m³)

Year	Objective	Measured as	Objective value	PC	% PC of objective	Screened in?
2018	Short-term AQO	Maximum 8-hour rolling average	10,000	68	0.7	No
2019				67	0.7	No
2020				69	0.7	No

18.14 IMPACT ASSESSMENT (ECOLOGICAL)

The predicted impact at ecological receptors is summarised below and presented in Figure 18-3. The location of the maximum concentration is the same for all pollutants and is shown in Table 18-15, for each year of meteorological data. The locations refer to the maximum impact at each habitat site for both the concentration in air and dry deposition assessments (which are the same), and also location of maximum impact at each habitat site for wet deposition assessment (different from air and dry).

Table 18-15 Location of the maximum PCs for each modelled year

Habitat	Year	Concentration in Air, Dry Deposition		Wet Deposition	
		x	y	x	y
North Uist Machair SPA/SAC/Vallay; Balranald Bog and Loch nam Feithean; and Baleshare and Kirkibost SSSIs	2018	75832	876189	75699	876493
	2019	75832	876189	75832	876319
	2020	75920	876102	75611	876668
Mointeach Scadabhaigh SPA/SAC/SSSI	2018	81194	871900	81194	871900
	2019	81194	871900	80156	869266
	2020	81193	871900	81194	871900

18.14.1 Nitrogen Oxides

The maximum annual average NO_2 concentrations are **screened out** for all years.

The maximum daily average NO_x PC at North Uist Machair SPA and SAC, and associated SSSIs is 13 µg/m^3, 17 % of the critical level of 75 µg/m^3, predicted with 2018 and 2019 meteorological data. At Mointeach Scadabhaigh SPA/SAC/SSSI the maximum daily average NO_x PC is 4.1 µg/m^3, 5.5 % of the critical level, predicted with 2018 meteorological data. With site-specific background data added (taken from the APIS website), the maximum PECs are below the critical level of 75 µg/m^3 for maximum daily average NO_x concentrations.

Table 18-16 and Table 18-17 show the maximum predicted annual average and daily average PCs to ground level concentrations of nitrogen oxides (NO_x) at each of the designated sites, using meteorological data for the three modelled years.

18.14.2 Nitrogen Deposition

The maximum predicted annual PCs to deposition rates of nitrogen at each of the designated sites are presented in Table 18-18, together with the PC as a percentage of the most stringent critical load. The mass output from the model effectively represents a single launch, and this was factored (multiplied by 10) to account for 10 launches over a year. Note that this is based on the unrealistic but conservative assumption that all 10 launches occur during the same worst-case meteorological conditions.

The maximum PCs to nitrogen deposition are **screened out** for all modelled years as they are less than 1% of the critical load**.**

18.14.3 Acid Deposition

The rate of acid deposition calculated in this assessment is based on the PC to acid deposition from dry deposition of NO_2, and from dry and wet deposition of HCl. Table 18-19 presents the maximum predicted contributions from nitrogen and sulphur to the acid deposition rates at the designated sites. The annual average output from the model was factored to account for 10 launches over a year.

The APIS Critical Load Function Tool was used to assess the combined impact of the nitrogen and sulphur contributions at each of the designated sites. The minCLmaxS, minCLmaxN and minCLminN were input to the tool, along with the maximum PCs to the nitrogen and sulphur contributions. The HCl contributions were treated as contribution to the sulphur, as per the AQTAG06 guidance note, which states that "*The acid contribution from HCl should be added to the S contribution and treated as S in the APIS tool*".

Table 18-20 presents the maximum PC as a percentage of the critical load function, as output from the APIS Critical Load Function Tool, for each identified habitat at each site.

According to the Critical Load Function Tool, the maximum PCs to nitrogen and acid deposition are **screened out**.

18.14.4 Summary Result Tables

The summary results for each assessment which was undertaken are provided below, for each meteorological year.

Table 18-16 Predicted annual average NOx concentrations (µg/m³) at designated sites

Site name	Critical level	Year	PC	% PC of critical level	Screened in?
North Uist Machair SPA/SAC/Vallay; Balranald Bog and Loch nam Feithean; and Baleshare and Kirkibost SSSIs	30	2018	0.04	0.12	No
		2019	0.04	0.12	No
		2020	0.02	0.07	No
Mointeach Scadabhaigh SPA/SAC/SSSI	30	2018	0.01	0.04	No
		2019	0.01	0.03	No
		2020	0.01	0.04	No

Table 18-17 Predicted daily average NOx concentrations (µg/m³) at designated sites

Site name	Critical level	Year	PC	% PC of critical level	Screened in?	Background	PEC	% PEC of critical level
North Uist Machair SPA/SAC/Vallay; Balranald Bog and Loch nam Feithean; and Baleshare and Kirkibost SSSIs	75	2018	13	17	Yes	1.6	14.6	19
		2019	13	17	Yes		14.6	19
		2020	8	11	Yes		9.6	13
Mointeach Scadabhaigh SPA/SAC/SSSI	75	2018	4.1	5.5	No	-	-	-
		2019	3.7	5.0	No			
		2020	4.1	5.4	No			

Table 18-18 Maximum PC to nitrogen deposition (kg N ha^{-1} yr^{-1}) at the Designated Sites

Site name	Critical load class	Critical load	Year	PC	PC as % of critical load	Screened in?
North Uist Machair SPA/SAC/Vallay; Balranald Bog and Loch nam Feithean; and Baleshare and Kirkibost SSSIs	Raised and blanket bogs	5 - 10	2018	0.05	1	No
			2019	0.05		
			2020	0.03		
Mointeach Scadabhaigh SPA/SAC/SSSI	Permanent dystrophic lakes, ponds and pools	3 - 10	2018	0.02	0.7	No
			2019	0.02		
			2020	0.02		
	Permanent oligotrophic waters: Softwater lakes	3 - 10	2018	0.02		
			2019	0.02		
			2020	0.02		

Table 18-19 Maximum predicted S and N contributions to the acid deposition rates at the Designated Sites (kq ha^{-1} yr^{-1})

Site name	Year	PC (N)	PC (S)
North Uist Machair SPA/SAC/Vallay; Balranald Bog and Loch nam Feithean; and Baleshare and Kirkibost SSSIs	2018	0.00048	0.0014
	2019	0.00048	0.0014
	2020	0.00028	0.00083
Mointeach Scadabhaigh SPA/SAC/SSSI	2018	0.00015	0.00043
	2019	0.00013	0.00039
	2020	0.00014	0.00007

Table 18-20 Results from APIS Critical Load Function Tool

Site name	Critical load class	PC as % of CL Function	Screened in?
North Uist Machair SPA/SAC/Vallay; Balranald Bog and Loch nam Feithean; and Baleshare and Kirkibost SSSIs	Bogs	0.1	No
	Acid grassland	0.1	No
Mointeach Scadabhaigh SPA/SAC/SSSI	Bogs	0.1	No

18.15 IMPACT ASSESSMENT (HEAT)

Heat is transferred in three ways:

- Conduction (via direct contact) – where there is direct contact with the heat source (in this case, to experience harm, the organism would have to be in the exhaust plume or close enough to such that the surrounding air has been heated to dangerous levels)
- Convection (via fluid flow) – where the heat is circulated from hot to cold in gas or liquid (in this case the heat rising above and around the exhaust plume)
- Radiation (via electromagnetic radiation) – where the heat electromagnetically radiates from the source and does not rely on a medium (such as air) to carry it. An example of this is the sun, which radiates heat through the vacuum of space, and the heat is felt when the radiation excites molecules in the substance at the receiver (in this case it would be felt in very close proximity to the exhaust plume)

Potential receptors for effects of heat are people, animals and vegetation.

In terms of understanding the potential impact of heat generated from a launch vehicle, it is important to recognise the short duration of this high temperature at any single point in space. The rocket will begin its ascent as soon as the motor ignites, the duration of the heat source moves very, and increasingly, rapidly away from the surface of the launch pad, and is therefore, brief. The risk to organisms is the potential for organisms to be in, above or very close to the flame[6].

Based on data provided by one of the launch vehicle suppliers, around 14.3 % of the total exhaust emissions are emitted in the first 500 feet (~152 metres). With a maximum total exhaust release of 1,622 kg predicted (see Table 18-5), this would correspond to 231.9 kg in the first 152 m – or around 1.5 kg/m. Based on data from another of the suppliers, around 8.0 % of the total exhaust emissions are emitted in the first 140 m. Based on a maximum total exhaust release of 1,622 kg, this would correspond 0.9 kg/m. Whilst it will vary, the temperature of release could be up to 2,600 K (~ 2,327 °C), though most estimates which have been identified are lower than this.

At an estimated 0.9 kg/m – 1.5 kg/m in a worst-case scenario, with most vehicles being significantly lower, this is considered a relatively small quantity of material over a relatively large distance. By the time this has mixed with a column of ambient air (with an assumed temperature of 10 °C) of radius in the region of 1.3 m, significant cooling would occur.

Because of the dynamic nature of the gases on emission from the rocket, this mixing will be rapid. On this basis, even allowing for some uncertainty in these calculations, there is confidence that the exhaust gases from the airborne rocket would have cooled to a safe temperature relatively quickly by mixing with ambient air. This is a narrow column of air

[6] In terms of the likely impacts, the cigarette lighter example is useful to consider for context. A finger placed in the flame would rapidly burn due to conduction and temperature being well in excess of 80 °C (according to the Burn Centre Care organisation, "a high temperature (more than 80 degrees Celsius) can cause more severe burns in a very short period of time (less than a second)". Therefore, anything in the immediate plume flame is likely to be harmed. Similarly, a finger placed immediately above the lighter flame would likely be harmed by the convection effect, due to the temperature of the rising air being above 80 °C. Lastly, a finger placed close to (1 cm), but not touching, the side of the lighter flame may feel the heat but will not burn due to the very low level of radiation produced – in fact, the detected heat will be due to the air around the flame conducting the heat, not the radiation effect. While the sounding rocket plume flame is obviously considerably bigger than a lighter flame, the same principles apply.

around the rocket trajectory, and as long as there are no birds within this, there are unlikely to be heat impacts upon them.

At ground level, on rocket launch, the hot exhaust gases will be directed into the launch pad. The launch pad is described in Chapter 4: Project Description. It has been designed with a view to adequately containing any heat impact from a launch. The speed of the hot gases will cause air turbulence and will cause them to mix quickly with the ambient air as they spread away from the rocket. This impact will rapidly decrease the temperature away from the rocket. The blast deflectors (AQH01) will further direct heat away from ground level, facilitating dispersion and cooling.

The magnitude of impact on all receptors is assessed to be low. Receptor sensitivity is considered to range between medium – high. Overall, the potential impact is considered **not significant**.

18.16 ASSESSMENT SUMMARY AND CONCLUSIONS

A detailed air quality assessment was undertaken to assess the potential impact of emissions from the launch of rockets from the proposed Project. The full results of this assessment can be found in Appendix 18.1: Detailed Dispersion Modelling.

The propellant/oxidiser combinations assessed are based on real launch vehicles and reflect the scope of vehicles most likely to be used at the Project site, however other potential propellants mixtures may be adopted by individual clients. From those currently considered, no single vehicle is the worst case. The maximum emission rate (mass) for each pollutant of concern has been estimated for each, and this confirmed that two of four vehicles considered provide the maximum emission rate for the five pollutants of most concern. It is these maximum emission rates that were progressed to full modelling and therefore the assessment aims to represent the (currently understood) worst-case scenario in terms of emissions.

Whilst the heat emission profile of vehicles launched during the operational phase of the Project will vary from rocket to rocket, they will typically exhibit heat emissions characteristics of rockets using fuel/oxidant mixtures. The operational schedule of 10 launches per year has been assessed and is expected to be a worst-case scenario.

The dispersion model prepared does not explicitly account for the blast deflector or the launch pad protection that may be installed to direct exhaust gases (and heat) from the launch pad to facilitate dispersion. Given these measures are taken to aid dispersion, their exclusion is viewed as a conservative approach.

Actual impacts from any given launch will depend on many factors specific to the time of launch, and these cannot be precisely predicted in advance. Generally, a worst-case approach to these has been taken in the assessment. This includes assumptions with regard to the mass of emissions (using maximum pollutant emission rate from any scenario in each instance), meteorological conditions (three years of hourly data have been used) and the location of human health receptors (assumed to be present at the location of maximum impact outwith the site boundary).

Various guidance was used to support the air quality assessment. The significance of each emission release was assessed by comparing the Process Contribution (PC) to the relevant air quality objective. The maximum concentration of these emissions is predicted at the site boundary (for human health receptors) and at ecological receptors (for designated sites) and compared to applicable air quality standards – to allow the potential impact of rocket exhaust emissions to be better understood.

In general, for long-term air quality objectives, the release was screened out from further assessment if the PC is less than 1 % of the air quality objective. For short-term objectives, including percentiles, the release is screened out from further assessment if the PC is less than 10 % of the air quality objective. The process for ecological receptors in some instances followed a different methodology, where appropriate, via use of the APIS Critical Load Function Tool.

Where a release is not screened out, the Predicted Environmental Concentration (PEC) for that substance was calculated. For long-term objectives, the PEC was calculated by adding the PC to the estimated background concentration of the emission. For short-term objectives, including percentiles, the PEC was calculated by adding the PC to twice the estimated background concentration of the emission. The inclusion of background concentration data in these instances is to allow the prediction of the total combined impact (i.e., PC + background) for comparison against relevant air quality standards.

With regard to heat, there are no specific criteria for the assessment of significance, conclusions are drawn based on the professional judgement of the author, based on a review of the relevant literature and the expected heat emission profile of the launch.

The key results of the assessment undertaken are summarised below.

Human Health

- For HCl, the maximum offsite hourly average PC is 134 µg/m^3, 18 % of the air quality objective of 750 µg/m^3. Including the background concentration of 0.27 µg/m^3, the maximum predicted PECs are well below the air quality objective of 750 µg/m^3.
- For NO_2, the maximum annual average offsite PCs are **screened out.**
- For particulates/Al_2O_3, the maximum offsite PC is 7.3 µg/m^3, 15% of the daily average PM10 air quality objective of 50 µg/m^3. Including the background concentration of 9.8 µg/m^3, maximum predicted offsite PECs are well below the air quality objective of 50 µg/m^3. For the annual average PM10 and PM2.5 standards, and for the 8-hour average Al_2O_3 standard, the offsite PCs are **screened out.**
- For CO, the maximum offsite concentrations are **screened out**.

Ecological

- The maximum annual average NOx concentrations are **screened out**.
- The maximum daily average NOx PC at North Uist Machair SPA and SAC, and associated SSSIs, is 13 µg/m^3, 17 % of the critical level of 75 µg/m^3. At Mointeach Scadabhaigh SPA/SAC/SSSI, the maximum daily average NOx PC is 4.1 µg/m^3, 5.5 % of the critical level. With site-specific background data added, the maximum PECs are below the critical level of 75 µg/m^3 for maximum daily average NOx concentrations.
- For both nitrogen and acid deposition, the maximum PCs are **screened out** as they are less than 1 % of the critical load.

Heat

An assessment of the impact from heat emissions was also undertaken. There are no specific criteria for the assessment of significance of such emissions, and conclusions are drawn based on the professional judgement of the author, and based on a review of the relevant literature and heat emission profile data for likely launch scenarios. Overall, the potential impact is evaluated as **not significant.**

Overall Significance

Based on the assessment, which was undertaken as outlined above, most impacts considered could readily be screened out as **not significant** based on the PC only. In some instances, the impacts could not be screened out, and further assessment was needed. When incorporating existing background concentrations, all PECs were comfortably below relevant air quality standards.

Various conservative assumptions were made during completion of the assessment, as per air quality assessment good practice. Most notably, this includes:

- It has been (unrealistically) assumed that all 10 launches occur during the same worst-case meteorological conditions;
- Each launch vehicle will have a bespoke propellant mixture and emissions profile, assumptions in the modelling have assumed 10 launches of the worst-case propellant mixture for a particular pollutant;
- Human health receptors were assumed to be present at the points outside the site boundary, which predicted the maximum level of impact. Additionally, even if persons were present in these locations, such points do not represent relevant exposure for daily or annual average standards.

Additionally, the following points are noted:

- The dispersion model prepared does not explicitly account for the blast deflector or the launch pad protection, which may be installed to direct exhaust gases (and heat) from the surrounding gravel area and wider vegetation to facilitate dispersion.
- In order to estimate NO_x emissions a NASA conversion factor based on solid propellant was used.
- 100% of the NO_x emissions were assumed to be in the form of NO_2.
- For a conservative assessment of PM10 and PM2.5 impacts, 100 % of the total particle emissions were assumed to be PM10 and PM2.5 in each case.
- Many sources suggest that CO would be rapidly converted to CO_2 under the high exhaust temperatures. The modelling assumption that the CO is not converted to CO_2, but that the CO emitted at the nozzle exit is conserved, is highly conservative.

Considering that all PECs were comfortably below relevant air quality standards, even with the conservative assumptions outlined above (and as such the actual impacts are likely to be less than has been shown), the proposed Project would not appear to present any significant risk to local human health or the environment, and the overall impact from air quality and heat is therefore evaluated as **not significant** in the context of the EIA Regulations.

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19 NOISE AND VIBRATION

CONTENTS

19 NOISE AND VIBRATION

19.1 INTRODUCTION

This chapter of the EIA Report describes the potential noise and vibration impacts that may arise during launch activities associated with the Project. The assessment evaluates the potential significant effects arising from noise and vibration from Launch Vehicles (rockets) on human receptors only. It is supported by Appendix 19-1: Noise Technical Report, which details the modelling methodology and criteria used in this assessment. This assessment was undertaken by Arcus Consultancy Services Ltd (Arcus).

Noise impacts on ecological and heritage receptors are assessed in the following chapters:

- Chapter 10: Archaeology and Cultural Heritage;
- Chapter 14: Ornithology;
- Chapter 15: Terrestrial Ecology; and
- Chapter 16: Marine Ecology.

19.2 STUDY AREA

Modelling has been undertaken to determine noise levels during rocket launches, as well as audible sonic booms generated by downward supersonic flight. A separate study area was generated for each of these impacts based on the modelled outputs.

The resulting study areas consider all noise sensitive receptors within 10 km of the Project site (specifically the launch pad) for rocket launch noise, and receptors within 150 km for sonic boom noise, as determined by the extent of the modelling predictions. No noise effects are anticipated outwith these study areas (Figure 19-1).

The nearest human, ecological and cultural heritage receptors are shown in Figures 1 to 6 in Appendix 19-1: Noise Technical Report.

19.3 LEGISLATIVE FRAMEWORK AND POLICY CONTEXT

This assessment follows the legislative framework outlined in the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017[1] (hereafter referred to as the 'EIA Regulations'). The EIA Regulations implement European Union (EU) Directive 2014/52/EU which amended Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

There is no guidance on the assessment of noise effects from commercial spaceport developments. As such, the following guidelines / polices have been used to inform the general approach to this assessment and to provide input to the assessment criteria. Details of these guidelines/policies can be found in Appendix 19-1: Noise Technical Report.

- Planning Advice Note PAN 1/2011 *Planning and Noise*[2];
- Technical Advice Note *Assessment of Noise*[3];
- BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites. Part 1: Noise*[4];
- BS 4142:2014 + A1:2019 *Methods for rating and assessing industrial and commercial sound*[5];
- WHO *Environmental Noise Guidelines for the European Region* (2018)[6].

19.4 SUPPORTING SURVEYS AND STUDIES

In support of this assessment, a review of available literature and modelling methodologies for the prediction and assessment of rocket launch and sonic boom noise was carried out. The following guidance and studies are relevant to this assessment:

- *Acoustic Loads Generated by the Propulsion System*[7];
- *User Guides for Noise Modelling of Commercial Space Operations – RUMBLE and PCBoom*[8];
- *Procedure for the Calculation of the Perceived Loudness of Sonic Booms*[9]

A summary of the above studies can be found within the modelling methodology provided in Sections 3.1 and 3.2 of Appendix 19-1: Noise Technical Report. Two specialist software packages have been used to model and predict both launch noise and sonic boom noise. These are described in detail, along with the underlying calculation theory, in Sections 2.3 and 2.4 of Appendix 19-1: Noise Technical Report.

Rocket launch noise has been predicted using the RUMBLE[10] 2.0 software package. RUMBLE was developed in the USA under the Airport Cooperative Research Program (ACRP) to predict noise effects from commercial space operations.

In order to predict the effects and extent of sonic booms generated by the Project's Launch Vehicles (LVs), modelling has been carried out using the PCBoom v4.99 software package. PCBoom has been developed by Wyle Laboratories, Inc. in the USA under the ACRP to predict the extent of sonic booms from single flight operations taking into account vehicle type, atmospheric conditions and flight trajectory.

19.5 DATA GAPS AND UNCERTAINTIES

Regarding the prediction of noise from rockets, the following sources of uncertainty have the potential to result in variation in practice to the noise levels predicted and assessed:

- Source characteristics: the assessment has been carried out based on a 'worst-case' representative LV. In practice other types of LVs may be used, and any differences in the specification of these other types, could lead to corresponding differences in the noise emission and therefore the noise levels affecting receptors;
- Ground Reflections: the RUMBLE noise model assumes propagation over soft ground, i.e., the effects of reflection from water, sand or other acoustically reflective surface are not considered; and
- Atmospheric Effects: the effects of wind speed, temperature, pressure and wind speed gradients have not been considered; however, worst-case assumptions have been made in this respect.

Regarding the prediction of sonic booms, the following sources of uncertainty are present:

- Results of the modelling are shown at the calculation points only, and booms may be audible at other locations and may vary between points within the predicted boom area; and
- The model assumes calm conditions with no wind. It is possible that atmospheric wind conditions present during specific launches may result in different noise levels to these predicted here and refraction may result in booms being audible at other locations. However, these secondary booms would occur at a lower sound level than the primary booms considered in the assessment.

Overall, it is unlikely that these uncertainties could have a material effect on the outcome of the assessment. In practice, it is likely the assumptions made as part of this assessment will overestimate the levels of noise, and as such this assessment considers worst-case scenarios.

19.6 CONSULTATIONS

Following issue of the Scoping Report in 2018[11], consultation has been carried out with Comhairle nan Eilean Siar (CnES) Environmental Health to agree assessment methodology. Feedback has also been received from Marine Scotland in terms of underwater noise. The key points regarding noise and vibration raised by consultees are summarised in Table 19-1.

Table 19-1 Key issues raised by stakeholders during consultation

Stakeholder	Comment	Response/Action taken	Section cross-reference
Environmental Health – Scoping Response June 2018	No Comment to Scoping Report	N/A	N/A
Environmental Health – response to Planning Application (Noise) August 2019	Application refers to 10 launches per year and that the maximum sound that will be heard at the nearest noise sensitive premises, at a distance of 762 m would be 85 dB(A) with a maximum of 15 seconds of noise per launch; equating to 115 seconds in the year. Based on this information no concerns if launch numbers etc. are restricted to this.	Since this initial consultation, further modelling of proposed worst case rocket type results in predicted noise levels at these receptors of 95 dB(A). In addition, the distance to the nearest receptor has increased to 890 m.	Section 19.9
Environmental Health - response to Planning Application (Vibration) August 2019	It may be worth clarifying the potential for vibration, both ground and airborne, and if there is likely to be any impact given the distance to the nearest adjacent premises. Conditions covering vibration, as well as noise, for any of the launches may be applied.	Given large separation distances, both ground and airborne vibration at human receptors is scoped out in Section 19.7.5 Assessment of vibration at cultural heritage receptors is assessed in Chapter 10: Archaeology and Cultural Heritage.	Section 19.7.5, Chapter 10: Archaeology and Cultural Heritage.
Environmental Health – response to Planning Application (Operating hours) August 2019	It is assumed that the hours of operation of the site are tied to the individual rocket launches (which last for approximately 4 days for each of the 10 proposed launches) and will therefore not be continuous all year round.	Confirmed and this is assessed within this chapter.	N/A
Environmental Health – response to Planning Application (Construction noise) August 2019	In terms of construction, recommend that the normal noise [and dust] conditions are applied.	Due to the minimal amount of construction and large separation distance to nearest human receptor, no significant construction noise or vibration effects are anticipated.	Section 19.7.5

Stakeholder	Comment	Response/Action taken	Section cross-reference
Environmental Health, Comhairle nan Eilean Siar (CnES) – response to email consultation outlining assessment and modelling methodology April 2020	Agreed that BS4142 is not applicable and that suggested aircraft noise example (suggested by consultants) would be more appropriate. EH is not aware of any other relevant guidance, criteria or comparable noise sources, nor would they expect any other information, other than what [the consultants] have described, to be provided in the report.	As agreed, assessed noise from launches and sonic booms against noise measured aircraft and other common noise sources.	Section 19.7
Marine Scotland Licensing Operations Team (MS-LOT) 15/06/2021	Noted noise from jettisoned stage splashdown not likely to be of concern for marine mammals due to there being no explosion, impulsive or persistent noise, such as associated with piling activities.	No further action related to underwater noise.	Chapter 16: Marine Ecology

A planning application to develop a proposed Spaceport at Scolpaig Farm in North Uist was submitted to the Comhairle nan Eilean Siar on 26 June 2019 (Planning Reference 19/00311/PPD). The planning application attracted significant public attention and consequently, approximately 640 representations from the public were received. Comments raised from both the public and consultees highlighted key issues and concerns of relevance to the EIA process. Given the relationship to the EIA process, an analysis was undertaken of the representations submitted. The complete analysis is provided in Appendix 5-1: Review of Planning Representations.

In summary, there were 94 objections (15 % of the total of objections), which expressed concern over the unknown impact of noise pollution on local archaeological sites, wildlife (specifically birds) and the sense of peace and tranquillity for which the Uists are known. It was felt that noise and the accompanying vibrations from construction and use of the site could compromise the strength of Scolpaig Tower. The impact of noise and vibration on birds is covered in Chapter 14: Ornithology, and on archaeological features in Chapter 10: Archaeology and Cultural Heritage.

19.7 ASSESSMENT METHODOLOGY

Whilst the policy and guidance documents detailed in Section 19.3 of this report provide assessment methodologies for a wide range of noise generating developments, there is no specific guidance regarding noise generated from operation of spaceports. In addition, due to the occasional occurrence and short duration of the sound during rocket launches at the Project site, conventional noise assessment standards are of limited relevance.

In the absence of specific guidance, and as agreed through consultation with CnES Environmental Health, noise effects have therefore been considered with reference to levels generated by familiar noise sources, as detailed in Section 19.7.1 and 19.7.2.

This report therefore considers operational noise from the Project, which has two potential components:

- Noise from the launching of sounding rockets; and
- Sonic booms.

Two rocket models are assessed and presented in this chapter and Appendix 19-1 Noise Technical Report: Rocket A and Rocket B; each representing the 'worst-case scenarios' for noise from the launch of sounding rockets and noise generated by sonic booms respectively:

- Rocket A is a single stage rocket, and the largest rocket type proposed for launch at the Project site. It controls descent by way of early parachute deployment, which means that it does not reach supersonic speeds during this stage and as such will not produce audible sonic booms. Due to its size, Rocket A will generate the highest noise levels during launch and as such presents a worse case for launch noise;
- Rocket B is a two-stage rocket with the descent of the second stage reaching supersonic speeds, and as such generating an audible sonic boom. Rocket B presents a worst case for sonic booms.

The full details and specifications for Rockets A and B are commercially sensitive and as such are not reproduced here. Further details, including the methodology used to predict launch noise and sonic booms and modelling assumptions are provided in Sections 2.3 and 2.4 of Appendix 19-1: Noise Technical Report.

19.7.1 Launch Noise

Noise from each rocket launch will be of very short duration; the powered phase of Rocket A will last for approximately 120 seconds. The powered phase of the first stage of Rocket B will last for approximately 12 seconds, and the second stage powered phase approximately 31 seconds, i.e., the rocket will produce potentially high levels of noise for a total 43 seconds. However, the noise may not be audible for the full length of these powered phases, due to the altitude and distance covered. Launches will occur no more than 10 times per year, and during daytime hours only.

As agreed through consultation with CnES Environmental Health in April 2020, conventional approaches to the assessment of noise are not appropriate, given the very short duration and occasional nature of each event. Conventional methods for assessment of commercial noise (e.g., BS 4142) are typically based on the equivalent continuous ('average') sound level over a defined period of time (e.g., 1 hour) and are assessed against either absolute criteria, or against pre-existing background noise levels. Such an approach is not suitable for the assessment of occasional, short duration sounds such as rocket launches, where the maximum noise levels occurring during the launch event is likely to be more important than the 'average' over a period of time.

The WHO Community Noise Guidelines 1999 make reference to the use of L_{Amax} for the assessment of noise events which occur occasionally, for short duration or varying in level. As such, and as agreed with CnES Environmental Health in

April 2020 (see Table 19-1), the short duration noise levels (lasting up to 120 seconds) have been assessed by comparison to L_{Amax} noise levels generated by common noise sources. Table 19-2 provides a range of commonly experienced noise levels of increasing level.

Table 19-2 Commonly experienced L_{Amax} noise levels

Level, dB, L_{Amax}	Source	Effect / Comparison
60	WHO Guidelines for Community Noise 1999	Recommended limit for night-time noise outside of an open window. Daytime noise below this level highly unlikely to be disturbing.
65	Regulation (EU) 168/2013[12]	Road motorcycle at 40 m
70		Road motorcycle at 25 m
75		Road motorcycle at 15 m
80	BS 5228[13]	39 t road lorry at 10 m (Table C.6.21)
85		35 t bulldozer at 10 m (Table c.5.14 - 86 dB)
90		Dump trucks on haul roads at hard rock quarries at 10 m (Table c.9. 16-22)
110	WHO Guidelines for Community Noise 1999	Recommended limit for protection of hearing. Noise at this level or above may be harmful.[14]

Noise from rocket launches at the surrounding human receptors is therefore assessed by comparing the predicted noise level to the commonly experienced noise levels presented in Table 19-2, with an upper limit of L_{Amax} 110 dB.

19.7.2 Sonic Boom Noise

There are no standard assessment criteria for sonic boom noise. A review of relevant studies, as discussed in Section 1.4 in Appendix 19-1: Noise Technical Report, indicates that Perceived Decibel Level (PLdB) provides the most appropriate metric for consideration of sonic boom noise. The PLdB is a metric developed to take account of the human response to shock waves relating to sonic booms, taking into account their high levels of low frequency content. Whilst there are no standard criteria for the assessment of PLdB, NASA research indicates that a PLdB of up to 75 dB is *"acceptable for unrestricted supersonic flight over land"*[15].

In addition to the PLdB, the maximum overpressure during descent of the second stage is also predicted. As with launch noise, assessment of the maximum over pressure is compared against levels generated by a range of different aircraft travelling at supersonic speeds[16] as outlined in Table 19-3. Maximum overpressure is described in PCBoom in pounds per square foot (psf) (1 psf equals 48 Pascals) and is the pressure over and above normal atmospheric pressure (2,116 psf).

Table 19-3 Example measured maximum overpressure for comparison

Source	Source speed	Overpressure
Lockheed SR-71 Blackbird	Mach 3.0 at 80,000 ft (24 km)	0.90 psf
Concord	Mach 2.0 at 52,000 ft (16 km)	1.94 psf
Lockheed F-104 Starfighter	Mach 1.9 at 48,000 ft (15 km)	0.80 psf
NASA Space Shuttle	Mach 1.5 at 60,000 ft (18 km)	1.25 psf

Although there are no recommended criteria for overpressure from sonic booms generated by aircraft, it should be noted that a complaint was made relating to a sonic boom from Concord at 0.75 psf[17].

19.7.3 Sensitivity of Receptors and Magnitude of Change in EIA Methodology

The assessment is prepared in accordance with the EIA Regulations, and its purpose is to identify whether a significant effect will occur under this context.

Sections 19.7.1 and 19.7.2 of this chapter provide context for quantifying the level of noise with reference to other sources, and it is important to consider the sensitivity of receptor and magnitude of change to determine whether an effect is significant or not under the EIA regulations.

Sensitivity of receptors is an important consideration when determining the magnitude of impact. The sensitivity of receptors to potential impacts is based on their capacity to avoid, tolerate, recover from, or adapt to a particular impact. This is informed by the magnitude of change, which is experienced by a receptor of varying sensitivity. For the purposes of environmental assessment, magnitude of a change or "effect" is generally dependent on the degree to which the change affects the feature or asset, from a fundamental, permanent or irreversible change that changes the character of the feature or asset, to barely perceptible changes that may be reversible. Magnitude would also encompass the certainty of whether an impact would occur.

This assessment evaluates effects on residential receptors, and therefore all receptors are considered to be of high sensitivity. To draw conclusions on whether the noise levels identified as part of this EIA are significant, consideration is given to the magnitude of change, and whether this would be negligible; low; medium; or high. Definitions of these levels are presented in Table 19-4.

Table 19-4 Framework for Determining Magnitude of Change

Magnitude of Change	Definition
High	A fundamental change to the baseline condition of the receptor, leading to a total loss or major alteration of character.
Medium	A material, partial loss or alteration of character.
Low	A slight, detectable, alteration of the baseline condition of the asset.
Negligible	A barely distinguishable change from baseline conditions.

When classifying magnitude of change within the above framework, the following factors are taken into consideration:

- Extent;
- Scale, including predicted noise levels compared to those identified from the literature review as being applicable:
  - Launch noise: L_{Amax} 110 dB, based on WHO guidelines;
  - Sonic boom noise: 75 PLdB, based on NASA research.
- Duration;
- Frequency of timing; and
- Reversibility.

19.7.4 Significance Criteria

As per the EIA Regulations, as referenced in Section 19.3, the purpose of an EIA Report is to identify whether or not a significant effect is likely to occur as a result of a particular development.

For the purposes of this assessment and following consultation with the planning authority, launch and sonic boom noise criteria has been determined based on:

- The literature review summarised in Appendix 19-1: Noise Technical Report and Sections 19.7.1 and 19.7.2;
- Consideration of the magnitude of change experienced by a receptor, as set out in Section 19.7.3;
- Professional judgement.

Where the magnitude would result in an effect deemed to be a material or fundamental change to a high sensitivity receptor e.g., a *medium* or *high* magnitude of change, effects would be generally deemed **significant** in accordance with the EIA Regulations. Where effects are deemed to be as a result of *negligible* or *low* magnitude of change on a high sensitivity receptor, effects would generally be deemed **not significant** in accordance with the EIA Regulations.

19.7.5 Elements Scoped Out

The launching of rockets of the scale considered within this report is unlikely to be a significant source of vibration due to the low levels of sound and air overpressure being generated. In addition, the sound would be dominated by mid-range frequencies that are less prone to result in induced vibration in structures than low frequencies. As such, both ground and airborne vibration at human receptors have been scoped out of further assessment, however precautionary measures for protecting specific structures located within the site are set out in Chapter 10: Archaeology and Cultural Heritage.

Due to the minimal amount of construction required for the Project, as well as the large separation distances (approximately 890 m to the nearest noise sensitive receptor), no significant construction noise or vibration effects are anticipated. Construction noise and vibration impacts have therefore been scoped out of further assessment. However – and as indicated above - precautionary measures for protecting specific structures located within the site are set out in Chapter 10: Archaeology and Cultural Heritage.

19.8 BASELINE DESCRIPTION

Due to its rural nature, North Uist has a quiet acoustic environment, dominated by natural sources including the wind and sea. Artificial sources are usually limited to low levels of road traffic, occasional aircraft, agriculture and shipping.

An existing MOD rocket range is present on South Uist, and the wider area is used bi-annually for Joint Warrior[18] and other military exercises, which can generate noise from activities such as missile firings, ships and aircraft, including low-flying supersonic fighter jets and helicopters. Although baseline noise levels in the area are normally low, there are existing noise sources which have a comparable character and pattern of occurrence to those associated with the Project.

19.8.1 Potential Noise Sensitive Receptors

This chapter considers impacts on human receptors only, with impacts on cultural heritage, ornithology, terrestrial ecology, and marine ecology receptors addressed in Chapters 10, 14, 15 and 16 respectively.

Figure 1 in Appendix 19-1: Noise Technical Report shows the locations of human noise-sensitive receptors. These have been identified from Ordinance Survey MasterMap AddressBase Plus data, a database that combines features shown on large-scale digital mapping with the Royal mail address database. These consist mainly of dwellings but also include other noise-sensitive buildings such as schools and places of worship. The closest noise sensitive receptors have been identified as follows:

- Scolpaig Farmhouse is located approximately 175 m from the launch site but is currently uninhabited. It is proposed that Byre 2 in the farm steading complex is modified for use as a covered workshop, assembly and communications area. There is no intention of reinstating Scolpaig Farmhouse as a residential dwelling;
- The next closest receptor is An Ataireachd Ard at approximately 890 m south of the launch site; and
- The closest receptors to the east are at a distance of approximately 1,900 m.

All noise sensitive receptors are considered to be of **high** sensitivity for the purposes of this assessment.

The locations of ecological / ornithological receptors, in the form of Designated sites and Nature Reserves are shown on Figure 2 in Appendix 19-1: Noise Technical Report. The assessment of noise impact on such receptors is covered in Chapter 14: Ornithology, Chapter 15: Terrestrial Ecology and Chapter 16: Marine Ecology.

Figure 3 in Appendix 19-1: Noise Technical Report shows the locations of Scheduled Monuments and records from the CANMORE historic site record. The assessment of noise and vibration impact on such receptors is covered in Chapter 10: Archaeology and Cultural Heritage.

19.9 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

19.9.1 Launch Noise

Figure 1 in Appendix 19-1: Noise Technical Report shows predicted noise level contours for the powered phase of Rocket A's Stage 1 trajectory, which represents the worst-case scenario for launch noise. The near-circular shape of the contours and the fact that they are centred on the launch site indicate that the highest noise levels would occur shortly after lift-off.

The predicted L_{Amax} noise level is below the 110 dB criteria outlined in Section 1.7 of Appendix 19-1: Noise Technical Report at all identified receptors, and would only be experienced during the launch period, which is limited to 120 seconds at any one time, up to 10 times per year. Given the short duration that this noise level would occur for, this is not a

considered to represent a material or fundamental change to the baseline conditions. The predicted noise level exceeds the criteria for a negligible magnitude of change, set out in Section 19.7.3, therefore, as a result of the predicted noise level but limited duration, this impact is characterised as **low** magnitude of change. The effects from launch noise are consequently assessed as **not significant** in the context of the EIA Regulations.

19.9.2 Sonic Booms

Based on the rocket dimensions and trajectory of the worst-case Rocket B, the footprint of the predicted PLdB of the sonic boom generated during the descent of the rocket has been calculated and is shown in Figures 4 to 6 in Appendix 19-1: Noise Technical Report, covering the most northerly trajectory of a potential flight path, the most southerly trajectory and a typical mid-range trajectory.

Westerly trajectory

The levels range from 67 PLdB to 97 PLdB occurring at distances of between 20 and 80 nautical miles outwards from the launch site. The proposed trajectory stretches out to the west of the launch site at a bearing of 275°. With this trajectory, sonic boom noise is predicted to be experienced on one habitable island, St Kilda, with a Perceived Decibel Level of 70 PLdB. This is below the 75 PLdB limit and would occur for less than a second, up to a maximum of 10 times a year. However, it is also important to note that not all LV specifications generate sonic boom, and the range of potential trajectories available indicate that the experience of sonic boom at these locations would be infrequent. Given the short duration that this noise level would occur for, this is not a material or fundamental change to the baseline conditions. The predicted noise level is below 75 PLdB limit identified through the literature review and the duration is limited to less than one second; therefore, the impact is considered to be a **negligible** magnitude of change as defined in Section 19.7.3. The effects from sonic boom noise at a westerly trajectory are consequently assessed as **not significant** in the context of the EIA Regulations.

Northern and southern trajectories

In order to allow flexibility in the trajectory of each launch event (the trajectory of any given launch can be subject to change depending on weather conditions), a Space Launch Hazard Area (SLHA) has been defined, ranging from bearings 212° to 352°, within which alternative trajectories can be used. As a worst case, the sonic boom footprint has been modelled for the southern-most possible trajectory at 212° (see Figure 5 in Appendix 19-1: Noise Technical Report) and the most northerly at 352° (see Figure 6 in Appendix 19-1: Noise Technical Report).

Figure 5 in Appendix 19-1: Noise Technical Report indicates that for the most southerly possible trajectory, the Perceived Noise Levels are predicted to be up to 85 PLdB on the Isle of Coll. For the most northernly (Figure 6 in Appendix 19-1: Noise Technical Report), sonic boom noise is predicted to be audible across the northern half of the Isle of Lewis with predicted Perceived Decibel Levels up to 95 PLdB. The Perceived Decibel Levels predicted for these worst-case trajectories exceed the suggested criteria at human receptors. However, the duration of these effects would be limited and occur for less than one second at a maximum of 10 times a year. Again, it is also important to note that not all LV specifications generate sonic boom, and the range of potential trajectories available indicate that the experience of sonic boom at these locations would be infrequent. Given the short duration that this noise level would occur, this is not considered to represent a material, or fundamental change to the baseline conditions. The predicted noise level exceeds the criteria for a negligible magnitude of change, as set out in Section 19.7.3. Therefore, as a result of the predicted noise level but limited duration (less than 1 second, up to 10 times per year), this impact is characterised as **low** magnitude of change. The effects from sonic boom noise, at a southern and northern trajectory, are consequently assessed as **not significant** in the context of the EIA Regulations.

It should also be noted that sonic booms will only be generated using two-stage rockets such as Rocket B, which represents a worst-case.

As well as Perceived Decibel Level, the maximum overpressure has also been calculated ranging from 0.01 to 0.54 psf. This is markedly below the overpressure measured for commercial and military aircraft, and almost 100 times lower than Concorde travelling at Mach 2 at an altitude of 16 km.

19.10 MITIGATION AND RESIDUAL EFFECTS

Due to the nature of the noise and its source, there are no physical mitigation measures such as screens or enclosures available to reduce the level of noise at the nearest receptors.

However, mitigation measures set out in Table 19-5 include community notification process (GM05 Pre-Launch Communications: Advance Alert and Community Notifications) and Maritime Management Procedures (MU01) for publicising information on the timing of launches through various media will be implemented so that the local population and visitors are aware of the possible occurrence of noise. This will also include a provision for alerting mariners to noise with the timing and location of launches.

Table 19-5 Mitigation Measures

Ref	Title	Description
GM05	Pre-Launch Communications: Advance Alert and Community Notifications	An Advance Alert / Pre-Launch Contact Service will provide advance notice of activities relevant to key stakeholders including emergency services, fishermen, hauliers and closest residential receptors. Stakeholders can register for the alert service on a dedicated email address and can view the range activity programme on a dedicated website. The Spaceport Operator will additionally publish notifications in local/social media, their website and at key information points in the surrounding locality to the wider community and stakeholders informed of key project activities and any associated restrictions. Measures are likely to include: • Regular updates via e-mail to local community groups. • Website – showing schedule of planned activity. Social Media – posts about planned activity.
MU01	Maritime Management Procedures	The Maritime Management Procedures will ensure the safe launch of LVs from the spaceport and include prior notification procedures and operational procedures throughout a launch campaign. Key measures to eliminate risk and minimise disruption to marine users include procedures relating to: • Maritime notifications – pre-launch, mission deviation, post-launch; (community updates through various mediums, advance alert service, Notice to Mariners (NtM), Navigation Warnings (NavWarning);

The residual effects of launch noise following implementation of the above notification process will remain **not significant**. Likewise, the resulting residual effects of sonic boom noise will remain **not significant** for the proposed westerly trajectory and **not significant** for the worst-case northern and southern trajectories for the duration of audible sonic booms (less than one second up to 10 times per year). Providing prior notice to residents will ensure that the effects have been further minimised as far as practicable.

19.11 ASSESSMENT SUMMARY AND CONCLUSIONS

This chapter assesses the potential noise and vibration impacts that may arise during launch activities associated with the Project. The assessment evaluates the potential significant effects arising from noise and vibration from Launch Vehicles (rockets) on human receptors only. It is supported by Appendix 19-1: Noise Technical Report, which details the modelling methodology and criteria used in this assessment.

Noise impacts on ecological and heritage receptors are assessed in the following chapters: Chapter 10: Archaeology and Cultural Heritage; Chapter 14: Ornithology; Chapter 15: Terrestrial Ecology; and Chapter 16: Marine Ecology.

Construction noise and vibration impacts have been scoped out of the assessment due to the minimal construction required for the Project, as well as the large separation distances from residential receptors. Construction best practice measures will be followed to minimise potential noise disruption.

The launching of rockets of the scale considered for the Spaceport are unlikely to be a significant source of vibration due to the low levels of sound and air overpressure being generated. Therefore, ground and airborne vibration at human receptors have been scoped out of further assessment, however precautionary measures for protecting specific structures located within the site are set out in Chapter 10: Archaeology and Cultural Heritage.

Noise from each rocket launch will be of very short duration, ranging from approximately 43 to 120 seconds. Launches will occur no more than 10 times per year, and during daytime hours only. The magnitude of the predicted launch noise is within the range of commonly experienced noise levels (L_{Amax} 110 dB) at all noise sensitive receptors and of a duration of up to 120 seconds. The impact of noise from rocket launches on human receptors has been assessed as **not significant.**

Sonic booms will occur during the descent of some rockets, although modelling of the worst-case rocket type and proposed trajectory indicates that these are likely to predominantly affect areas at sea, with a possible effect on St Kilda. Depending on the flight path of the LV, other surrounding habited islands may be affected. Levels predicted at St Kilda are below that defined as acceptable by NASA and at substantially lower levels than sonic booms from commercial and military aircraft. These effects will occur for less than one second up to 10 times per year and, when considering the overall negligible magnitude of change, the effects are assessed to be **not significant**.

It is likely that other launch trajectories will be adopted when necessary; limited to within the proposed SLHA. Levels above the 75 PLdB criteria are predicted on the surrounding habitable islands at the most northernly and southernly extremes of the SLHA. The limited duration of these effects (less than one second up to 10 times per year) suggests this is not a fundamental or material change to the baseline conditions, and results in a low magnitude of change. As such, the effects of noise at these trajectories are considered **not significant** for the duration of the audible sonic boom event (less than one second).

Implementation of a community notification process will provide advanced notice to residential properties.

19.12 REFERENCES

[1] Scottish Government (2017) Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 [Online] Available at: http://www.legislation.gov.uk/ssi/2017/102/contents/made (Accessed 15/07/2021)

[2] Planning Advice Note 1/2011: planning and noise, The Scottish Government, 2011

[3] Technical Advice Note: Assessment of Noise, The Scottish Government, 2011

[4] BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 1: Noise, BSI 2014

[5] BS4142:2014 + A1:2019 Method for Rating and Assessing Industrial and Commercial Sound, BSI 2019

[6] Environmental Noise Guidelines for the European Region, World Health Organisation, 2018

[7]National Aeronautics and Space Administration, (1971) *Acoustic Loads Generated by the Propulsion System*, NASA SP-8072

[8] Airport Cooperative Research Program, (2018) *User Guides for Noise Modelling of Commercial Space Operations – RUMBLE and PCBoom*, Research Report 183

[9] Bolander, Christian R., et al., (2019) *Procedure for the Calculation of the Perceived Loudness of Sonic Booms*, AIAA Scitech 2019 Forum

[10] For details, please see http://www.trb.org/Main/Blurbs/177510.aspx last accessed 15 July 2021

[11] Spaceport 1, Environmental Impact Assessment: Scoping Report, Atkins (2018)

[12] Regulation (EU) No 168/2013 of the European Parliament and the Council of 15 January 2013 on the approval and market surveillance of two- and three-wheeled vehicles and quadracycles. Annexe D defines a maximum permissible exhaust noise level for motorcycles >175 cc of 80 dB, $L_{A,max}$, measured according to UNECE regulation No 41 (at 7.5 m distance)

[13] BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 1: Noise.

[14] NB, on p41 of the WHO Guidelines for Community Noise 1999, it is stated that it is uncertain whether the relationships between hearing impairment and noise exposure given in ISO Standard 1999 (ISO 1990) are applicable for environmental sounds of short rise time. For example, in the case of military low-flying areas (75 – 300 m above ground), L_{Amax} values of 110-130 dB occur within seconds after the onset of the sound.

[15] https://www.nasa.gov/topics/aeronautics/features/sonic_boom_thump.html last accessed 15 July 2021

[16] https://www.nasa.gov/centers/armstrong/news/FactSheets/FS-016-DFRC.html last accessed 15 July 2021

[17] "The Challenges of Defining an Acceptable Sonic Boom Overland", F. Coulouvrat, 15th AIAA/CEAS Aeroacoustics Conference, 2009

[18] Joint Warrior is a UK-led war exercise that takes place in spring and autumn each year. The Royal Navy, Royal Air Force and British Army are joined by forces from 13 other nations. Taking place over two weeks, Joint Warrior includes airborne assaults, amphibious landings, evacuations and live-fire exercises.

20 CLIMATE CHANGE

CONTENTS

20 CLIMATE CHANGE

20.1 INTRODUCTION

This Chapter of the EIA Report considers the potential contribution of the project to climate change, in terms of greenhouse gas (GHG) emissions, as well as the vulnerability of the Project to the effects of climate change.

An assessment of climate change is required under the European Commission (EC) Environmental Impact Assessment (EIA) Directive 2014/52/EU1 which was transposed into Scottish legislation through The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.

This chapter should be read in conjunction with:

- Chapter 18: Air Quality and Heat;
- Chapter 17: Hydrology, Hydrogeology and Geology; and
- Appendix 20.1: Risk Register.

20.2 STUDY AREA

There are several scales of study area that are relevant for climate change issues. The study area for the assessment of vulnerability of the Project to the effects of climate change is defined as the site boundary (Figure 4.2 and Figure 4.3), but also includes nearby transport links, maritime safety/launch vehicle recovery areas and projected launch trajectories (Figure 4.4).

The potential contribution of the Project to climate change, in terms of greenhouse gas (GHG) emissions, relates to project activities on, and connected to the site. Any resultant GHG effects will theoretically have global spread but where Global Warning Potential (GWP) inventories have been calculated they have been assessed for significance in terms of both local 1 km^2 extent and in terms of the Outer Hebrides data reporting area. Both of these latter scales are reflected in the scales of UK atmospheric monitoring, modelling and reporting processes.

20.3 LEGISLATIVE FRAMEWORK AND POLICY CONTEXT

The following legislation and policies are considered relevant to the climate assessment:

- The Climate Change Act 2008 establishes a legally binding target to reduce the UK's greenhouse gas emissions by at least 80% in 2050 from 1990 levels;
- Department for Transport (2021). Draft Guidance to the regulator on environmental objectives relating to the exercise of its functions under the Space Industry Act 2018. This guidance sets out the environmental objectives set by the Secretary of State under section 2(2)(e) of the Space Industry Act 2018 and provides specific guidance from the Secretary of State to the regulator on how to interpret its environmental duties with respect to these objectives;
- The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019, which amends the Climate Change (Scotland) Act 2009, sets targets to reduce Scotland's emissions of all greenhouse gases to net-zero by 2045 at the latest, with interim targets for reductions of at least 56% by 2020, 75% by 2030, 90% by 2040;
- The EIA Directive 2014/52/EU7; transposed in Scotland as the Town and Country Planning (Environmental Impact Assessment (Scotland) Regulations 2017. The regulations introduced the need to consider climate as part of EIA;
- Scottish Government Climate Change Plan (CCP) (2018-2032) sets out how Scotland will continue improve resilience to climate change and reduce emissions by 66% over the period to 2032;

- The Outer Hebrides Local Development Plan (Adopted Plan) November 2018 seeks to provide a framework for some of impending challenges such as climate change adaptation;
- The Scottish Space Strategy (Scottish Government, 2021) sets out specific objectives to identify methods for public and private sector collaboration that positions Scotland as a thought leader in taking a more sustainable approach to space activity and enables the sector to contribute towards our Net Zero ambitions; and
- Comhairle nan Eilean Siar's Carbon Management Plan (CM Plan) 2017/2023 sets out their ambitions for carbon emissions reduction and a roadmap for progress, including a 9.87% reduction in total annual carbon footprint by 2023.

20.4 DATA GAPS AND UNCERTAINTIES

The key gaps and uncertainties with respect to this assessment are as follows:

20.4.1 Climate Variability and Change Prediction

There is uncertainty around natural climate variability and the associated effects of extreme weather and conditions associated climate change has led to a precautionary approach taken in terms of project design where, for example, the new causeway/culvert has been designed to include additional freeboard beyond the 1 in 200-year flood event. It has been estimated that in a 200-year event, water level in the loch would rise by 0.35 m, however a 0.47 m freeboard has been designed into the culvert to account for climate variability and increased future flooding (Chapter 17: Hydrology, Hydrogeology and Geology). Similarly, the levels, timing and frequency of sea level change and storm surges, extreme winds and weather patterns arising from climate change are uncertain, measures to address climate extremes, and other unplanned events have been identified and integrated into Appendix 20.1 Risk Register.

20.4.2 Propellant / Oxidisers Characterisation

The propellant/oxidiser combinations set out in Table 20-4 are based on real launch vehicles (albeit some are still in development) and reflect the scope of vehicles most likely to be used at the Project site, however other potential propellant mixtures may be adopted by individual clients. The majority of propellants have a relatively small total propellant masses (< 100 kg), however one potential propellant assessed has a total propellant mass of 1,622 kg, this represents the worst-case scenario for propellants and is unlikely to be exceeded based on design parameters of the proposed infrastructure.

20.5 CONSULTATIONS

The key points raised by stakeholders during Scoping and pre-application consultation regarding climate change are presented in Table 20-1.

Table 20-1 Key issues raised by stakeholders during consultation

Stakeholder	Comment	Response/Action taken	Section cross-reference
SEPA Scoping Opinion 04/07/2018	Crossings should be sized to convey the 1 in 200 surface water flood flows. Further information on the watercourse crossing over Loch Scolpaig should be provided. An assessment should also be made of the existing crossing to ensure any new crossing is appropriately sized, and flood risk is not increased elsewhere.	Culvert sized to convey 1:200 flow with sufficient freeboard to minimise risk of future overtopping. Crossing details and information on track upgrades are provided.	Appendix 17.2. Water Management Chapter 17. Hydrology, Hydrogeology and Geology
SEPA, Scoping Opinion (2018)	Scottish Planning Policy (SPP) states (Paragraph 205) that where peat and other carbon rich soils are present, applicants should assess the likely effects of development on carbon dioxide (CO2) emissions. Where peatland is drained or otherwise disturbed, there is liable to be a release of CO2 to the atmosphere. Developments should aim to minimise this release.	Design substantially revised since proposals submitted at Scoping. No part of the development is located on significant peat deposits. Surveys (trial pit report and vegetation survey) indicate the development is located on fixed dune systems. Two trial pits indicated that there is an area adjacent to proposed track upgrades which are located on discrete shallow peat deposits <0.5 m, this depth of peat is not formally classified as peat soils (SEPA, 2017). Impacts on peat are therefore assessed to be negligible and are scoped out of the EIA Report.	Appendix 17-3. Test Excavations Profiles and Photographs Chapter 17 Hydrology, Hydrogeology and Geology
Letter from SEPA 02/06/2020	The culvert design has been informed by an assessment of flows into the Loch. The FRA states that the upgraded culvert will remove the current restriction and overtopping, so the loch will act as one waterbody. It has been estimated that in a 200-year event, water level in the loch would rise by 0.35m. We recommend that this is also factored into the design levels for the site, and set 600mm above the flood level at the loch (or the coastal flood level plus climate change and freeboard, whichever is higher).	The Flood Risk Assessment sets out the calculations informing the culvert design; a 470 mm freeboard is above normal loch level and modelled 350 mm loch rise due to 1:200-year event, and culvert should not overtop.	Appendix 17.2: Water Management

Stakeholder	Comment	Response/Action taken	Section cross-reference
General Public (92 representations to 2019 planning application[1])	Synopsis of all comments made in relation to climate change: The Scottish Government has declared a climate emergency, and respondents maintain that local authority focus should be on the preservation and not industrialisation of the environment. The expected loss of peatland is cited as a future contributor to climate change. Respondents are concerned about the overall carbon footprint generated by the creation of the site and its related infrastructure. Transportation and the use of fossil fuels during the development and operation of the site are also listed likely contributors to climate change.	No project infrastructure is located in areas of blanket bog/peatland. Only a small proportion of rocket fuels adopt hydrocarbon-based fuels as a propellant (kerosene). Due to the high levels of efficiency required for rocket fuels, non-fossil fuels are more frequently adopted as an alternative (hydrogen peroxide, liquid O_2). The infrastructure required for the proposed project is relatively small scale and the construction/operational activities and traffic associated are similarly small in scale.	Chapter 17 Hydrology, Hydrogeology and Geology Chapter 4: Project Description

20.6 ASSESSMENT METHODOLOGY

20.6.1 Approach to assessment

The general EIA Report process and methodology is detailed in Chapter 6: Approach to EIA. The approach adopted is high-level due to the relatively small scale of the proposed construction and operational requirements. The climate assessment in this chapter focusses on the following:

- Evaluation of the potential effects of climate change variables on the proposed Project; and
- Evaluation of the potential effects of the proposed Project on climate change in terms of GHG emissions.

IEMA guidance on Climate Resilience and Adaptation in EIA (amended in 2020)[2] provides a framework for the effective consideration of climate change resilience and adaptation through EIA procedures. It includes case studies of EIAs which have considered climate adaptation and resilience issues, reflecting legislative developments and evolving practice.

20.7 BASELINE DESCRIPTION

Topography

The Project occupies a low-lying area formerly used for the rough grazing of sheep and cattle, with the lowest point within the planning boundary approximately 2 m (at the crossing point between upper and loch Scolpaig) (Figure 17.1) and the highest point just under 20 m AOD at the access point to the site. The surrounding topography is dominated by the Beinn Scolpaig hillock to the northeast (88 m AOD) and Beinn Riabhach (177 AOD) to the southeast. The current access track accesses the site from the A865 and runs over rough moorland before reaching a culverted causeway over

[1] Submitted 26 June 2019 (Planning Reference 19/00311/PPD).

[2]https://www.iema.net/resources/reading-room/2020/06/26/iema-eia-guide-to-climate-change-resilience-and-adaptation-2020 (accessed 15/12/2021)

Scolpaig Loch. The existing track continues over moorland to unused farm buildings. The area to the northwest of the farm buildings comprises fixed dune systems or fertile machair land typical of the area.

Surface Hydrology and Drainage

The study area is located within the North Uist coastal catchment, with localised drainage dominated by Beinn Scolpaig which feeds the main waterbody on the site, Scolpaig Loch, via a series of linear drainage channels. Run off to the study area is also generated by Beinn Riabhach (Figure 17.1 and Appendix 17-2 Water Management).

Modifications to the loch structure have altered the response of the loch to flooding events. A short causeway crosses the loch, and the drainage underneath the crossing comprises a small traditional stone culvert (0.3 m x 0.4 m). The small size of the stone culvert restricts the throughflow from the 'upper' body to the 'lower' body of the loch. As a result, the two bodies of Loch Scolpaig have distinctive sub catchments, also delineated by the track. A schematic of the two catchments is illustrated in Appendix 17.2: Water Management and the sub catchments are illustrated on Figure 17.1.

The complete loch system eventually drains to Port na Copa to the west of the planning boundary via a corrugated steel pipe of approximately 600 mm in diameter, which subsequently discharges to a grated concrete structure on the upper shoreline. This drainage arrangement can exacerbate sea flooding on site when the outfall from the Loch can become partially blocked with seaweed and other marine debris. Anecdotal evidence suggests there are also significant rises in the loch during winter after severe storms, in addition to sea flooding from storm surges. During a site visit 6th November 2019, marine debris was observed in the channel and also to the north of the 'lower' loch suggesting some inundation of seawater to the loch system.

Climatic conditions

The climate factors that could influence the site activities most are visibility, wind speed, prevalence of icing conditions and excessive heat. Such factors may influence the integrity and reliability of site infrastructure, they may influence the availability of suitable launch windows and may influence the nature of operating procedures and working practises.

A review of the Met Office climate averages database[3] was used to establish a climate baseline for the proposed project. The South Uist range, at approximately 30 km from the site, is the closest MET office station to the proposed site (57.358, -7.397). The data presented show the latest set of 30-year averages, covering the period 1981-2010, for the South Uist range climate station. The conditions at the Project site and can be summarised as follows:

- The South Uist range data station recorded an average annual maximum temperature of 11.5°C, 0.8°C higher than the average annual minimum temperature for Scotland (10.7°C).
- The average annual minimum temperature of 6.9°C was 2.7°C warmer than the average annual minimum temperature for Scotland (4.2°C).
- An annual average of 1,193.5 mm of rain was recorded at South Uist. This is less than the average annual rainfall for Scotland for the same period which stands at 1,570.9 mm.
- The monthly mean wind speed at 10 m on South Uist is 15.2 knots, with the highest average wind speed recorded in the month of January, an average of 18.6 knots.

Critical changes to baseline conditions are more likely to be associated with upper extreme conditions rather than normal operating conditions and averages. However, by nature such extreme results are difficult to describe at a site-specific

[3] https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gf4wr9twt (accessed 14/12/2021)

level without site specific records and extensive additional work. It is important to recognise that extreme events may become more frequent and severe.

Vulnerability to Climate Change

The low-lying, relatively flat landscape of the western seaboard of the Uists has a particular vulnerability to climate change, especially to rising sea levels. Winter water tables are high, and a high proportion of the area is permanent open water and marsh. Rising sea level alone has the potential to raise water levels within the islands by progressively reducing the effectiveness of an ageing drainage network[4], not only raising water levels, but possibly also facilitating saline infiltration of the water table (Angus, 2014).

Greenhouse gases

The preparation for and firing of rockets from the site will have a number of associated gaseous emissions that relate to Global Warming Potential. However, existing natural conditions and local community activities as well as adjacent transport sources lead to an existing inventory of gases that create the current baseline activities. A range of these wider forcing factors for emissions are modelled across the whole of the UK under the UK Government, UK local authority and regional carbon dioxide and greenhouse gas emissions national statistics. Some of the local results from this national database for the site and surrounding areas are presented below (Image 20-1). What this data shows is that for the area under consideration for development the main background sources anthropogenic CO_2 arise from transport and other mobile sources of emissions. It can also be seen that the levels of direct CO_2 generated are at a 'low to typical' level in comparison to the wider area[5].

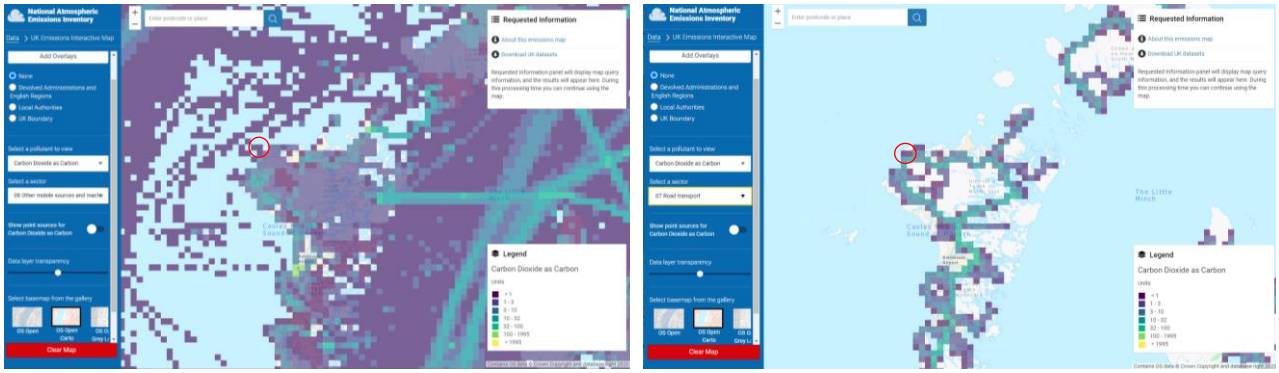

Image 20-1 Marine transport and road transport CO_2 emission levels for the North Uist area (development site indicated by red circle)

There are also existing sources of CO and CH_4 that need to be considered to help establish the total baseline GWP for the area. The individual and collated results for the 1 km^2 area of the proposed test site from the National Emissions Inventory are shown in Table 20-2.

[4] As sea levels rise, however, the drains are rendered less effective due to the reduction in the height between the inland water table and the sea.

[5] National Atmospheric Emissions Inventory (accessed 14/12/2021)

Table 20-2 Baseline greenhouse gas emissions for proposed development area in North Uist

Greenhouse gas	Existing emissions (tonnes per km²)	GWP factor	Existing emissions (tonnes CO_2e per km²)
Carbon dioxide	2.947	1	2.94
Carbon monoxide	0.094	<10	0.94
Methane	0.66	21	13.86
Total			**17.74**

At a wider scale the non-land use emissions of CO_2 for the Outer Hebrides are modelled at 161,000 tonnes, with total CO_2 emissions predicted to be around 500,000 tonnes. Based upon UK figures, the total GWP CO_2 equivalent emissions can be expected to be around 20% higher than CO_2 emissions alone. This suggests a SWP potential of 193,000 tonnes CO_2e for non-land use sources and around 684,000 tonnes CO_2e overall.

20.8 POTENTIAL IMPACTS

Potential impact pathways associated with climate change include:

- Construction works and operations associated with the Project may be vulnerable to climate change effects; and
- Operations associated with the Project may contribute to GHG emissions and influence climate change.

20.8.1 Scoped Out

The following impacts have been scoped out:

- **Emissions associated with ground works and peat disturbance / loss** - design mitigation has avoided peat deposits.
- **Emissions associated with support vehicles, support vessels and buildings during operation** - the emissions associated with operation of the site are also anticipated to be minor in scale and sporadic in nature due to the relatively low intensity of the proposed launch plan. They will be associated with a small number of cars, vans and light lorries and with the electricity supply to the site. Similarly, any support vessel activity to patrol areas or recover any launch debris will involve sporadic use of small vessels, either already operating locally or very similar to local fishing and work boats. Provisional estimates have suggested that the construction works may involve around 380 local / island based traffic movements. This is a very small proportion of the total vehicles movements that will take place locally.

20.9 MITIGATION AND MANAGEMENT MEASURES

The following mitigation and management measures are proposed to remove, avoid, reduce and, where possible, offset any impacts. These measures are considered in the assessment of residual effects in Section 0.

Table 20-3 Mitigation measures

Ref.	Title	Description
GM01	Design Mitigation	• Reuse of existing infrastructure where possible: one existing farm building upgraded and the existing access road from the A865 will be upgraded. • Substantial reduction of original project infrastructure (Figure 3.1) and footprint to avoid peat. • Project revised to provide a venue for sub-orbital launch vehicles, substantially smaller than orbital launch vehicles proposed in the Scoping Report; • Key infrastructure (including the construction compound) has been located outwith a 50 m buffer of all surface watercourses and on land higher than 4.73 m AOD to avoid potential flooding impacts
HHG6	Inspection and Maintenance Schedule	Inspection and maintenance programme will cover outflow from lower Loch Scolpaig to ensure debris does not accumulate and contribute to localised flooding. The inspection programme will also include periodic inspections of the culvert at Loch Scolpaig, to ensure that flow is not obstructed by blockages or debris.
CC01	Policy Drivers & Sustainability	Scotland's Space Strategy has a target to transition to a net zero society by 2045 and sets out a process for identifying methods for public and private sector collaboration to support the development of a more sustainable approach to space activity and enables the sector to contribute towards national Net Zero ambitions. Space Scotland's Environmental Task Force and the Sustainable Space Challenges initiative have been developed to create a world-leading environmental strategy for the space sector covering vehicle emissions, a lifecycle analysis of missions to include those emissions associated with R&D, manufacturing emissions and coherent end of life planning, through to achieving space-based data for environmental monitoring and mitigation.

20.10 IMPACT ASSESSMENT

No likely significant effects due to or as a result of climate change were identified in the initial Scoping exercise of 2018. The current project proposals have been significantly revised with a reduced scope in terms of on-site infrastructure required and scale of launch operations. This outcome has resulted in further reduction of any impacts as now explained in more detail.

20.10.1 Construction works and operations associated with the Project may be vulnerable to climate change effects

The development may be vulnerable climate change effects such as extreme weather events, most notably sea level rise and flooding, however extreme weather may also disrupt operational activities. In line with feedback from SEPA, key site infrastructure lies above 4.73 AOD, with the exception of the upgraded causeway at Lock Scolpaig which has a new culvert designed to accommodate a 1 in 200 yr flood event. These levels also mitigate impacts from coastal (sea) flooding.

The Flood Risk Assessment (Appendix 17-2 Water Management) sets out the calculations informing the culvert design; a 470 mm freeboard is above normal loch level and the modelled 350 mm predicted loch rise under 1:200-year event. However, a maintenance regime managed by the Spaceport Operator will ensure period cleaning (removal of debris and blockages) from the Loch Scolpaig outfall channel to the sea to retain flow rates from the loch (HHG06). Periodic inspection of the culvert would also be undertaken to identify and remove any potential debris restricting flow. The Risk Register provided in Appendix 20.1 outlines how the development will plan for and mitigate other extreme climatic events. Implementation of standard design mitigation (GMO1) and appropriate maintenance regime will ensure that the potential effects of climate change on the project during the construction and operation phases are **not significant.**

20.10.2 Operations associated with the Project may contribute to GHG emissions and influence climate change

This impact relates to the potential effects of greenhouse gas (GHG) emissions associated with the operation of the project on climate change. The project is anticipated to use a number of possible fuel/oxidiser propellant mixes for launches during operation, these are:

- Hydroxyl Terminated Polybutadiene (HTPB) / High Test Peroxide (HTP)[6] (total mass 70 Kg);
- High Test Peroxide (HTP) / Kerosene (total mass 1622 kg);
- HTPB, ammonium perchlorate (AP), and powdered aluminium metal (total mass 100 kg);
- High Density Polyethylene (HDPE) / nitrous oxide (total mass 4.9 kg).

The process of combustion coverts these compounds into emissions, detailed in Table 20-4.

Table 20-4 Propellant/Oxidiser Exhaust Constituent Percentages

Species	Mass %	Mass (kg)
High test peroxide (HTP) and kerosene		
Water (H_2O)	61.3	994
Carbon dioxide (CO_2)	32.7	530
Carbon monoxide (CO)	5.4	87.6
Hydrogen gas (H_2)	0.5	8.1
High Density Polyethylene (HDPE) and nitrous oxide		
Methane (CH_4)	0.8	0.41
Carbon monoxide (CO)	8.1	0.395
Carbon dioxide (CO_2)	28.6	1.400
Hydrogen gas (H_2)	1.1	0.055
Water (H_2O)	6.5	0.318
Ammonia (NH_3)	0.004	0.02

[6] Information provided by the launch vehicle manufacturer states that the exhaust gases are water, carbon monoxide (CO), carbon dioxide (CO_2) and hydrogen (H_2). CO_2 emissions were not calculated for this propellant mixture; however, the relatively small mass of this fuel (70 kg) suggest that this fuel does not represent the worst-case scenario for GHG emissions (Appendix 18-1 Detailed Dispersion Modelling).

Species	Mass %	Mass (kg)
Nitrogen gas (N_2)	54.5	2.672
Elemental carbon (C)	0.4	0.018
Ammonium perchlorate (AP), aluminium powder and HTPB		
HCl	21.4	21.4
Al_2O_3	28.4	28.4
PM_{10} and $PM_{2.5}$	28.4	28.4
CO	28.7	28.7

The key GHG components relevant to contribution to climate change of relevance are CO_2, CO and NO, where present. As detailed in the Chapter 4 Project Description, a maximum of 10 launches per year are anticipated. Appendix 18-1 Detailed Dispersion Modelling presents the range of fuel and rocket options being considered. The modelling outlines the fuel inventories and composition of a number of rocket and fuel types. A number of these technology and fuel scenarios have very low inventories, for example the smaller rockets operate with between 5 kg and 100 kg of fuel, with associated very small emissions inventories. One rocket system has a larger total propellant mass of approximately 1.6 tonnes. This system was therefore used to undertake a worst-case assessment of possible emissions from rocket flights. The details are presented in Table 20-5.

Table 20-5 Estimation of worst-case greenhouse gas emissions

Rocket fuel emissions per launch/flight	Emissions (tonnes per launch)	GWP factor	Emissions associated with site (tonnes CO2e per km2)
Carbon dioxide	0.530	1	0.530
Carbon monoxide	0.087	<10	0.876
Methane	0.0	21	0.0
Total per launch			1.4
Total per year (10 launches)			**14**

From this worst-case assessment an estimate of the rocket fuel emissions of CO_2 and CO give a combined GWP of 1.4 tonnes per flight/launch and with 10 such events planned per year an annual GWP contribution of around 14 tonnes. For comparison this level of emission is slightly higher than the present, pre-development, GWP inventory modelled for the site of 17 tonnes. Another benchmark arises by considering that a typical UK petrol driven car has an annual output of around 1.7 tonnes CO_2 (extracted from Department for Transport statistics by NimbleFins, 2021). Consequently, the rocket flight activity will have GWP emissions equivalent to just over 8 typical cars.

The space sector is actively developing measures to reduce carbon footprint, and efforts to reach Net Zero by 2045 form a core part of the Scotland's Space Strategy. It should be noted, for example, that the specification of the worst case above scenario analysed in the example above (HTP / Kerosene) has developed a replacement for kerosene based on an innovative plastic recycling method using a catalytic pyrolysis to obtain new sources high-quality fuels for aerospace

industry[7]. It is also important to acknowledge that sub orbital launches play an important role in climatic and atmospheric research, with typical applications including weather observations, plasma physics, research in the study of the upper atmosphere, astronomy, remote sensing of natural resources and micro gravity research (NASA, 2015).

Based on the anticipated GHG emissions associated with launch events, the potential effects of the project on climate change during the operation phase will be **not significant**.

20.11 CUMULATIVE EFFECTS

No other projects of this type are planned in the local vicinity. Wider project development activity across the Outer Hebrides is considered to be covered under the CO_2 emissions baseline. The overall CO_2 emissions for the Outer Hebrides is estimated by the UK Government to be 570,000 tonnes for all sources with 161.000 tonnes from non-land use sources, equivalent to 684,000 tCO_2e and 193,000 tCO_2e of GWP. The proposed flight activity would therefore equate to only 0.004% of total and 0.01% of direct anthropogenic global warming potential emissions locally. The progressive reduction in local CO_2 emissions in the Outer Hebrides is taking place at around 9,600 tCO_2e per year at present. The project flight activity would therefore have a greater influence on this value but would still only represent a change of 0.3% to the present reduction trajectory. These influences are considered to be **not significant** in terms of climate change emissions.

20.12 CONCLUSIONS

The assessment evaluation of the potential effects of climate change variables on the proposed Project and the potential effects of the proposed Project on climate change in terms of GHG emissions. Emissions associated with CO_2 liberation from disturbed peat has been scoped out as design mitigation / changes have avoided peat deposits. Similarly, emissions associated with construction plant and support vehicles / vessels during operation are scoped out as these are expected to be minor in scale and sporadic in nature due to the relatively low intensity of the proposed launch plan.

Key climate vulnerabilities were identified in relation to flooding of Loch Scolpaig from both overland flow and coastal flooding. These have been mitigated through the placement of infrastructure above SEPA recommended levels of 4.73 AOD and replacement of the existing undersized culvert to have sufficient freeboard for future rises in water level / flooding. A site operation and maintenance regime cover inspections and works to maintain the free flow of water at both the culvert and outflow to the sea. A project risk register (Appendix 20.1) sets out the mitigation measures for other climatic extremes. Potential impacts in terms of the development vulnerability to climate change are assessed as **not significant** with the proposed mitigation.

Site construction and operation has potential to generate greenhouse gases which can contribute to climate change. Contributions from the construction phase and vehicular traffic are scoped out due to the nominal volumes expected from these activities. However, a conservative assessment of the contribution of rocket launches was undertaken based on the worst-case scenario propellant mass over 10 launches. The total contribution was assessed as 14 tonnes CO_2, equivalent to less than 8 typical cars (based on 1.7 t / year / car). However, the majority of propellants anticipated to be used on site are relatively small due to the lower size class of sub-orbital launches proposed at the site (<100 kg) and this quantity is highly conservative. In addition, the particular launch operator adopting this worst-case propellant has developed a recycled kerosene fuel based on recycled plastics. Impacts in terms of the contribution to climate change are assessed as **not significant**.

[7] https://www.skyrora.com/ecosene

The space sector is actively developing measures to reduce carbon footprint, and efforts to reach Net Zero by 2045 form a core part of the Scotland's Space Strategy. The assessment also acknowledges that sub-orbital launches play an important role in climatic and atmospheric research, with typical applications including weather observations, plasma physics, research in the study of the upper atmosphere, astronomy, remote sensing of natural resources and micro gravity research (NASA, 2015).

20.13 REFERENCES

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21 ENVIRONMENTAL MANAGEMENT AND MONITORING

CONTENTS

21 ENVIRONMENTAL MANAGEMENT AND MONITORING

21.1 INTRODUCTION

The purpose of this chapter is to present the Developer's commitment to environmental management throughout the lifetime of the Project. A robust environmental management programme is important to ensure that environmental effects are appropriately managed and that no unforeseen adverse effects arise during the implementation of the Project.

This chapter outlines the framework for implementing environmental management and protection measures during construction, operation, and decommissioning of the Project. Mitigation and monitoring measures identified throughout the EIA Report are collated into a Schedule of Mitigation (Annex C).

21.2 ENVIRONMENTAL MANAGEMENT PROCESS

The Project will be under the ownership of CnES and will be leased to 'Spaceport 1' a distinct commercial entity and designated Spaceport Operator. Under the new regulations, facilities supporting the launch of sub-orbital and orbital Launch Vehicles (LVs) require a Spaceport Operator to obtain a Spaceport Licence (or Air Navigation Order) (refer to Chapter 2: Legislation and Policy for further information. The Space Industry Regulations also place a number of specific requirements in terms of the management of the Spaceport with prescribed personnel responsible for maintaining the Spaceport management system and ensuring that the activities are undertaken in compliance with licence requirements. Environmental management will form part of that management system and will be implemented at all stages throughout the Project.

21.2.1 Construction

A Construction Mitigation Register (CMR) will be collated detailing the mitigation commitments in the EIA and any relevant planning and licensing conditions. The CMR will be based on the Schedule of Mitigation in Annex C. The CMR will outline all required mitigation commitments and relevant planning conditions for ornithological, ecological, cultural heritage and hydrological receptors, providing details of key sensitivities present and timings. The CMR will form a part of tender documentation for a construction contractor, who will be required to provide a dedicated 'Construction Environment Manager' to ensure compliance with the CMR during construction. The Construction Environment Manager will ensure all activities with potential to affect the environment are appropriately managed, commitments made during the EIA process and relevant planning conditions are implemented. All identified environmental risks and necessary protection measures will be integrated into the contractor's method statements for all key construction activities. The contractor will also be required to produce a set of minimum control standards for sub-contractors working at the site. The CMR will also include monitoring, reporting and communication protocols to manage changes.

21.2.2 Operation

A dedicated Environmental Manager/Officer will form part of the core Spaceport personnel, employed to ensure that the Project complies with environmental legislation and planning conditions throughout the operation of the Project. They will advise on implementation of the prescribed mitigation measures (Annex C: Schedule of Mitigation), auditing and monitoring activities and reporting to relevant stakeholders. They will also be responsible for delivering the commitments detailed in the Habitat and Amenity Management Plan (HAMP), including a remit covering community grazing, public access, habitat management and other aspects related to the HAMP (an outline plan is provided in Appendix 7-2).

21.3 MITIGATION AND MONITORING

Annex C: Schedule of Mitigation presents an overview of the mitigation and monitoring measures identified through the EIA process and detailed in the chapter-specific topics of the EIA Report. These measures are anticipated to remove, reduce, or offset the predicted adverse effects so that there are no significant residual effects and that any potential effects identified are reduced to an acceptable level. Mitigation measures are also recommended in cases where impacts have been assessed as unlikely to be significant in accordance with best practice and to ensure that no unforeseen significant effects arise.

21.4 HABITAT AND AMENITY MANAGEMENT PLAN (HAMP)

A Habitat and Amenity Management Plan (HAMP) will be developed post-consent, an outline of the HAMP is provided in Appendix 7-2, which set out the general principals and objectives for site management. The Plan will provide the basis for managing the multiple uses of the site focusing primarily on the operation of the site as a Spaceport facility, but in alignment with core objectives around habitat enhancement, agricultural / grazing activities, public access, cultural heritage and recreation. Management measures implemented to support each one of these objectives are inherently connected, subsequently the consideration of all of these topics must be evaluated – and managed - jointly. Provision in the Plan will be made to respond to community feedback via an Advisory Group to further develop the site.

The objectives for the plan will also be required to align with any conditions related to any planning consent issued under the Town and Country Planning (Scotland) Act 1997 as amended. Conditions may include commitments made as part of the EIA process under The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. These commitments, where relevant, are detailed under the specific plan objectives headings.

Detailed objectives for the HAMP will be centred around the core use of the site as an operational spaceport facility and implementation of any planning conditions. However, secondary objectives of HAMP will focus on the maintenance, enhancement, and where necessary, the creation of habitat, to support and encourage priority species. Further objectives will focus on the encouragement of proportionate public access arrangements and the development of various other aspects of the site as a community resource.

A number of commitments have been made during the EIA process to ensure potentially significant adverse effects from the operation of the Spaceport are removed or reduced. The implementation of the commitments, which may also form planning conditions, require consideration as part of future development proposals. Key commitments include:

- Species specific signage and control of speed limits for authorised (Spaceport and grazing tenancy) vehicular traffic;
- Maintenance of a Disturbance Prevention Zone for corncrake;
- Monitoring for corncrake before and after each launch up to a 1 km distance from the launch pad;
- Biannual monitoring for otter up to a distance of 300 m from the launch pad;
- Provision of nest boxes for displaced starlings;
- Development of the habitat enhancement plan, originally developed by the RSPB to benefit species-rich grasslands, waders, wetland and corncrake and extend habitat principals to full Scolpaig Farm area, and explore other potential restoration or enhancement opportunities e.g., peatlands.

21.5 GENERAL ENVIRONMENTAL MANAGEMENT MEASURES

General construction site management and environmental protection principles are outlined below.

21.5.1 Pollution Prevention

A Pollution Prevention Plan (PPP) will be provided pre-construction and will detail all pollution prevention measures to be implemented throughout all stages of the Project, including those identified in the EIA Report and through conditions of any planning consent. The PPP will also be required as part of a Construction Site Licence required from SEPA under the Water Environment (Controlled Activities) (Scotland) Regulations 2011.

The PPP will manage the potential for accidental pollution, management of materials on site and response for any pollution events. Measures will be implemented in line with current legislative requirements, industry technical guidance and codes of practice, particularly SEPA's Pollution Prevention Guidelines (PPG).

The PPP will include the following controls:

- Silt fences should be employed to reduce contamination of runoff;
- Welfare facilities will be adequately designed and maintained to ensure all sewage is disposed of appropriately;
- Development of contingency plans will ensure that emergency equipment (e.g. spill kits and absorbent materials) is available at appropriate locations; and
- Toolbox talks should be carried out to ensure all relevant staff are trained in both normal operating and emergency procedures.

Relevant best practice guidance that will inform the PPP will including (but not limited to):

- Guidance for Pollution Prevention and Pollution Prevention Guidance: GPP 5: Works or maintenance near water;
- PPG1: General Guide to the Prevention of Pollution;
- GPP21: Pollution Incident Response Planning;
- GPP26: Safe Storage – Drums and Intermediate Bulk Containers;
- CIRIA (2002) SP156 Control of Water Pollution from Construction Sites: Guide to Good Practice;
- SEPA WAT-SG-26. Good Practice Guide: Sediment Management;
- SEPA WAT -SG-29: Good Practice Guide: Temporary Construction Methods; and

21.5.2 Waste Management

The generation of waste will be minimised through implementation of a Site Waste Management Plan. Waste generated during the construction period that cannot be safely re-used will be either recycled through appropriate recycling providers or disposed of at licensed waste management facilities. The LO will be required to establish waste segregation bins and to separate all waste materials arising from construction activities, launch preparations and demobilisation.

Waste generated during the lifetime of the Project will be managed in accordance with legislative requirements and the waste hierarchy principles as defined in the EU Waste Framework Directive, to ensure sustainable use of resources and minimise environmental impacts. Relevant waste management legislation includes:

- EU Waste Framework Directive (75/442/EEC, as amended);
- Environmental Protection Act 1990;

- Environmental Protection (Duty of Care) (Scotland) Regulations 2014; and
- Waste (Scotland) Regulations 2012.

A site-specific waste management plan (WMP) will be developed prior to construction and submitted to the planning authority and statutory bodies, including SEPA, for approval. The WMP will identify and quantify all major waste streams; include principles and procedures for waste minimisation, waste separation, storage and disposal; and detail relevant legislative obligations, guidelines and best practice. Waste prevention and minimisation will be the priority strategy during all project phases, with disposal considered as a last resort.

21.5.3 Hazardous Material Management Plan

A detailed hazardous management plan for the transport, storage and use of hazardous substances will be developed post-consent. An Outline Hazardous Materials Management Plan setting out the general principals, maximum materials inventory and pollution control response to different scenarios is provided in Appendix 17-1. The plan will cover the following details:

- Regulatory context and legislative interactions;
- Maximum materials inventory;
- Management, Roles and Responsibilities;
- Pre-launch appraisal / contract agreement processes;
- Principals for the transport and storage of hazardous materials;
- Spillage Management and Catastrophic Events;
- Storage of residual materials post launch; and
- Security.

21.6 DECOMMISSIONING

The decommissioning process is the reverse of the construction/installation procedure and requires similar plant and machinery. Any impacts associated with decommissioning will be similar to or less than those identified for the construction phase, assessed in each of the technical impact assessments.

This application seeks planning approval for a permanent project. Project infrastructure, including containment tank, water storage tanks and site fencing etc. will be removed from site, should operations cease. Access infrastructure and hardstanding is proposed to remain in place to facilitate access to the site as a common grazing resource and any ongoing habitat management requirements.

21.7 ACCIDENTAL AND UNPLANNED EVENTS

The management of accidental and unplanned events have been covered throughout the EIA, notably Chapter 13: Marine Users and Assets, and Chapter 17: Hydrology, Hydrogeology and Geology. A summary of potential accidental events is provided in the Risk Register (Appendix 21-1), which covers key potential risk arising from the development itself as well as development vulnerabilities.