7 ASSESSMENT OF POTENTIAL SIGNIFICANT EFFECTS

7.1 The potential effects that are included in the scope of this ES includes flooding and wave action as well as the potential future effects from climate change on sea level rise. The potential effects from pollutant or contamination influx into the local coastal waters are also included.

Coastal Processes Effects

7.2 The site of the proposed new power station is located on an area of previously reclaimed land on the North Mole, Gibraltar. The new reclamation to the west and north includes coastal defence structures, revetments and rock armour, which will provide defence against tidal flooding and wave action over the lifetime of the site. The height of the revetments are built at a minimum of 3.41 m above CD and the rock armour are built at a minimum of 3.91 m above CD. Comparing against the 1-in-100 year maximum wave height (2 - 3 m) and the expected increase in sea level (0.5 m) this shows that the coastal defences will protect against the worst-case wave heights, therefore it is expected that there will be **no significant effects** from flooding or wave action or from the future effects from sea level rise.

Water Quality Effects

Construction Effects

7.3 During construction, there is potential for the creation of pollution pathways due to damage to any existing infrastructures, or from contaminant leaks, leaching or spillages. There is also the potential for pollutant leaching from contaminant land and sediment following rainfall (stormwater runoff). These potential impacts will be managed by the implementation of a Construction Environmental Management Plan (CEMP) and the design of site drainage, such that all construction chemicals will be appropriately treated in bunded areas away from the shoreline. The CEMP will be produced to cover the construction phase of the new power station, the plan will contain contingencies to control and limit any potential pollutant or contaminant spills into the local marine environment. **No significant effects** are predicted during construction with the CEMP measures implemented.

Operational Effects

7.4 Wastewaters from the site are removed by three main drainage systems; characterised as surface, oily or sewage. Surface and sewage waters, including storm water runoff, will be collected separately and disposed of in the local sewer systems. Appropriate sediment controls, such as settlement areas, sediment traps and covering of contaminated areas, will be employed to prevent or minimise the washing of all sediment (contaminated or not) into the local drainage network and the surrounding environment. Oily wastewaters, including oil-contaminated surface and sewage waters, will be collected and transported by tanker for treatment (see Chapter 11 – Contaminated Land).

7.5 All industrial plants have the potential for pollutant and contaminant leaks, however all chemical and fuel storage will be bunded, to 110% capacity, and contained in purpose manufactured double-skin steel or concrete containers. These are petroleum industry specified and tested to high standards of pressure (including facture, temperature, vibration and corrosion in seawater locations). Additionally, a spill management and contingency plan will be produced to respond to and manage any potential spillages and the subsequent risks. With such measures in place, **no significant effects** are predicted.

7.6 The key oil and chemical system areas within the new power station will be bunded and contained and wastewaters will be disposed of offsite, it is therefore unlikely that there will be any discharges of contaminated or polluted waters entering the local marine environment.

7.7 Should any spill occur over and above these measures, the size of any spills will be very small and will be significantly diluted if they enter the water body. The power station will be fitted with automated leak detection equipment, and alarms will be fitted to all fuel and chemical lines, including urea and diesel tanks and lines. These will be audited regularly for compliance. A back-up emergency response plan will be implemented. Combined with the contaminant and pollutant control and prevention measures it is expected that there will be **no significant effects** to water quality.

8 MITIGATION AND RESIDUAL SIGNIFICANT EFFECTS

8.1 The proposed site is protected from tidal flooding and wave action by coastal defences, including caissons, revetments and rock armour, from the North Mole Reclamation, located to the north and west (HM Government of Gibraltar, 2014). There are therefore expected to be no significant effects from coastal processes to the proposed new power station, therefore no further mitigation practices and measures are necessary.

Construction Management

8.2 Potential significant effects during the construction phase are the polluting of surrounding waters from spillages, leaks and leaching of contaminants, which includes diesel, urea and other construction chemicals.

8.3 The implementation of a Construction Environmental Management Plan, which will detail the on-site practices to reduce the likelihood of contamination and the measures to clean up after leaks or spillages to reduce the effect will ensure that there are **no residual significant** effects to water quality during the construction phase. A Marine Action Plan is also already in place, this details the reactive methodology to minimise the impacts to Gibraltar's surrounding waters from any contaminations.

Operational Management

8.4 Potential significant effects to water quality of surrounding waters during the operational phase are from contamination due to leaks and accidental spillages. All potential contaminants will be bunded and the power station will be fitted with automatic leak detection equipment. An Operational Environmental Management Plan will also be implemented. Combined, these measures will ensure that there are **no significant residual effects** from the proposed new power station.

Residual Significant Effects

8.5 It is predicted that there will be **no significant residual effects** from the proposed new power station.

9 CONCLUSION

9.1 The proposed new power station is located along Gibraltar's North Mole, in an area that has been previously reclaimed from the Bay of Gibraltar. The EIA for the coastal processes and water quality of the reclamation have been summarised in this report, the main potential impacts are: flooding, wave action and the future impacts due to sea level rise; as well as polluting effects to the surrounding waters.

9.2 The proposed new power station will be protected from coastal processes by the new reclamation, which includes caissons, revetments and rock armour. These defences will cover the projected lifetime of the power station, relative to potential rises in sea level; therefore **no significant effects** due to coastal processes are predicted from the proposed new power station.

9.3 There is the potential for significant effects from water quality to the surrounding waters of the site. The implementation of a CEMP and an OEMP combined with infrastructural features of the site, including leak detection, automated alarms and bunding of potential contaminants, means that there are predicted to be **no significant residual effects** from the proposed new power station.

10 REFERENCES

HM Government of Gibraltar (2014). Government of Gibraltar: North Mole Reclamation, Environmental Statement, Document Registration Number: 34598rr016, May 2014

European Union (2000) Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy: the Water Framework Directive 2000.

HM Government of Gibraltar (2009). The Gibraltar Development Plan 2009 (produced by the Town Planning Division, Department of Enterprise and Development)

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APPENDICES

APPENDIX CP1 GIBRALTAR DEVELOPMENT PLAN

Policy ENV6 – Development and Flood Risk:

The low-lying nature of Gibraltar makes many areas susceptible to inundation from the sea and this effect is considered greatest on the south and east coasts, which are not protected by the Bay of Gibraltar. The effect and risk of seawater inundation is expected to increase in the future, as a result of sea level rise from climate change and global warming; so planning must include consideration of these likely future changes and effects, where 5 mm sea level rise per year should be considered the minimum.

Proposed developments in areas considered to be at risk must demonstrate preventive and protection measures against inundation; if coastal defences are employed then the environmental impacts of these structures must be further considered.

Policy ENV7 – Air and Water Quality:

In accordance with EU requirements, the HM Government of Gibraltar aims to ensure a good standard or air quality to benefit human health and the environment generally.

The potable water supply of Gibraltar is almost exclusively supplied by seawater desalination, so maintaining high quality coastal waters is imperative. Gibraltar's coastal waters are also key recreational and fishing areas and much of Gibraltar's coastal water is also protected under European and/or national legislation, so maintaining the quality of Gibraltar's waters is of significant importance.

Developments must therefore not have significant adverse effect on air or water quality; where potential pollutants are identified, appropriate mitigation measures should be employed to ensure no long-term effects.

Policy ENV8 – Protection of Water Quality in the Vicinity or Seawater Intakes:

The potable water supply of Gibraltar is almost exclusively supplied by seawater desalination. In order to maintain potable water supplies, there should be a minimum of two distinct sites with access to high quality seawater, for desalination. Current desalination plants are located at the ex-MoD laundry

at Governor's Cottage and at North Mole. Saltwater pumping stations also require a supply of good quality seawater; these are located at Gun Wharf and North Mole.

Proposed developments in the vicinity of existing or future seawater intakes for desalination or for saltwater pumping must ensure that there are no adverse impacts to the water quality; where pollutants are identified, appropriate mitigation measures should be employed to ensure no long-term effects.

CHAPTER 11

CONTAMINATED LAND

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GLOSSARY AND ABBREVIATIONS

Aquiclude	A solid, impermeable layer underlying or overlying an aquifer.
BAT	Best Available Technique
BH	Borehole
Borehole	A technique of obtaining information of the sub-surface conditions by boring or drilling a typically 150 mm to 200 mm diameter hole.
BS	British Standard
BSI	British Standards Institute
°C	Celsius
CEMP	Construction Environmental Management Plan
COC	Chemical of Concern – potential contaminants which have the potential to cause harm.
DIVs	Dutch Intervention Values – calculated concentrations of various chemicals. Concentration of chemicals below their relevant intervention levels are assumed to not require remediation.
EC	European Commission
EA	Environmental Agency (Gibraltar)
EIA	Environmental Impact Assessment
EU	European Union
Geotechnical	An area of civil engineering concerned with geological materials, earth structures and foundations.
Hazard	Anything that can cause harm to a receptor.
Hydrogeological	Branch of geology that is concerned with the occurrence, distribution and effect of ground water.
HM	Her Majesty's
m	metre
m^3	metre cubed
Made ground	Fill materials which have been placed for the purpose of ground raising, levelling and improvement.
µg/l	micrograms per litre
mg/kg	milligram per kilogram
OD	Ordnance datum – the mean sea level as defined for Ordnance Survey.
OEMP	Operational Environmental Management Plan
ORC	Organic Rankine Cycle
PAHs	Poly aromatic hydrocarbons
PCB	Polychlorinated biphenyls

Pollutant linkage	Source-pathway-receptor linkage conceptualisation, used for risk assessment purposes.
Risk	The likelihood that a receptor will be harmed by any perceived hazard.
SPT	Standard Penetration Test – a test designed to provide information on the relative density of soil.
Threshold value	Value of contaminant concentration above which further assessment of risks posed to receptors and/or mitigation is required.
TPH	Total petroleum hydrocarbons
TP	Trial pit - The excavation of a pit/trench typically using a machine excavator.
VHH	Volatile Halogenated Hydrocarbons

1 INTRODUCTION

1.1 This chapter assesses the effects of the proposed power station on the environment in terms of geology and soil quality. It:

- Identifies the relevant European Union (EU), national and local policy;
- Sets out the approach to the assessment;
- Describes the existing environment, evaluates the sensitivity of the soil and environment in the vicinity of the proposed development;
- Assesses the potential significant effects of the power station disturbing any existing contaminated ground, or the potential for contamination to occur from the development proposals during construction or operation;
- Proposes mitigation measures for any potential significant effects.

1.2 An appropriate level of investigation for the purposes of the EIA has been carried out to characterise the soil conditions that underlie the site and to characterise the level and extent of contamination present. Unexpected areas of contamination may be encountered during construction, however, the characterisation of this site is sufficient to provide confidence that, if such occurrences should arise, they can be adequately and appropriately dealt with.

1.3 In Gibraltar, the Environmental Agency (EA) is responsible for protecting the environment (for air, land and water); regulating discharges to controlled waters; managing the disposal and storage of waste; and controlling major industrial processes. The EA and Department of the Environment and Climate Change have been consulted as part of this assessment.

1.4 Other chapters associated with this assessment include Coastal Processes and Water Quality (Chapter 10), which examines marine water quality and contamination to controlled waters, and Waste and Material Resources (Chapter 17), which assesses waste arisings and management.

2 LEGISLATIVE CONTEXT

2.1 Key legislation considered for this assessment has included EC Directives and Gibraltar laws that are concerned with the appropriate management of land, primarily where characterisation investigations, prior to and during construction, identify contaminants that require removal and disposal.

European Law

Landfill of Waste Directive

2.2 The Landfill of Waste Directive 1999/31/EC, has the objective to prevent or reduce as far as possible negative effects on the environment from the landfilling of waste. The Directive particularly focuses on the effects to surface water, groundwater, soil, air and human health. The Directive has been transposed in Gibraltar under the Landfill Act 2002 (as amended, Her Majesty's (HM) Government of Gibraltar, 2002)

2.3 Council Decision 2003/33/EC further specifies the criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC. Both the Directive 1999/31/EC and the Council Decision 2003/33/EC are applicable to this proposed development, as in the event of the discovery of land contamination (both prior to and during construction), soil or groundwater must be removed and disposed as waste at an appropriate landfill.

Regulation EC No. 1013/2006 on the Shipment of Waste

2.4 This Regulation specifies and simplifies procedures for controlling and supervising waste shipments within and between national borders to improve environmental protection. This is relevant to the proposed development as any contamination will have to be removed from the site, transported to and disposed in an appropriate landfill facility in Spain.

Water Framework Directive

2.5 The Water Framework Directive (WFD) 2000/60/EC commits EU member states to achieve 'good' water quality status by 2020. The WFD sets out clear

qualitative and quantitative objectives and achievement dates in order for all aquatic ecosystems, including groundwaters and surface waters, to reach standards. Pollutants from developments, such as the proposed power station, have the potential to contaminate and impact water quality status, therefore, management strategies are key.

National Law

Pollution Prevention and Control Regulations 2013

2.6 The Pollution Prevention and Control Regulations 2013 (HM Government of Gibraltar, 2013a) offer a regulatory system that takes an integrated approach to control environmental impacts from industrial processes, including activities in the energy sector. It involves the Integrated Pollution Prevention and Control (IPPC) permitting process where the Operators must demonstrate the use of 'Best Available Techniques' (BAT) and the fulfilment of requirements.

2.7 Treatment of waste is considered in the permitting process.

Guidelines and Standards

Dutch Circular on Target Values and Intervention Values for Soil Remediation 2013

2.8 The Dutch Circular on Target Values and Intervention Values for Soil Remediation 2013 (Dutch Ministry of Housing Spatial Planning and Environment (VROM), 2000 as amended 2013) identifies environmental pollutant concentration target values, which provide a benchmark for environmental quality, and intervention values, which are the maximum tolerable concentrations before plant, human and animal life is threatened or impaired. Dutch Intervention Values (DIVs) are concentrations of chemicals above which remediation is required.

British Standard 5930: Code of Practice for Site Investigators

2.9 The British Standard (BS) 5930 (British Standards Institute (BSI), 1999) provides a code of practice for site investigations, in order to guide the assessment of a site's suitability for the construction of civil engineering and building works.

British Standard 10175: Investigation of Potentially Contaminated Sites

2.10 The BS10175 (BSI, 2011) provides guidance on the investigation of potentially contaminated sites and provides recommendations and guidance on the assessment of contamination or naturally elevated concentrations of potentially harmful substances in order to determine or manage risks.

Eurocode 7: Geotechnical Design

2.11 Eurocode 7 (EC-7) (BSI, 2015) is the European standard for the design of geotechnical structures, as approved by the European Committee for Standardization in 2006. It provides rules in relation to planning and reporting of ground investigations, requirements for laboratory and field tests, and derivation of parameters.

Gibraltar Development Plan 2009: Policy ENV4 - Contaminated Land

2.12 Land is one of Gibraltar's scarcest resources. In line with the sustainability principle, the re-use of land minimises the necessity to utilise undeveloped or to reclaim new land from the sea. Under the Gibraltar Development Plan 2009 it is stated that "[*p]lanning permission for development on contaminated land will normally be granted provided that it can be demonstrated that measures can be taken to satisfactorily overcome any significant risk to life, health or property*" (HM Government of Gibraltar, 2009: 27).

Gibraltar Waste Management Plan 2013

2.13 The Gibraltar Waste Management Plan 2013 (HM Government of Gibraltar, 2013b) details Gibraltar's aim to reduce the amount of waste sent to landfill, whilst providing a framework to enable decisions for efficient and sustainable waste prevention and management.

3 SCOPE AND METHODOLOGY

Scope

3.1 A scoping assessment was undertaken indicating the potential effects of the development proposals with respect to contaminated soil. The scope of the EIA has been influenced by the past and current land uses of the site and the future development proposals.

3.2 Current and past uses of the area pointed to the possibility of contamination that could have an impact on receptors as a result of the proposed development, and therefore, further investigations have been conducted. As part of the EIA, potential impacts during the construction and operational phases have been assessed for land contamination.

3.3 The technical scope of the site investigation covered groundwater and soil conditions.

3.4 The assessment describes the made ground and natural geological sequence and investigates the extent and potential effects of any contamination that may exist at the proposed development site. It also considers the past land use of the site.

3.5 The assessment has been informed by:

- A desk and walkover study carried out by Belilos Civil and Structural Consulting Engineers Ltd. (Belilos, 2015);
- A site factual investigation carried out by Sergeyco (Sergeyco, 2015a)
- A soil and waste characterisation study carried out by Sergeyco (Sergeyco, 2015b);
- Consultation and data collection from key stakeholders including the EA, the Department of the Environment and Climate Change, HM Government of Gibraltar, the Ministry of Defence, the Port Authority and local land users.

Transboundary Effects

3.6 There are no predicted transboundary effects from contaminated land, therefore, this has been scoped out of this assessment. Information on actions related to contaminated land as waste are provided in Chapter 17 – Waste and Material Resources.

Unexploded Ordinance

3.7 During the original reclamation of North Mole in the 1990's, the Ministry of Defence identified unexploded ordinance in the area, which were appropriately disposed of. Since this time, there have not been any incidents of discoveries in the North Mole area. It is not expected that any unexploded ordinance is present in the made land as it was generated by hydraulically pumped fill. Potential risk to the proposed development from buried ordinance at or below sea level is very low as the development's deep foundation system is designed in the form of precast driven piles with a toe depth of approximately 15 metres (m). Therefore, this topic has been scoped out of this assessment.

Data Collection

3.8 A desk based assessment of available information was undertaken, as recommended by BS5930 (BSI, 1999), BS10175 (BSI, 2011) and EC-7 (BSI, 2015), in order to inform contamination testing on site. In addition to a walk-over survey, this included:

- An investigation into the history of the proposed development site;
- A review of available geological maps;
- Analysis of public infrastructural records;
- Site service clearances;
- Aerial photography and cartography.

3.9 Following the desk study, the site was investigated to establish the geological, hydrogeological and geotechnical conditions via intrusive ground investigation. The investigations in the area of the proposed power station comprised trial pits (TP) and boreholes (BH). Soil and water samples were analysed for a range of potential contaminants taking account of the site history, which have been listed in Appendix CL1.

3.10 The 'Phase 1' sampling distribution was designed to provide a general characterisation of the site (Figure CL3.1, Volume 2 Figures). The sampling distribution was restricted by land uses currently on site, however, it is considered to be representative of the whole site.

Sampling Techniques and Testing Strategy

3.11 The locations of exploratory holes were guided by the conceptual model and were chosen to provide a general coverage across the site.

3.12 The purpose of chemical sampling was to assess the areas likely to be affected by the proposed development. Soil samples were taken and analysed for a range of chemical determinants including those identified from desk study information as having potential to form pollutant linkages (Belilos, 2015).

3.13 Soil samples were taken from four trial pits (TP-1 to TP-4), with an additional six being taken in two boreholes (BH-3 and BH-6) - three in each, at different depths. Groundwater samples were collected from four boreholes (BH-1, BH-2, BH-4 and BH-6). A list of the sampling points and depths is provided in Appendix CL2.

3.14 Samples for laboratory testing were submitted to an appropriately accredited laboratory - Laboratories Eurofins-Analytico, Netherlands.

3.15 The laboratory soil testing suite was chosen to provide a screening of the likely contaminants on site, including heavy metals, polycyclic aromatic hydrocarbons (PAHs) and total petroleum hydrocarbons (TPH). The full list is provided in Appendix CL1.

Assessment Methodology

Soils and Groundwater

3.16 An initial 'Tier 1' risk assessment has been used to compare the results for the observed concentrations of chemicals of concern in soils against conservative threshold values for those chemicals provided by the Dutch Circular 2013 (VROM, 2000). DIVs are the maximum tolerable concentration above which remediation is required. For example, if one or more compounds are found in concentrations equal to or higher than the intervention value in 25 (cubic metres) m^3 of soil or 1000 m^3 of groundwater. This level of assessment assumes there is no significant risk where the thresholds are not exceeded.

3.17 If chemical concentrations on site exceed generic thresholds appropriate for the intended end use of the site, then site specific quantitative risk assessment

and remediation may be necessary. Similarly, if concentrations are below the thresholds, the soil and groundwater conditions underlying the site would be considered to be acceptable for the proposed use.

3.18 Council Decision 2003/33/CE has provided threshold values for the identification of soil to be treated as waste if contamination is encountered. The Directive also includes appropriate levels for acceptance to landfill for inert and non hazardous waste.

Risk

3.19 Contamination is assessed in terms of the risk of an identified contamination source affecting a receptor via an exposure pathway, to form a complete 'source-pathway-receptor' pollutant linkage. A source is defined as contamination by chemicals of concern (COC) having the potential to cause significant harm to humans, or the environment (receptors). Where there is a complete linkage and assessment indicates the potential for significant harm to a receptor, there is considered to be a significant pollutant linkage. If any one of the three elements is absent, there is not considered to be a pollutant linkage.

3.20 The 'source-pathway-receptor' approach is the basis for the risk assessment and the design of necessary remediation measures. Remediation techniques can remove the source, intercept the pathway, or remove a receptor by controlling the end use of the site.

3.21 Receptors for the proposed development include:

- On-site personnel, including groundworkers during construction;
- Future site maintenance personnel after construction;
- Future site personnel and visitors;
- Nearby existing and new employment uses;
- Controlled waters (i.e. Gibraltar Bay) (assessed under Chapter 10 - Coastal Processes and Water Quality;
- Buildings, below ground structures, services and building foundations.

Significance Criteria

3.22 The assessment of significant effects has been carried out using several factors, including the location of any hazards relative to the ground surface, the sensitivity of receptors, the ability to mitigate and/or remediate against the potential hazard and the magnitude of any potential impact. Using these factors, each effect is assigned either as not significant, low, moderate or high risk. An overall risk assessment of not significant, low, moderate or high is then made. The criteria used to assess the significance of each risk of an effect are presented in Table CL3.1.

Table CL3.1 Levels of significance and criteria

Significance	Criteria
High	Major adverse effects would be important considerations for both the site and surrounding area including sensitive receptors. Mitigation and/or remedial measures may not be fully successful due to the magnitude of such an event.
Medium	Moderate adverse effects would be important on a site wide basis and may affect key decisions for the development. Mitigation and/or remediation would wholly or partly ameliorate the identified effect.
Low	Slight adverse effects are relevant on a small scale. These effects are likely to be generally reduced or removed using appropriate mitigation and/or remediation techniques.
Not Significant	Effects are assigned this level of significance if they are nil, imperceptible or negligible.

Assumptions and Limitations

3.23 The site investigation consisted of discrete sampling across the site. This sampling method was limited in certain locations by accessibility, and assumes that the sampled locations are representative of and can be interpolated between the tested locations.

3.24 If future work discovers ground conditions that vary significantly from the presented findings, the conclusions will be reviewed in the context of the new information. Moreover, ground and groundwater conditions may change with time, and a further 'Phase 2' ground investigation will be conducted immediately prior to earthworks to identify any area of risk.

3.25 The accuracy or completeness of any information derived from third party sources cannot be accounted for in this assessment.

4 EXISTING CONDITIONS

Site History

4.1 The proposed development is to be built on existing reclaimed land made in the 1990's. The desk study indicates that the site was initially used as a concrete casting facility and subsequently as a bottling plant and a power generation facility (Belilos, 2015).

Geological Baseline

4.2 The geological conditions underlying the site were determined by seven rotary boreholes with 83 Standard Penetration Tests (SPT), seven "undisturbed" waxed samples and 28 Lefranc tests (Sergeyco, 2015a).

4.3 The borehole surveys determined the present ground conditions as:

- Made ground: a 9-12 m thick layer of a heterogeneous mixture of sands;
- White sand: a 2-8 m thick layer of white gravely silty coarse sand with organic matter and carbonate precipitates;
- Yellow sand: a 6-11 m thick layer of yellow fractured calcarenite with shell remains;
- Tertiary clay: 3-10 m thick layer of stiff – very stiff overconsolidated marly clay with interbeded limestone and marl layers.

4.4 The solid geology consists of limestone bedrock, found approximately 32 m below ordnance datum (OD).

4.5 Previous site investigations for developments to the east of the proposed development site identified the ground conditions to consist of reclamation sand, original seabed sand, compacted (cemented) seabed sand with fine gravel, weathered and cracked shale, overlying a limestone bedrock.

4.6 This suggests the geological profile is consistent throughout the site.

Contamination Results

4.7 The test results obtained from the soil and groundwater investigations are presented in Appendix CL3.

4.8 Soil contaminant concentrations were all determined to be within the DIVs relevant to the proposed development, including mono aromatic hydrocarbons,

TPHs, PAHs, heavy metals, volatile halogenated hydrocarbons (VHHs) and organotins. Asbestos was not detected in any of the soil samples tested.

4.9 Groundwater contaminant concentrations for mono aromatic hydrocarbons, TPHs, PAHs, VHHs, suspended solids and most heavy metals showed no exceedences of DIVs. *In situ* measures of groundwater conditions during sampling (including pH, conductivity, temperature and dissolved organic oxygen) were recorded and are presented in Appendix CL4.

4.10 The only exceedence of the DIVs was for lead in the groundwater samples (Table CL4.1).

Table CL4.1 DIV Exceedences

Sample Point	Contaminant	Level recorded (µg/l)	Exceedence level (µg/l)
BH-1	Lead	80	75
BH-2	Lead	200	75
BH-6	Lead	100	75

Lead

4.11 The laboratory test results obtained from the groundwater investigations identified DIVs were exceeded for lead (DIV = 75 micrograms per litre (µg/l)) at three of the four boreholes (BH-1, BH-2 and BH-6). The maximum concentration of lead recorded was 200 µg/l which was recorded at BH-2. The boreholes were all located to the eastern end of the proposed development site, and no source of these elevated concentrations has been identified. It is possible that the elevated lead could result from natural mineralisation in the Jurassic limestones and marls underlying the site. It is very unlikely that the source of the lead was from surface leaching given the historic use of the site and that the rRecorded lead levels in the near surface soil samples analysed were all below limits.

Composite Samples

4.12 Samples from the four trial pits used for waste characterisation showed results that adhere to the requirements of the Council Decision 2003/33/CE

thresholds for inert landfilling, with the exception of Total Petroleum Hydrocarbons in one of the four samples (TP-4) which failed the 'inert' requirements of the waste classification (500 mg/kg) with a value of 620 mg/kg.

4.13 Total Petroleum Hydrocarbons (total C10-C40), were detected at low concentrations in each of the four soil samples tested. The highest recorded concentration at TP-1 at 56 milligram per kilogram (mg/kg) was not in exceedence of the DIV of 5000 mg/kg. TPHs (total C10-C40) for groundwater samples were detected in each of the four borehole samples. The highest concentration was found at BH-1 at 570 μg/l which was not in exceedence of the DIV of 600 μg/l. The TPHs are not considered to be of concern to human or ecological health.

5 FUTURE BASELINE

5.1 During construction, it is possible that potential contaminants in the made ground may become exposed and possibly released in the form of dust or as a liquid. This could have an impact on any construction workers and possibly a number of future occupiers of the site as well as off-site receptors, such as local workers or fauna and flora.

5.2 During construction, procedures will be put in place to avoid spillages of fuels and oils. However, if such an event should occur then it may have an impact on the ground, elevating the contaminant concentration within.

5.3 Drainage from vehicle parking areas on the site will pass through suitable petrol/oil interceptors before being discharged. If these interceptors are well maintained and kept in good condition then any oil/petrol spillages will not form a future contamination issue.

5.4 Fuel and chemical storage areas will be constructed with suitable secondary containment and leak detection so as to prevent any spills from entering the environment, impacting the underlying geology and ultimately the groundwater. The fuel supply for the power station will be stored in steel tanks constructed with secondary containment, which will be sized to suit 110% of the largest tank. Similarly, urea used to abate air pollutants will be stored in appropriately bunded tanks.

5.5 Prior to earthworks, a further detailed ground investigation will be conducted across the site to assess ground conditions. If concentrations of pollutants are discovered above limit levels, these will be identified and a method statement for their appropriate containment or removal will be agreed with the relevant authorities.

5.6 No other consented developments have been identified that could affect any cumulative future contamination of or from this proposed power station development.

6 POTENTIAL IMPACTS

Construction

6.1 Elevated concentrations of lead in excess of the Dutch Circular 2013 (VROM, 2000) DIVs were measured in groundwater at three of the four sampling locations. Borehole records indicate rest groundwater is at a level around 2 m to 2.5 m below ground level. Piling is planned to a maximum depth of approximately 15 m, therefore will penetrate the groundwater. The bedrock is approximately 30 m below OD, therefore it is not at risk of contamination. There is no aquiclude (a clay layer with an aquifer beneath) within the proposed development site, or its vicinity, therefore the piling process will not create additional pathways for contaminant migration into other areas or to an aquifer.

6.2 Very slightly elevated TPHs were recorded in two of the four borehole sampling locations, but not at levels that would be considered significant.

6.3 Further unsuspected contaminated ground could be discovered during intrusive works, potentially exposing site workers to unacceptable levels of contamination.

6.4 Dust from the construction works could provide a health hazard to site workers or cause a nuisance.

6.5 Contamination risks may result from accidental chemical releases and surface water runoff to controlled waters during construction. This has been assessed in Chapter 10 – Coastal Processes and Water Quality.

Operation

6.6 The concentrations of contaminants recorded during this investigation are considered likely to relate to made ground of the past reclamation at the site. As such, any risks will be mitigated by the use of personal protective equipment as per the Health and Safety Plan for the future construction works. During normal operations the majority of the area will be sealed or landscaped and the risk of exposure is minimal.

6.7 In areas of chemical storage/transport there is a risk of the accidental release of products through leakages and spillages. Potential chemicals that may be stored include those identified as hazardous (e.g. cyclopentane) which will be used for the heat recovery system (Organic Rankine Cycle (ORC)). Flammable chemicals are included in the EU Directive concerning equipment and protective systems intended for use in potentially explosive atmospheres (the ATEX Equipment Directive, 94/9/EC)

7 ASSESSMENT OF SIGNIFICANT EFFECTS

7.1 This section discusses the assessment and significance of effects arising from the potential impacts. It takes into account the source, pathway and receptor in describing any associated risks and the final assessment is based on the significance criteria as detailed in Table CL3.1.

7.2 Table CL7.1 identifies the potential significant effects from contamination arising from the construction of the proposed development.

Table CL7.1 Assessment of Significance – Construction Phase

Identified Impact	Explanation	Significance
Contamination – risks to human health	Limited areas of ground impacted by contamination have been identified. Further contaminated ground could be discovered during development. This gives rise to potential risks to site workers during any excavation or earth moving works. The risk pathway is via contact/inhalation/ingestion during construction.	Low
Dust	Dust could be generated during construction that could mobilise contamination which could impact site works and off-site people. This is considered further in the air quality and ecology chapters of this study.	Low
Accidental chemical releases	There is a risk associated with the release of chemicals during the construction phase. This could impact groundworkers and/or the surrounding soils and underlying groundwater.	Low

7.3 Table CL7.2 identifies the significant effects from the operational phase of the proposed power station.

Table CL7.2 Assessment of Significance – Operational Phase

Identified Impact	Explanation	Significance
Contamination – risks to human health	Limited areas of ground impacted by contamination have been identified in three of four groundwater borehole samples. This gives rise to potential risk to site workers during operation through dermal contact or ingestion.	Low
Accidental chemical releases	There is a risk associated with the release of oils and/or chemicals during the operation phase. This could impact groundworkers and/or the surrounding soils and underlying groundwater.	Low

8 MITIGATION AND RESIDUAL SIGNIFICANT EFFECTS

8.1 Mitigation measures are provided to break the 'source-pathway-receptor' pollutant linkage. The following describes appropriate mitigation to minimise the risk of contamination to people, places and the environment including fauna and flora, soil quality and groundwater. These mitigation measures will be in place through a Construction Environmental Management Plan (CEMP) and Operational Environment Management Plan (OEMP) to protect both the construction workers and users of the site and the wider environment.

Mitigation Measures – Construction Phase

8.2 Many of the potential contamination risks will be rendered insignificant by performing the construction in accordance with an appropriately designed CEMP.

8.3 No contamination has been identified by the investigation works to date that would impact on the selection of foundation systems for the proposed structures.

8.4 Piling, during construction, will not reach the bedrock, and there is no risk of contamination through an aquiclude to an aquifer. However, the contractor may wish to conduct a Foundation Works Risk Assessment, in accordance with *Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention* (Environment Agency (UK), 2001) to ensure correct measures can be implemented before works.

8.5 During construction, on-site remediation offers an option to reduce locally elevated TPH levels to within 'inert' landfill standards by ex-situ bioremediation so that waste may be disposed of within Gibraltar, in accordance with the proximity principle of the Gibraltar Waste Management Plan (HM Government of Gibraltar, 2013b), rather than being transported internationally to Spanish "non-hazardous" facilities.

8.6 Prior to excavation, a further 'Phase 2' ground investigation will be conducted, which will include additional sample sites. The methodology will be agreed with the relevant authorities, and results of testing against limits (Dutch levels)

will be analysed. If exceedences are found, method statements for remediation (removal or containment) will also be agreed.

8.7 If contaminated ground is encountered during construction works, this will be addressed in accordance with the CEMP such that the risks to site workers and the environment is minimised and any contamination is remediated. During the construction all personnel will use appropriate personal protective equipment.

8.8 Dust suppression techniques will be employed to minimise dust impacts and nuisance whether contamination is encountered or not.

8.9 The Contractor will consult with the relevant authorities to agree methods to safely manage and/or dispose of any contaminated material. These measures will mitigate the risk and result in **no residual significant effects**. All contaminated material moved off-site will be through an appropriately licensed waste contractor and disposed of to a suitably licensed facility.

8.10 Secondary containment and leak detection will be provided for any fuel and chemical storage, to minimise the potential for a spill to impact the environment.

8.11 Suitably managed onsite activities including bunding of chemical storage areas, spill response plans, providing appropriate workforce training and covering of spoil, will minimise the potential for a spill to occur and also enable any spills to be controlled and remediated effectively.

8.12 Cyclopentane for the ORC system will require particular handling and safety requirements, which will necessarily follow the requirements of the ATEX Equipment Directive 94/9/EC. The ORC system will be fitted with a continuous control system to stop ORC turbogenerators in case of a failure, and with 'durably technically tight' units to couplings, vents and drains, valve stems etc. The design and management is subject to specific risk assessment in compliance with the ATEX Equipment Directive. No significant effects of this system are therefore predicted.

8.13 The control of storm water run-off will be through the use of appropriate sediment controls such as settlement areas and covering of any contaminated

areas. This will prevent storm water washing sediment (with or without contamination) off the area into local drains and the surrounding environment.

8.14 The investigation comprised sampling at specific locations and intervening ground conditions may differ. Any visual or olfactory evidence of contamination observed during future ground works will be brought to the attention of the regulatory authorities to ensure that the risks to receptors (including site workers) can be appropriately assessed.

Mitigation Measures – Operational Phase

8.15 By incorporating mitigation measures in the development design the potential contamination risks will be rendered insignificant. In particular, hard surfacing around and under the power station will mitigate the pollutant linkages via dermal contact and/or ingestion. The installation of a leak detection system will enable rapid identification of leakages enabling effective management of any accidents.

8.16 An OEMP will include health and safety measures during normal operations, as well as accident and spill response procedures to be implemented in the event of an emergency in order to cut any 'source-pathway-receptor' linkages. Correct implementation of the OEMP will prevent contamination to soils, groundwaters and groundworkers. Action measures in the event of contamination to water bodies surrounding the site are suggested in Chapter 10 – Coastal Processes and Water Quality.

Residual Significant Effects

8.17 Through implementing an appropriate CEMP and incorporating suitable design criteria into the development, and developing an OEMP to manage operational risks, it is predicted that there will be **no residual significant effects**.

9 CONCLUSION

9.1 Site investigations were carried out to determine possible sensitive receptors and the current status of soil and groundwater on proposed power station site. Samples were assessed against DIVs to determine whether there were any significant pollutants that could harm receptors such as groundworkers, local soils or groundwater.

9.2 Results indicated exceedences of DIVs for lead in three of four groundwater samples. No other exceedences for soil or groundwater DIVs were recorded. Given the absence of an aquiclude, it is deemed that the risk of the construction works creating a pathway whereby the lead would migrate further is very low. To confirm this, it is suggested that a Foundation Works Risk Assessment may wish to be conducted by the piling contractor prior to works taking place.

9.3 Samples were also tested against soil as waste characterisation limits, as specified in the Landfill of Waste Directive 1999/31/EC, to determine disposal requirements and options. TPH (C10-C40) recorded exceeded requirements at one of four sample points. Possible remediation options have been suggested.

9.4 A 'Phase 2' investigation will be carried out prior to the commencement of construction works to ensure no further contaminants are present. If any contaminants are identified, further remediation measures will be agreed with the relevant authorities.

9.5 A CEMP and OEMP will manage procedures during construction and operation of the proposed power station to minimise risks of contamination.

9.6 This investigation has determined that there will be **no significant effects** to the environment associated with land contamination, if all appropriate measures are adhered to.

10 REFERENCES

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Sergeyco (2015a) Site Investigation Factual Report New Power Station at North Mole Gibraltar, April 2015.

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APPENDICES

APPENDIX CL1 LIST OF TESTED COMPOUNDS

Table CL.A1.1 Tests conducted on samples

Reference	Matrix	Testing
M-03-04-15	Soil	Dry material Heavy metals Total THP (total petroleum hydrocarbons) PAH BTEX (benzene, toulene, ethylbenzene, xylenes) VOCs
M-03-06-15		
M-03-08-15		
M-03-10-15		
M-04-04-15	Soil	Dry material VOCs TOC Organotin Asbestos
M-04-05-15		
M-04-06-15		
M-04-07-15		
M-04-08-15		
M-04-09-15		
M-04-12-15	Groundwater	Heavy metals Total THP (total petroleum hydrocarbons) PAH BTEX (benzene, toulene, ethylbenzene, xylenes) VOCs Suspended solids
M-04-13-15		
M-04-14-15		
M-04-15-15		
M-03-05-15	Soil as waste	Listing Council Decision of 19 December 2002 **l**a**y**i**d**own the criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2003/33/CE)
M-03-07-15		
M-03-09-15		
M-03-11-15		

Table CL.A1.2 Compounds in Testing of Soil as Waste

Dry Residue	
Volatile Aromatic Compounds	Benzene
	Toluene
	Ethylbenzene
	O-xylene
	P and M xylene
	Xylenes
	Total BTEX
	Polycyclic Aromatic Hydrocarbons
	Naphthalene
	Anthracene
	Phenanthrene
	Fluoranthene
	Benzo (a) anthracene
	Chrysene
	Benzo (a) pyrene
	Benzo (ghi) perylene
	Benzo (k) fluoranthene
	Indeno (1,2,3-cd) pyrene
	Acenaphthylene
	Acenaphthene

	Fluorene
	Pyrene
	Benzo (b) fluorenthene
	Dibenzo (a,h) anthracene
	PAH-sum (VROM, 10)
	PAH-sum (EPA, 16)
Polychlorinated Biphenyls (PCB)	PCB 28
	PCB 52
	PCB 101
	PCB 118
	PCB 138
	PCB 153
	PCB 180
	Total PCB (7)
Oil	C10-C12
	C12-C22
	C22-C30
	C30-C40
	total C10-C40
Dissolved Organic Carbon	
Organotins	Monobutyltin (MBT)
	Dibutyltin (DBT)
	Tributyltin (TBT)
	Tetrebutyltin (TTBT)
Leachate	
Metals	Antimony
	Arsenic
	Barium
	Cadmium
	Chrome
	Copper
	Mercury
	Lead
	Molybdenum
	Nickel
	Selenium
	Zinc
Ions	Fluoride
	Chloride
	Sulphate
Phenol	Phenol index
Total Dissolved Solids	

APPENDIX CL2 SAMPLING POINTS AND REFERENCES

Table CL.A2.1 Sampling Points and Reference

Reference	Matrix	Sampling Point	(Pit or Borehole Depth) Sampling Depth	Date
M-03-04-15	SOIL	TP-1	(1.50m) sample at 1.3m	23/03/2015
M-03-06-15	SOIL	TP-2	(1.50m) sample at 1.4m	23/03/2015
M-03-08-15	SOIL	TP-3	(1.80m) sample at 1.5m	23/03/2015
M-03-10-15	SOIL	TP-4	(1.30m) sample at 1.3m	23/03/2015
M-04-04-15	SOIL	BH-3	(40.50m) sample at 0.15m	14/04/2015
M-04-05-15	SOIL	BH-3	(40.50m) sample at 0.75m	14/04/2015
M-04-06-15	SOIL	BH-3	(40.50m) sample at 2m	14/04/2015
M-04-07-15	SOIL	BH-6	(35.20m) sample at 0.1m	14/04/2015
M-04-08-15	SOIL	BH-6	(35.20m) sample at 1m	14/04/2015
M-04-09-15	SOIL	BH-6	(35.20m) sample at 2.5m	14/04/2015
M-03-05-15	SOIL (Soil as waste)	TP-1	(1.50m) sample at 0.7m	23/03/2015
M-03-07-15	SOIL (Soil as waste)	TP-2	(1.50m) sample at 0.7m	23/03/2015
M-03-09-15	SOIL (Soil as waste)	TP-3	(1.80m) sample at 0.8m	23/03/2015
M-03-11-15	SOIL (Soil as waste)	TP-4	(1.30m) sample at 0.4m	23/03/2015
M-04-12-15	GROUNDWATER	BH-1	n/a	22/04/2015
M-04-13-15	GROUNDWATER	BH-2	n/a	22/04/2015
M-04-14-15	GROUNDWATER	BH-4	n/a	22/04/2015
M-04-15-15	GROUNDWATER	BH-6	n/a	22/04/2015

APPENDIX CL3 RESULTS

Table CL.A3.1 Soil Characterisation from trial pits

Sample / Test	Unit	TP-1 M-03-04-15	TP-2 M-03-06-15	TP-3 M-03-08-15	TP-4 M-03-10-15	Dutch Circular Intervention
Characteristics						
Dry weight	%	97.1	96.9	95.5	94.7	-
Mono Aromatic Hydrocarbons						
Benzene	mg/kg dm	< 0.050	< 0.050	< 0.050	< 0.050	1.1
Toluene	mg/kg dm	< 0.050	< 0.050	< 0.050	< 0.050	32
Etilbenzene	mg/kg dm	< 0.050	< 0.050	< 0.050	< 0.050	110
o-Xilene	mg/kg dm	< 0.050	< 0.050	< 0.050	< 0.050	-
m,p-Xilene	mg/kg dm	< 0.050	< 0.050	< 0.050	< 0.050	-
Xilenes (sum)	mg/kg dm	< 0.10	< 0.10	< 0.10	< 0.10	17
BTEX (total)	mg/kg dm	< 0.25	< 0.25	< 0.25	< 0.25	-
TPHs						
TPH (C10-C12)	mg/kg dm	< 3.0	< 3.0	< 3.0	< 3.0	-
TPH (C12-C16)	mg/kg dm	< 5.0	< 5.0	< 5.0	< 5.0	-
TPH (C16-C21)	mg/kg dm	< 6.0	< 6.0	< 6.0	< 6.0	-
TPH (C21-C30)	mg/kg dm	41	< 12	< 12	20	-
TPH (C30-C35)	mg/kg dm	< 6.0	< 6.0	< 6.0	14	-
TPH (C35-C40)	mg/kg dm	< 6.0	< 6.0	< 6.0	< 6.0	-
TPH total (C10-C40)	mg/kg dm	56	<38	<38	45	5000
Polycyclic Aromatic Hydrocarbons						
naphthalene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	-
acenaphthylene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	-
acenaphthene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	-
fluorene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	-
phenanthrene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.029	-
anthracene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.015	-
fluoranthene	mg/kg dm	< 0.010	< 0.013	< 0.010	0.035	-
pyrene	mg/kg dm	< 0.010	< 0.011	< 0.010	0.039	-
benzo(a)anthracene	mg/kg dm	< 0.010	< 0.011	< 0.010	0.045	-
chrysene	mg/kg dm	< 0.010	< 0.011	< 0.010	0.056	-
benzo(b)fluoranthene	mg/kg dm	< 0.010	< 0.011	< 0.010	0.042	-
benzo(k)fluoranthene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.017	-
benzo(a)pyrene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.039	-
dibenzo(a,h)anthracene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	-
benzo(ghi)perylene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.021	-
indeno(1,2,3-cd)pyrene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.024	-
sum 10 PAH VROM	mg/kg dm	< 0.010	< 0.010	< 0.010	0.28	40
sum 16 PAH EPA	mg/kg dm	< 0.016	< 0.016	< 0.016	0.36	-

Sample		TP-1 M-03-04-15	TP-2 M-03-06-15	TP-3 M-03-08-15	TP-4 M-03-10-15	Dutch Circular Intervention
Test	Unit					
Heavy Metals						
Arsenic	mg/kg dm	8.5	11	11	9.7	76
Cadmium	mg/kg dm	< 0.40	< 0.40	< 0.40	< 0.40	13
Chromium	mg/kg dm	33	41	40	40	180* (Cr III)
Copper	mg/kg dm	< 5.0	< 5.0	< 5.0	< 5.0	190
Mercury	mg/kg dm	< 0.10	< 0.10	< 0.10	< 0.10	36
Nickel	mg/kg dm	60	74	74	67	100
Lead	mg/kg dm	< 10	< 10	< 10	< 10	530
Zinc	mg/kg dm	17	22	24	23	720
Cobalt	mg/kg dm	< 5.0	6.6	6.7	6.1	190
Volatile Halogenated Hydrocarbons						
Dichloromethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	3.9
Trichloromethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	5.6
Tetrachloromethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	0.7
Trichloroethene	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	2.5
Tetrachloroethene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	8.8
1,1-Dichloroethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	15
1,2-Dichloroethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	6.4
1,1,1-Trichloroethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	15
1,1,2-Trichloroethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	10
cis1,2-Dichloroethene	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	-
trans 1,2-Dichloroethene	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	-
cis+trans 1,2-Dichloroet(sum)	mg/kg dm	< 0.040	< 0.040	< 0.040	< 0.040	1
Chlorinated Hydrocar (sum)	mg/kg dm	< 0.21	< 0.21	< 0.21	< 0.21	-
1,1-Dichloroethene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	0.3
Vinyl chloride	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	0.1

Note: Shaded values indicate Dutch Intervention Values and exceedences.

Table CL.A3.2 Soil Characterisation from Boreholes

Sample / Test	Unit	BH-3 M-04-04-15	BH-3 M-04-05-15	BH-3 M-04-06-15	BH-6 M-04-07-15	BH-6 M-04-08-15	BH-6 M-04-09-15	Dutch Circular Intervention
Characteristics								
Dry weight	%	96.3	96.1	97.5	82.9	84.1	89.8	-
TOC	g/kg dm	35	< 5	< 5	< 5	< 5	< 5	-
Asbestos								
Asbest	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected	100
TBT								
Monobutyltin (MBT)	µg Sn/kg dm	< 0.353	4.38	< 0.357	0.482	< 0.377	< 0.384	-
Dibutyltin (DBT)	µg Sn/kg dm	< 0.267	2.88	< 0.270	< 0.305	< 0.285	< 0.290	-
Tributyltin (TBT)	µg Sn/kg dm	0.423	5.23	0.287	< 0.245	< 0.228	< 0.233	-
Tetrabutyltin (TTBT)	µg Sn/kg dm	< 0.179	< 0.172	< 0.181	< 0.204	< 0.191	< 0.194	-
Volatile Halogenated Hydrocarbons								
Dichloromethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	3.9
Trichloromethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	5.6
Tetrachloromethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	0.7
Trichloroethene	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	2.5
Tetrachloroethene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	8.8
1,1-Dichloroethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	15
1,2-Dichloroethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	6.4
1,1,1-Trichloroethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	15
1,1,2-Trichloroethane	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	10

Sample		BH-3	BH-3	BH-3	BH-6	BH-6	BH-6	Dutch
Test	Unit	M-04-04-15	M-04-05-15	M-04-06-15	M-04-07-15	M-04-08-15	M-04-09-15	Circular Intervention
Volatile Halogenated Hydrocarbons								
cis1,2-Dichloroethene	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	-
trans 1,2-Dichloroethene	mg/kg dm	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	-
cis+trans 1,2-Dichloroet(sum)	mg/kg dm	< 0.040	< 0.040	< 0.040	< 0.040	< 0.040	< 0.040	1
Chlorinated Hydrocar (sum)	mg/kg dm	< 0.21	< 0.21	< 0.21	< 0.21	< 0.21	< 0.21	-

Note: Shaded values indicate Dutch Intervention Values and exceedences.

Table CL.A3.3 Groundwater characterisation

Sample / Test	Unit	BH-1 M-04-12-15	BH-2 M-04-13-15	BH-4 M-04-14-15	BH-6 M-04-15-15	Dutch Circular 2013 Intervention
MONO AROMATIC HYDROCARBONS						
Benzene	µg/l	< 0.20	< 0.20	< 0.20	< 0.20	30
Toluene	µg/l	1.1	< 0.20	< 0.20	< 0.20	1000
Etilbenzene	µg/l	< 0.20	< 0.20	< 0.20	< 0.20	150
o-Xilene	µg/l	< 0.20	< 0.20	< 0.20	< 0.20	-
m,p-Xilene	µg/l	< 0.20	< 0.20	< 0.20	< 0.20	-
Xilenes (sum)	µg/l	< 0.40	< 0.40	< 0.40	< 0.40	70
BTEX (total)	µg/l	1.1	< 1.0	< 1.0	< 1.0	-
TPHs						
TPH (C10-C12)	µg/l	< 10	< 10	< 10	< 10	-
TPH (C12-C16)	µg/l	< 10	< 10	< 10	< 10	-
TPH (C16-C21)	µg/l	15	< 10	< 10	11	-
TPH (C21-C30)	µg/l	315	140	130	320	-
TPH (C30-C35)	µg/l	160	85	68	170	-
TPH (C35-C40)	µg/l	67	34	25	64	-
TPH total (C10-C40)	µg/l	570	270	230	560	600
POLYCYCLIC AROMATIC HYDROCARBONS						
naphthalene	µg/l	0.047	0.024	< 0.020	< 0.020	70
acenaphthylene	µg/l	< 0.050	< 0.050	< 0.050	< 0.050	-
acenaphthene	µg/l	0.015	< 0.010	< 0.010	< 0.010	-
fluorene	µg/l	0.023	< 0.010	< 0.010	< 0.010	-
phenanthrene	µg/l	0.12	0.011	0.078	0.017	5
anthracene	µg/l	0.021	< 0.0050	0.011	< 0.0050	5
fluoranthene	µg/l	0.13	< 0.010	0.075	0.016	1
pyrene	µg/l	0.12	< 0.010	0.068	0.015	-
benzo(a)anthracene	µg/l	0.082	< 0.010	0.018	< 0.010	0.5
chrysene	µg/l	0.041	< 0.010	0.033	< 0.010	0.2
benzo(b)fluoranthene	µg/l	0.024	< 0.010	0.034	< 0.010	-
benzo(k)fluoranthene	µg/l	< 0.010	< 0.010	0.012	< 0.010	0.05
benzo(a)pyrene	µg/l	0.026	< 0.010	0.031	< 0.010	0.05
dibenzo(a,h)anthracene	µg/l	< 0.010	< 0.010	< 0.010	< 0.010	-
benzo(ghi)perylene	µg/l	0.034	< 0.010	0.025	< 0.010	0.05
indeno(1,2,3-cd)pyrene	µg/l	0.025	< 0.010	0.021	< 0.010	0.05
sum 10 PAH VROM	µg/l	0.53	< 0.10	0.3	< 0.10	-
sum 16 PAH EPA	µg/l	0.7	< 0.20	0.41	< 0.20	-
HEAVY METALS						
Arsenic	µg/l	11	17	15	7	60
Cadmium	µg/l	< 0.40	< 0.40	< 0.40	< 0.40	6

Sample		BH-1	BH-2	BH-4	BH-6	Dutch Circular 2013
Test	Unit	M-04-12-15	M-04-13-15	M-04-14-15	M-04-15-15	Intervention
HEAVY METALS						
Chromium	µg/l	20	9.7	21	11	30
Copper	µg/l	34	5.3	14	22	75
Mercury	µg/l	0.25	0.18	0.23	0.27	0.3
Nickel	µg/l	16	8.7	16	12	75
Lead	µg/l	80	200	71	100	75
Zinc	µg/l	61	80	78	120	800
Cobalt	µg/l	< 3.0	< 3.0	< 3.0	< 3.0	100
VOLATILE HALOGENATED HYDROCARBONS						
Dichloromethane	µg/l	< 0.10	< 0.10	< 0.10	< 0.10	1000
Trichloromethane	µg/l	< 0.10	< 0.10	< 0.10	< 0.10	400
Tetrachloromethane	µg/l	< 0.10	< 0.10	< 0.10	< 0.10	10
Trichloroethene	µg/l	< 0.10	< 0.10	< 0.10	< 0.10	500
Tetrachloroethene	µg/l	< 0.10	< 0.10	< 0.10	< 0.10	40
1,1-Dichloroethane	µg/l	< 0.10	< 0.10	< 0.10	< 0.10	900
1,2-Dichloroethane	µg/l	< 0.10	< 0.10	< 0.10	< 0.10	400
1,1,1-Trichloroethane	µg/l	< 0.10	< 0.10	< 0.10	< 0.10	300
1,1,2-Trichloroethane	µg/l	< 0.10	< 0.10	< 0.10	< 0.10	130
cis 1,2-Dichloroethene	µg/l	< 0.10	< 0.10	< 0.10	< 0.10	-
trans 1,2-Dichloroethene	µg/l	< 0.10	< 0.10	< 0.10	< 0.10	-
cis+trans 1,2-Dichloroet(sum)	µg/l	< 0.20	< 0.20	< 0.20	< 0.20	20
Chlorinated Hydrocar (sum)	µg/l	< 1.1	< 1.1	< 1.1	< 1.1	-
SUSPENDED SOLIDS						
Suspended solids	mg/l	640	130	310	520	-

Note: Shaded values indicate Dutch Intervention Values and exceedences.

Table CL.A3.4 Waste Characterisation

Sample		TP-1 M-03-05-15	TP-2 M-03-07-15	TP-3 M-03-09-15	TP-4 M-03-11-15	Council Decision 2003/33/CE	
Test	Unit					Inert Waste	Non Hazardous Waste
Characteristics							
Dry weight	%	96.7	95.4	94.5	94.1	-	-
COT	g/kg ms	< 5.0	< 5.0	< 5.0	13	30	< 5%
CaCO3	% (m/m) ms	29.4	81.9	35.3	44.7	-	-
CaCO3	g/kg ms	294.4	819.3	353.2	447.4	-	-
BTEX							
BTEX (total)	mg/kg dm	< 0.25	< 0.25	< 0.25	< 0.25	6	-
TPHs							
TPH total (C10-C40)	mg/kg dm	93	41	<38	620	500	-
Polychlorinated Biphenyls							
PCB (sum 7)	mg/kg dm	< 0.0070	< 0.0070	< 0.0070	< 0.0070	1	-
Polycyclic Aromatic Hydrocarbons							
naphthalene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	-	-
acenaphthylene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	-	-
acenaphthene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	-	-
fluorene	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	-	-
phenanthrene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.1	-	-
anthracene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.017	-	-

Sample		TP-1 M-03-05-15	TP-2 M-03-07-15	TP-3 M-03-09-15	TP-4 M-03-11-15	Council Decision 2003/33/CE	
Test	Unit					Inert Waste	Non Hazardous Waste
Polycyclic Aromatic Hydrocarbons							
fluoranthene	mg/kg dm	< 0.010	< 0.010	0.012	0.049	-	-
pyrene	mg/kg dm	< 0.010	< 0.010	0.011	0.24	-	-
benzo(a)anthracene	mg/kg dm	< 0.010	< 0.010	0.011	0.21	-	-
chrysene	mg/kg dm	< 0.010	< 0.010	< 0.010	3	-	-
benzo(b)fluoranthene	mg/kg dm	< 0.010	< 0.010	0.011	0.12	-	-
benzo(k)fluoranthene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.024	-	-
benzo(a)pyrene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.19	-	-
dibenzo(a,h)anthracene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.047	-	-
benzo(ghi)perylene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.11	-	-
indeno(1,2,3-cd)pyrene	mg/kg dm	< 0.010	< 0.010	< 0.010	0.057	-	-
sum 10 PAH VROM	mg/kg dm	< 0.10	< 0.10	< 0.10	1.1	-	-
sum 16 PAH EPA	mg/kg dm	< 0.16	< 0.16	< 0.16	1.5	-	-
Inorganic Compounds							
pH (KCl)		11.9	11.9	11.9	11.5	-	-
Temperature (pH test)	°C	21	21	21	21	-	-
Leachate							
CEN test LS=10	L/g ms	0.0101	0.00999	0.00999	0.01	-	-
Antimony ELUTRIATE	mg/kg dm	< 0.0040	< 0.0040	0.0048	0.0048	0.06	0.7
Arsenic ELUTRIATE	mg/kg dm	0.009	< 0.0050	0.04	0.061	0.5	2
Barium ELUTRIATE	mg/kg dm	< 0.20	1.1	< 0.20	< 0.20	20	100
Cadmium ELUTRIATE	mg/kg dm	< 0.0040	< 0.0040	< 0.0040	< 0.0040	0.04	1

Sample		TP-1 M-03-05-15	TP-2 M-03-07-15	TP-3 M-03-09-15	TP-4 M-03-11-15	Council Decision 2003/33/CE	
Test	Unit					Inert Waste	Non Hazardous Waste
Leachate							
Chromium ELUTRIATE	mg/kg dm	0.055	0.047	0.1	0.053	0.5	10
Copper ELUTRIATE	mg/kg dm	< 0.051	< 0.050	0.066	< 0.050	2	40
Mercury ELUTRIATE	mg/kg dm	< 0.00040	< 0.00040	< 0.00040	< 0.00055	0.01	0.2
Lead ELUTRIATE	mg/kg dm	< 0.10	< 0.10	< 0.10	< 0.10	0.5	10
Molybdenum ELUTRIATE	mg/kg dm	0.03	0.031	0.029	0.02	0.5	10
Nickel ELUTRIATE	mg/kg dm	< 0.051	< 0.050	< 0.050	< 0.050	0.4	10
Selenium ELUTRIATE	mg/kg dm	< 0.0071	< 0.0070	< 0.0070	0.0081	0.1	0.5
Zinc ELUTRIATE	mg/kg dm	< 0.30	< 0.30	< 0.30	< 0.30	4	50
Fluoride ELUTRIATE	mg/kg dm	0.97	0.37	1.8	0.84	10	150
phenol (index) ELUTRIATE	mg/kg dm	< 0.010	< 0.010	< 0.010	< 0.010	1	
Chloride ELUTRIATE	mg/kg dm	7.1	73	18	5.8	800	15000
Sulphate ELUTRIATE	mg/kg dm	150	110	180	68	1000	20000
COD elutriate	mg/kg dm	< 20	< 20	35	< 20	500	800
pH		12.1	12.1	11.7	11.4	-	-
Conductivity 20ºC	mS/m	150	180	72	38	-	-
Conductivity 20ºC	µS/cm	1500	1800	720	380	-	-
Conductivity 25ºC	mS/m	160	200	80	42	-	-
Conductivity 25ºC	µS/cm	1500	2000	800	420	-	-
Temperature pH	°C	20.8	20.6	20.6	20.8	-	-

Note: Shaded values indicate Inert Waste Landfill limits. Shading also corresponds to exceedences of limit values.

APPENDIX CL4 IN SITU MEASUREMENTS DURING GROUNDWATER SAMPLING

Table CL.A4.1 In Situ Measurements during Groundwater Sampling

Sampling point and sample	pH	Conductivity in microsiemens per centimetre (µS/cm)	Temperature (°C)	Dissolved Oxygen
BH-1 M-04-12-15	6.87	52.940 (20ºC)	18.58	46.2% / 3.3 ppm (1021 mbar and 40.54 Sal)
BH-2 M-04-13-15	7.07	50.180 (20ºC)	17.92	51% / 3.8 ppm (1022 mbar and 38.87 Sal)
BH-4 M-04-14-15	7	60.100 (20ºC)	20.72	64% / 4.3 ppm (1020mbar and 44.41 Sal)
BH-6 M-04-15-15	6.89	58.700 (20ºC)	18.07	54.6% / 3.8 ppm (1021mbar and 46.18 Sal)

Note: ppm – Parts per million, mbar - millibar (measure of pressure), Sal - Salinity.

CHAPTER 12

ECOLOGY AND NATURE CONSERVATION

CONTENTS

LIST OF TABLES

GLOSSARY AND ABBREVIATIONS

Al_3^+	Aluminium cation
APIS	Air Pollution Information System
BAP	Biodiversity Action Plan
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CMS	Convention on the Conservation of Migratory Species of Wild Animals
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
GNPO	Gibraltar Nature Protection Ordinance. Legislation passed by the HM Government of Gibraltar and dealing with wildlife protection and nature conservation.
GONHS	The Gibraltar Ornithological and Nature History Society. Non-governmental organisation concerned with nature conservation in Gibraltar. Also acts as a statutory consultee to the HM Government of Gibraltar.
HM	Her Majesty's
IUCN	International Union for Conservation of Nature
JNCC	The Joint Nature Conservation Committee
kgN/ha/yr	Kilograms of nitrogen per hectare per year
km	Kilometre
m	Metre
$\mu g/m^3$	Micrograms per cubic metre
MOD	Ministry of Defence
N	Nitrogen
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
PAF	Prioritised Action Framework
Pers comm	Personal communication
SOx	Sulphur oxides
SAC	Special Area of Conservation. Also known as a Natura 2000 site, designated under the EU Habitats Directive
SPA	Special Protection Area. Also known as a Natura 2000 site, designated under the EU Habitats Directive
UK	United Kingdom

1 INTRODUCTION

1.1 This chapter assesses the potential ecological effects of the proposed North Mole power station. It sets out the regulatory context, including relevant wildlife legislation, policy, guidance and conventions in operation in Gibraltar, followed by a description of the methods used to asses potential impacts on ecology. It goes on to describe the baseline ecological conditions on and around the proposed development site, and defines the potential zone of influence and the ecological receptors that are potentially affected.

1.2 The section on potential impacts and potential significant effects considers the aspects of the project that could lead to ecological effects, at the construction and operational stages.

1.3 This chapter cross-refers to other assessments reported in this assessment including air quality (Chapter 9), coastal processes and water quality (Chapter 10), contaminated land (Chapter 11), landscape and visual amenity (Chapter 13) and noise and vibration (Chapter 15).

2 REGULATORY CONTEXT

International Legislation

2.1 The two principal European Union (EU) Directives relating to nature conservation are the European Commission (EC) Habitats Directive 1992 (92/43/EEC) and the EC Birds Directive 2009/147/EC. The Birds Directive makes provision for the designation of conservation areas for rare and vulnerable birds as Special Protection Areas (SPA). The Habitats Directive makes provision for the designation of wildlife conservation areas as Special Areas of Conservation (SAC).

Conventions

2.2 Gibraltar is also signatory to three international conventions through which it is committed to the conservation of biodiversity:

- The Convention on Biological Diversity (United Nations, 1992);
- The Convention on the Conservation of Migratory Species of Wild Animals (UN, 1983);
- The Convention on the Conservation of European Wildlife and Natural Habitats.

The Convention on Biological Diversity

2.3 The Convention on Biological Diversity commits the signatory to the convention's three main goals: the conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of the benefits from the use of genetic resources.

The Convention on the Conservation of Migratory Species of Wild Animals

2.4 The Convention on the Conservation of Migratory Species of Wild Animals (CMS), more commonly known as the Bonn Convention, aims to conserve terrestrial, marine and avian migratory species throughout their range. As stated in Article 2(3) the convention requires signatories to *"promote, cooperate in and support research relating to migratory species"*, *"endeavour to provide immediate protection for migratory species included in Appendix I and shall endeavour to conclude agreements covering the conservation and*

management of migratory species included in Appendix II" (CMS, 2003: Article 2(3)).

The Convention on the Conservation of European Wildlife and Natural Habitats

2.5 The Convention on the Conservation of European Wildlife and Natural Habitats, more commonly known as the Bern Convention, aims to conserve wild fauna and flora including their natural habitats in addition to promoting European cooperation in this field. Signatories are required to promote anti-pollution measures, national conservation policies, educational and informative measures as well as coordinating efforts to protect migratory species and to establish legislative and administrative measures.

National Law

Nature Protection Act 1991

2.6 Both the Habitats Directive 92/43/EEC and Birds Directive 2009/147/EC are transposed into Gibraltar's national legislation through the Nature Protection Act 1991 (Her Majesty's (HM) Government of Gibraltar, 1991) (as amended). Part II of the Act outlines the protection afforded to wild plants and animals in Gibraltar (except European protected species). Part IIA of the Act implements the EC Habitats Directive in respect of European designated sites and species. Part III of the Act outlines how habitats are protected from pollution or deterioration.

2.7 Schedule 1 of the Nature Protection Act lists the species (and groups of species, such as all bats) of wild animals for which legal protection is provided, making it an offence to intentionally kill, injure or take any of the listed species. Schedule 2 lists all plants that are not protected, and therefore, plants that are not on this list are protected. Schedule 3 of the Act lists endangered species for which no licence shall be issued (under section 13 of the Act) which may result in the extinction of that species in Gibraltar. Schedule 5 implements the EC Habitats Directive in Gibraltar and includes lists of Annex I Habitat Types (natural habitat types of community interest whose conservation require the designation of special areas of conservation) that occur in Gibraltar, and Annex II species (whose conservation require the designation of special areas

of conservation). Schedule 8 implements the EC Birds Directive, including a list of Annex I bird species that shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution.

Marine Protection Regulations 2014

2.8 The Marine Protection Regulations 2014 implement the designation of five Marine Conservation Zones. The Regulations impose limitations on activities affecting marine species within the zones, principally relating to fish catches and tourist activities and their potential effects on cetaceans. Schedule 1 of the Regulations provides maps of the Marine Conservation Zones. Schedule 2 of the Regulations lists ten species and species-groups requiring special protection.

Policy and Guidance

The Gibraltar Biodiversity Action Plan

2.9 The Gibraltar Biodiversity Action Plan aims to *'conserve and enhance biological diversity within Gibraltar and to contribute to the conservation of global biodiversity through all appropriate mechanisms'* (Perez, 2006). It recognises that the key threats to Gibraltar's biodiversity are invasive species, urbanisation and vegetation succession. The plan lists numerous priority species including five birds, five mammals (as well as all cetaceans), nine vascular plants (as well as all orchids), one insect, one arachnid and two terrestrial molluscs. The plan recognises that the Upper Rock Nature Reserve is an important area for biodiversity, containing most of the habitat types found in Gibraltar, and a large percentage of the species that have individual species action plans.

2.10 All bat and swift species are protected by law in Gibraltar (under the Nature Protection Act, 1991). These species are threatened by continual loss of their nesting and roosting sites on old buildings as a result of redevelopments. Table EC2.1 lists the swift and bat species of Gibraltar, provided within the *Bats and Swifts in Buildings* planning guidance note (The Gibraltar Ornithological and Natural History Society (GONHS), 1996).

Table EC2.1: List of bat and swift species found in Gibraltar and their International Union for Conservation of Nature (IUCN) status

Scientific Name	Common Name	Status
Rhinolophus hipposideros	Lesser Horseshoe Bat	Least Concern
Plecotus auritus	Brown Long-eared Bat	Least Concern
Miniopterus schreibersii	Schreiber's Bent-winged Bat	Near Threatened
Myotis myotis	Greater Mouse-eared Bat	Least Concern
Pipistrellus pipistrellus	Common Pipistrelle	Least Concern
Pipistrellus savii	Savi's Pipistrelle	Least Concern
Pipistrellus kuhlii	Kuhl's Pippistrelle	Least Concern
Eptesicus serotinus	Serotine	Least Concern
Nyctalus lasiopterus	Greater Noctule Bat	Near Threatened
Barbastella barbastellus	Western Barbastrelle	Near Threatened
Tadarida teniotis	European Free-tailed Bat	Least Concern
Apus apus	Common Swift	Least Concern
Apus pallidus	Pallid Swift	Least Concern

Pollution Prevention Guidance 5: Works in, near or over watercourses, PPG5: prevent pollution

2.11 The Pollution Prevention Guidance 5 (PPG5) (Environment Agency (UK), 2014) provides information on how to prevent pollution and comply with environmental law when works are carried out near, in or over ponds, lakes, ditches, streams, rivers and other watercourses. This includes management of materials, oils and chemicals which may be used to inform management proposed development.

3 SCOPE AND METHODOLOGY

Scope

3.1 This ecological impact assessment identifies the ecological receptors in the proposal's zone of potential ecological influence, and considers their vulnerability to the likely effects of the project.

3.2 The scope of the assessment has been consulted on with the Department of the Environment and Climate Change, and the Gibraltar Ornithological and Natural History Society (GOHNS).

3.3 Considering the nature of the proposals, the zone of potential ecological influence includes the proposed development footprint, the extent to which light and noise from the project could be detected by ecological receptors, and the extent to which there is potential for airborne pollutants to be deposited upon ecological receptors. The spatial scope of these factors is defined with reference to the other technical chapters of this Environmental Statement (ES), and includes the proposal site and its immediate surroundings, the northern and northwest slopes of the Rock of Gibraltar, and the marine environment around the proposed site.

3.4 It is not anticipated that the proposed power station will have any direct construction or operational impacts on marine mammals. The studies carried out for the North Mole Reclamation project (HM Government of Gibraltar, 2014), found that predicted levels from the reclamation would not exceed ambient levels generated by the existing busy shipping traffic. Therefore because of the proposed project's land-based location, behind the new North Mole reclamation, no noise or vibration impacts on the marine environment are predicted to occur.

3.5 The proposed power station will be cooled using an air cooling system (further described in Chapter 5 – Project Description) therefore, no sea water will be removed or returned to the Bay of Gibraltar or the Gibraltar Harbour. As such, the potential effects of seawater intake and discharge are scoped out of the assessment.

3.6 The generating equipment will be mounted on skids and housed inside soundproofed buildings. Therefore, potential impacts from noise and vibration on ecological receptors during operation of the power station are scoped out of this assessment.

Data Collection

3.7 Data has been collated and evaluated from the following sources:

- The HM Government of Gibraltar's 'Thinking Green website', which provides information on biodiversity on the Rock from referenced sources (HM Government of Gibraltar, 2015);
- The Natura 2000 Data Form for the Rock of Gibraltar Special Area of Conservation, for information on species and habitats of the site (European Commission, 2012a);
- The Natura 2000 Data Form for the Rock of Southern Waters of Gibraltar Special Protection Area and Special Area of Conservation, for information on species and habitats of the site (European Commission, 2012b);
- Format for a Prioritised Action Framework (PAF) for Natura 2000 for the EU Multiannual Financing Period 2014-2020 (Gibraltar), which provides further detailed information on the species and habitats of the Natura 2000 sites;
- The Environmental Statement produced in May 2014 (HM Government of Gibraltar, 2014) for the North Mole Reclamation Project, which provides detailed information on the marine and inter-tidal habitats of Gibraltar and the proposed project site (HM Government of Gibraltar, 2014).

Assessment Methodology

3.8 The assessment has used, amongst others, guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM, 2006) on ecological impact assessment and significance criteria.

3.9 The EU Environment DG's guidance on Appropriate Assessment methodology has been used where qualifying features of the SAC/SPA may be significantly adversely affected, this outlined in Appendix EC3.

3.10 For this ecological assessment, the term 'impact' is used to denote the physical attribute or change caused by the proposals. Such impacts will act upon ecological features either directly or indirectly. The impact acting upon the receptor creates an effect, and the significance of the effect is dependent upon a number of factors, but principally the magnitude of the impact and the sensitivity of the receptor.

3.11 The magnitude of an impact is often quantifiable in terms of, for example, extent of habitat loss or predicted change in feeding opportunities.

3.12 In this assessment, the importance of the identified wildlife features (receptors) within the assessment area has been determined based on their spatial level of importance (local, national, international). Where possible the determination of the level of importance has considered conservation status information of the habitat or species, or otherwise it has been based upon the professional experience and knowledge of the assessor in line with guidance from the organisations consulted.

3.13 Table EC3.1 provides a description of the terms used to define the level of significance used for this assessment.

Table EC3.1 Description of the Terms used in the Determination of Significant Effects

Term	Description	Significance
Negligible	The predicted impact will be highly localised.	Not significant
Low	The predicted impact has significance at local level only.	Significant
Medium	The predicted impact has significance at a national scale.	Significant
High	The predicted impact has significance at an international scale.	Significant

3.14 The matrix in Table EC3.2 has been used to determine the level of significance of an impact upon a receptor. In determining the final predicted level of significance of an effect, other factors are taken into consideration. Where possible, these are objective and quantifiable factors, such as the time period over which the effect will occur and the reversibility of the effect. The assessment is based on experience of similar impacts from other developments, the ecological requirements of flora and fauna, and an understanding of ecological systems and their interactive nature. Where limitations in information have affected this assessment, they have been identified.

Table EC3.2 Matrix used to Determine the Level of Significance of Effect in this Assessment

Impact	Quality or Rarity of Ecological Feature			
	International	National	Local	Site
High	High	Medium	Low	Low
Medium	High	Medium	Low	Very Low
Low	Medium	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low

3.15 The shaded parts of the matrix are considered in this assessment as significant effects.

Assumptions and Limitations

3.16 Engain cannot verify the accuracy of third party data.

3.17 There are significant gaps in research and information relating to background nitrogen deposition rates, critical nitrogen loads for the most important vegetation types for the Rock of Gibraltar SAC. Additionally, there is a lack of published research and information regarding nitrogen impact on Mediterranean vegetation and potential atmospheric deposition effects of nitrogen on Gibraltar vegetation. This is further discussed in Appendix EC3.

4 EXISTING CONDITIONS

Marine Habitats and Species

4.1 The marine environment immediately to the north of the proposed power station is designated as the North-West Marine Conservation Zone (MCZ) as shown in Appendix EC1 (Figure 5). The MCZ provides protection for marine species (particularly fish and cetaceans) and limitations on activities (such as fishing and tourism) that potentially affect these species.

4.2 The Southern Waters of Gibraltar SAC lies approximately 3.5 kilometres (km) to the south of the proposal site as shown in Appendix EC1 (Figure 2). The two protected habitat types within the Southern waters of Gibraltar SAC (i.e. habitats listed on Annex I of the EC Habitats Directive, and consequently in Schedule 5 of the Nature Protection Act 1991 (as amended)) are reefs, and submerged and partly submerged sea caves. Reefs are largely found within the southern part of the Southern Waters of Gibraltar SAC, with a small area of shallow reefs to the west of the Detached Mole (approximately 700 m south-west of the proposed development, see Appendix EC1, Figure 6). Sea caves are only found within the Southern Waters of Gibraltar SAC boundary. Neither of these habitats is present in the marine environment immediately surrounding the North Mole.

4.3 Protected species found in the coastal waters around Gibraltar (i.e. species listed in Annex II or Annex IV of the EC Habitats Directive, and consequently on Schedule 5 of the Nature Protection Act 1991 (as amended)) include cetaceans (whales and dolphins), Mediterranean monk seals, turtles, marine invertebrates, seahorses and several species of fish. Of these, the only species whose known range is within the potential zone of influence are the limpet *Patella ferruginea* (which is present on the proposal's artificial shoreline around the North Mole) and the fish species *Gobius niger* and *Gobius paganellus*, which may be present in the inshore environment). The noble pen shell (*Pina noblis)* is an Annex IV species that may occur in the general area, though there were no findings from the surveys around the North Mole, conducted in 2014. Baseline surveys for the North Mole Reclamation Project (HM Government of Gibraltar, 2014) did not record any cetaceans in the coastal waters around the North Mole, and given the habitats present and the

high level of shipping activity it is unlikely that cetaceans use these waters frequently, if at all.

Vegetation and Plant Species

4.4 The proposed development site is currently in industrial use with little to no vegetation. There is a single Norfolk Island pine *Araucaria heterophylla* tree on the north-west corner of the site, and North Mole Road is lined with small tamarisk trees. The site is therefore of negligible current ecological value.

4.5 The North Mole, within which the proposed project is located, is a largely industrial and residential area with port and marina facilities, and has little vegetation or other habitats for wildlife, and is also therefore of negligible value for wildlife.

4.6 The northwest and west slopes of the Rock of Gibraltar are approximately 1.5 km from the site of the proposed project. The slopes are dominated by scrub and woodland, broadly referable to the EC Habitats Directive Annex I habitat type 9320 *Olea and Ceratonia Forests*, broken by steep slopes with open vegetation including the Annex I habitat type 8210 *Calcareous rocky slopes with chasmophytic vegetation*. The slopes also have the Annex I habitat type 5230 *Arborescent matorral with Laurus nobilis*. The underlying Jurassic limestone gives a calcareous character to the vegetation, which can be broadly described as Mediterranean scrub, maquis and pseudosteppe.

4.7 The Rock also supports several rare plant species, listed in Table EC4.1 (extracted from the Rock of Gibraltar SAC Standard Data Form). Most of these are species of open grassland and scrub on thin calcareous soils, with the exception of *Limonium emarginatum*, which is a coastal plant.

Table EC4.1 Rare Plant Species Recorded from the Rock of Gibraltar SAC

Species	Population (Number of plants)
Silene tomentosa	1-5
Ononis natrix var. ramosissima	1001-1000
Saxifraga globulifera	251-500
Thymus wildeowii	501-1000
Iberis gibraltarica	1001-10000
Limonium emarginatum	1001-10000
Cerastium gibraltaricum	101-250

Non-Marine Animal Species

4.8 There are no structures on the site that are suitable to support bats or swifts.

4.9 Gibraltar lies on the migration route of large numbers of birds in spring (generally peak numbers between March and June) and autumn (peaking in late August and September). Passerines and near-passerines use the Rock of Gibraltar as an important staging post and feed on the vegetation of the Upper Rock Nature Reserve, whilst the larger soaring birds (birds of prey and storks for example) typically fly directly over the Rock, using thermals generated on the slopes. The species most often seen on migration are listed in tables in Appendix EC2.

4.10 Given the location of the proposals, i.e. near sea level and at the extreme northwest of the peninsula, it is not on the main migration route, and it is not overflown regularly by large numbers of birds.

4.11 In addition to the birds discussed above, other rare and endemic animal species that have been recorded from the Rock of Gibraltar are listed in Table EC4.2 below (extracted from the Rock of Gibraltar SAC Standard Data Form).

Table EC4.2 Rare Animal Species Recorded from the Rock of Gibraltar SAC

Species	Common Name	IUCN Red List	Gibraltar SAC Population
Tadarida teniotis	European free-tailed bat	LC	C
Macaca sylvanus	Barbary macaque	EN	101-250
Hemidactylus turcicus	Turkish gecko	LC	R
Hemorrhois (syn. Coluber) hippocrepis	horseshoe whip snake	LC	C
Chalcides bedriagai	Bedriaga's skink	NT	R
Macrothele calpeiana	Gibraltar funnel-web spider	-	C
Ceciliodes spp.	a terrestrial mollusc	-	R
Zygaena fausta ssp. Gibraltarica	day-flying burnet moth	-	C
Buprestis (Yamina) sanguinea ssp. Calpetana	a jewel beetle	-	R
Laemostenus (Leuthostenes) mauretanicus ssp. polymephus	a ground beetle	-	V

Species	Common Name	IUCN Red List	Gibraltar SAC Population
Alphasida (Betasida) argentolimbata	a beetle	-	V
Tetramorium parvioculum	an ant	-	R
Technomyrmex vexatus	an ant	-	C
Acicula norrisi	a land snail	VU	V
Oestophora calpeana	a land snail	-	R

Summary of Ecological Receptors within the Project Potential Zone of Influence

4.12 Table EC4.3 lists the valued ecological receptors within the proposed development's potential zone of influence that are further assessed.

Table EC4.3 Valued Ecological Receptors within the Potential Zone of Influence

Ecological Receptor	Ecological Value at a Geographical Scale	Policy or Protection[a]
Marine		
North West Marine Conservation Zone	Medium: National	UK Marine and Coastal Access Act 2009
Patella ferruginea	High: European	Nature Protection Act 1991, Habitats Directive Annex IV Species
Pinna noblis	High: European	Habitats Directive Annex IV Species, Nature Protection Act 1991
Cetaceans	High: International	Habitats Directive Annex II, Bonn Convention Appendix II
Fish	Medium: National	Nature Protection Act 1991
Non-Marine		
Vegetation of the Rock of Gibraltar	High: European	Habitats Directive Annex I
Rare plants occurring on the Rock of Gibraltar	Medium: National	Nature Protection Act 1991

[a] For species-groups (such as cetaceans), this column lists the highest level of designation: some species in the group may have a lower conservation status.

Ecological Receptor	Ecological Value at a Geographical Scale	Policy or Protection[a]
Soaring raptors and storks	High: International	Habitats Directive Annex II, Bonn Convention Appendix II
Passerines and near-passerines	High: International	Habitats Directive Annex II, Bonn Convention Appendix II
Animals dependant upon the vegetation of the Rock of Gibraltar (see Table EC4.2)	Medium: National	Nature Protection Act 1991

5 FUTURE BASELINE

5.1 The vegetation of the Rock of Gibraltar SAC, and in particular the open and maquis habitat types, are vulnerable to succession and the colonisation of invasive plant species, leading to increased vegetation cover and decreased species diversity. This process, if it continues, will lead to reductions in the diversity and abundance of the animal species that depend upon the quality of vegetation on the Rock.

5.2 The populations of migratory birds that cross the Rock are likely to change in line with current trends of population declines in most species. At present, approximately 302 migratory bird species use the Mediterranean/Black Sea Flyway, which is the main route that crosses the Straits of Gibraltar. Many of these species have undergone sustained and often severe population declines. Migratory birds are particularly vulnerable to a variety of threats partly due to the migration pushing many birds to the limit of their endurance. As a result, conditions such as the weather can have a substantial impact, for example a Sahelian drought in 1968 resulted in over a 90% decline in the population of the common whitethroat (*Sylvia communis*).

5.3 Another important factor is the necessity of these birds to find sufficient food at multiple sites along the route. This problem is exacerbated by agricultural expansion and intensification throughout their global range, resulting in a decrease in the extent and quality of feeding habitats. Hunting has had a catastrophic effect on birds, with annual mortality rates nearing a thousand million, an effect that is worsened by occasional collisions with man made structures. The effects of climate change may also lead to increased desertification of the African continent, further reducing populations of migratory birds.

5.4 These pressures make it likely that the numbers of migratory birds that cross the Straits of Gibraltar will continue to decline, such that in future the baseline diversity and abundance of birds crossing, or landing on, the Rock of Gibraltar will be lower than at present.

6 POTENTIAL IMPACTS

Introduction

6.1 The ecological receptors that are vulnerable to potential impacts from the proposed project are:

- Vegetation and plant species of the Rock of Gibraltar SAC are potentially vulnerable to deposition of airborne pollutants;
- Migratory birds are potentially vulnerable to collision with tall structures or disruption of flight routes by artificial lighting;
- Migratory passerines that feed on the vegetation of the Rock of Gibraltar SAC as a staging post during migration are potentially vulnerable to an indirect impact through deterioration of the vegetation on the Rock;
- Marine and inter-tidal species and habitats are potentially vulnerable to accidental spillages.

Construction

6.2 During construction, the aspects of the project that have the potential to have significant impacts on ecological receptors are:

- Dust generated during site clearance and construction;
- Un-attenuated lighting for construction work;
- Accidental spills of polluting materials (e.g. hydrocarbons or construction materials), into the marine environment.

Dust Deposition

6.3 If a sufficient amount of dust is generated during construction it could have an adverse effect on the vegetation of the Upper Rock Nature Reserve. In large amounts, dust deposition onto vegetation can lead to decreased photosynthesis and adversely affect respiration and transpiration. The magnitude of these effects depends upon factors including the sensitivity of the plant species affected, and the type and amount of material deposited.

6.4 The evergreen, sclerophyllous plants and species with glabrescent or sticky leaves (which are abundant on the Rock), are most vulnerable to the effects of dust deposition, as they are aerodynamically rough, are not readily cleaned by rainfall, and may not shed all of their leaves annually.

6.5 The deposition of large amounts of dust with a low pH value could theoretically affect the chemical nature of soils (such as increasing mobility of aluminium (as Al_3^+ ions), which may cause toxicity to plants and mycorrhiza), leading to adverse effects on plant species diversity.

Construction Lighting

6.6 Works will be restricted to daytime (0800 to 2000) working hours, although the 24 month schedule may result in working with lighting in the winter months. Lighting could affect migratory species.

Accidental Spills

6.7 In the very unlikely event that an accidental spill occurred during construction, it is possible that it would comprise hydrocarbons (e.g. vehicle fuel). It is most likely that these would be acute, small magnitude events rather than large quantities being discharged over a long period of time (Chapter 10 – Coastal Processes and Water Quality describes these potential impacts in further detail). The effects of such acute, small magnitude spills may include localised degradation of inter-tidal or near-shore habitat quality, potential for mortality of small numbers of flora or fauna that are directly exposed to pollutants, and the bioaccumulation of contaminants taken in by marine filter feeding animals.

Operation

6.8 During operation of the power station, the potential impacts on ecological receptors are:

- Deposition from airborne pollutants (especially nitrogen) that could lead to adverse effects on vegetation and plant species of the Rock of Gibraltar SAC;
- Artificial lighting and the presence of stacks that could lead to adverse effects on migratory birds such as disorientation or collision;
- Accidental spills that could have adverse effects on marine and inter-tidal species and habitats.

Deposition of Airborne Pollutants

6.9 Deposition of nitrogen onto vegetated areas can lead to increased soil nutrient levels, favouring the growth of competitive plant species and leading to a reduction in plant species diversity. Deposition of nitrogen can also lead to soil

acidification, potentially increasing mobility of aluminium (as Al_3^+ ions) and causing toxicity to plants and mycorrhiza.

6.10 The power station will be equipped with selective catalytic reduction to abate the amount of emitted nitrogen oxides. The dispersal of the remaining nitrogen oxides (NOx) will depend largely on the height of the stack, thermal characteristics of the plume and meteorological conditions.

6.11 The magnitude of potential effect of nitrogen deposition is dependant on the sensitivity of the vegetation of the Rock, and the volume of deposition that will occur.

6.12 Generally speaking, the most vulnerable ecosystems are those with a naturally low nutrient status, particularly oligotrophic bogs, lakes and rivers, which are vulnerable to eutrophication. Ecosystems with a characteristic high diversity of bryophytes and lichens are also particularly vulnerable. The vegetation of the Rock does not fall into either of these categories.

6.13 Terrestrial plant communities on calcareous substrates, such as those on the Rock, may be vulnerable to the acidifying effects of nitrogen deposition to a lesser degree than the most sensitive ecosystems due to the buffering capacity of the substrates.

6.14 There are no published scientific studies on screening the potential effects of nitrogen deposition on the vegetation of the Rock, so any assessment of whether an impact will be significant must make use of published data for analogous habitats and vegetation types. Table EC6.1 presents guideline amounts for screening potential effects of NOx. The guideline amounts are taken from the Air Pollution Information System (APIS) and a workshop of experts held in Noordwijkerhout in 2010 (Bobbink *et al*., 2010).

Table EC6.1 Habitats of the Rock and their Sensitivity to Nitrogen Deposition

ANNEX 1 Habitat Code and Percentage Cover of the SAC	Corresponding EUNIS Habitat	Closest Corresponding Habitat in APIS Database	APIS Nutrient Nitrogen Critical Load for Screening Stage of Assessment (kgN/ha/yr)	Noordwijkerhout Workshop Closest Corresponding EUNIS Code	Noordwijkerhout Workshop Critical Load for Screening Stage of Assessment (kgN/ha/yr)	Selected Screening Level
9320 *Olea* and *ceratonia* forests (30%)	G2.4 *Olea europaea - Ceratonia siliqua* woodland and G2.1	G1	10	G1 Broadleaved deciduous woodland	10-20	10
8210 Calcareous rocky slopes with chasmophytic vegetation (30%)	n/a	E4.4 Alpine and subalpine calcareous grasslands (poor correspondence)	5	E4.4	5-10	5
5230 Arborescent matorral with *Laurus nobilis* (5%)	F5.1 Arborescent matorral	G1.A Meso- and eutrophic *Quercus* woodland	15	F5 Mediterranean Scrub	20-30	15

6.15 Precautionary critical loads for screening potential impacts are therefore set at 5 kilograms of nitrogen per hectare per year (kgN/ha/yr) for the most sensitive vegetation type (8210), 10 kgN/ha/yr for *Olea and Ceratonia* forests (9320) and 15 kgN/ha/yr for Arborescent mattoral (5230).

Stacks and Artificial Lighting

6.16 The stacks will be approximately 25 m tall and will be lit to the standards required for obstacle lighting in relation to aircraft safety given the proximity to the airport. The stacks will not be substantially above the height of surrounding buildings, and will be located in an area where there is already a significant spill from artificial lighting.

6.17 Migratory raptors and storks are at very little risk of collision with stacks, as they typically soar high on thermals during migration.

6.18 Passerines and near passerines are more likely to travel at night and would theoretically be at higher risk of collision with unseen objects.

Accidental Spills

6.19 During operation there will be diesel, urea and small quantities of lubricants and other chemicals stored on site. In the extremely unlikely event that urea was released to the marine environment, it could lead to short-term

eutrophication. Given the small quantities of other chemicals present on site, the likely effects of a spill would be localised and short-term. Diesel spillage could result in longer term effects to the marine environment, particularly rocky shores and sandy beaches. Direct contact with plants or animals could lead to injury or death, and there could be localised degradation of habitat quality and loss of species.

7 ASSESSMENT OF POTENTIAL SIGNIFICANT EFFECTS

Construction

Dust Deposition

7.1 Dust generation during construction will be controlled under the terms of a Construction Environmental Management Plan (CEMP) to the standards required by the Control of Dust Regulations, 2010 (Chapter 9 – Air Quality examines this topic in detail) to have no impact on the airport and surrounding industrial and residential areas. The project will be constructed on an existing concrete slab and the building structure will largely be of steel construction. There will therefore be very little dust generated during construction, and the dust that is generated will be controlled on site.

7.2 The small amounts of dust generated by the project will be largely from construction of the concrete slab, and will therefore likely be alkaline in nature, so that even in the unlikely event that large amounts were generated and deposited on the Rock, there would be no potential for acidification.

7.3 It is therefore near certain that the dust generated by the construction stage of the project will have **no significant effect** on the vegetation of the Rock.

Construction Lighting

7.4 Any required construction lighting will be required to be strictly managed not least for airport operational safety. Additional conditions in the CEMP will control lighting to be directional and screened. **No significant effects** to migratory species are predicted.

Accidental Spills

7.5 Strict on-site controls during construction outlined in the CEMP will prevent spills to the marine environment. Refuelling will only be under controlled conditions according to the CEMP, and any stored materials will be in bunded enclosures (further information provided in Chapter 11 - Contaminated Land). It is therefore extremely unlikely that accidental spills to the marine environment would occur. It is therefore near certain that there would be **no significant effect**.

Operational

Deposition of Airborne Pollutants

7.6 The predicted nitrogen deposition from the power station of 0.4 kg/N/ha/yr constitutes 4.1% of the critical load of 10 kg/N/ha/yr. As this exceeds the 1% screening level defined by UK Environment Agency guidance a more detailed assessment has been undertaken.

7.7 The outcome of this assessment, presented in Appendix EC3, has concluded that the levels of nitrogen deposition resulting from the operation of the power station will have **no significant effect** on the SAC.

Stacks and Artificial Lighting

7.8 The lighting on the stacks will make them visible to birds at close range, so that there is very little risk of collision. Whilst very bright lights in an otherwise dark landscape can disorientate migrating birds, the lights on the stack will not create bright illumination substantially above baseline levels. It is therefore near certain that the project will have **no significant effect** on migrating passerines and near passerines.

Accidental Spills

7.9 There will be strict controls and management of the transport and storage of diesel, urea and other chemicals, such that it would be extremely unlikely that a spill to the marine environment would occur. The power station is designed to include leak detection, automated cut-off valves and alarms. Should a leak occur, backup spill contingency responses will be implemented. It is therefore near certain that there will be **no significant effect** on the marine environment.

Bird Strike

7.10 The building design has taken into account the potential for attracting nuisance birds, e.g. gulls, which could affect Gibraltar International Airport operations by bird strike. The design of the roof and ancillary equipment does not include sheltered features and ledges that could attract birds. **No significant effect** is therefore predicted.

Transboundary Effects

7.11 The air quality assessment (Chapter 9) has reported no transboundary effects from the new power station to neighbouring countries. Hence there will be **no significant effects** on the ecology from changes to air quality at neighbouring countries. There are no other significant transboundary effects in relation to ecology.

Cumulative Effects

7.12 There are **no significant effects** predicted to local ecology from the identified list of proposed developments in Gibraltar.

8 MITIGATION AND RESIDUAL SIGNIFICANT EFFECTS

Construction Mitigation

8.1 There are **no significant effects** during the construction stage to ecology and mitigation is therefore not required.

Construction Management

8.2 The existing Norfolk Island pine *Araucaria heterophylla* tree on site will be protected and retained.

8.3 The marine ecosystem will be protected from accidental spillages or other possible contamination by the implementation of a CEMP. This is detailed in Chapter 10 – Coastal Processes and Water Quality. Reference to good practice outlined in the UK Government's Pollution Prevention Guidelines (PPG) including PPG5 relating to works in or near water (Environment Agency (UK), 2014) will be made in the CEMP. An Incident Response Plan will be prepared, which will include:

- A list of key external and internal contacts;
- Reporting procedures;
- Site plan including drainage and location of storage / refuelling areas;
- List of stored materials;
- Details of the ecological receptors that are vulnerable to impacts;
- Location of spill response equipment;
- Procedures for spill containment and remediation.

8.4 The Incident Response Plan will be prepared with reference to PPG21 Incident Response Planning.

Operational Mitigation

8.5 There are **no significant effects** during the operational stage to ecology.

Operational Management and Design

8.6 The proposed landscaping design makes use of locally appropriate, native plant species to provide a small **beneficial ecological effect**. The landscaping and building design (e.g. minimising sheltered features and ledges) have been

carefully considered to avoid attracting birds so that there will be no increased risk of bird strike at the nearby Gibraltar International Airport.

8.7 The Operational Environmental Management Plan for the proposed power station includes the risk management to prevent pollution from leaks or accidental spills, including emergency early warning systems and automatic cut-off valves, detailed in Chapter 10 – Coastal Processes and Water Quality and Chapter 11 – Contaminated Land.

8.8 The OEMP will also contain an Incident Response Plan, updated from the construction stage plan to include details relevant to the operational site.

Residual Significant Effects

8.9 **No residual significant effects** are predicted to ecology as a result of the power station.

9 CONCLUSION

9.1 The construction and operation of the power station, by virtue of its location, alignment and design, will have **no significant ecological effects**.

9.2 The proposed power station is located in a site of little or no ecological value. There are ecological receptors of high value within the potential zone of influence, including the Rock of Gibraltar SAC and the Southern Waters of Gibraltar SAC and their habitats and species.

9.3 Following the impact assessment conducted for the project, it has been determined that there will be **no significant effect** to the ecology of Gibraltar**.**

9.4 The proposed landscape planting has been designed to provide an ecological enhancement by using native, locally appropriate plant species as recommended by GONHS. The construction and operation of the proposed power station therefore has the potential to have a **low beneficial ecological effect**.

9.5 The Applicant is committed to protecting the environment, and will implement a robust CEMP and OEMP to manage the risk of pollution to the marine environment.

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APPENDICES

APPENDIX EC1 EXTRACT FROM NATURA 2000 HABITATS FACTSHEET

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora

and

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

FORMAT FOR A PRIORITISED ACTION FRAMEWORK (PAF) FOR NATURA 2000

For the EU Multiannual Financing Period 2014-2020

GIBRALTAR

January 2013

A. Introductory overview of Natura 2000 network for territory

A.1 Short introduction to the habitat types of Annex I and species of Annex II of the Habitats Directive and Annex I and migratory bird species for which Natura 2000 sites are designated

Under Directives 2009/147/EC on the conservation of wild birds and 92/43/EEC on the conservation of natural habitats, Gibraltar hosts 10 Annex I habitat types which support 45 species of Annex I, 3 Annex II species, alongside a further 138 priority species.

The **Rock of Gibraltar** nature reserve SAC/SPA (see figure 1) has undergone several transformations in its habitats and uses. Habitats have ranged from a once (presumably) forested landscape to a totally denuded slope during the Great Siege, 1779 – 1783, to a succession of vegetation back to dense maquis with scattered patches of garrigue and pseudosteppe in recent times. More recently, the emphasis has changed to that of a Nature Reserve which remains, a tourist attraction with several tourist sites.

The Rock of Gibraltar SAC/SPA boasts a rich flora, with 363 species having been recorded within the boundary of the Nature Reserve (Linares 2003). The vegetation of the Upper Rock Nature Reserve is dominated by closed Mediterranean shrubland known as maquis (a tall, thick type of Mediterranean matorral), which consists of a dense community of evergreen, sclerophyllous shrubs that typically replaces evergreen woodland after fire or deforestation (Rocamora, 1997), as was the case with the Upper Rock following the initial removal of its Mediterranean woodland. Maquis habitats are not determined by any species of trees or bushes in particular (Tomaselli 1977), but the typical shrub genera that dominate in this habitat, depending on location, soil and other conditions, are *Arbutus*, *Cistus*, *Erica*, *Olea*, *Phyllirea*, *Genista*, *Calycotome*, *Sarothamnus*, *Quercus*, *Ulex*, *Rhamnus*, *Pistacia* and *Myrtus* (Rocamora 1997).

The Rock of Gibraltar, and in particular the Upper Rock Nature Reserve is dominated by a dense cover of mostly maquis, with some garrigue, and these habitats include many important fruit-bearing shrubs that support large passerine populations during passage periods and in winter (Heath et al. 2000). The slopes of the Rock also serve as a staging site for large numbers of passerine and near-passerine migrants. Most migratory western European species can occur at Gibraltar during the northward or southward migration periods (Cortes 1996). The passerine and near-passerine species that occur within the Nature Reserve on migration are listed in table 1, which shows that a number of these birds have an unfavourable conservation status within Europe.

In addition, many migratory birds of prey and storks congregate at the Strait of Gibraltar on their way towards their wintering grounds in Africa. When westerly winds blow across the Strait, Gibraltar itself sees the majority of raptor passage during both the pre-nuptial (northerly) and post-nuptial (southerly) migrations, and most of these birds fly directly over the Upper Rock Nature Reserve. The species that can be observed over the Rock on migration are listed in table 2.

Extending three miles to the East and South of Gibraltar and stretching all the way up to the median line to the West of Gibraltar, the marine SAC/SPA or **Southern Waters of Gibraltar SAC/SPA** has long been recognized as an important marine area due to its rich diversity in species and habitats (see figure 2). Sea cliffs and caves, reefs and sandy marine habitats all

form part of the marine ecosystem found along the southern shores of Gibraltar. The abundance and richness of species is largely influenced by the strong currents and upwelling that are so characteristic of the Strait of Gibraltar. Seasonal abundance, due to migratory movements between the Mediterranean and the Atlantic, results in a multitude of pelagic and predatory fish along with cetaceans including the Striped and Common Dolphins. The latter cetaceans breed in the Bay of Gibraltar.

The Southern Waters of Gibraltar SAC/SPA is also located on an important migration route for seabirds. Many species stop over and feed within the marine SAC/SPA during their migratory journeys and some, such as the Cory's Shearwater, forage in the marine SAC/SPA whilst breeding. Other species rely on the SAC/SPA during the winter in variable numbers depending on weather conditions (e.g. numbers of Gannets feeding inshore during storms).

Table 1. Migrant passerines and near-passerines of the Upper Rock Nature Reserve, together with their frequency of occurrence and conservation status and category attributed to them by BirdLife International.

Common Name	Scientific Name	Frequency of Occurrence	SPEC Category	European Threat Status
stone curlew	*Burhinus oedicnemus*	O	3	V
woodpigeon	*Columba palumbus*	O	4	S
turtle dove	*Streptopelia turtur*	R	3	D
great spotted cuckoo	*Clamator galandrius*	R		S
common cuckoo	*Cuculus canorus*	O		S
European scops owl	*Otus scops*	R	2	D
common nightjar	*Caprimulgus europaeus*	R	2	D
red-necked nightjar	*Caprimulgus ruficollis*	R		S
common swift	*Apus apus*	R		S
pallid swift	*Apus pallidus*	R		S
alpine swift	*Apus melba*	R		S
European bee-eater	*Merops apiaster*	R	3	D
Common Name	**Scientific Name**	**Frequency of Occurrence**	**SPEC Category**	**Threat Status**
European roller	*Coracias garrulus*	O	2	D
Eurasian hoopoe	*Upupa epops*	R		S
Eurasian wryneck	*Jynx torquilla*	R	3	D
short-toed lark	*Calandrella brachydactyla*	R	3	V
woodlark	*Lullula arborea*	O	2	V
common skylark	*Alauda arvensis*	R	3	V
sand martin	*Riparia riparia*	R	3	D
crag martin	*Ptyonoprogne rupestris*	R		S
barn swallow	*Hirundo rustica*	R	3	D
red-rumped swallow	*Hirundo daurica*	R		S
house martin	*Delichon urbica*	R		S
tawny pipit	*Anthus campestris*	R	3	V
tree pipit	*Anthus trivialis*	R		S
meadow pipit	*Anthus pratensis*	R	4	S
yellow wagtail	*Motacilla flava*	R		S
grey wagtail	*Motacilla cinerea*	R		S
white wagtail	*Motacilla alba*	R		S
rufous bush robin	*Cercotrichas galactotes*	O		S
European robin	*Erithacus rubecula*	R	4	S
common nightingale	*Luscinia megarhynchos*	R	4	S
black redstart	*Phoenicurus ochruros*	R		S
common redstart	*Phoenicurus phoenicurus*	R	2	V
whinchat	*Saxicola rubetra*	R	4	S
stonechat	*Saxicola torquata*	R	3	D
northern wheatear	*Oenanthe oenanthe*	R		S
black-eared wheatear	*Oenanthe hispanica*	R	2	V
rock thrush	*Monticola saxatilis*	O	3	D
ring ouzel	*Turdus torquatus*	R	4	S
song thrush	*Turdus philomelos*	R	4	S

redwing	*Turdus iliacus*	R	4	S
zitting cisticola	*Cisticola juncidis*	R		S
grasshopper warbler	*Locustella naevia*	R	4	S
sedge warbler	*Acrocephalus schoenobaenus*	O	4	S
European reed warbler	*Acrocephalus scirpaceus*	R	4	S
olivaceous warbler	*Hippolais pallida*	O	3	V
melodious warbler	*Hippolais polyglotta*	R	4	S
Dartford warbler	*Sylvia undata*	R	2	V
spectacled warbler	*Sylvia conspicillata*	R		S
subalpine warbler	*Sylvia cantillans*	R	4	S
Orphean warbler	*Sylvia hortensis*	R	3	V
common whitethroat	*Sylvia communis*	R	4	S
garden warbler	*Sylvia borin*	R	4	S
blackcap	*Sylvia atricapilla*	R	4	S
western Bonelli's warbler	*Phylloscopus bonelli*	R	4	S
wood warbler	*Phylloscopus sibilatrix*	O	4	S
common chiffchaff	*Phylloscopus collybita*	R		S
willow warbler	*Phylloscopus trochilus*	R		S
firecrest	*Regulus ignicapillus*	R	4	S
spotted flycatcher	*Muscicapa striata*	R	3	D
pied flycatcher	*Ficedula hypoleuca*	R	4	S
Short-toed treecreeper	*Certhia brachydactyla*	O	4	S
golden oriole	*Oriolus oriolus*	R		S
woodchat shrike	*Lanius senator*	R	2	V
Spanish sparrow	*Passer hispaniolensis*	O		S

Common Name	**Scientific Name**	**Frequency of Occurrence**	**SPEC Category**	**Threat Status**
chaffinch	*Fringilla coelebs*	R	4	S
brambling	*Fringilla montifringilla*	O		S
European serin	*Serinus serinus*	R	4	S
greenfinch	*Carduelis chloris*	R	4	S
goldfinch	*Carduelis carduelis*	R		S
siskin	*Carduelis spinus*	R	4	S
linnet	*Carduelis cannabina*	R		S
common crossbill	*Loxia curvirostra*	O		S
ortolan bunting	*Emberiza hortulana*	R	2	V

Frequency of Occurrence:
R = regular (every year)
O = occasional

SPEC category (Taken from Tucker & Heath (1994)):
1 = species of global conservation concern
2 = concentrated in Europe and with an unfavourable conservation status
3 = not concentrated in Europe but with an unfavourable conservation status
4 = concentrated in Europe and with a favourable conservation status

European Threat Status (Taken from Tucker & Heath (1994)):
E = Endangered
V = Vulnerable
D = Declining
R = Rare
S = Stable

Table 2. Raptor, stork and crane species that can be seen from the Upper Rock Nature Reserve on migration, together with their frequency of occurrence and conservation status and the category attributed to them by BirdLife International (which follow those of table 1).

Common Name	**Scientific Name**	**Frequency of Occurrence**	**SPEC Category**	**Threat Status**
black stork	*Ciconia nigra*	R	3	R
white stork	*Ciconia ciconia*	R	2	V
honey buzzard	*Pernis apivorus*	R	4	S
black-winged kite	*Elanus caeruleus*	O	3	V
black kite	*Milvus migrans*	R	3	V
red kite	*Milvus milvus*	R	4	S
griffon vulture	*Gyps fulvus*	R	3	R
cinereous vulture	*Aegypius monachus*	O	3	V
short-toed eagle	*Circaetus gallicus*	R	3	R
marsh harrier	*Circus aeruginosus*	R		S
hen harrier	*Circus cyaneus*	R	3	V

Montagu's harrier	*Circus pygargus*	R	4	S
goshawk	*Accipiter gentilis*	O		S
sparrowhawk	*Accipiter nisus*	R		S
common buzzard	*Buteo buteo*	R		S
Spanish imperial eagle	*Aquila adalberti*	O	1	E
booted eagle	*Hieraaetus pennatus*	R	3	R
Bonelli's eagle	*Hieraaetus fasciatus*	R	3	E
osprey	*Pandion haliaetus*	R	3	R
lesser kestrel	*Falco naumanni*	R	1	V
common kestrel	*Falco tinnunculus*	R	3	D
merlin	*Falco columbarius*	O		S
hobby	*Falco subbuteo*	R		S
Eleonora's falcon	*Falco eleonorae*	R	2	R
lanner	*Falco biarmicus*	O	3	E
peregrine	*Falco peregrinus*	R	3	R
European crane	*Grus grus*	O	3	V

Frequency of Occurrence:
R = regular (every year)
O = occasional

SPEC category (Taken from Tucker & Heath (1994)):
1 = species of global conservation concern
2 = concentrated in Europe and with an unfavourable conservation status
3 = not concentrated in Europe but with an unfavourable conservation status
4 = concentrated in Europe and with a favourable conservation status

European Threat Status (Taken from Tucker & Heath (1994)):
E = Endangered
V = Vulnerable
D = Declining
R = Rare
S = Stable

Sources of information:

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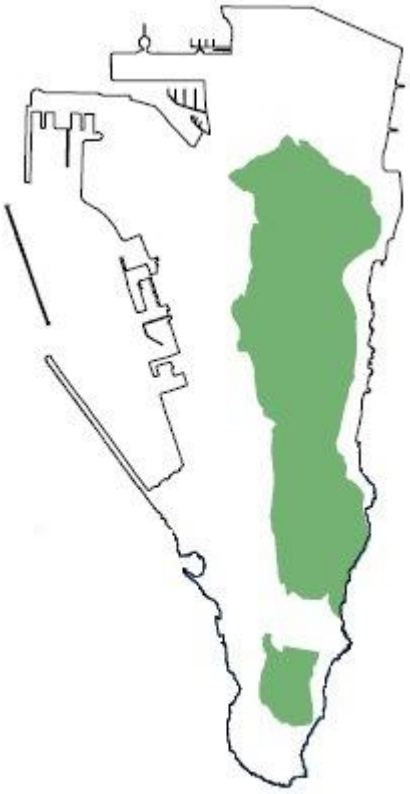
A.2 Number and area of Natura 2000 sites

Sites of Community Importance (SCIs)	*Number and Area* *2*
Reference to Commission Decisions on SCIs	*Link to Decisions at* *Commission Decision* *2012/9/EU of 18 November 2011 adopting, pursuant to Council Directive 92/43/EEC, a fifth updated list of sites of Community importance for the Mediterranean biogeographical region (notified under document number C(2011) 8172)* *2011/85/EU of 10 January 2011 adopting, pursuant to Council Directive 92/43/EEC, a fourth updated list of sites of Community importance for the Mediterranean biogeographical region (notified under document number C(2010) 9676)* *2010/45/EU of 22 December 2009 adopting, pursuant to Council Directive 92/43/EEC, a third updated list of sites of Community importance for the Mediterranean biogeographical region (notified under document number C(2009) 10406)* *2009/95/EC of 12 December 2008 adopting, pursuant to Council Directive 92/43/EEC, a second updated list of sites of Community importance for the Mediterranean biogeographical region (notified under document number C(2008) 8049)* *2008/335/EC of 28 March 2008 adopting, pursuant to Council Directive 92/43/EEC, a first updated list of sites of Community importance for the Mediterranean biogeographical region (notified under document number C(2008) 1148)* *2006/613/EC of 19 July 2006 adopting, pursuant to Council Directive 92/43/EEC, the list of sites of Community importance for the Mediterranean biogeographical region (notified under document number C(2006) 3261)* *http://ec.europa.eu/environment/nature/natura2000/sites_hab/biogeog_regions/index_en.htm*
Special Areas of Conservation (SACs)	*Number and Area 2*
Special Protection Areas (SPAs)	*Number and Area 2*
Total Natura 2000 terrestrial area	*To be compiled 200.5 (ha)*
Total Natura 2000 marine area	*To be compiled 5486.5 (ha)*

Figure 1. Outline map of Gibraltar with the boundary of the Rock of Gibraltar SAC/SPA.



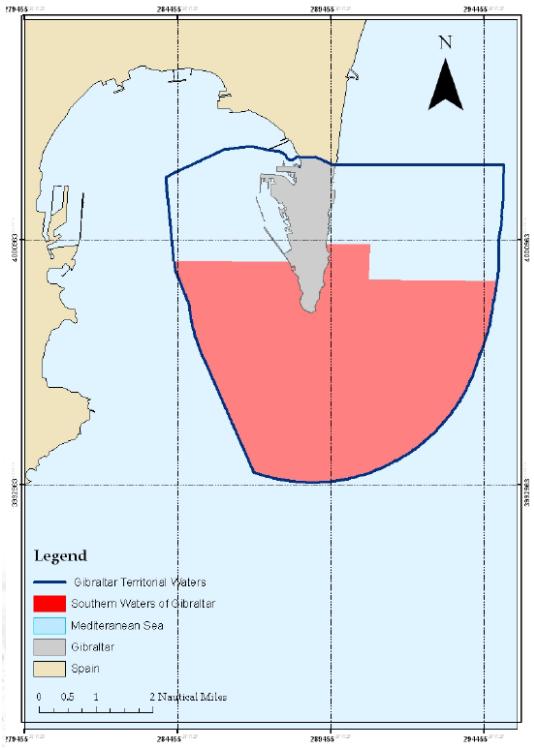
Key:

Rock of Gibraltar Special Area of Conservation

Legend:

0 1km 2km

Figure 2. Extent and location of the Southern Waters of Gibraltar SAC / SPA



A.3 Main land use cover and ecosystem categories for Natura 2000 sites

Gibraltar				
Cultivated land %	Arable Land %	Permanent crops %	Other lands %	Total Land Area (km2)
0	0	0	100	7

Southern Waters SAC habitat type:

Code	Site description	% Cover
1170	Reefs	10.5
8330	Submerged or partially submerged sea caves	1.42

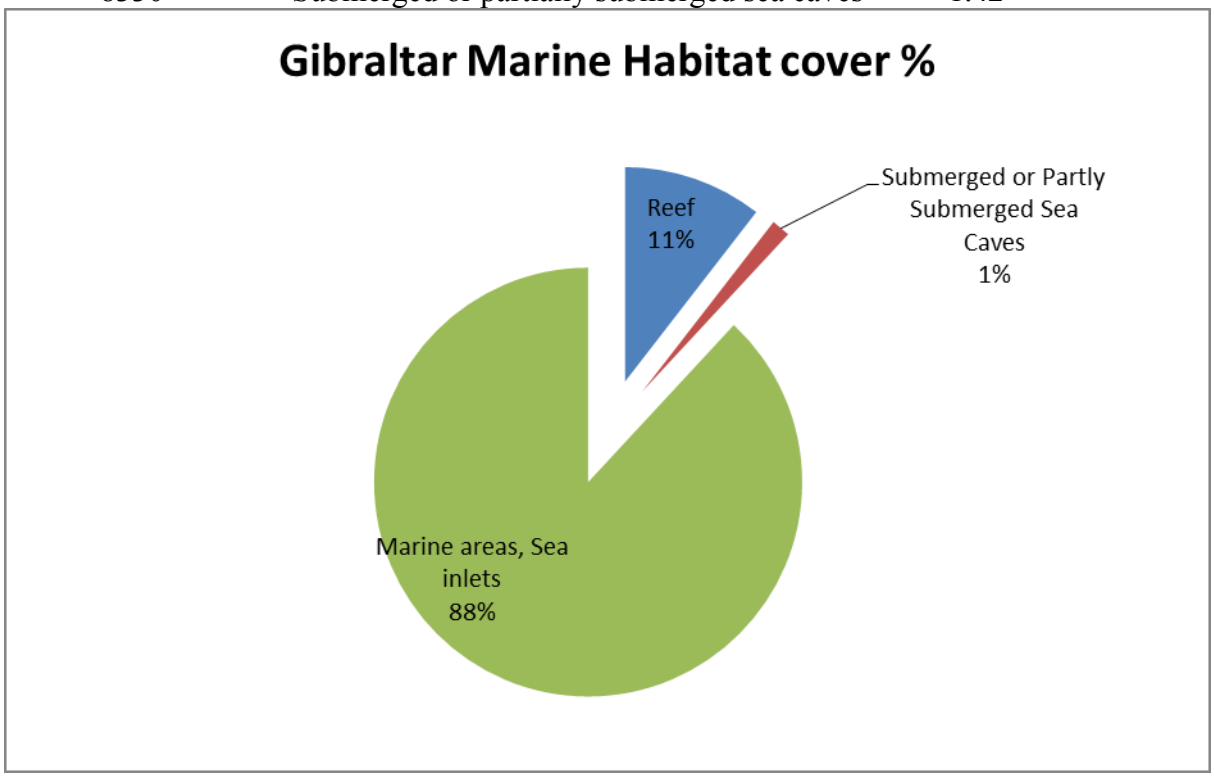


Figure 3: Gibraltar marine habitat cover

Upper Rock SPA habitat type;

Code	Site description	% Cover
1240	Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium spp.*	5
2230	Malcolmietalia dune grasslands	20
5230	Arborescent matorral with *Laurus nobilis*	5
8210	Calcareous rocky slopes with chasmophytic vegetation	30
8310	Caves not open to the public	2
9320	*Olea* and *Ceratonia* forests	30
5320	Low formations of *Euphorbia* close to cliffs	5
2220	Dunes with *Euphorbia terracina*	3

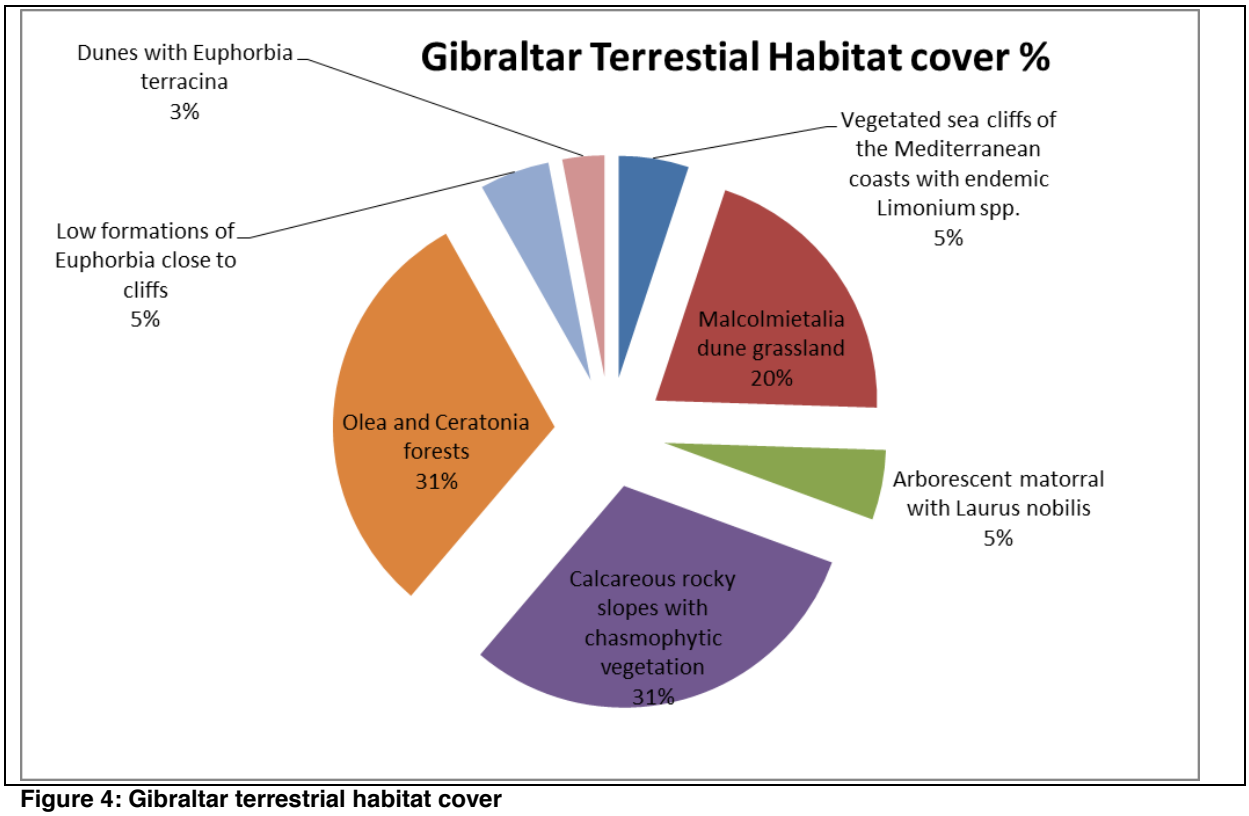


Figure 4: Gibraltar terrestrial habitat cover

Table 3. Cortes' (1979) classification of vegetation types on the Upper Rock. Domin values are given as approximations, and both these and species compositions may obviously differ slightly from one area to another.

Vegetation Type	**Species**	**(Approximate) Domin Value**
High Maquis	*Olea europea*	8
	Pistacia lentiscus	5
	Rhamnus alaternus	5
	Osyris quadripartita	4
	Chamaerops humilis	3
	Calicotome villosa	2
	Genista linifolia	2
	Acanthus mollis	5
	Pinus pinea (in some areas)	8-9
Low Maquis	*Genista linifolia*	9
	Calicotome villosa	5
	Olea europea	5
	Pistacia lentiscus	4
	Osyris quadripartita	3
	Coronilla valentina	3
Maquio-garrigue	*Olea europea*	6
	Oxalis pes-capre	6
	Hyparrhenia hirta	6
	Rhamnus alaternus	5
	Osyris quadripartita	3
	Calicotome villosa	3
	Genista linifolia	3
	Pistacia lentiscus	3
	Coronilla valentina	2
Garrigue	bare ground	5
	Oxalis pes-capre	5
	Narcissus papyraceus	5
	Acanthus mollis	4
	Pistacia lentiscus	3
	Asphodelus aestivus	3

	Chamaerops humilis	3
Pseudosteppe & Steppe	bare ground	5
	Dactylis glomerata	5
	Ferula tingitana	3
	Smyrnium olusatrum	3
	Asteriscus maritimus	3
	Asphodelus aestivus	3
	Narcissus papyraceus	3
	Gladiolus communis	2

Table 4. Domin scale, with the definition of each value.

Amount of cover/species	**Domin value**
cover about 100%	10
cover >75%	9
cover 50-75%	8
cover 33-50%	7
cover 25-33%	6
abundant, cover about 20%	5
abundant, cover about 5%	4
scattered, cover small	3
very scattered, cover small	2
scarce, cover small	1
isolated, cover small	X

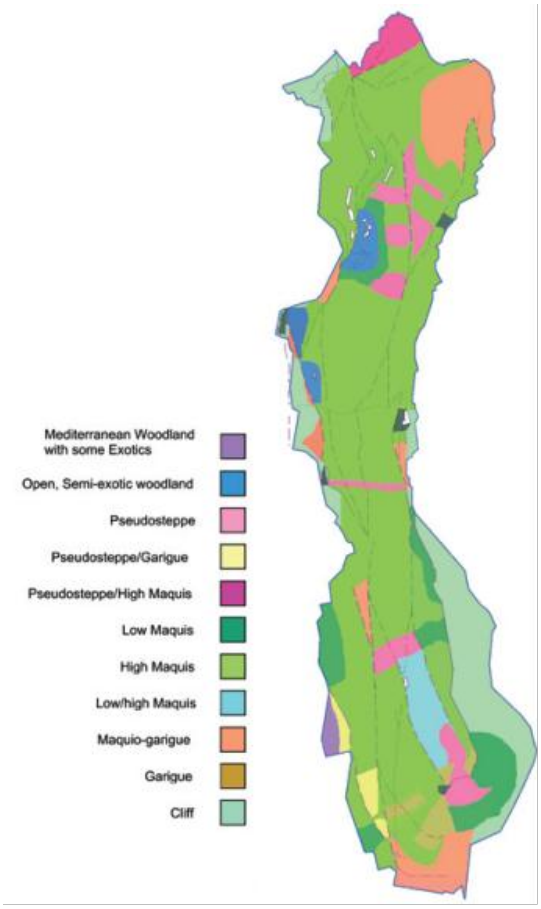


Figure 4 : Map of the Upper Rock Nature Reserve showing the extent of each habitat recorded.

Figure 5: Marine Conservation Zones within British Gibraltar Territorial Water

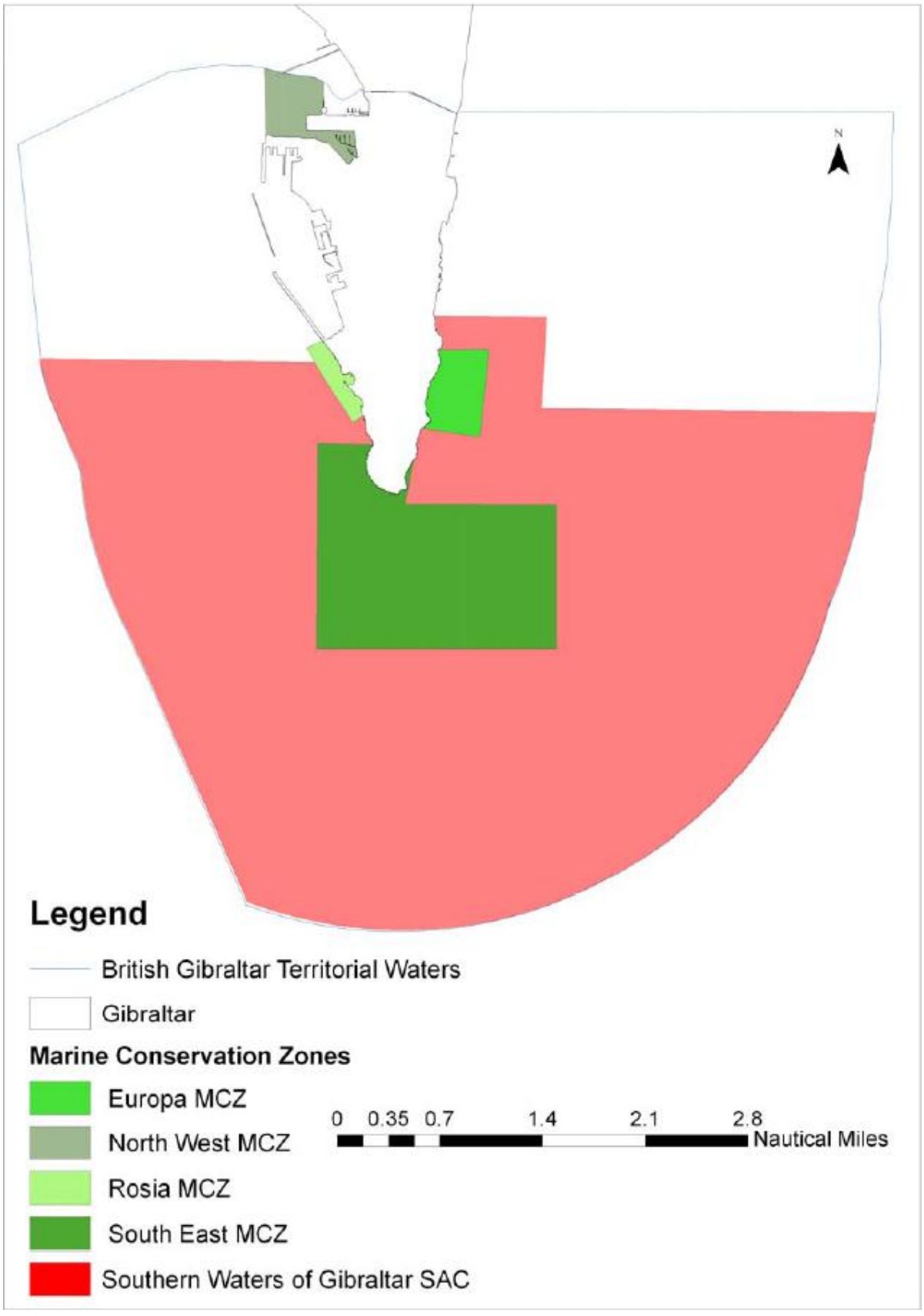


Figure 6: Reefs – (EU Habitat code 1170)

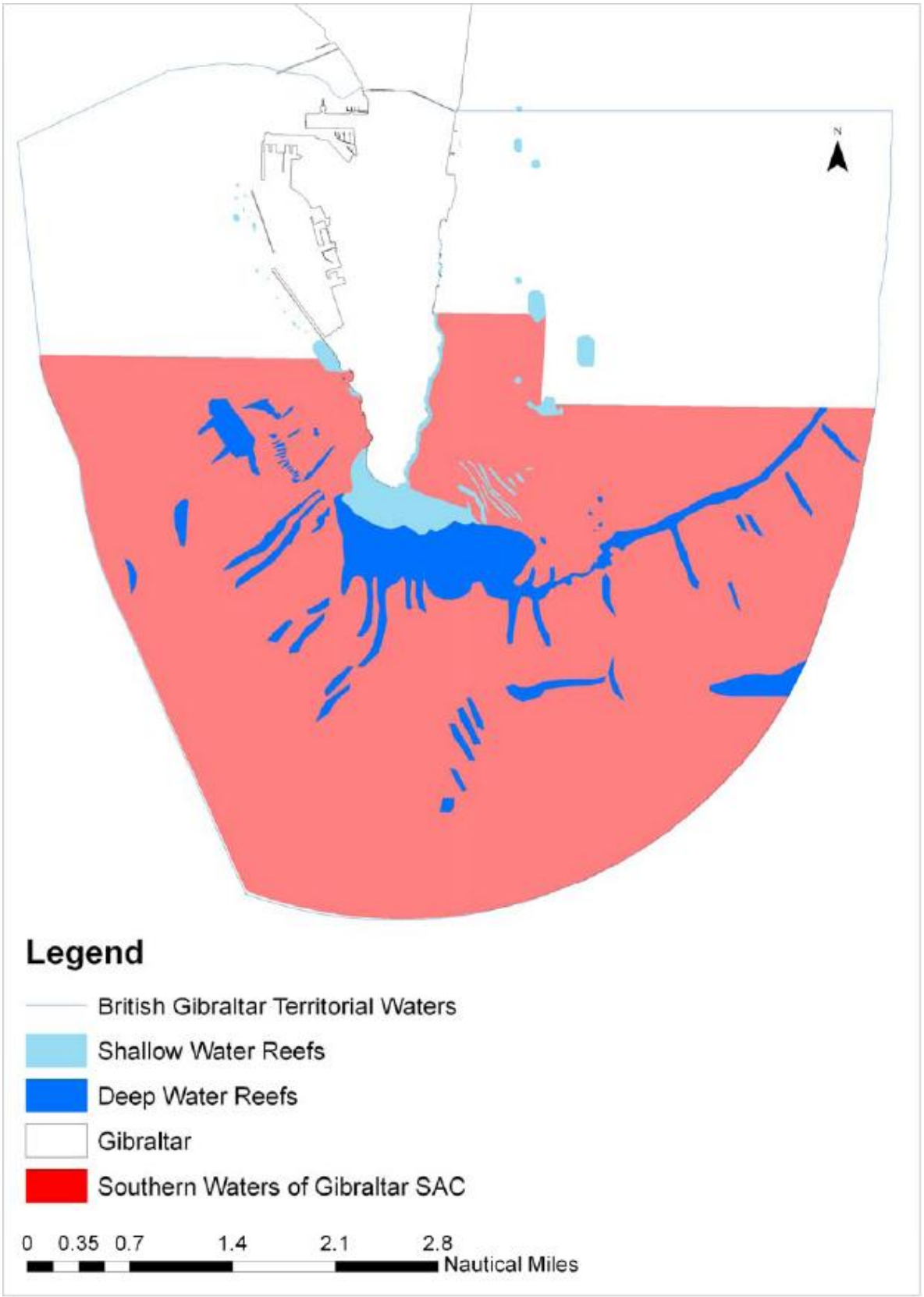
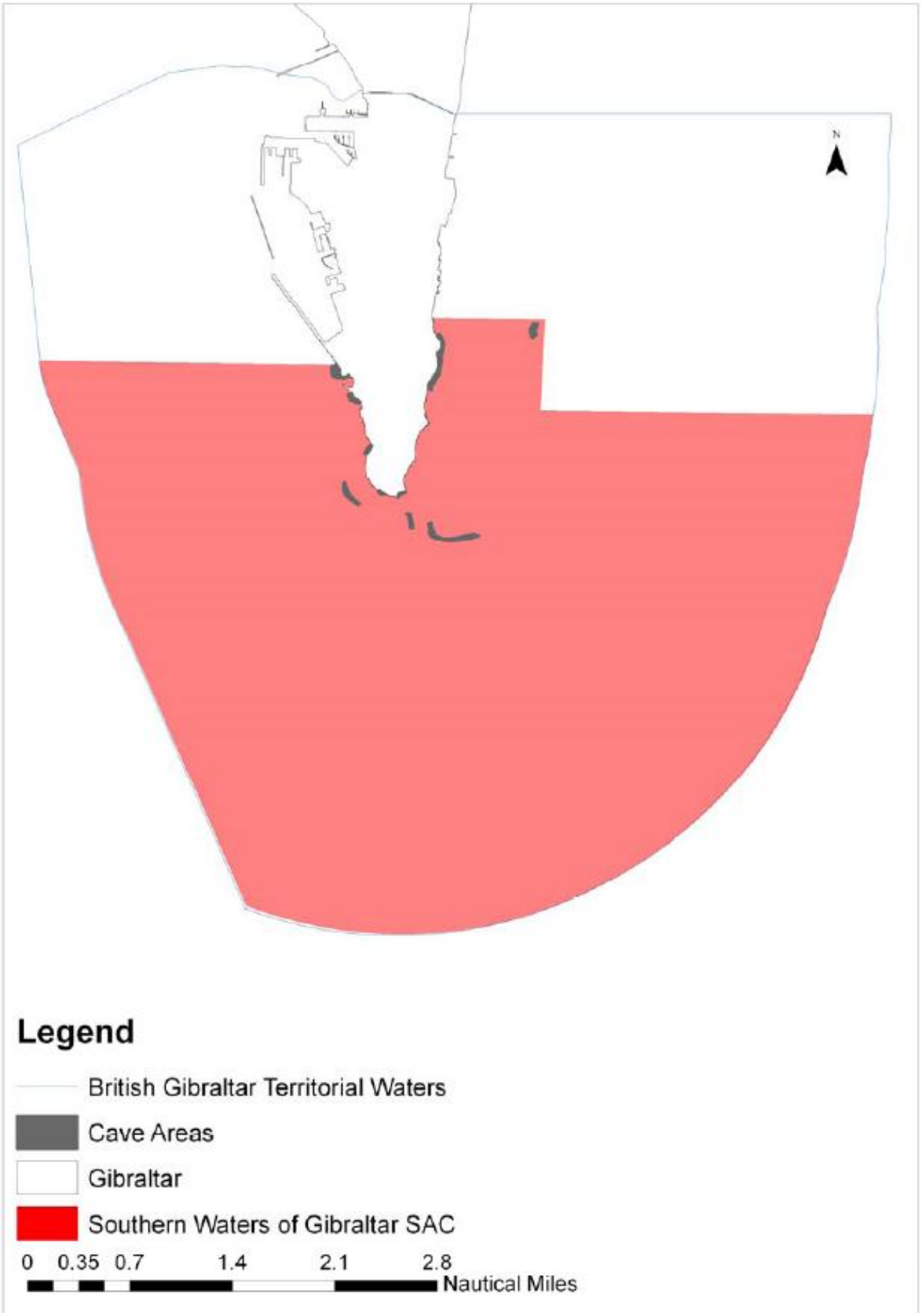


Figure 7: Submerged or Partially submerged sea caves – (EU Habitat code 8830)



APPENDIX EC2 MIGRATORY BIRDS RECORDED OVER THE ROCK OF GIBRALTAR

Table EC.A2.1 Raptor, stork and crane species that can be seen from the Upper Rock Nature Reserve on migration, together with their frequency of occurrence and conservation status and the category attributed to them by BirdLife International).

Common Name	Scientific Name	Frequency of Occurrence[1]	SPEC category[2]	Threat Status[3]
Black stork	*Ciconia nigra*	R	3	R
White stork	*Ciconia ciconia*	R	2	V
Honey buzzard	*Pernis apivorus*	R	4	S
Black-winged kite	*Elanus caeruleus*	O	3	V
Black kite	*Milvus migrans*	R	3	V
Red kite	*Milvus milvus*	R	4	S
Griffon vulture	*Gyps fulvus*	R	3	R
Cinereous vulture	*Aegypius monachus*	O	3	V
Short-toed eagle	*Circaetus gallicus*	R	3	R
Marsh harrier	*Circus aeruginosus*	R	-	S
Hen harrier	*Circus cyaneus*	R	3	V
Montagu's harrier	*Circus pygarus*	R	4	S
Goshawk	*Accipiter gentilis*	O	-	S
Sparrowhawk	*Accipiter nisus*	R	-	S
Common buzzard	*Buteo buteo*	R	-	S
Spanish imperial eagle	*Aquila adalberti*	O	1	E
Booted eagle	*Hieraaetus pennatus*	R	3	R
Bonelli's eagle	*Hieraaetus fasciatus*	R	3	E
Osprey	*Pandion haliaetus*	R	3	R
Lesser kestrel	*Falco naumanni*	R	1	V
Common kestrel	*Falco tinnunculus*	R	3	D
Merlin	*Falco columbarius*	O	-	S
Hobby	*Falco subbuteo*	R	-	S
Eleonora's falcon	*Falco eleonorae*	R	2	R
Lanner	*Falco biarmicus*	O	3	E
Peregrine	*Falco peregrinus*	R	3	R
European crane	*Grus grus*	O	3	V

Table EC.A2.2 Migrant passerines and near-passerines of the Upper Rock Nature Reserve, together with their frequency of occurrence and conservation status and category attributed to them by BirdLife International

Common Name	Scientific Name	Frequency of Occurrence[1]	SPEC Category[2]	Threat Status[3]
Stone curlew	*Burhinus oedicnemus*	O	3	V
Woodpigeon	*Columba palumbus*	O	4	S
Turtle dove	*Streptopelia turttur*	R	3	D
Great spotted cuckoo	*Clamator galandrius*	R	-	S
Common cuckoo	*Cuculus canorus*	O	-	S
European scops owl	*Otus scops*	R	2	D
Common nightjar	*Caprimulgus europaeus*	R	2	D
Red-necked nightjar	*Caprimulgus ruficollis*	R	-	S
Common swift	*Apus apus*	R	-	S
Pallid swift	*Apus pallidus*	R	-	S
Alpine swift	*Apus melba*	R	-	S
European bee-eater	*Merops apiaster*	R	3	D
European roller	*Coracias garrulus*	O	2	D
Eurasian hoopoe	*Upupa epops*	R	-	S
Eurasian wryneck	*Jynx torquilla*	R	3	D
Short-toed lark	*Calandrella brachydactyla*	R	3	V
Woodlark	*Luxullula arborea*	O	2	V
Common skylark	*Alauda arvensis*	R	3	V
Sand martin	*Riparia riparia*	R	3	D
Crag martin	*Ptyonoprogne rupestris*	R	-	S
Barn swallow	*Hirundo rustica*	R	3	D
Red-rumped swallow	*Hirundo daurica*	R	-	S
House martin	*Delichon urbica*	R	-	S
Tawny pipit	*Anthus campestris*	R	3	V
Tree pipit	*Anthus trivalis*	R	-	S
Meadow pipit	*Anthus pratensis*	R	4	S
Yellow wagtail	*Motacilla flava*	R	-	S
Grey wagtail	*Motacilla cinerea*	R	-	S
White wagtail	*Motacilla alba*	R	-	S
Rufous bush robin	*Cerotrichas galactotes*	O	-	S
European robin	*Erithacus rubecula*	R	4	S
Common nightingale	*Luscinia megarhynchos*	R	4	S
Black redstart	*Phoenicurus ochruros*	R	-	S
Common redstart	*Phoenicurus phoenicurus*	R	2	V
Whinchat	*Saxicola rubetra*	R	4	S
Stonechat	*Saxicola torquata*	R	3	D
Northern wheatear	*Oenanthe oenanthe*	R	-	S
Black-eared wheateaer	*Oenanthe hispanica*	R	2	V
Rock thrush	*Monticola saxatilis*	O	3	D
Ring ouzel	*Turdus torquatus*	R	4	S
Song thrush	*Turdus philomelos*	R	4	S
Redwing	*Turdus iliacus*	R	4	S
Zitting cisticola	*Cisticola juncidis*	R	-	S

Common Name	Scientific Name	Frequency of Occurrence[1]	SPEC Category[2]	Threat Status[3]
Grasshopper warbler	*Locustella naevia*	R	4	S
Sedge warblet	*Acrocephalus schoenobaenus*	O	4	S
European reed warbler	*Acrocephalus scirpaceus*	R	4	S
Olivaceous warbler	*Hippolais pallida*	O	3	V
Melodious warbler	*Hippolais polyglotta*	R	4	S
Dartford warbler	*Sylvia undata*	R	2	V
Spectacled warbler	*Sylvia conspicillata*	R	-	S
Subalpine warbler	*Sylvia cantillans*	R	4	S
Orphean warbler	*Sylvia hortensis*	R	3	V
Common whitethroat	*Sylvia communis*	R	4	S
Garden warbler	*Sylvia borin*	R	4	S
Blackcap	*Sylvia atricapilla*	R	4	S
Western Bonelli's warbler	*Phylloscopus bonelli*	R	4	S
Wood warbler	*Phylloscopus sibilatrix*	O	4	S
Common chiffchaff	*Phylloscopus collybita*	R	-	S
Willow warbler	*Phylloscopus trochilus*	R	-	S
Firecrest	*Regulus ignicapillus*	R	4	S
Spotted flycatcher	*Muscicapa striata*	R	3	D
Pied flycatcher	*Ficeula hypoleuca*		4	S
Short-toed treecreeper	*Certhisa brachydactyla*	O	4	S
Golden oriole	*Oriolus oriolus*	R	-	S
Woodchat shrike	*Lanius senator*	R	2	V
Spanish sparrow	*Passer hispaniolensis*	O	-	S
Chaffinch	*Fringilla coelebs*	R	4	S
Brambling	*Fringilla montifringilla*	O	-	S
European serin	*Serinus serinus*	R	4	S
Greenfinch	*Cardeulis chloris*	R	4	S
Goldfinch	*Carduelis carduelis*	R	-	S
Siskin	*Carduelis spinus*	R	4	S
linnet	*Carduelis cannabina*	R	-	S
Common crossbill	*Loxia curvirostra*	O	-	S
Ortolan bunting	*Emberiza hortulana*	R	2	V

[1]Frequency of Occurrence:
R = Regular (every year), O = Occasional

[2]Species of European Conservation Concern category (taken from Tucker and Heath (1994)):
1 = species of global conservation concern
2 = concentrated in Europe and with an unfavourable conservation status
3 = not concentrated in Europe but with an unfavourable conservation status
4 = concentrated in Europe and with a favourable conservation status

[3]European Threat Status (Taken from Tucker and Heath (1994)):
E = Endangered, V = Vulnerable, D = Declining, R = Rare, S = Stable

APPENDIX EC 3 INFORMATION TO INFORM AN APPROPRIATE ASSESSMENT

CONTENTS

GLOSSARY AND ABBREVIATIONS

Al_3^+	Aluminium cation
APIS	Air Pollution Information System
CIEEM	Chartered Institute of Ecology and Environmental Management
EIA	Environmental Impact Assessment
EU	European Union
GNPO	Gibraltar Nature Protection Ordinance. Legislation passed by the HM Government of Gibraltar and dealing with wildlife protection and nature conservation.
GONHS	The Gibraltar Ornithological and Nature History Society. Non-governmental organisation concerned with nature conservation in Gibraltar. Also acts as a statutory consultee to the HM Government of Gibraltar.
kgN/ha/yr	Kilograms of nitrogen per hectare per year
km	Kilometre
m	Metre
$\mu g/m^3$	Micrograms per cubic metre
N	Nitrogen
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
SOx	Sulphur oxides
SAC	Special Area of Conservation. Also known as a Natura 2000 site, designated under the EU Habitats Directive
SPA	Special Protection Area. Also known as a Natura 2000 site, designated under the EU Habitats Directive
UK	United Kingdom

1 INTRODUCTION

1.1 This report provides a detailed assessment of whether there is likely to be a significant effect of the proposed power station on the Rock of Gibraltar Special Area of Conservation.

1.2 This detailed assessment makes use of the air quality modelling and assessment presented in Chapter 9 – Air Quality of the ES.

2 BACKGROUND

2.1 The Directive on Conservation of Natural Habitats and of Wild Fauna and Flora 92/43/EEC (the "Habitats Directive") identifies and protects a pan-European network of sites with high biodiversity value, against negative effects of development. Special Areas of Conservation form part of the "Natura 2000" network.

2.2 Where it is likely that a proposed project will result in an adverse effect on a Natura 2000 site, the competent authority must undertake an Appropriate Assessment before consenting the project, as stated in Article 6(3) of the Directive:

> *"A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which (a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects), and (b) is not directly connected with or necessary to the management of that site, must make an appropriate assessment of the implications for that site on view of that site's conservation objectives".*

2.3 Article 6(4) of the Habitats Directive goes on to say that:

> *"If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures".*

2.4 These requirements are transposed into Gibraltar's national legislation through the Nature Protection Act 1991 (Her Majesty's (HM) Government of Gibraltar, 1991) (as amended). Part IIA of the Act implements the EC Habitats Directive in respect of European designated sites and species.

3 APPROACH AND METHODOLOGY

Approach

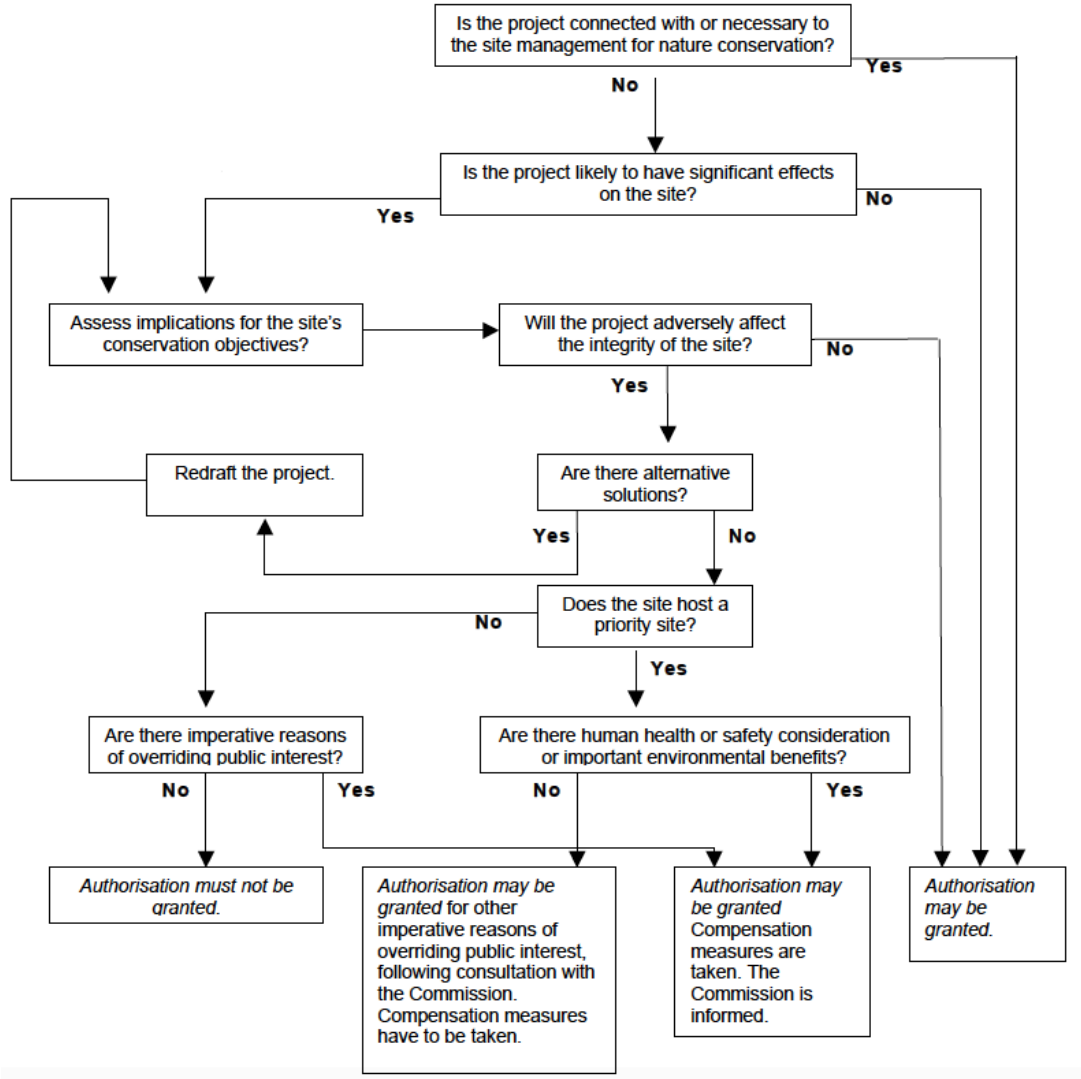
3.1 The approach to this assessment has been to:

- obtain baseline ecological information relating to the Special Area of Conservation.
- collate information regarding the known sensitivities of the SAC to the potential impacts of the proposed power station
- assess the potential effects of modelled outputs (Chapter 9) against alternative scenarios
- assess the significance of any potential effects
- provide appropriate mitigation for potential effects if they occur.

Methodology

3.2 The EU Environment DG's guidance (European Communities, 2000) on AA methodology has been used where qualifying features of the SAC may be significantly adversely affected. Figure 3-1 (below) shows the approach to considering projects affecting Natura 2000 sites (taken from the EU guidance). The detailed AA methodology can be found in the EU's guidance document and is not reproduced here.

Figure 3-1: Flow Chart for the Procedures for AA



4 POTENTIAL IMPACTS

Potential Impacts

4.1 Deposition of nitrogen can lead to increased soil nutrient levels, favouring the growth of competitive plant species, leading to a reduction in plant species diversity. At very high concentrations, or at low concentrations over long periods of time, atmospheric nitrogen can also cause leaf damage to plants.

5 ECOLOGICAL RECEPTORS

Vegetation of the SAC

5.1 The Rock of Gibraltar SAC supports a range of vegetation types with a broadly Mediterranean and calcareous character. The habitat features for which the site is designated (i.e. habitats listed on Annex I of the Habitats Directive and Schedule 5 of the Nature Protection Act 1991) are listed in Table 5-1.

Table 5-1: Annex I Habitat Types Present on the Rock of Gibraltar SAC and their Percentage Cover of the SAC

Annex I Habitat Code	Annex I Habitat Type	Percentage Cover
1240	Vegetated sea cliffs of the Mediterranean coasts with endemic Limonium spp.	5
2230	Malcolmietalia dune grasslands	20
5230	Arborescent matorral with Laurus nobilis	5
8210	Calcareous rocky slopes with chasmophytic vegetation	30
8310	Caves not open to the public	n/a
9320	Olea and Ceratonia forests	30
5320	Low formations of Euphorbia close to cliffs	5
2220	Dunes with Euphorbia terracina	3

5.2 These vegetation types are not distributed evenly across the SAC. Generally speaking the taller, more dense scrub and woodland is found on the lower slopes, the more open garrigue and maquis vegetation is found around the steeper slopes and upper parts of the Rock, and the open vegetation types are found around the steepest slopes and cliffs.

5.3 Detailed descriptions of these vegetation types, and the other features of the SAC, are provided in the Rock of Gibraltar Habitats Factsheet presented in Appendix EC1 of the Ecology Chapter of the EIA.

6 ASSESSMENT OF POTENTIAL SIGNIFICANT EFFECTS

Introduction

6.1 The likelihood of deposition of atmospheric nitrogen leading to a significant effect on the Rock of Gibraltar SAC is considered in the context of:

- Background levels of atmospheric NOx and nitrogen deposition arising from other existing sources.
- The levels of atmospheric concentration, and rates of deposition (known as critical levels and critical loads) above which it is possible that an effect may occur.
- The sensitivity of the vegetation of the Rock of Gibraltar with reference to vegetation types for which critical levels and critical loads have been established.
- The predicted airborne concentrations of NOx and rates of nitrogen deposition that would result from the power station, in comparison with background levels, critical levels and critical loads.

Background Levels

6.2 There is substantial evidence that industrialisation has resulted in global increases in concentrations of atmospheric nitrogen and deposition rates of N. N deposition rates of 5-25 kg/ha/yr have been reported for eastern North America and 50-60 kg/ha/yr for northern Europe (Lee, 1998). Some authors report even higher levels, with 85 kg/ha/yr of N being deposited in the Netherlands (Allen *et al*. 1998).

6.3 Monitoring of background levels and rates in Gibraltar is limited, but monitoring indicates that average annual concentrations are 92.6 µg m^{-3} (average concentration measured 2009 – 2013 at Rosia Road, as reported in Chapter 9 – Air Quality).

6.4 The potential effect of any emissions from the proposed power station is therefore considered in the context of existing levels of emission and deposition. The contribution of the power station is likely to be small in context of the background levels, and this is examined in more detail in the following sections.

6.5 The level at which an effect might be considered likely to occur is discussed below in terms of critical levels and critical loads.

Critical Levels and Critical Loads

6.6 The effects of atmospheric NOx and nitrogen deposition on sensitive receptors can be considered in terms of critical levels and critical loads. A critical level relates to the concentration of an airborne pollutant, usually measured in $\mu g/m^{-3}$, above which it is possible that a significant effect may occur. A critical load, usually measured in kg/ha/yr, describes the amount of deposition below which there is a negligible likelihood that an ecological effect will occur. There is a direct relationship between atmospheric concentrations and deposition rates.

6.7 An exceedence of a critical load or level does not automatically mean that a significant effect will occur, nor does it provide a quantitative estimate of damage to an ecosystem. In addition, exceedence of the critical load may not be manifest in terms of actual ecosystem damage, as the timescales for effects to occur may be very long (10-100 years). The purpose of these loads and levels is therefore to determine levels below which an effect is not considered likely to occur, rather than to define a point at which an effect will occur.

6.8 An annual mean concentration of 30 $\mu g\ m^{-3}$ has been identified by the World Health Organisation as the critical level above which direct damage to vegetation may occur. The actual level at which damage will occur will vary from species to species and some groups of taxa (including lichens and bryophytes) contain species that are particularly sensitive.

6.9 Critical loads and critical levels for effects on vegetation do not have a legal basis in Gibraltar (i.e. exceedence would not automatically result in a breach of legislation). In respect of the Habitats Directive and the Nature Protection Ordinance 1991, a breach would only be likely to occur if an exceedence led to an adverse effect on the SAC, in the absence of any derogation.

6.10 Critical levels are a useful means of assessing relative contributions of atmospheric pollutants from different sources, but in this assessment it is the critical loads that are of most use in assessing the likelihood and magnitude of any ecological effect. The following section goes on to discuss the use of critical loads in relation to the vegetation of the Rock of Gibraltar SAC.

Sensitivity of the Vegetation of the Rock to Effects of N Deposition

6.11 The extent to which different plant communities may be affected by atmospheric N deposition depends on many factors including the amount of N being deposited, the buffering capacity of the system, soil nutrient status and soil factors that influence the nitrification potential and nitrogen immobilization rate (Bobbink *et al*. 1998). As discussed, above, critical loads are a useful reference point when assessing whether an impact is so small that an effect will almost certainly not occur, or whether an impact is of sufficient magnitude that further consideration of the likelihood of an effect is required. This section discusses the most useful reference point for critical loads relevant to the Rock of Gibraltar.

6.12 There are no published scientific studies on the sensitivity of the vegetation of the Rock to increased N or acidification, and therefore no directly applicable critical loads. This assessment of whether an impact will be sufficient to have an effect (and whether that effect will be significant) therefore makes use of published data for analogous habitats and vegetation types.

6.13 Table 6-1 presents guideline amounts for screening potential effects of nitrogen on analogous vegetation types. The guideline amounts are taken from the Air Pollution Information System (APIS) and a workshop of experts held in Noordwijkerhout in 2010 (Bobbink *et al*., 2010).

Table 6-1: Critical Loads and their application to the Rock of Gibraltar SAC

ANNEX 1 Habitat Code and Percentage Cover of the SAC	Corresponding EUNIS Habitat	Closest Corresponding Habitat in APIS Database	APIS Nutrient Nitrogen Critical Load for Screening Stage of Assessment (kgN/ha/yr)	Noordwijkerhout Workshop Closest Corresponding EUNIS Code	Noordwijkerhout Workshop Critical Load for Screening Stage of Assessment (kgN/ha/yr)	Selected Screening Level
9320 *Olea* and *ceratonia* forests (30%)	G2.4 *Olea europaea - Ceratonia siliqua* woodland and G2.1	G1	10	G1 Broadleaved deciduous woodland	10-20	10
8210 Calcareous rocky slopes with chasmophytic vegetation (30%)	n/a	E4.4 Alpine and subalpine calcareous grasslands (poor correspondence)	5	E4.4	5-10	5
5230 Arborescent matorral with *Laurus nobilis* (5%)	F5.1 Arborescent matorral	G1.A Meso- and eutrophic *Quercus* woodland	15	F5 Mediterranean Scrub	20-30	15

6.14 The similarity between the vegetation types used in APIS and Noordwijkerhout and the vegetation of the Rock is in most cases poor, therefore these critical loads are treated with caution. The data in Table 6-1 show a possible relationship between vegetation type and predicted sensitivity, in that the taller woodland vegetation types have higher critical loads than the more open vegetation of calcareous rocky slopes.

6.15 These vegetation types are distributed patchily over the Rock of Gibraltar, therefore in broad terms emissions from the power station could theoretically fall upon any of these vegetation types. In reality, the dispersion modelling (presented in Chapter 9 – Air Quality) indicates that deposition of N is only likely to occur in anything other than negligible amounts at the extreme northern end of the SAC. It is possible that small parts of this zone of the SAC support open vegetation of calcareous rocky slopes, albeit in small quantities. For this reason, a precautionary approach has been taken and the critical load for screening potential effects has been set at 5 kg/N/ha/yr – the lowest critical load of any of the vegetation types.

Predicted Contribution

6.16 In terms of concentrations of oxides of nitrogen, the proposed power station is predicted to contribute, at most, up to 0.4 $\mu g/m^3$ as an annual mean, which would equate to 0.43% of estimated background levels (based on background levels of 92.6 $\mu g/m^3$). This gives an indication of the very small contribution of the power station relative to existing sources.

6.17 The proposed power station is predicted to result in maximum deposition rates of 0.4 kg/N/ha/yr over the SAC (see Figure AQ6.9 and AQ6.10).

6.18 Therefore in the area with the highest rates of deposition, maximum process contributions from the proposed power station would be 8% of the 5 kg/N/ha/yr threshold. However, background levels of nitrogen deposition are predicted to already be in exceedence of the screening threshold of 5 kg/ha/yr.

6.19 As critical loads are already likely to be exceeded by existing atmospheric N from other sources, it cannot immediately be concluded that the proposed power station, in combination with existing levels, would not have an effect on the integrity of the SAC. The likelihood that such an effect would occur, and

the likelihood that it would be significant, is discussed in more detail in the following section.

Likelihood of a Significant Effect

6.20 In order for the proposed power station to have a significant effect on the integrity of the SAC through increased N deposition, it would have to result in a change of sufficient magnitude to adversely affect the *'coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*' (European Commission, 1992). For such a change to be driven by increased N deposition, in combination with other environmental processes and factors, deposition would have to be sufficiently high to result in changes to the plant communities in terms of their structure and species composition.

6.21 There is no evidence that the current background levels of atmospheric NO_x, and the consequent deposition rates, are having an adverse effect on the vegetation of the Rock even in the absence of the contribution from the proposed power station. Given that the contribution from the power station would contribute less than 1% of current levels it is deemed that there will be **no significant effect**.

Consideration of Alternatives

6.22 In the 'no-development' option, in the short term power would continue to be generated by the existing power stations. These existing power stations do not have the same levels of N abatement that are incorporated into the design of the proposed new power station. Therefore the proposed power station would result in a reduction in the current levels of atmospheric N by replacing the older generation systems.

7 CONCLUSIONS

7.1 The predicted nitrogen deposition attributable solely to the proposed power station is below the critical load. The predicted deposition rates would equate to 8% of the critical load for the most sensitive habitat type i.e. 0.4 kg/N/ha/yr = 8% of 5 kg/N/ha/yr. This effect would occur over only a very small part of the Rock, at the extreme northern end (i.e. the section over which prevailing winds would disperse the plume when blowing in an easterly direction).

7.2 The background levels of atmospheric NOx, and the consequent nitrogen deposition rates, mean that the critical level and critical load is currently exceeded, in the absence of the proposed power station. The emissions from the proposed power station would constitute only a very small addition to the existing background N levels.

7.3 The amount generated by the proposed power station is so small in proportion to background levels that there will be **no significant effect** to the SAC as a result of NOx emissions and subsequent N deposition.

7.4 Replacing the existing generators with a new power station will reduce the overall contribution of atmospheric N from power generation in Gibraltar, so that there would be a reduction in the total amount of atmospheric nitrogen, and the consequent deposition rates onto the Rock of Gibraltar. In this sense the proposed power station may result in a small beneficial effect, although the magnitude of this effect has not been quantified.

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CHAPTER 13

LANDSCAPE AND VISUAL AMENITY

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GLOSSARY AND ABBREVIATIONS

CEMP	Construction Environmental Management Plan
EC	European Commission
HM	Her Majesty's
IEMA	Institute of Environmental Management and Assessment
Landscape	The appearance of the land made up of combinations of various forms, colours and textures that create a specific identity to a place.
Landscape Character Area	The distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how people perceive this. It can reflect particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape.
LVIA	Landscape Visual Impact Assessment
Receptor	A physical landscape resource, special interest or viewer group that will experience an effect.
SAC	Special Area of Conservation
SCI	Site of Community Interest
SPA	Special Protected Area
Visual Impacts	A type of landscape impact. They relate solely to changes in a variable view of the landscape and the effects of those changes on people and properties.

1 INTRODUCTION

1.1 This chapter assesses the likely landscape and visual impacts for the proposed North Mole Power Station in Gibraltar. The site is located on previously reclaimed land at the western end of the North Mole industrial area as shown on Figure 3.1 (Volume 2: Figures).

1.2 The Landscape and Visual Impact Assessment (LVIA) considers the effects of the construction and operational phases of the power station on the landscape character and visual amenity of the site and surrounding area.

1.3 Effects on landscape character and on visual amenity are separate but related issues. Landscape effects are changes in the character and quality of the landscape as a result of the proposal. Visual effects are changes in the available views of the landscape and the effects of those changes on viewers.

1.4 The objectives of the assessment are to:

- Describe and evaluate the landscape of the site, its surroundings and the visual amenity of the surrounding area which may be affected by the development;
- Identify and describe the visual envelope of the site and the proposed development;
- Examine the development proposals and analyse the potential effects on the landscape and visual amenity;
- Set out mitigation measures which could be implemented in order to avoid, reduce or offset adverse effects;
- Provide an assessment of the landscape and visual effects of the proposed development with mitigation measures in place.

1.5 Consultation with the Town Planner and the Tourist Board informed this assessment.

2 RELEVANT POLICY

2.1 The Gibraltar Development Plan 2009 has two parts that relate to the site. Part I has policies that apply throughout Gibraltar whilst part II divides Gibraltar into 9 zones for land use planning purposes and where each zone has specific policies that apply.

2.2 Part I has a number of policies and objectives that relate to the proposed power station. Maintaining the quality of the environment is identified as one of the most important objectives of the planning system. With this in mind the policy ENV1 is the most significant policy relating to the site

2.3 Policy ENV1 – Effect on the environment

> *"The effect on the environment of development proposals shall be a prime consideration in determining applications."*
>
> (HM Government of Gibraltar, 2009:25)

2.4 In part II of the development plan the power station site at North Mole falls within Zone 3 – Port and Harbour

2.5 Within this Zone, Policy Z3.2 – Potential Impact on North Mole Road, states;

> *"In considering proposals for new development that fronts or are visually prominent from North Mole Road, particular attention shall be paid to:*
>
> *A The architectural character and appearance of the buildings and*
>
> *B The visual impact of the proposals on North Mole Road"*
>
> (HM Government of Gibraltar, 2009:99)

3 SCOPE AND METHODOLOGY

Scope

3.1 This section describes the methodology of the assessment, evaluates landscape character, describes the extent of views from the surrounding areas into the site, assesses the potential effects of the proposed power station development upon the visual receptors, identifies mitigation where required and assesses any residual and cumulative effects. Potential effects have been addressed for both construction and operation phases. The scope of this assessment also follows the findings in the scoping report (Appendix 2, Main Report)

3.2 The scoping report outlined the proposed approach to the LVIA, the form of methodologies to be followed and the nature of potential impacts that could occur.

3.3 In addition to formal scoping, consultation with HM Government of Gibraltar's Town Planner was also held in order to refine the scope of the LVIA in more detail, in particular the identification of viewpoints for the visual assessment.

3.4 The geographical scope of the study area has been influenced by the sensitivity of receptors within a distance of approximately 1 km of the proposed power station. Longer distances have been included where appropriate.

Assessment Methodology

3.5 This assessment has been prepared based upon the following guidance:

- Guidelines for Landscape and Visual Impact Assessment, third edition, published by The Landscape Institute and the Institute of Environmental Management and Assessment, in 2013;
- Advice Note 01/2011 'Photograph and Photomontage in Landscape and Visual Assessment, published by the Landscape Institute.

3.6 The assessment was carried out in May 2015 and the process comprised a combination of desk studies and field surveys with subsequent analysis. This involved the following:

- Review of planning policies and other documents published by HM Government of Gibraltar;
- A survey of the site and inspection of views from publicly accessible viewpoints, including a photographic survey;
- Evaluation of the features and elements of the landscape and their contribution to the landscape character and local setting;
- Consideration of potential landscape and visual effects of the proposed development;
- Assessment of the sensitivity of the landscape and visual amenity to the changes likely to arise from the development;
- Identification of the extent of theoretic visibility of the development and potential sensitive view locations, based on a viewpoint analysis;
- Assessment of magnitude of change and the significance of effects on the landscape and on visual amenity, with the mitigation proposals in place.

Assessment of Landscape Effects

3.7 Baseline studies for assessing the landscape effects include a mix of desk and fieldwork to identify and record the character of the landscape and the elements, features, aesthetic and perceptual factors which contribute to it. The baseline information about the landscape will be combined with an understanding of the development proposals to identify and describe the landscape effects.

3.8 The elements and aspects of the landscape, which might be affected by the proposals, otherwise known as the landscape receptors, will be identified. Interactions between the landscape receptors and the construction phase of the development will also be considered.

Susceptibility to Change and Value of the Landscape Receptor

3.9 Susceptibility to change is the ability of the landscape receptors to accommodate the proposed development without significant changes to the baseline situation. It is categorised as high, medium or low susceptible in accordance with the criteria as set out below.

Table LV3.1 Landscape Susceptibility Criteria

Landscape Susceptibility	Criteria
High susceptibility	The changes arising from the development would significantly alter the overall character and quality of the landscape
Medium susceptibility	The changes from the development would alter the overall character and quality of the landscape
Low susceptibility	The changes from the development would not alter the overall character and quality of the landscape

3.10 The value attached to the landscape receptor is established in the baseline study and is categorised as high, medium or low in accordance with the criteria as set out below.

Table LV3.2 Landscape Value Criteria

Landscape Value	Criteria
High value	Landscape subject to international, national or local designations, or non-designated landscapes where the following applies: Has valued features that are significant in the context of the surrounding area, with distinctive components and structure.
Medium value	Areas of landscape that have features that are distinctive to the local area, with some recognisable and consistent structure
Low value	Areas of landscape that have no distinct features or character and is often in a poor condition

3.11 The susceptibility and value of the landscape receptor is combined to assess the sensitivity of the landscape receptors.

Magnitude of Landscape Effect

3.12 Effects on landscape receptors are assessed in terms of size or scale, geographical extent of the area influenced, its duration and reversibility.

Table LV3.3 Magnitude of Landscape Effects Criteria

Consideration	Criteria
Size or scale of change	Categorised on a scale of High, Medium or Low based upon: The extent of existing landscape elements that will be lost or changed and the degree to which aesthetic or perceptual aspects of the landscape are altered either by removal of existing components of the landscape or additions of new ones.
Geographical area over which the landscape would be changed	Described by reference to the Site, its immediate context and wider landscape.

The duration of the changes	Categorised on a scale of Short, Medium and Long term: Short term: 0 – 5 years Medium term: 5 – 10 years Long term: 10 – 25 years
Reversibility	The prospect and the practicality of the effect being reversed within 25 years.

Overall Landscape Effects

3.13 Final conclusions about the overall landscape effect relate the separate judgements about sensitivity of the landscape receptors and magnitude of the changes combined, to judge whether the effect is important or not.

3.14 The following descriptive thresholds have been used to assess the importance at different stages of the proposals. The following thresholds will consider whether the effect is adverse or beneficial.

Table LV3.4 Overall Landscape Effect Thresholds

Threshold	Description	Significance
Major	An effect considered very important in the decision process	Significant
Moderate	An effect that is considered material in the decision process	Significant
Minor	An effect that will be noticed, but is not relevant to the decision process	Not significant
Negligible	An effect that will be discernible but of very limited consequence that is not relevant to the decision process	Not significant
No Effect	No effect discernible	Not significant

Assessment of Visual Effects

3.15 An assessment of visual effects deals with the effects of change and development on the views available to people and their visual amenity. Baseline studies for assessing the visual effects include a mix of desk and fieldwork to identify and record the area in which the proposals may be visible, the different groups of people who may experience views of the proposals, the location where they will be affected and the nature of the views at those points.

3.16 The potential area where the site and development proposal are likely to be visible was mapped. This can be done using computer software to map the Zone of Theoretical Visibility or by manual methods through studying maps.

3.17 The people within the area who may be affected by the changes in views or visual amenity, known as the visual receptors, were identified. These are:

- People living, working or visiting the area;
- People passing through on roads;
- People engaged in recreation of different types including users of public rights of way and bridleways.

3.18 Following identification of the visual receptors and consultation with the Town Planner, a series of viewpoints were selected to represent what can be seen. The viewpoint locations were mapped and the direction and area covered by the view recorded, Figure LV3.1 (Volume 2: Figures).

3.19 Note that in accordance with the current LVIA Guidelines, private viewpoints from residential properties have been excluded from this assessment.

Sensitivity of the Visual Receptors

3.20 The visual receptors likely to be affected at a specific viewpoint are assessed in terms of their susceptibility to change and the value attached to the particular view.

3.21 Judgements on susceptibility to change are categorised on a scale of high, medium or low and take into consideration the following criteria:

Table LV3.5 Visual Susceptibility Criteria

Visual Susceptibility	Criteria
High susceptibility	People engaged in outdoor recreation, including use of public rights of way, whose attention or interest is likely to be focused on the landscape or particular views. Visitors to designated landscape, heritage assets, or other attractions where the views of the surroundings are an important contributor to the experience. Slow to medium moving vehicles on scenic routes where awareness of views is likely to be high.
Medium susceptibility	People engaged in outdoor sport or recreation that does not involve or depend upon appreciation of views of the landscape. Slow to medium moving vehicles.
Low susceptibility	People at their place of work whose attention may be focused on their work or activity not on their surroundings and where the setting is not important to the quality of working life Fast moving vehicles on road.

3.22 Judgements on the value attached to the views identified are categorised on a scale of high, medium or low and take into consideration the following:

Table LV3.6 Visual Value Criteria

Visual Value	Criteria
High value	Recognised views of value for example in relation to heritage assets, or through planning designations. Indicators of value attached to views by visitors, for example through appearance in guidebooks or on tourist maps.
Medium value	Views that have scenic value
Low value	Views that have no value

Magnitude of the Visual Effects

3.23 The visual effects identified are evaluated in terms of size or scale, the geographical extent of the area influenced, duration and reversibility.

Table LV3.7 Magnitude of Visual Effects Criteria

Consideration	Criteria
Size or scale of change	Categorised on a scale of High, Medium, Low and Negligible based upon: The degree of the loss or addition of features in the view; The extent of changes in the composition of the view, including the proportion of the view occupied by the proposed development; The degree of contrast or integration of the changes with the Existing or remaining landscape elements and characteristics; The nature of the view of the proposed development, whether full, partial or glimpsed, or the relative amount of time over which it will be experienced.
Geographical extent	The distance of the viewpoint from the proposed development
Nature of view	Categorised on a scale of Full, Partial, Glimpse, None.
The duration of the changes	Categorised on a scale of Short, Medium and Long term: Short term: 0 – 5 years Medium term: 5 – 10 years Long term: 10 – 25 years.
Reversibility	The prospect and the practicality of the effect being reversed within 25 years.

Overall Visual Effects

3.24 Final conclusions about the overall visual effect relate the separate judgements about sensitivity of the visual receptors and magnitude of the changes combined, to judge whether the effect is important or not.

3.25 The following descriptive thresholds have been used to assess the importance at different stages of the development proposal. The following thresholds will consider whether the effect is adverse or beneficial.

Table LV3.8 Overall Visual Effects Thresholds

Threshold	Description	Significance
Major	An effect considered very important in the decision process	Significant
Moderate	An effect that is considered material in the decision process	Significant
Minor	An effect that will be noticed, but is not relevant to the decision process	Not significant
Negligible	An effect that will be discernible but of very limited consequence that is not relevant to the decision process	Not significant
No Effect	No effect discernible	Not significant

Approach to Mitigation

3.26 Opportunities to reduce and remedy or compensate for adverse significant visual effects for construction and operation have been identified where practicable and appropriate.

Assumptions and Limitations

3.27 The assessment has been carried out using currently available information on the power station proposals. Not all potential viewpoints were visited, as a full inspection from the sea was not possible. Private properties were also not visited. As a result, impacts to these viewpoints have been estimated based upon professional judgement and experience of similar developments.

4 EXISTING CONDITIONS

Location

4.1 The site of the proposed power station is on previously reclaimed land at the western end of the North Mole as shown on Figure 3.1 (Volume 2: Figures).

Topography

4.2 Gibraltar is near the junction of two continents, Europe and Africa and stands close to the boundary of the Mediterranean Sea and the Atlantic Ocean. It forms a narrow peninsular approximately 5.82 km in length and up to 1.6 km wide. The east west profile is asymmetrical with the eastern side being much steeper than the west. The shallower lower part of the west side is where the majority of development in Gibraltar has occurred. The Rock of Gibraltar is an iconic and impressive landmark a little over 400 m high at its highest point and is visible from a wide area, particularly from the sea. It is a focus for tourists and visitors throughout the year, as well as being a physical emblem of Gibraltar.

4.3 The proposed power station site is on reclaimed land forming part of the flatter western part of Gibraltar.

Vegetation

4.4 The vegetation of Gibraltar generally consists of two main types of scrubland: Maquis - typically consisting of densely growing evergreen shrubs; and Garrigue - a lower growing scrubland type usually found nearer the coastline.

4.5 Due to dense development there is little or no vegetation on the proposed power station site and its surroundings.

Land Use

4.6 The immediate area is mainly in industrial or harbour use with housing further to the east. The quay on the North Mole is used for cruise ships, cargo handling and bunkering. A port office, other commercial buildings and a pump station are situated close to the western boundary of the site. The Flying Angel venue and accommodation is directly opposite the site across North