CHAPTER 4 SITE SELECTION, DESIGN ITERATION AND CONSIDERATION OF ALTERNATIVES

4. Site Selection, Design Iteration and Consideration of Alternatives

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4.1 Introduction

4.1.1 The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) requires the Environmental Impact Assessment Report (EIA Report) to include *"a description of the reasonable alternatives studied by the developer, which are relevant to the development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment"* (Regulation 5(2)(d)) (Scottish Government, 2017).

4.1.2 Schedule 4 of the aforementioned Regulations also requires *"a description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects"* (Scottish Government, 2017).

4.1.3 This chapter articulates the site selection process for the Proposed Development from the initial identification of Saxa Vord as the optimum strategic location for such a facility on account of having the *"best orbital access"* in the north of Scotland, through to the site specific identification of Lamba Ness for the proposed Launch Site; the former Valhalla Brewery Building at Saxa Vord for the Launch and Range Control Centre; the new length of Access Road at Northdale; and, the reuse of the existing Fuel Storage Area at Baltasound Airport.

4.1.4 It also describes the iterative process from which the final design of the Proposed Development presented in this EIA Report evolved and was arrived at following detailed consideration of a number of alternative design configurations.

4.1.5 As highlighted above, the Proposed Development involves the following principal elements:

- Proposed Launch Site – a launch area at Lamba Ness comprising three launch pads, a satellite tracking station, launch vehicle integration buildings, roadways (largely re-using existing roads), fuel storage and ancillary infrastructure;
- Proposed Launch and Range Control Centre (LRCC) at Saxa Vord;
- Proposed New Section of Access Road – a stretch of new road at Northdale; and,
- Reuse of the existing Fuel Storage Area at Baltasound Airfield (As highlighted in Chapters 1 and 3 of this EIA Report, this element is an integral part of the Proposed Development. However, it does not form part of any one of the three submitted planning applications as formal planning permission is not required for this element being re-use of an established use).

4.1.6 In terms of site selection, the key driver was the proposed Launch Site on the Lamba Ness peninsula being the 'major' element of the Proposed Development, as of necessity, it covers the largest area of land and comprises the following:

- Launch Pad Complex: three launch sites, each incorporating a launch pad, ground services storage and control, lightning protection masts, liquid and compressed gas storage and water deluge tanks for launch operations;
- Satellite Tracking Station: an area of hardstanding housing satellite tracking and telemetry devices;

- Launch Site Processing Facility (LSPF) hangar buildings (two): a building where the LVs are assembled and the payloads (the satellites) are integrated into the LVs;
- Administration Building, Pyrotechnics Store, and Hazardous Materials Store located adjacent to the LSPF;
- Integration Hangar/TEL building: a forward position building close to the launch pads housing the transporter erector launcher (TEL) and where the final integration activities take place as required;
- Support Infrastructure including access, an internal track system and a series of small temporary buildings and a construction compound;
- Gate House, including a tourist information area; and,
- Wildlife Hide.

4.1.7 The proposed Launch Site, which is centred on reference point 466500 E, 1215500 N and occupies an area of approximately 80.8 hectares (ha), is located approximately 2.5 km north-east of the settlement of Norwick.

4.2 Site Selection

The Proposed Launch Site – The SCEPTRE Site Evaluation

4.2.1 The SCEPTRE report, sponsored by the UK Space Agency (see Appendix 4.1), introduces site selection for the development of a UK satellite launch location with the following comment: *"Given that LVs cannot overfly populated areas, and considering the geography of the UK and its surroundings, together with the physics of spaceflight, it is clear that a UK launch site would have to be at a coastal location in northern Scotland, either on the mainland or an island".*

4.2.2 The report goes on to identify a number of important criteria including:

- site geography;
- accessible orbits;
- population;
- environmental considerations;
- access and infrastructure;
- weather; and,
- development potential.

4.2.3 The report concludes that: *"The Shetland Isles has the best orbital access"* and that *"Saxa Vord offers significant advantages over all other sites. This is largely due to its orbital access (no population in the down range area so is able to deliver the maximum payload to both orbits) but it also scores consistently highly across the other criteria as well."*

4.2.4 It is understood that when referencing Saxa Vord for the proposed Launch Site, the SCEPTRE Report is referring in general to the northern coastal area of Unst in the vicinity of the village of Saxa Vord and the RAF Remote Radar Head at Saxa Vord.

Statutory Environmental Designations

4.2.5 In seeking to identify the most appropriate area for the proposed Launch Site, consideration was given to an area extending beyond Saxa Vord across the northern part of Unst. As graphically articulated on Drawing 4.1 and reproduced as Figure 4.1 below, there is no part of Saxa Vord and

the wider surrounding northern part of Unst that is without an environmental designation and, in some cases, is the subject of multiple designations.

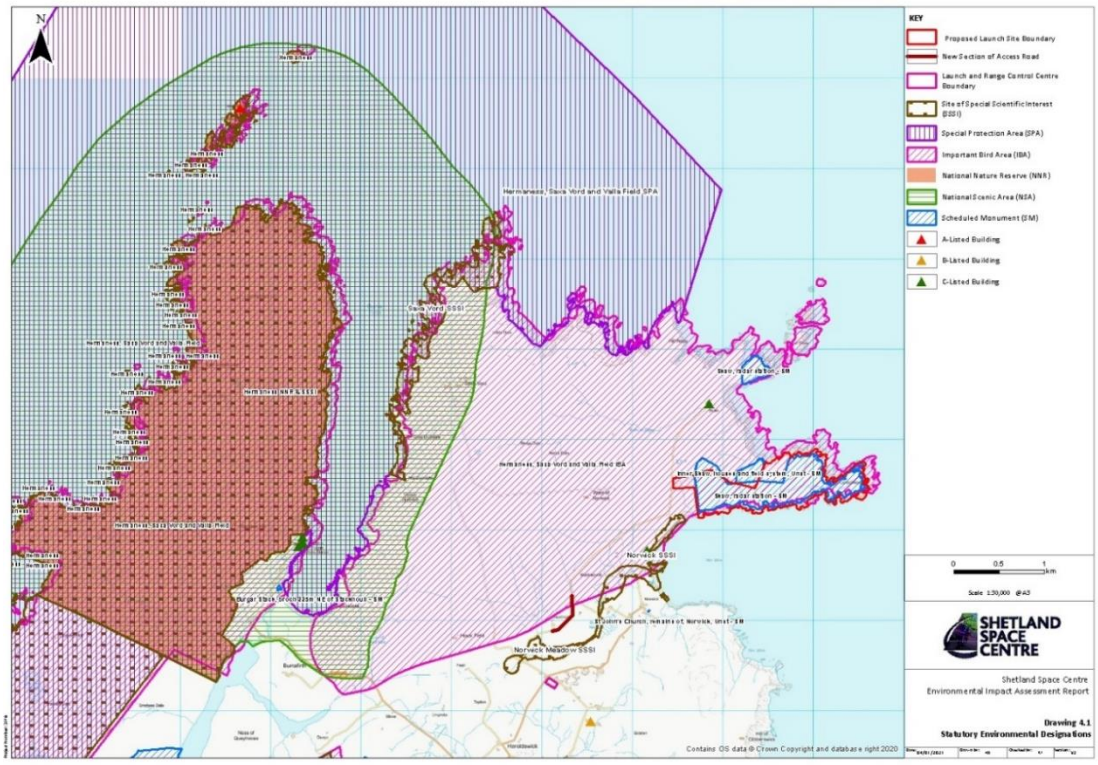

Figure 4.1 Statutory Environmental Designations

4.2.6 The key statutory environmental designations can be summarised as follows:

- Shetland National Scenic Area (NSA);
- Hermaness National Nature Reserve (NNR) and Site of Special Scientific Interest (SSSI);
- Saxa Vord SSSI;
- Norwick SSSI;
- Norwick Meadow SSSI;
- Hermaness, Saxa Vord and Valla Field Special Protection Area (SPA);
- Hermaness, Saxa Vord and Valla Field Important Bird Area (IBA);
- Skaw Radar Station Scheduled Monument (SM) (two distinct areas); and,
- Inner Skaw Houses and Field System SM.

4.2.7 Following on from the findings and conclusions presented in the SCEPTRE report, in identifying an appropriate Launch Site within Saxa Vord and the wider northern area of Unst, it was clear that it would be impossible to avoid impacting directly on a statutory environmental designation in some form to accommodate the proposed Launch Site.

Site Selection Criteria

4.2.8 Specific site selection criteria considered included the following:

- A safety exclusion zone from the launch pad(s) for inhabited domestic properties, including the settlements of Saxa Vord and Norwick, to ensure compliance with anticipated health and safety protocols during launches;
- An assumed 2.24km radius exclusion zone from the MOD RAF Remote Radar Head at Saxa Vord;
- The extent of land required to accommodate the proposed Launch Site;
- Land ownership and availability;
- Topography; and,
- Accessibility and availability of services and infrastructure.

4.2.9 At the time of the original site selection there were no existing UK regulations as to launch exclusion zones, so a decision was taken to use those of the United States of America Federal Aviation Administration (US FAA). This was in line with UK Government thinking: *"The regulations used in the USA for commercial space transportation were used as the starting point to develop methods to assess the public safety from UK launches. Identifying what could be used from the US approach was considered a sensible approach as the USA has a long-established track record in carrying out spacecraft launches."* (UK Health and Safety Laboratory, Spaceports: Keeping People Safe September 2018). The two methods for defining an Exclusion Zone are described in 14 CFR Part 420 – License to Operate a Launch Site. The first method is used where the launch site does not know the exact rocket that will be launched and is therefore calculated without knowledge of the actual rocket trajectory. This is the method that was used in the original site selection as the Applicant did not know what rockets would be operated, although they would conform to the "small" definition given in Part 420 and therefore have a maximum launch exclusion zone of 1.2 Nautical miles (Nm) (2.24 km).

4.2.10 Once an actual rocket is identified, the second method from Part 420 can be used to calculate a more accurate exclusion zone. Working with potential launch site users, the Applicant was able to determine, using this method, that the largest rocket likely to launch from Lamba Ness would have a launch exclusion zone in the region of 1.8 km.

4.2.11 There is no publicly available information on a required MOD exclusion zone around the RAF Remote Rader Head at Saxa Vord. The Applicant needs to be able to exclusively manage and control the exclusion zone during launches for health and safety reasons. The Remote Radar Head is MOD property and is subject to the Official Secrets Act. Furthermore, although an unmanned facility, it is the subject of frequent visits by MOD personnel. As the Applicant is not empowered to control its use or the movement of MOD personnel, consistent with FAA requirements as detailed above, a 2.24 km radius 'no development exclusion zone' was determined around RAF Saxa Vord during the site selection process. This is illustrated on Drawing 4.2, reproduced as Figure 4.2 below.

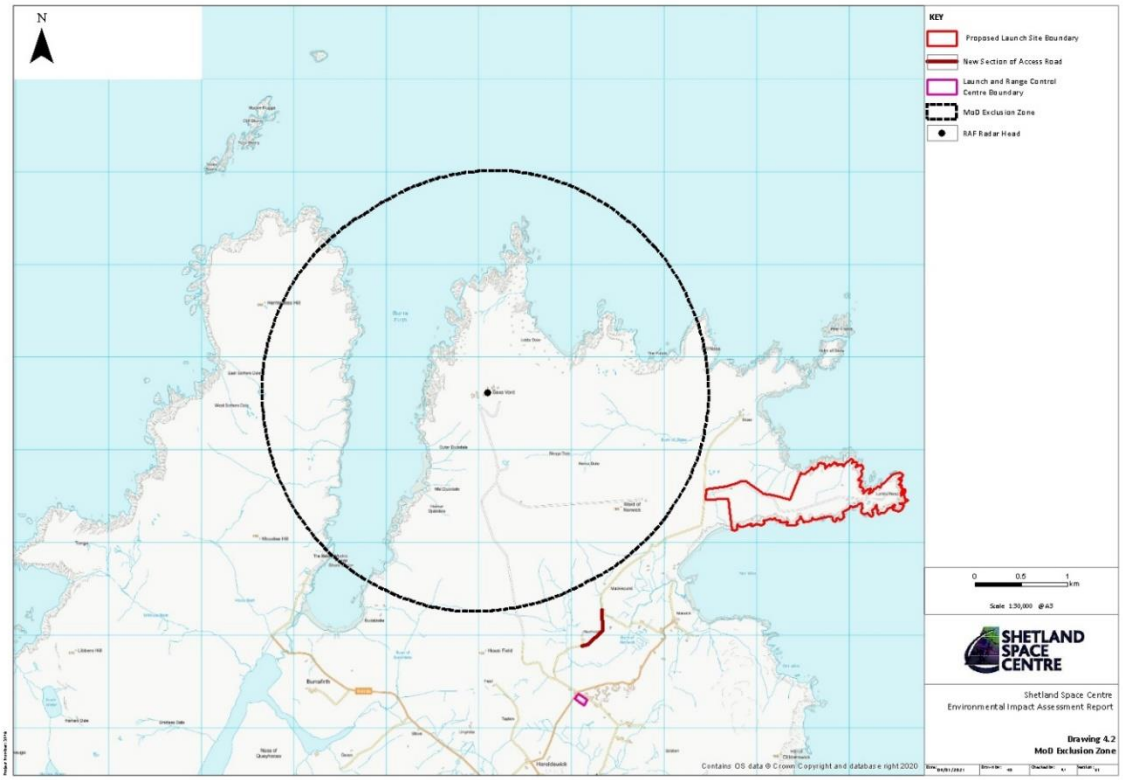

Figure 4.2 MOD Exclusion Zone

4.2.12 Collectively, the following were key considerations in determining the most appropriate site for the proposed launch operations:

- the extent of land required to facilitate the proposed Launch Site being a minimum of two km in length in order to satisfy anticipated health and safety protocols during launch site operations;
- the need for willing landowners to enter into an agreement to lease the land;
- topographical constraints given the need for the chosen site to be relatively flat to effectively accommodate the proposed operations; and,
- easy access to the road network and the availability of existing services and infrastructure close to the site.

4.2.13 Application of these collective requirements, following an assessment of the Saxa Vord area and the wider northern part of Unst, pointed conclusively to the proposed Launch Site at Lamba Ness as being the only suitable site for the Applicant's proposed operations.

4.2.14 The RAF may well have faced some of these issues when considering a site in the same area for its radar station operations during World War II, namely RAF Skaw. It is therefore no coincidence that in seeking to facilitate its spaceport proposals, the Applicant, following consideration of possible alternatives, concluded in identifying the same site at Lamba Ness as the only feasible option.

4.2.15 The proposed Launch Site is under the control of two land owners. A 30 year lease has been agreed with both parties with the option to extend to 50 years. A separate lease has also been agreed with the Lamba Ness Common Grazing Committee.

4.2.16 The proposed Launch Site is an area of relatively flat, partly previously developed land on account of its former RAF Skaw use, with an existing access road running across it from west to east, a remnant of its past, meaning that major earthworks were not required to facilitate a viable Launch

Site. Whilst road and access improvements are included in the proposals, the availability of existing road infrastructure and services nearby means that the cost of implementing the required support infrastructure for the proposed Launch Site is significantly reduced, while also helping to reduce environmental impacts by avoiding virgin areas in the northern part of Unst which will be maintained as such.

4.2.17 The proposed Launch Site is already accessible from the public road network. A local electricity supply can be provided from the existing main supply at Saxa Vord. While there is no public water supply available, a former MOD reservoir and supply exists to the north-west. The intention is to test this supply and, if found to be suitable, it will provide non-potable water for WCs and water deluge systems. Potable water will be imported for use throughout the site due to the generally intermittent need.

4.2.18 In conclusion, as stated above, following on from the findings and conclusions presented in the SCEPTRE report, in identifying an appropriate Launch Site within Saxa Vord and the wider northern area of Unst, it was clear that it would be impossible to avoid impacting directly on a statutory environmental designation in some form to accommodate the proposed Launch Site.

4.2.19 As a consequence, identifying an appropriate location for the proposed Launch Site was very much predicated on the application of the specific site selection criteria articulated in paragraph 4.2.8 above, which concluded in identifying the Lamba Ness site as the only location which could effectively accommodate the proposed space port operations, while minimising both direct and indirect resulting environmental impacts.

Proposed Launch and Range Control Centre (LRCC) Building at Saxa Vord

4.2.20 Initially, the intention for the LRCC was to erect a new bespoke building on an area of open space previously utilised as a football pitch within the existing Saxa Vord Resort complex. (see Figure 4.3 below). However, on review of available buildings in the area, the Applicant identified an opportunity to site the LRCC within an existing building at Saxa Vord. (see Figure 4.4 below) The building was originally erected as part of the RAF facility but has been more recently converted to form the Valhalla Brewery. The brewery has now closed, and the building is lying unused.

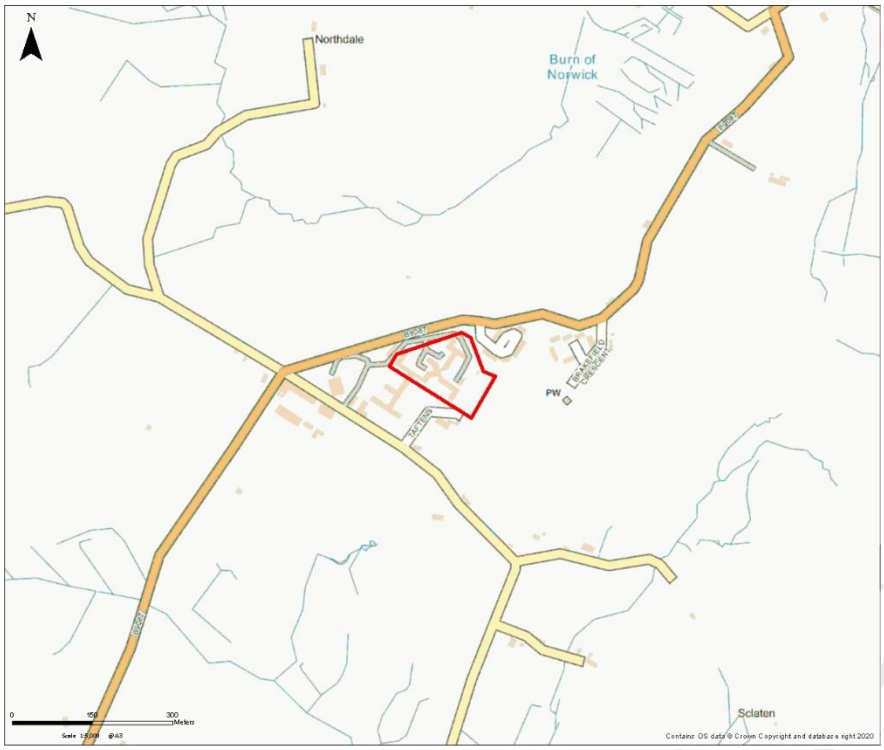

Figure 4.3 Initial location - LRCC

Figure 4.4 Proposed location – LRCC

4.2.21 It is intended to retain as much of the building as is feasible. However, some elements of the existing building are coming to the end of their expected lifespan. These are to be replaced like for like. A Design Statement articulating the design approach to refurbishing the building for the proposed use forms part of the planning application for the LRCC building.

4.2.22 Reusing and renovating an existing redundant building was considered a more environmentally sound solution to providing the required accommodation. In this respect, the embodied energy that has been used to erect the building has been recognised thus reducing the carbon footprint of the new facility.

Proposed New Section of Access Road at Northdale

4.2.23 As part of the project engineers' initial site assessment work, a number of route options to Lamba Ness, as articulated in Chapter 9 of this EIA Report and the accompanying Transport Assessment, were considered. This exercise arrived at the conclusion that a new section of link road at Northdale as proposed would have environmental benefits in reducing potential disturbance to residents at Saxa Vord and Norwick. The location of the proposed New Section of Access Road at Northdale represents the shortest possible, and therefore optimum, link and follows the alignment of an existing private track, thereby keeping to a minimum any potential environmental impacts, as highlighted in this EIA Report.

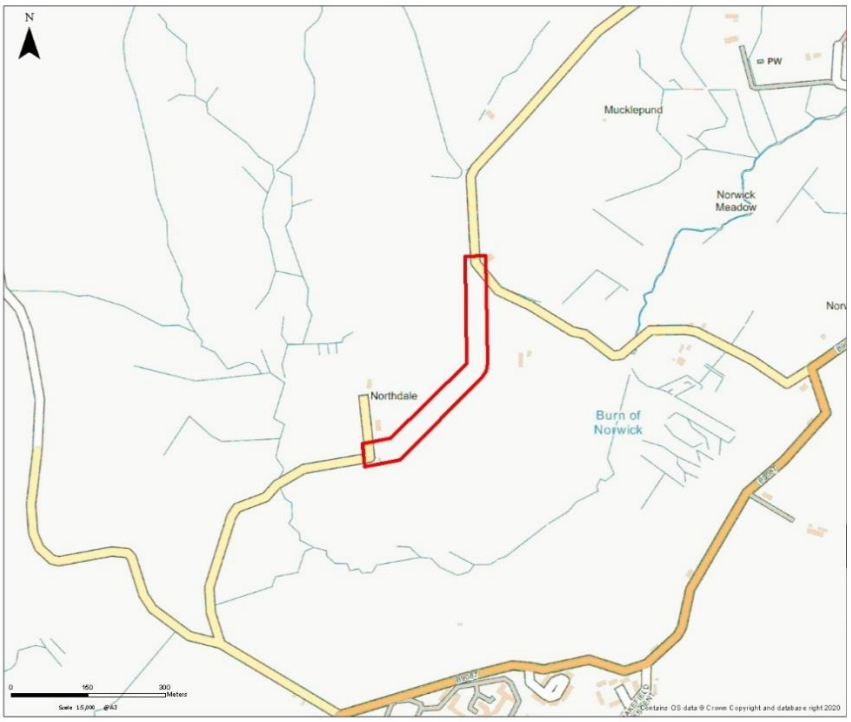

Figure 4.5 Proposed location – New Section of Access Road at Northdale

Proposed Fuel Storage Area at Baltasound Airport

4.2.24 The proposed use of Baltasound Airport utilises an existing established fuel storage facility. In using this facility, potential environmental impacts are at worst negligible and are significantly less than would arise from promoting a new fuel storage facility at another location. In this regard, no alternative locations were considered.

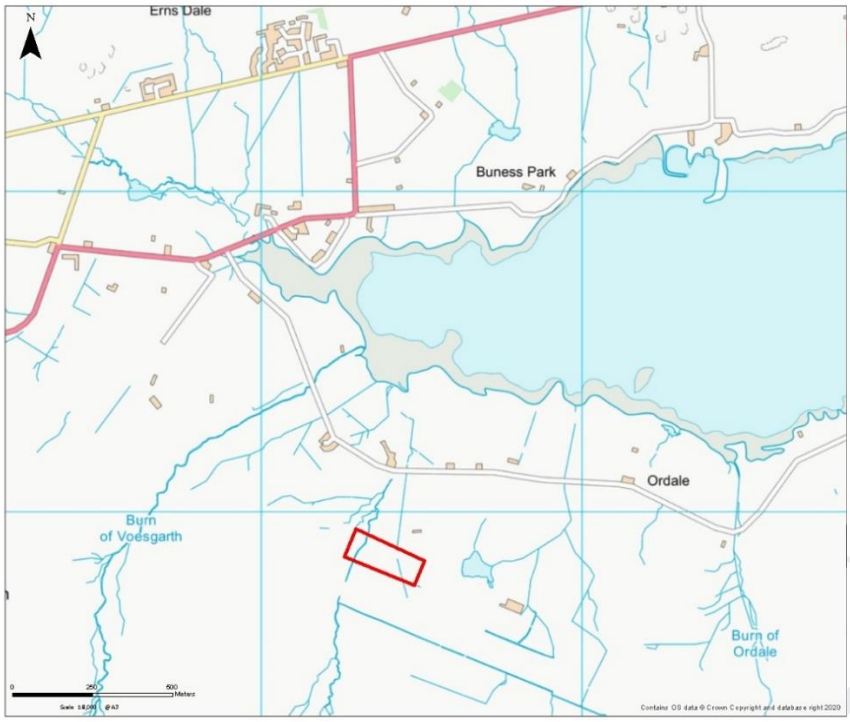

Figure 4.6 Proposed Fuel Storage Area, Baltasound

4.3 'Do-Nothing' Alternative

4.3.1 The 'do-nothing' scenario is a hypothetical alternative conventionally considered during the EIA process as a basis for comparing the Proposed Development being promoted. The 'do nothing' scenario represents the current baseline situation as described in the individual chapters of this EIA Report.

4.3.2 Without development, it is considered that the proposed Launch Site would very likely continue to be managed for grazing, as is the case now. With respect to the Scheduled Monument features on the proposed Launch Site, without intervention and management as proposed, it is considered extremely likely that the existing structures will continue to deteriorate both structurally and visibly as is currently the position.

4.3.3 Whilst it is recognised that the baseline would not remain static for the lifetime of the Proposed Development with, for example, potential changes to biodiversity and landscape as a result of climate change, the current baseline has been assumed throughout the EIA Report in order to produce a precautionary and robust approach.

4.4 Design Principles

Key Environmental Design Objectives

4.4.1 With respect to the overall Proposed Development, project design iteration has been on-going throughout the EIA process. The design process has considered the following key environmental design objectives:

- Minimising the visibility of the Proposed Development, and in particular the proposed launch pads at Lamba Ness, from designated landscapes, sensitive character areas and human receptor locations;
- Following best practice guidance e.g. CIEEM (2018; 2019) which identifies a hierarchy of mitigation for potential impacts:
  - Avoid and prevent adverse ecological impacts in the first place, especially those that would likely be significant to important receptors;
  - Minimise and reduce adverse impacts that cannot be avoided; and,
  - Compensate and offset for any remaining likely significant residual impacts.
- Avoiding and minimising construction and operational disturbance to legally protected species, including birds;
- Avoiding direct land take impacts on designated sites and minimising construction and operational disturbance to sensitive habitats and ecological receptors;
- Avoiding direct impacts on known cultural heritage assets and, where not possible, minimisation of disturbance to heritage assets;
- Enhancing the visitor experience and interpretation of heritage assets at RAF Skaw;
- Enhancing the visitor experience in terms of wildlife tourism;
- Avoiding noise and air quality impacts on nearby sensitive human and ecological receptors; and,
- Minimising greenhouse gas emissions associated with construction and operation of the Proposed Development.

Key Technical Design Considerations

4.4.2 For the proposed Launch Site, there is also a requirement to meet key health and safety and operational design requirements stipulated by the Applicant and future LSPs.

4.4.3 The UK Space Agency had not published its design standards and compliance requirements when the site layout was being designed by AECOM. The proposed Launch Site has therefore been designed having regard to the United States of America Federal Aviation Administration (US FAA) standards as well as the United Kingdom Civil Aviation Authority requirements.

4.4.4 A Technical Assistance Agreement (TAA) will be put in place between the parties, including the UK Space Agency.

4.4.5 The layout for the proposed Launch Site addresses the safety risks associated with the proximity of launch pads to one another, the risk to assembly, administration and other spaceport related buildings and the risk to occupied properties beyond the boundary. These safety risks are dependent on the particular launch requirements of each LSP and will be reviewed for each launch operation period.

4.4.6 In terms of the proposed LRCC, New Section of Access Road at Northdale, and the use of the existing fuel storage area at Baltasound Airport, there are no specific key technical design considerations similar to the requirements stated above for the Launch Site.

4.5 Proposed Development Design Iterations

4.5.1 The Applicant has undertaken a number of design iterations for the Proposed Development, which have primarily focused on the proposed Launch Site boundary, launch pad locations, infrastructure layout and the location of the LRCC (as detailed above in section 4.2). This section describes the principal design iterations that have been undertaken as the Applicant has sought to minimise the environmental effects of the proposals.

Proposed Launch Site at Lamba Ness

Preliminary Design

4.5.2 As shown in Figure 4.7 below, in addition to identifying locations for the Gate House, administration building, three hangar buildings and storage areas close to the main entrance to the site, the preliminary design work principally focused on the technical aspects of the proposed Launch Site layout in terms of the launch pad locations and the separation distances stipulated by the US FAA for operational health and safety purposes.

4.5.3 To help minimise the overall development footprint and impacts on the Scheduled Monument, the existing access track running west-east across the peninsula was also incorporated into the layout wherever possible at this early stage.

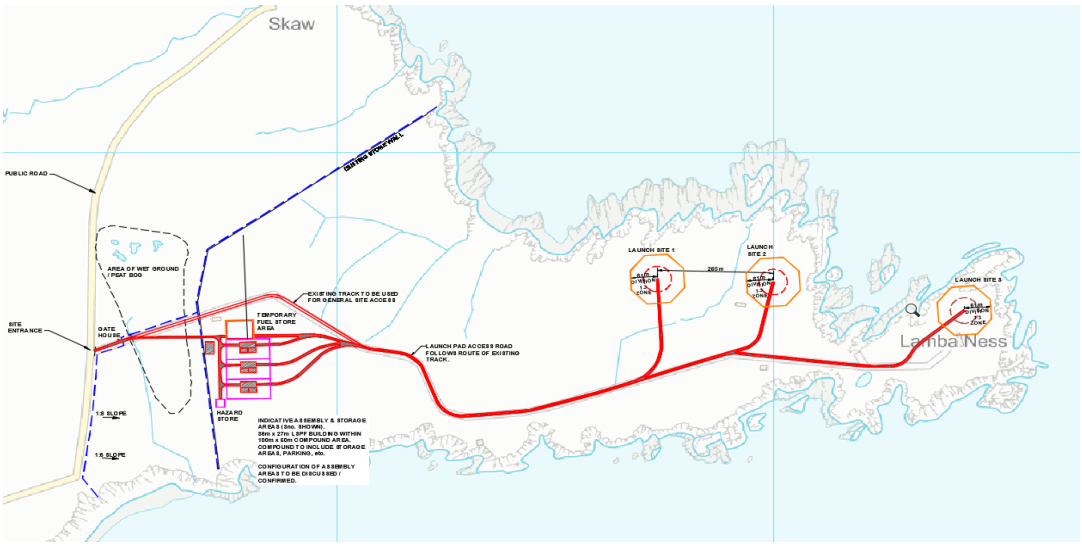

Figure 4.7 Proposed Launch Site Preliminary Site Layout

Subsequent Design Iterations

4.5.4 Figures 4.8 and 4.9 below illustrate the two site layouts for the proposed Launch Site at Lamba Ness that were presented to the community as part of the two pre-planning application public engagement events. They commonly show the additional inclusion of the satellite tracking area, the integration hangar/TEL building being relocated to the eastern sector of the Site and, additional road works associated with proposed launch pads 1 and 2. Figure 4.9 also includes a relocated Gate House, additional areas of open storage and, a temporary contractors' compound between proposed launch pads 1 and 2.

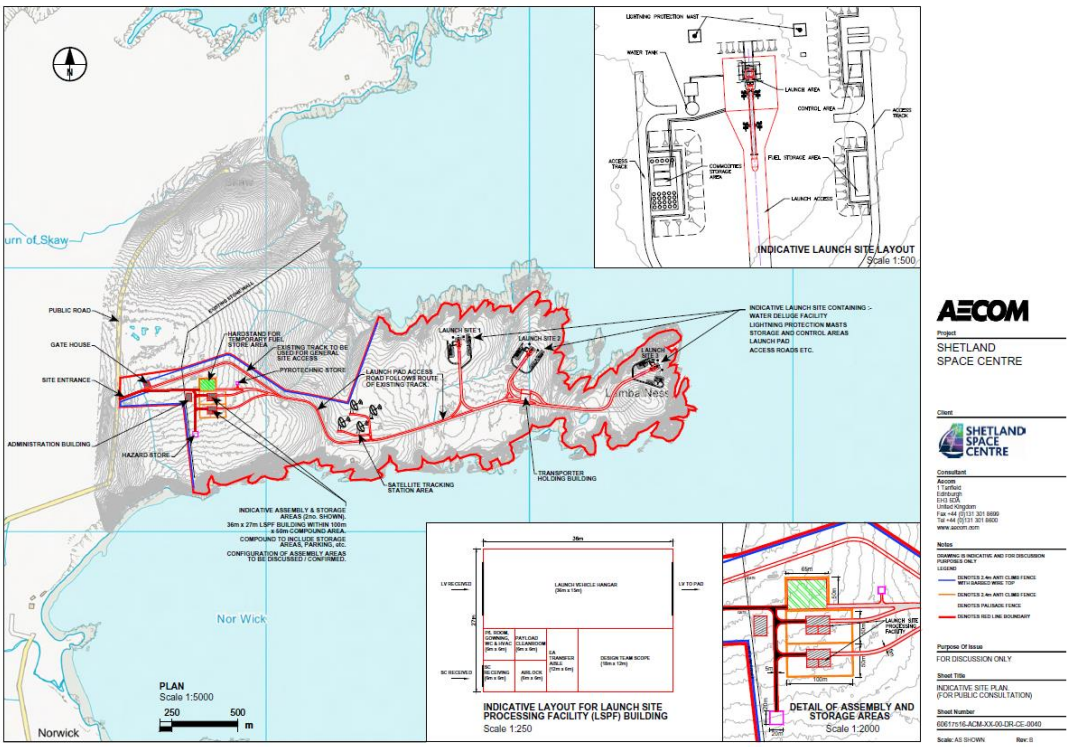

Figure 4.8 Indicative Site Layout Plan for the Community Consultation in May 2020

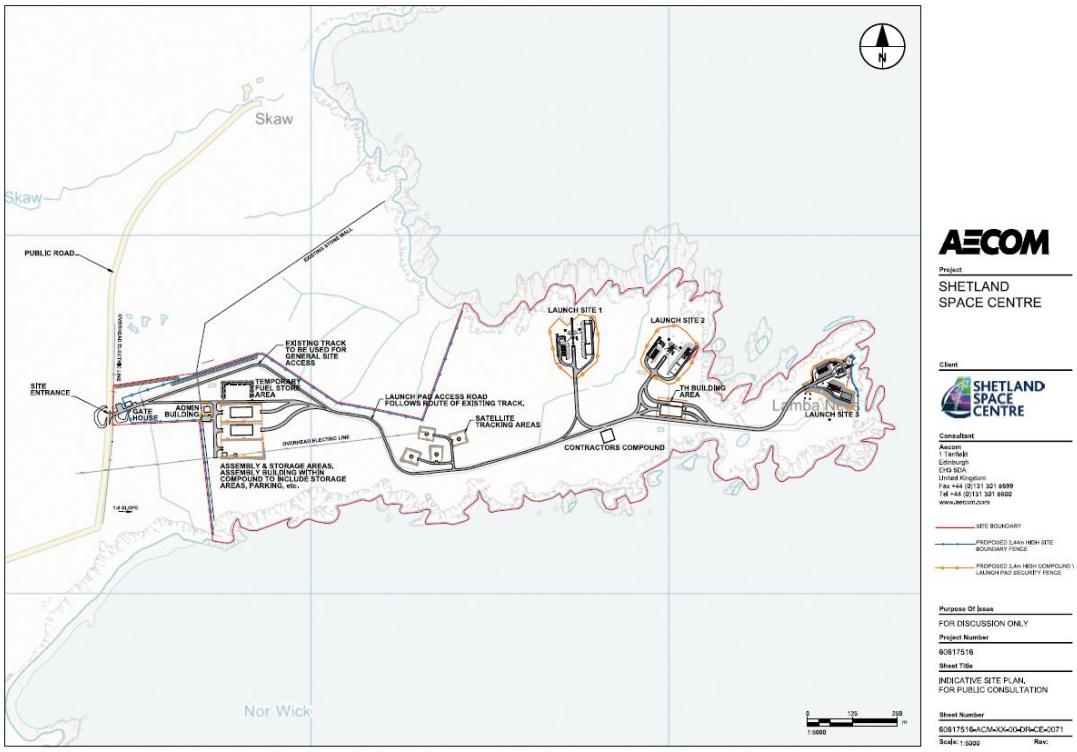

Figure 4.9 Indicative Site Layout Plan for the Community Consultation in October 2020

4.5.5 Figure 4.10 below illustrates the current site layout. This drawing includes *inter alia* the relocation of the contractors' compound following feedback from the project ecologists, the addition of bunding to the north of the gate house to address any potential disturbance to birds utilising the ponds at Swartling and, the repositioning of structures associated with the easternmost launch pad 3 to minimise impacts on the RAF Skaw Scheduled Monument. The site boundary to the immediate north of the satellite tracking station has also been reduced to avoid any direct impacts on Inner Skaw Scheduled Monument, while a proposed wildlife hide is introduced to the east of launch pad 3.

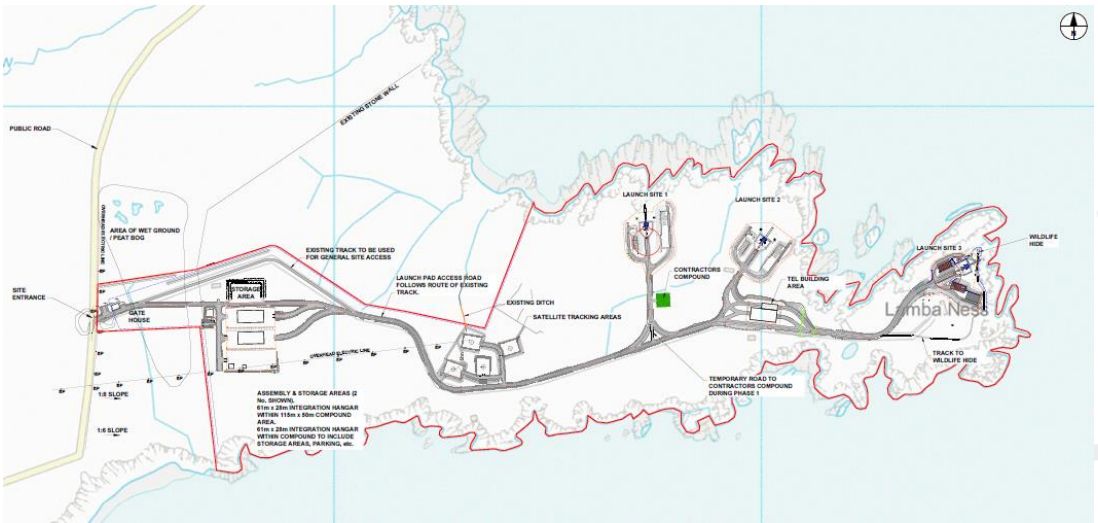

Figure 4.10 Proposed Site Layout

Embedded Design Mitigation

4.5.6 Review and iteration of the proposed infrastructure within the proposed Launch Site has facilitated effective mitigation and resulted in potentially significant effects being avoided or minimised as far as reasonably practicable, as detailed below.

Landscape

4.5.7 Design iteration of the proposed development was undertaken as part of the preparation of the Landscape Visual Impact Assessment (Chapter 5) to reduce the visual effects. The following embedded mitigation measures have been adopted.

Topography and Landform

4.5.8 The buildings and roads are sited to minimise the requirement for major ground modelling thereby reducing the extent of earth moving and the need to alter the existing landform. This has the added benefit of reducing the need to remove surplus material from construction of the proposed Launch Site.

Massing and Form

4.5.9 Through careful site planning, an integrated relationship has been developed between the proposed buildings, infrastructure and the existing site roads and former radar infrastructure, which are listed as scheduled monuments, to create a simple harmony that builds on the existing grain of the landscape and fits the proposed development sensitively between existing structures.

4.5.10 Visual integration will be secured through orientation, positioning of buildings and structures, profile, colour and facade treatments, design detailing, use of materials, and sensitive land profiling. This approach is intended to give cohesion to the proposed Launch Site and create an appropriate response to the components of the surrounding landscape. It is intended that the proposed Launch Site is seen as an appropriate addition in the context of the existing site elements and infrastructure.

Assembly Hangars, Storage & Administration Areas

4.5.11 The western sector of the proposed Launch Site is set aside for a cluster of buildings which will form the entrance area. A new Gate House will control access at the western limit of the site and also provide visitor facilities and information about site access and interpretation. From here, the existing track will be upgraded to provide general site access. A new side road will lead to an area set aside for the launch vehicle assembly and the storage of materials with associated hard standings. This cluster of buildings will include: an Administration Building, 6 m high and with a footprint of c. 20 m x 20 m; two adjacent large Assembly Hangars (forming the LSPF) rising to c.13 m, with a footprint each of c. 29 m x 63 m; a small Pyrotechnics Store; a Hazardous Materials Store 5m high, with a footprint of 13 m x 13 m; and, a small substation.

4.5.12 The detailing of the Gate House differs slightly from the hangars and storage buildings to draw it apart from the main cluster, and to foster a sense of arrival and welcome.

Satellite Tracking Station

4.5.13 Mid-way along the proposed Launch Site a Satellite Tracking Station is proposed. This will include an area of hardstanding and four separate telemetry devices, housed within geodesic radomes.

Assembly & TEL Hangar

4.5.14 The transporter holding building, a large hangar rising to c.14 m, with a footprint of c.61 m x 41 m, will be located to the south of the three launch pads, at The Garths, immediately to the north of the former radar station Power House. The hangar is linked to the launch pads through the upgraded access track and the new tracks leading to each of the separate launch pads.

Launch Pads

4.5.15 Three separate launch pads are proposed. Launch Pad 1 will be positioned to the northern side of the Lamba Ness peninsula, carefully set between the remaining structures of the radar station. Some of the former radar station structures will however need to be carefully removed to accommodate the new launch pad structures. Two more launch pads are proposed on the northern side of The Garths, spaced approximately 180 m apart and integrated as far as possible between the substantially retained structures of the former radar station.

4.5.16 Each launch pad will comprise a central area of hard standing flanked by earth sheltered gabion walls which shelter further areas of hardstanding where temporary control buildings, storage containers and fuel stores will be placed during the course of a launch cycle. When the launch pad is not in use, these temporary building and containers will not be present.

4.5.17 Permanent lightning masts will be positioned either side of the launch pad, comprising telescopic towers which will be extended during a launch to their operational height of 46 m. At all other times the lightning masts will be retracted to their un-extended configuration of 25 m. As with other permanent structures proposed, they will be finished in a recessive grey colour.

4.5.18 The earth sheltered bunds will comprise a grassed earth bund on the inner face and rock filled gabion walls on the outer faces. The grassed faces will be vegetated with grass turves won from the site which will be carefully stored during the construction process and re-laid onto the profiled earth banks. The gabion walls will be filled with locally won rock to ensure effective integration with the surrounding rock type seen in the surrounding landscape and coastline. These measures will ensure that the simple structure of the launch pad sites will recede in views against the wider setting and marry in with the existing structures of the former radar station.

4.5.19 A Wildlife Hide is proposed to the east of Launch Pad 3 on the eastern edge of Lamba Ness, with a footprint of 9.5 m x 3.8 m, and a sloping roof, rising from 2 m at the rear to 3 m at the front. The hide will be constructed in brick work to tie in with the existing radar buildings at Lamba Ness, with sections of timber cladding on the external viewing façade and hinged durable mono density fibre board panels to secure the viewing openings when not in use. The roof will be constructed in timber with a 'green vegetated roof' finished in a pebble rich planting substrate overlaid with locally won moorland turves, securely held in place with steel mesh and wires. The final colour of brick and finishes for the exposed timber work will be agreed through discussion between the Applicant, hide users and Shetland Islands Council.

Colour

4.5.20 The clusters of new buildings at the proposed Launch Site will be given unity by use of similar colour themes and colour palettes that draw upon colours seen in buildings across Unst and natural colours occurring within the local Unst landscape. The red hues proposed in buildings are based on those colours seen in the minerology of the landscape; the tan colours of the surrounding grassland and cut hay meadows; and, in local buildings such as the painted barns and the large hangar at Baltasound Airport.

4.5.21 The graduation of colours in the elevations is intended to assist in breaking up the elevations of the larger buildings, with a transition from red, through tan, to the cool grey tones seen in the fast-moving cloudscape, a colour which will also be seen reflected in the foreground of the surrounding seascape.

Lighting

4.5.22 Lighting has been considered as an important element of the proposed Launch Site. Potential light sources will be associated with flood lighting for the launch pads during launch operation periods and cut off lighting within the new network of external spaces around the proposed buildings, including car parking areas.

4.5.23 A sympathetic lighting strategy will be prepared within the context of the design of the buildings to minimise any potential adverse effects. A number of measures will be introduced within the context of the operational requirements of the site to minimise the unwanted effects associated with light sources. These will include:

- Lighting will be used for specific tasks only. No unnecessary general lighting will be in use during normal operation;
- Cowls/shielding of lights to prevent glare;
- Minimisation of light spread through the use of directional lighting;
- Minimising the potential for sky glow by avoiding the potential for upward reflected light;
- Reducing the operational hours of the lighting to reduce the potential for disturbance; and,
- In some areas, intelligent dimming technology may be used to activate lighting through activity.

4.5.24 These measures are proposed to minimise light pollution and reduce night-time glare, while providing appropriate night-time illumination within the proposed development.

Services

4.5.25 All services associated with the proposed Launch Site will be routed underground and therefore, any visual effects, once construction is completed, will be limited to directional flood lighting units.

4.5.26 The site drainage strategy will, subject to the necessary agreements, be based upon roadside filtration trenches which are likely to include a combination of open swales and buried pipes/culverts and sustainable urban drainage systems.

Earthworks

4.5.27 The use of earthworks will be minimised wherever possible, limiting manipulation of the ground surface to ensure roads and built forms tie in sympathetically with the flow of the surrounding terrain. Where berms or earth shelters are necessary, these will be adjusted to draw upon the character of the earth sheltered buildings found on the proposed Launch Site. Earthworks will be stabilised where necessary with non-plastic biodegradable geotextiles. The earthworks will be restored with either locally won turves retained from the preliminary site stripping, natural regeneration, and or re-seeding with wild flower seed mixes harvested from the surrounding local area.

Fencing

4.5.28 The use of fencing has been minimised as far as possible. The proposed fencing comprises two types: 2.49 m high weldmesh security fencing along the outer boundary and 2.4m high steel palisade fencing around each of the launch pad sites. The fencing will be painted or finished in a recessive paint colour which will be a close match to the predominant colour of the adjoining coastal grasses. The final selection of colour in the fences will be agreed through discussion with representatives of the Applicant and the Council.

Archaeology

4.5.29 The proposed Launch Site layout has taken into consideration known heritage assets and features across the peninsula.

4.5.30 The proposed development has been sited to avoid impacts upon the Inner Skaw Scheduled Monument (SM) and, where possible, to minimise the impact on the remains of the former RAF Skaw SM buildings and infrastructure.

4.5.31 The boundary of the proposed Launch Site initially extended into Inner Skaw SM which resulted in part of the boundary security fence traversing through this designated area. In order to remove the potential for direct impacts upon this designated asset, this fence was re-sited further to the east and the site boundary reduced accordingly.

4.5.32 Many features within the RAF Skaw SM which are particularly considered to convey its National Importance, and which contribute substantially to an understanding, appreciation and experience of its significance, have been avoided. For example, the proposed Launch Site has been designed to preserve the Chain Home (CH) Transmitter, the CH Receiver and the CH Power House and these assets will remain in situ, though some impacts upon the bank around the CH Transmitter are expected. Further detailed design iterations at Launch Site 3 were undertaken to ensure retention, where possible, of features related to the Advance Chain Home (ACH) operation. As a result, ACH buildings, including the transmitter, receiver or generator buildings will be retained; with only the bank of the ACH Receiver due to be impacted upon. Adjustments have also been made to roads and verges to avoid impacts upon small buildings such the guard hut near the CH Power House.

4.5.33 Re-use of peat on site will be limited to use in the construction of bunding and verges as shown in the planning application drawings and, redepositing of extracted peat will not be undertaken elsewhere in the scheduled area to avoid further impacts.

4.5.34 All construction-related activity on site will be overseen by an Archaeological Clerk of Works.

Ecology and Ornithology

4.5.35 The proposed Launch Site layout has taken into consideration known important ecology and ornithology features.

4.5.36 Embedded ecology mitigation includes the following:

- Implementation of a Breeding Birds Protection Plan to be informed by, and updated annually through, targeted breeding bird surveys;
- Avoidance of unnecessary disturbance to habitats by minimising the extent of ground clearance and other construction practices as far as practicable e.g. the contractor compound has been re-located from its original location to avoid impacting on a particular habitat;
- Provision of new and extended underpasses (directly east of the Integration Hangar/TEL Building) to allow free movement of otters; and,
- Implementation of an Outline Habitat Management Plan (see Volume IV Technical Appendix 6.3) to:
    - Enhance habitats for species of importance present on, or linked to, the Site;
    - Restore important habitats and associated species;
    - Create a wildlife watching hide;
    - Restore peatland;
    - Create native riparian broadleaf tree/scrub cover;
    - Manage coastal grassland habitat; and,
    - Create nine artificial otter holts/shelters in suitable locations across Lamba Ness to provide additional resting places away from the coast.

4.5.37 Embedded ecology mitigation includes preserving the topsoil from the habitat that is lost and laying it over the top of the areas to be reinstated (e.g. over the 'cut and fill' and any damaged area in the 2 m buffer). This will provide a local seed source as well as viable root matter for the areas being reinstated.

4.5.38 Mitigation also includes a commitment to reducing grazing pressure (which will allow many of the heavily grazed plants to flower and set seed), and ditch management (where appropriate) within the bog habitats.

4.5.39 Embedded mitigation includes micro-siting which will be used to relocate infrastructure to further avoid sensitive habitats. This would necessarily be carried out on the ground under supervision by the Ecological Clerk of Works.

4.5.40 As regards the existing use of 'Natural Capital', the Applicant proposes to provide a purpose-built wildlife watching hide within the boundary of the Site for locals and visitors to use at the eastern end of Lamba Ness. The Applicant is willing to consider potential community ownership of the wildlife watching hide and also contribute towards providing an annual maintenance budget for hide repairs and improvements.

Peat

4.5.41 The location of the launch pads has been optimised to meet the detailed design standards and technical specifications for a space port complex. At Launch Pad 2, this means that an area of deeper peat (presumed to be previously disturbed given its location relative to buildings and structures associated with RAF Skaw) cannot be wholly avoided through design. This results in the requirement to remove a volume of localised peat which is detailed in the Preliminary Ground Investigation Report (Volume IV Technical Appendix 12.3) and the Outline Peat Management Plan (Volume IV Technical Appendix 12.4).

4.6 Summary

4.6.1 The SCEPTRE report, sponsored by the UK Space Agency, introduces site selection for the development of a UK satellite launch location. The report concludes that: *"The Shetland Isles has the best orbital access"* and that *"Saxa Vord offers significant advantages over all other sites."*

4.6.2 Following on from the findings and conclusions presented in the SCEPTRE report, in identifying an appropriate Launch Site within Saxa Vord and the wider northern area of Unst, it was clear that it would be impossible to avoid impacting directly on a statutory environmental designation in some form to accommodate the proposed Launch Site.

4.6.3 Following an assessment of the Saxa Vord area and the wider northern part of Unst, application of the collective requirements of the proposed Launch Site pointed conclusively to the proposed Launch Site at Lamba Ness as being the only suitable site for the Applicant's proposed operations.

4.6.4 The final layout and location for all elements of the Proposed Development has been informed by a robust EIA and design iteration process, considering potential environmental, landscape and visual impacts and their effects, physical constraints, and health and safety considerations.

4.6.5 The information used to inform the design iteration process has included consultation responses received, baseline data and the specific impact assessments with their respective conclusions described in this EIA Report.

The proposed Launch Site layout is as described in Volume II Chapter 3 and is considered to represent the most appropriate design, considering potential environmental impacts and their effects, physical constraints, and health and safety considerations.

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