Nigg East Quay
Volume 1: Environmental Impact Assessment Report

June 2019

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PREFACE

This Environmental Impact Assessment Report (EIAR) has been prepared under the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 ("the TCPA EIA Regulations) and the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ("the marine EIA Regulations"). It accompanies an application for planning permission to Highland Council as well as marine licence applications for construction and dredging/disposal to Marine Scotland.

The proposed development comprises the formation of a new East Quay at Nigg Energy Park, Nigg, Ross-shire comprising the construction of a perimeter-piled quay combi-wall, dredging of approximately 165,000m³ of sediment, demolition of existing outbuildings associated with the former Dunskeath House and subsequent construction of an onshore laydown area with associated lighting, fencing and access.

This EIAR reports the findings of an Environmental Impact Assessment (EIA) which has been co-ordinated and written by EnviroCentre Ltd, with specialist input from the following consultants. All authors contributing to this EIAR are competent experts in the context of the EIA Regulations. Further information verifying the expertise of the project team is found within section 1.7 of this EIAR.

Table 1: Project Team

Organisation/Consultant	Project Role
Arch Henderson	Project Engineering
Doug Harman Landscape Planning	Landscape and Visual
EnviroCentre Ltd	Project Management, EIA Co-Ordination, Marine Ecology, Water Environment and Soils, Airborne Noise, Other Issues
GH Johnston Building Consultants	Planning and Consultation
Headland Archaeology	Cultural Heritage and Archaeology
Irwin Carr Consulting	Underwater Noise Modelling
Systra	Traffic and Transport

This EIAR comprises the following elements:

- Volume 1: Environmental Impact Assessment Report
  - Providing a detailed description of the proposed development and its potentially significant environmental effects, detailing alternative options where applicable, reporting the findings of the EIA, as well as any proposed mitigation measures and providing other relevant background information
- Volume 2: Figures
  - Including figures and plans relating to individual chapters of Volume 1
- Volume 3: Technical Appendices
  - Containing detailed technical reports and baseline studies which act as background reports to Volume 1.

The following documents have also been prepared to support the application. These form part of the overall submission:

- Non-Technical Summary (NTS) – this provides an overview of the proposed development and summarises the findings of the EIA and any key mitigation measures proposed, in an easily accessible format;

- Pre-Application Consultation (PAC) Report – this provides information on the community engagement which has been undertaken prior to this submission with regards to the proposed development, and details public engagement initiatives and attitudes towards the proposed development. This covers both terrestrial and marine pre-application requirements and has been prepared by GH Johnston;
- Planning Statement – prepared by GH Johnston, this assesses the level of compliance of the proposed development, drawing upon the evidence contained within the EIAR, in relation to the Development Plan and other material considerations; and
- Applications for Marine Licences – these applications for dredging/disposal and construction in the marine environment are required to consent activities below Mean Low Water Springs (MLWS) and are accompanied by a Best Practicable Environmental Option (BPEO) appraisal.

Members of the public can view the NTS and the full EIAR (electronically) at the following deposit copy locations:

Cromarty Library
Hugh Miller Institute
51 Church Street
Cromarty
IV11 8XA

Tain Library
Stafford Street
Tain
IV19 1AZ

The Highland Council
Sutherland and Easter Ross Planning Office
Drummuie
Golspie
KW10 6TA

Electronic copies of the NTS are available for free from the following contact, whilst digital copies of the full EIAR on disc can be obtained for £10. Full hard copies of the EIAR can be supplied for £500 per copy.

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1 CHAPTER 1: INTRODUCTION

1.1 Introduction

Global Energy Nigg Limited ('The Applicant') have appointed EnviroCentre Ltd to undertake an Environmental Impact Assessment (EIA) of their proposed development approximately 1.5km north of Cromarty, within Nigg Energy Park. This Environmental Impact Assessment Report (EIAR) comprises the written findings of the EIA process. The EIAR has been prepared to support both terrestrial and marine applications under both the Town and Country Planning (Scotland) Act 1997 (as amended) and the Marine (Scotland) Act 2010 respectively, following which consent will be sought from The Highland Council (THC) and Marine Scotland Licencing Operations Team (MSLOT) as appropriate.

The relevant Regulations which underpin this EIAR are listed below:

- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 ('the TCP EIA Regulations'); and
- The Marine Works (Environmental Impact Assessment (Scotland) Regulations 2017 ('the Marine EIA Regulations').

This EIAR discusses the associated environmental effects related to the formation of a new East Quay adjoining the currently operational Nigg Energy Park, which serves the offshore oil, gas and renewables industries. The applications seek consent for a new quay of 250 metres (m) by 50m as well as an onshore laydown area on the lands of the former Dunskeath House. Consent is also sought for all preparatory and ancillary work including groundworks and dredging. A full description of the proposed development is contained within Chapter 2: Proposed Development of this EIAR, with the methodology and consultation detailed within Chapter 3: EIA Methodology and Scoping.

1.2 Background to Proposed Development

The Nigg fabrication yard was established in 1972 and consists of approximately 70 hectares (ha) of land reclaimed from the eastern edge of Nigg Bay. Nigg Oil Terminal was subsequently established to support the Beatrice oilfield development in the mid-1970s. The yard was operational from 1972 until 2001, providing fabrication services to the North Sea oil and gas industry. During peak operation, the facility employed around 5,500 personnel and supported a wider supply chain. Following sector-wide operational difficulty at the turn of the Millennium, approximately 5,000 jobs were lost along with the supply chain benefits. Following a period of instability, Global Energy purchased the facility in 2011 and have been operational since.

Following this, the Applicant is continuing to create an internationally competitive industrial multi-user facility providing fabrication and support service to the energy sector as outlined within the Nigg Development Masterplan[1] which was adopted by the Council in March 2013.

Subsequent applications have come forward in the intervening period between May 2013 and time of writing in January 2019, including:

- Extension of Assembly Shop 7 (17/05176/FUL);
- Extension to Assembly Shop 4 to join Fabrication Shop 7 including erection of new buildings (17/03411/FUL); and

[1] The Highland Council (2013) – Nigg Development Masterplan Supplementary Guidance

- Installation of hardstanding, compound area and welfare area, fuel tanks and delivery pipes (15/02216/FUL), as amended by 15/03325/FUL.

Offshore energy represents a key opportunity for sustainable economic growth in Scotland, with around 25% of all of Europe's wind energy crossing the seas around Scotland. Confidence in the offshore sector is growing since Electricity Market Reform, with several high profile offshore windfarms being consented in waters around Scotland in the last 5 years. According to the Scottish Government's Sectoral Marine Plan for Offshore Wind Energy[2], in the last two years Scottish Ministers have given consent to several demonstration scale projects in Scottish Waters (including offshore installations such as Hywind Scotland Pilot Park off Peterhead, Kincardine Offshore Wind Farm off the Aberdeen coast, and Dounraey demonstration project off the Caithness coast. It is intended that construction and operation of these projects would occur over the next few years.

Given that as of May 2018, Scotland had 217 Megawatts (MW) of installed offshore wind capacity but with a further 4.2 Gigawatts (GW) in construction or awaiting construction, it is clear that facilities such as Nigg Energy Park have a bright future in servicing this pipeline of development. The proposed development aims to address the current lack of suitable berths at Nigg to service both the Applicant's North Sea oil sector clients, whilst the wider Energy Park would service their current and potential clients in the rapidly growing offshore renewables sector.

To address this shortfall in suitable berths, Global has considered the east quay expansion for some time but the potential was limited due to the lack of available land to the east of the present site. However, with the purchase of Dunskeath House and associated land, the proposed development is now viable at a time when it is urgently needed in order to grasp the opportunities currently arising and likely to arise over the next decade.

Extending Nigg Energy Park to include the contiguous Dunskeath lands is regarded as a practical and safe option for handling and storing renewables and North Sea oil components, which would arrive, be assembled and ultimately leave by sea. The alternative considered was to expand into vacant land to the east on the other side of the B9175 public road but this was ultimately rejected in favour of the current proposal.

The applicant was aware also that the concept of an East Quay was identified within the Nigg Masterplan as a potential access option to the sea.

1.3 The Applicant

Global Energy Group is an Inverness and Aberdeen-based energy sector service group who operate worldwide. Global Energy Group Limited acquired Nigg Fabrication Yard and Complex, aiming to be a 'multi-sector, multiuser asset' in port and fabrication operations. Adapting expertise and experience gained from Scotland's 40-year involvement with oil and gas production, the Applicant has developed sector-leading services in integrity and maintenance solutions for the offshore market.

The primary function of the Nigg Energy Park is the provision of facilities and services to support the oil and gas and renewables sectors. The Applicant has since successfully diversified to satisfy current market needs in the north of Scotland. A typical day may include the repair of drilling rigs, fabricating subsea manifolds, berthing vessels or marshalling offshore wind components.

Also contained within Nigg Energy Park is the "not-for-profit" business - Nigg Skills Academy (NSA). The independent business was set up to support black trade skills (Welding, fabrication and pipe fitting) for local employees in partnership with North Highland College and is now diversifying into running courses for other industries.

[2] The Scottish Government (2018) – Sectoral Marine Plan for Offshore Wind Energy (encompassing Deep Water Plan Options Context Report

1.4 Regulatory Context

As described within section 1.1 and within Chapter 3: EIA Methodology and Scoping, the proposed development transcends two regulatory regimes, with two different sets of EIA Regulations to consider.

Both regulatory bodies responsible for consent: THC and MSLOT, were consulted with at various points throughout the formation of development plans and their assessment. This consultation included full Scoping Opinions under both consenting regimes, and this is fully discussed within Chapter 3: EIA Methodology and Scoping, as well as the corresponding sections of each technical chapter.

1.5 Objectives and EIA Context

The purpose of an EIA is to identify and evaluate the likely significant effects of a proposed development on the environment and to identify measures to mitigate or manage any significant adverse effects before a planning application or marine licence is determined. The EIA process provides an opportunity to 'design out' adverse effects wherever possible. Where adverse effects cannot be designed out, mitigation measures can be proposed to avoid, compensate or reduce significant environmental effects to an acceptable level. EIA is an iterative process which allows feedback from stakeholder consultation and the results from baseline studies to be fed into the design process of the development.

The EIA carried out in relation to the proposed development has been undertaken by specialist environmental and technical consultants on the basis of project information supplied by the Applicant and their engineers and following consultation with statutory consultees, other bodies and members of the public.

The objectives of the EIAR are:

- To establish a robust environmental baseline upon which to base environmental assessment, incorporating field surveys, desk study and consultation;
- To provide an assessment of the potential environmental impacts of the proposed development and to determine which of these, if any, are likely to result in a significant effect on the receiving environment; and
- Where significant effects are predicted, to determine mitigation measures to reduce the residual effects to acceptable levels.

The results and findings of the EIA are presented in this EIAR. The environmental information presented is derived through a systematic process of identification, prediction and evaluation of the likely significant environmental effects of the proposed development.

Schedule 4 of the TCPA and the Marine EIA Regulations requires that the following information is provided:

- A description of the location of development, its physical characteristics and land-use requirements during construction and operation;
- A description of the main characteristics of the operational phase of the development;
- An estimate of residues and emissions produced during the construction and operation phases;
- A description of reasonable alternatives, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects;
- A description of the relevant aspects of the current state of the environment and an outline of the likely evolution thereof without implementation of the development as far as reasonable;
- A description of environmental receptors likely to be significantly affected by the development;
- A description of the likely significant effects of the development on the environment;
- A description of the forecasting methods or evidence used to identify and assess the significant effects;
- A description of the measures envisaged to mitigate significant effects;

- A description of expected significant adverse effects deriving from the vulnerability of the development to risks of major accidents and/or disaster; and
- A non-technical summary of the aforementioned information.

This EIAR meets these requirements within each technical chapter.

1.6 Key Terms

To ensure clarity and consistency through the EIAR, the following key terms have been used:

- 'the proposed development' refers to the construction of the proposed development as described in Chapter 2: Proposed Development;
- 'the site' is the land and sea bound by the red-line boundary in which the proposed development lies, and is illustrated within Figure 1.1 within Volume 2 of this EIAR;
- The 'Study area' is the area over which desk based or field assessments have been undertaken and are identified within each chapter. The core study area varies depending on the nature of the potential effects within each discipline, as informed by professional guidance and best practice regarding EIA. All of the core study areas cover the site, and are described within the methodology section of the relevant chapters within this EIAR.

1.7 The Project Team

The EIAR has been undertaken by a team of competent experts as per Regulation 5(5) of the TCPA EIA Regulations, Regulation 6(5) of the Marine EIA Regulations and Regulation 3, Schedule 1, 3(f)(i) of the Miscellaneous EIA Regulations. As per the guidance contained within Planning Advice Note 1/2017, the EIA Report must be accompanied by a statement outlining relevant expertise or qualifications sufficient to demonstrate this is the case.

Accordingly, Table 1.1 details those with responsibility for undertaking this EIA Report, along with their relevant qualifications and expertise.

Table 1.1: Competent Expertise

Item / Role	Lead Author and Reviewer	Number of years' experience	Qualifications and Professional Memberships
Inputs to EIA Process			
EIA Project Manager / Co-ordinator	Craig Potter	11	MA (Hons), MSc, Registered EIA Practitioner with Institute of Environmental Management and Assessment
EIA Reviewer	Campbell Fleming	30	PhD, Chartered Geologist, Fellow of the Geological Society
Engineering Input	Michael Shuttleworth	16	BEng (Hons)
	Andy Neillings	19	HND (HVAC), Member of the Association of Project Management, Risk Practitioner

Item / Role	Lead Author and Reviewer	Number of years' experience	Qualifications and Professional Memberships
	John McLaren	39	BSc (Hons), Chartered Engineer, Member of the Institute of Chartered Engineers
Volume 1: Environmental Impact Assessment Report			
Chapter 1: Introduction	Craig Potter	11	MA (Hons), MSc, Registered EIA Practitioner with Institute of Environmental Management and Assessment
Chapter 2: Proposed Development			
Chapter 3: EIA Methodology and Scoping			
Chapter 4: Marine Ecology	Natalie Hooton (Lead Author)	4	BSc, Member of the Chartered Institute of Ecology and Environmental Management
	Kathy Dale (Reviewer)	33	BSc, MSc, Member of the Association of Environmental and Ecological Clerk of Works, Member of the Chartered Institute of Ecology and Environmental Management
Chapter 5: Water Environment and Coastal Processes	Martin Nichols (Lead Author)	8	BSc, MSc
	Kenneth MacDougall (Reviewer)	21	BEng, PhD, Member of the British Hydrological Society
Chapter 6: Airborne Noise	Craig Cloy (Lead Author)	8	MA (Hons) Member of the Institute of Acoustics
	Craig Potter (Reviewer)	11	MA (Hons), MSc, Registered EIA Practitioner with Institute of Environmental Management and Assessment
Chapter 7: Traffic and Transport	Bridget Fleming (Lead Author)	3	MA (Hons), Member of the Chartered Institute of Highways and Transportation
	Steven Livingstone (Reviewer)	15	BEng, Chartered Member of the Chartered Institute of Logistics and Transportation
Chapter 8: Landscape and Visual	Doug Harman	17	MSc, Chartered Member of the Landscape Institute
Chapter 9: Other Issues – *Terrestrial*	Tom Janes (Cultural Heritage)	21	MA (Hons), Licenced Archaeologist, Member of the Charted Institute for Archaeologists

Item / Role	Lead Author and Reviewer	Number of years' experience	Qualifications and Professional Memberships
Ecology, Ornithology, Cultural Heritage, Air Quality, Navigation and Vessel Movement , Population and Health, Climate Change & Natural Disasters	Matthew Sullivan (Ornithology)	14	BSc, MSc, Member of the Chartered Institute of Ecology and Environmental Management
	Craig Potter	11	MA (Hons), MSc, Registered EIA Practitioner with Institute of Environmental Management and Assessment
Chapter 10: Schedule of Mitigation	Craig Potter	11	MA (Hons), MSc, Registered EIA Practitioner with Institute of Environmental Management and Assessment
Chapter 11: Conclusions	Craig Potter	11	MA (Hons), MSc, Registered EIA Practitioner with Institute of Environmental Management and Assessment

1.8 Structure of the EIAR

The EIAR is presented within three volumes, which are set out within Table 1.2 below:

Table 1.2: Structure of the EIAR

Item	Description
Volume 1: EIAR	This comprises the overall written statement of the EIAR, including the following chapters:
Chapter 1: Introduction	This chapter sets the context for the EIA and introduces the development in a broad context
Chapter 2: Proposed Development	This chapter sets out the development description upon which the environmental assessment is based, as well as examining design and alternatives considered.
Chapter 3: EIA Methodology and Scoping	This chapter introduces the EIA methodology by which the proposed development was designed, along with an outline of how the EIAR has responded to comments throughout Scoping and consultation.
Chapter 4: Marine Ecology	This chapter assesses effects upon marine ecology from engineering works in the water environment, and is informed in part by underwater noise modelling and sediment dispersion modelling.

Item	Description
Chapter 5: Water Environment and Coastal Processes	Chapter 5 assesses the impact of the proposed development upon the water environment, including water quality and pollution, coastal processes and wave modelling. It also assesses the treatment of peat in relation to landward proposals.
Chapter 6: Airborne Noise	This chapter deals with airborne noise as a result of the proposed development with regards to construction and operational noise.
Chapter 7: Traffic and Transport	This chapter sets out baseline and predicted traffic in relation to the proposed development and assesses the capacity of the road network to carry traffic associated with the proposed development.
Chapter 8: Landscape and Visual	This chapter sets out the predicted effects upon local landscape and seascape, as well as a visual assessment of the proposed development upon sensitive receptors in proximity to the site.
Chapter 9: Other Issues	This chapter covers areas of the environment which are important to note but have not been identified as having potentially significant effects throughout the Scoping process (as detailed within Chapter 3: EIA Methodology and Scoping).
Chapter 10: Schedule of Mitigation	This chapter sets out a summary of all mitigation measures proposed within the EIAR within a schedule which can then be used to inform planning condition, marine licencing conditions and a (draft) construction environmental management plan (CEMP – see Technical Appendix 2.1 within Volume 3).
Chapter 11: Conclusions	This chapter summarises the key findings of the EIAR, discusses CEMP principles, and provides a Statement of Significance in relation to the proposed development.
Volume 2: Figures	This volume provides the figures relevant to each chapter within Volume 1 and is provided as a standalone volume to aid comparative assessment.
Volume 3: Technical Appendices	This volume provides the relevant technical background papers and studies which have informed each chapter.
Non-Technical Summary (NTS)	This provides an overview of the proposed development and summarises the key findings of the EIAR and key mitigation measures proposed, in an understandable and easy to read format.

2 CHAPTER 2: PROPOSED DEVELOPMENT

2.1 Site Description

2.1.1 Site Location and Description

The site is situated south east of Nigg Energy Park at an elevation of 5m above sea level and is centred at Ordnance Survey Grid Reference (OSGR) NH 79527 69016. The proposed entirety of the site boundary is approximately 11.27ha and is comprised of coastal waters and land of the former Dunskeath House, with derelict buildings associated with the former Dunskeath House situated within the site. The area above Mean Low Water Springs within the site boundary comprises approximately 4.78ha.

The site is dominated by bare ground with areas of dense and scattered scrub, grassland, tall ruderal vegetation and broadleaved trees. Sand and shingle above the high tide mark are also present in the south of the site and a sea wall exists in the west.

The Nigg Oil Terminal is located to the immediate north of Nigg Energy Park, with the B9175 and Fearn Peninsula to the east, the area where the Cromarty Firth meets the Moray Firth to the south (known as 'The Sutors') to the south, and Nigg Bay to the west (also part of the Cromarty Firth). Adjacent to the south-east of the site, the Cromarty Ferry crosses the entrance to the firth to the west of The Sutors in the summer season from May to September. Access to the facility can be gained from via the B9715.

The site is underlain by sandstone of the Raddery Formation, formed in a fluvial or estuary setting during the Devonian Period (383 – 393 million years ago). Coastal outcrops of the Devonian Period Cromarty Fish Bed Limestone are present to the west of the site. Further west metamorphic rocks (psammite and pelite) from the Moine Supergroup are present, these rocks were formed during the Neoproterozoic Era (541 – 1,000 million years ago).

Coastal superficial deposits in the vicinity of the site take the form of marine beach deposits, gravel, sand and silt formed up to 3 million years ago during the Quaternary Period. Immediately inland wind-blown sand deposits are present, also of the Quaternary Period, with glacial till present further inland.

The surrounding area contains several designations within a 5km radius, as illustrated within Figure 1.2 within Volume 2 of this EIAR. These include the following:

- Cromarty Firth Site of Special Scientific Interest (SSSI), situated approximately 0.59km to the west of the site, designated for intertidal mudflats and sandflats;
- Cromarty Firth Special Protection Area (SPA), situated approximately 0.59km west of the site, designated for a range of non-breeding birds;
- Cromarty Firth Ramsar Site, situated approximately 0.59km west of the site, designated for intertidal mudflats and sandflats and waterfowl assemblage;
- Rosemarkle to Shandwick Coast SSSI, situated approximately 0.76km east of the site, designated for maritime cliffs, geological features and breeding birds;
- Moray Firth Special Area of Conservation (SAC), situated adjacent to the east of the site and designated for bottlenose dolphin;

There are other designations at greater distance, for example the Dornoch Firth and Morrich More SAC, which are relevant to the marine ecology assessment but not in the immediate vicinity of the site.

Nearby settlements include the hamlets of Balnabruich and Balnapaling to the immediate north, with Castlecraig approximately 1.5km east, Cromarty approximately 1.5km to the south across the Firth, Nigg approximately 2km north and in the wider area, Arabella Ankerville, Ballintore and the A9 are further north.

The Port of Cromarty Firth (POCF) is the existing statutory harbour authority for the Cromarty Firth under the Cromarty Firth Port Order of Confirmation 1973 Act (as amended). Invergordon Port lies approximately 8.5km west of Nigg Port and is governed by POCF. Invergordon Port is central to Highland economy and is equipped to maintain, inspect and repair vessels and subsea infrastructure. POCF maintain overall control and management of shipping and vessel access/ egress from Nigg and the wider Cromarty Firth area. Northern European Cruise ships frequently make use of the extensive berthing at Invergordon, where several liners can be anchored simultaneously.

Oil fields that are serviceable by Nigg Energy Park are located in the Moray Firth, Fladen, Fortes, East and West Shetland; renewables fields including Firth of Forth, Moray Firth and Maygen are also in the vicinity and serviced by Nigg Energy Park. The Beatrice sub sea oil pipeline connects to oil storage facilities at Nigg Energy Park and traverses east across the Fearn Peninsula for 22km to the Beatrice Oil Field, which no longer produces oil. All oil field infrastructure including pipeline is scheduled for decommissioning from 2020-2024.

The Inner Moray Firth is considered to be part of the Ross-shire Growth corridor within the Inner Moray Firth Local Development Plan (2015), which sets out projected development objectives for the surrounding populations of Nigg, Alness, Evanton, Dingwall, Inverness and Invergordon which are well-placed to benefit from North Sea renewables and infrastructure investment such as the proposed development.

2.1.2 Existing Use

Nigg Energy Park is situated to the immediate north of the proposed development. A dry dock, extensive laydown and some 900m of heavy load bearing quayside (with depths of up to 12m) ensure versatility of services. Technical services currently provided by Nigg Energy Park include;

- Large scale and complex fabrication projects for subsea and offshore equipment;
- Shot blasting and painting of infrastructure;
- Specialist diving (i.e. anode replacement, subsea solutions);
- Survey and engineering;
- Architectural repair and refurbishment of offshore rigs;
- Specialist rig access and inspection;
- Construction and decommission of offshore and subsea infrastructure; and
- Import, storage, assembly and export of offshore wind generator components.

The South Quay development is situated to the west of the proposed development. In May 2013, an application to MSLOT and THC (reference 13/01825/FUL and amended by 13/04695/FUL) was submitted regarding an extension to the south quay harbour and berthing facilities at Nigg Energy Park, to accommodate large rig structures and floating production, storage and offloading vessels (FPSOs). The South Quay development was subject to a full EIA and was duly approved. Construction was completed in 2015 and the facility is now fully constructed and fully utilised, and in great demand with the Applicant's North Sea oil and energy sector clients.

2.2 Description of the Proposed Development

2.2.1 Summary of Component Parts

At an outline level, the proposed development comprises the following features:

- A proposed east quay of plan area 250m by 50m (0.88ha) constructed using perimeter piling to retain locally dredged material as infill, with concrete cope;
- Associated potential rock armouring;
- Dredging (via suction dredging, with barge mounted excavator used if needed) of approximately 165,000m^3 to achieve a minimum sea bed level at the main west facing berth of 12m below chart datum to facilitate the proposed development;
- High level lighting to quayside in accordance with Port Regulations
- Sea water extraction for fire-fighting capability
- Re-use of between 15,000m^3 and 30,000m^3 of dredged materials within the quay structure (dependent upon contractor's use of existing stockpiled material available on the Dunskeath lands);
- Part infilling of quay using up to 25,000m^3 of suitable material stockpiled on the site recovered from previous development excavations on Nigg Energy Park;
- Disposal of excess suitable dredged material (150,000m^3 maximum within The Sutors licenced disposal site at the mouth of the Cromarty Firth;
- Demolition and removal of buildings on site associated with the former Dunskeath House;
- Preparatory groundwork and associated landscaping for provision of a crushed rock laydown area for handling and temporary storage of plant and renewable energy components;
- A landscaped bund of 2m height on the eastern and northern extents of the laydown area
- Access provision from the B1975; and
- Security lighting and fencing associated with the laydown area.

Further details of these component parts including the methodology relating to their construction are contained within section 2.3.

The following drawings are contained within Volume 2of this EIAR and should be read alongside this chapter:

- Figure 2.1 – Overall Proposed Site Layout;
- Figure 2.2 – Existing Site Layout;
- Figure 2.3 – Entrance Feature;
- Figure 2.4 – Quay Layout;
- Figure 2.5 – Quay Dredge Areas;
- Figure 2.6 – Quay General Arrangement;
- Figure 2.7 – Quay Cross Sections; and
- Figure 2.8 – Illustrative External Lighting.

2.2.2 Component Parts by Consenting Regime

To demonstrate which elements fall under which consenting regime, Table 2.1 below sets out the component parts listed in section 2.2.1 above by their consenting regime. Figure 1.3 also demonstrates the Consenting Context.

Table 2.1: Proposed Development Components by Consenting Regime

Proposed Development Component	Consenting Regime	Competent Authority
Formation of quay including steel piling, infilling with reclaimed and dredged material and cathodic protection	Marine Licence – Construction	MSLOT
Rock Armouring (if required)		
Dredging	Marine Licence – Dredge and Disposal	MSLOT
Disposal of excess dredge material		
Demolition and removal of buildings	Town and Country Planning	THC
Preparatory groundwork and landscaped bund		
Provision of laydown area		
Access provision		
Security fencing and lighting		

2.2.3 Outline of Phasing

The proposed development is scheduled to begin in the last quarter of 2019 (Q4), with an estimated timetable of approximately 253 days from initial contractor mobilisation to completion, therefore a programme of approximately 10 months construction period is anticipated. This time period has been considered within the assessments for marine ecology (see Chapter 4: Marine Ecology), airborne noise (see Chapter 6: Noise) and vessel movements (see Chapter 8: Other Issues).

Overall timescales are dependent upon multiple factors including consent timescales, discharge of conditions and tendering processes including contractor mobilisation.

A detailed construction timetable would be included within the Construction Environmental Management Plan to be prepared post-consent, however programme assumptions and durations of each construction activity have been incorporated into modelling where applicable (i.e. within Chapter 6: Airborne Noise). Loosely, activities for the provision of the new quay can be broken into four stages, with outline timescales as follows:

- Phase 1: Creation of structures (including piling) - Month 1 to Month 7
- Phase 2: Dredging - Month 5 to Month 9;
- Phase 3: Concrete Works and Service Installation – Month 6 to Month 9;
- Phase 4: Surface layer and testing – Month 8 – Month 10.

In terms of the onshore works, it is proposed that landscaping and demolition works would occur between Month 1 and Month 4 (i.e. during the winter months beginning Q4 2019), with completion of all onshore works including

laying of concrete for laydown area, fencing, access and lighting being installed and completed in Q2 2020, around Month 9 of the project. It is likely to be that the earthworks and hardstanding preparation and formation would be carried out in phases, however for the purposes of environmental assessment it is assumed the worst case that this takes place in one continuous period.

Working times are generally assumed to be from 07.00 to 19.00 Monday – Sunday for construction activities, with 24 hours, 7 days a week operations for dredging works.

2.3 Description of Project and Construction Methodology

2.3.1 East Quay Project Sequence

The sections below set out a description of engineering works in sequence. Illustrations of the components described below can be viewed within Figure 2.1 onwards within Volume 2 of this EIAR.

2.3.2 Quay Phase 1 – Creation of Structures, including piling

2.3.2.1 Combi-Wall, King Piles and Sheet Piles

A combi-type quay wall structure design has been identified as a suitable robust, earth-retaining structure resistant to the bending movements and stresses typical of a port/marine environment. The structure is comprised of steel sheet pile sections which are founded by vibrating hammer to depths of 2-4m into the seabed/bedrock together with steel king piles, spaced at 3m intervals around the sea perimeter. The king piles extend deeper into the base material, offering greater bearing and integrity of structure. The king piles will be secured to the wall structure with steel tie rods when infilling has reached a suitable level, after which final infilling can be completed. Tie rods and a dedicated anchor wall will provide the structure with permanent support at high level.

Dependent upon final quay design when the contractor is appointed, it is possible that two piling rigs will be utilised to allow for an efficient piling phase, reducing the need for unnecessary construction noise and disturbance out-with the scheduled program of construction works. The rigs will be both land and water-based (via a temporary shore-side bund at the northern end of the new quay, and floating barge, respectively). This would allow the piling equipment to operate in dry conditions at most tidal states. In this instance, clean material will be deposited at the shore end of the new quay to provide a stable working platform from which the piling rig may operate. Once piling from the shore end is completed, the bund material, where deposited outwith the footprint of the new quay, will need to be removed and disposed of; either incorporated into the works, used elsewhere on-site or disposed of off-site. The imported material within the quay footprint will be retained. It is assumed that over 50% of the quay piling will be undertaken by piling equipment from a barge, with the remainder being completed by piling equipment from the temporary bund.

In addition to the outer walls of the quay structure, an anchor wall will be required to provide support to the piles at the south end of the pier. This wall will be formed of shorter sections of profiled steel sheet piles, and will be installed through the infill material using a vibrating hammer.

Vibrating hammer will be the primary method used to drive the piles, but given the risk of encountering dense layers of sea bed material it is likely there would be an element of limited impact-piling, it is recognised that underwater noise can cause distress to cetaceans and qualified Marine Mammal Observers (MMO) will be appointed to control the commencement of all piling operations over water (see Chapter 4: Marine Ecology and Technical Appendix 4.1). The appointed MMOs will adopt the suggested marine mammal mitigation zone of 500m prior to the commencement of piling and monitor any potential impacts of underwater noise and presence of mammals.

The Applicant has incorporated further proactive measures to reduce potential underwater and air-borne noise through the use of pre-treated socket structures in the construction method statement, especially where bedrock is encountered. Pre-treatment such as boring a socket will only be carried out in exceptional circumstances, i.e. where bedrock is encountered (or expected to be encountered) and where vibrating/impact hammering would not be effective. Bore arisings would be disposed of by pumping water in and out of the bore, allowing measures to prevent spill into the environment.

Suitable containment measures must be in place to prevent any spills or other releases of drilled arisings into the environment, and are further discussed within Chapter 5: Water Environment and Coastal Processes.

2.3.2.2 Tie Rods and Anchor Walls

Once the infill has been completed to a specific level, tie rods are installed to provide permanent support to the king piles at high level. The level of these tie rods will be such that they can be installed in the dry at least some of the time, i.e. within the tidal zone. Tie rods are generally lifted into position via crane and connected manually at either end. Tie rods are usually protected against corrosion by means of additional (sacrificial) steel, i.e. the tie rods are oversized initially. Tie rods can be installed through plastic ducting, in order to accommodate anticipated future settlement without creating any undue stress in the rods, or fitted with pins to allow some degree of rotation due to settlement.

At the north end of structure, approximately within the first 100m, and at the south wall, the main wall sections will be anchored by tie rods that are fixed to a dedicated anchor wall behind. The anchor wall is formed by profiled steel sheet pile sections driven into the infill material using a vibrating hammer.

During infill works care should be taken to ensure that the filling is brought up in layers so that the outward force form the infill is gradually transmitted to and resisted by the tie rods and the outer wall alignment is maintained.

2.3.2.3 Existing Wall Protection

It will be necessary to protect the existing steel sheet piling at the north end of the proposed quay where the sea bed level will be dredged potentially undercutting this wall. Whilst the final methodology for accomplishing this will be determined by the contractor, one method would consist of forming a bund, protected by a rock armour revetment, in front of the existing sheet piles.

A temporary wall formed using steel sheet piles may be constructed parallel to the existing piles to allow dredging to be undertaken in a controlled manner locally in stages down to the required -12mCD level with selected rock armour being placed against the temporary sheet piling at a stable slope. Following completion of the rock armoured slope the temporary piling can be withdrawn carefully using vibro-hammering. The material dredged during this operation, may be used to infill the quay above tie rod level.

An alternative method may be to secure provision of a new sheet piled wall directly in front of the existing wall that would be tied back to an anchor wall behind it. A third option may be to combine methods. It is assumed within this EIA that options are open.

2.3.3 Quay Phase 2 – Dredging and Disposal

This stage will involve dredging up to 165,000m^3 of material to create the required final sea bed levels at the proposed berth. Some dredged material would be used to infill the quay structure (approximately 15,000m^3 – 30,000m^3) with the remainder (a maximum of approximately 150,000m^3) to be disposed at The Sutors licenced disposal facility at the mouth of the Cromarty Firth. Discussion of the best practicable environmental option (BPEO) accompanies the dredge and disposal licence application for the proposed development and discusses potential re-use for material before concluding that disposal is the most appropriate option.

Marine ground investigations have confirmed that seabed material is predominantly comprised of loose to firm sands and gravels and is consequently suitable for removal by suction dredging. This method involves a specialised vessel lowering dredge pumps and hoses to the seabed to remove material.

Where dense pockets are encountered, a hydraulic excavator mounted upon a pontoon barge may be used. The arising material can either be brought ashore and stockpiled ahead of use as infill to the new quay, or deposited directly within the footprint of the quay or disposed of to the Sutors licensed disposal site (depending upon the contractor's construction methods/phasing).

It is considered that the initial dredging exercise in front of the existing sheet piled wall at the north end of the structure will be by barge-mounted excavator. This area of dredging will also remove some of the temporary bund used for the piling exercise that falls outside the face of the quay.

Whilst the suitability of the material has been generally assumed based on the ground investigation works undertaken, the continued suitability would be confirmed on-site by taking and testing samples at random intervals. Where the arising material is in excess of what is required it will be taken to and released at the Sutors' licensed disposal site.

Dredging and disposal would be subject to control by the mitigation measures as set out within the Marine Mammal Mitigation Plan (MMPP) within Technical Appendix 4.1 of Volume 3.

2.3.4 Quay Phase 3 – Concrete Works and Service Installation

2.3.4.1 Concrete Copes

Reinforced concrete cope beams will be installed across the head of the combi-wall structure around the perimeter of the quay. This will be achieved by erecting shuttering along the line of the piling and fixing reinforcement prior to placing/compacting concrete. It is anticipated that the concrete will be sourced from a concrete plant within a 20-mile radius of the site, meaning vehicles will need to travel to and from site to supply the concrete. Given the extent of concrete required it is likely that it will be placed using a suitably sized concrete pump.

2.3.4.2 Services

Once infill of the structure is complete, installation of any services such as electrical ducting, pipe trenches or surface water provisions can be completed. This will usually involve some excavation of the compacted infill material using an excavator to form a trench into which the ducts, pipework or any concrete trench units can be accurately placed. Once installed backfilling and compaction can be completed using mechanical means. Lighting towers of approximately 30m would be provided on the site perimeter to provide a minimum lighting level of 5 LUX on the site, in line with industry recognised lighting levels for similar projects.

2.3.5 Quay Phase 4 – Surface Layer and Finish

Following installation of services, the final surface layer can be placed. This will consist of a layer of a suitable geotextile being placed over the infill material, which is overlain by a layer of compacted crushed rock fill material approximately 500mm thick. The surface will be graded so that rainwater does not discharge direct to the marine environment.

Following placing of the surface layer, any applicable deck furniture can be placed and installed on the quay. This is likely to take the form of bollards, fenders, ladders, life-saving equipment (life buoys etc.) mechanical/electrical equipment (e.g. water/fire main pumps and valves, high-level lighting masts etc.).

It should be noted that ladders life-saving equipment and high mast lighting will be positioned to be in accordance with the requirements of the L148 "Safety in docks" Approved Code of Practice 2014.

At some time following installation of the main wall structures and dredging, sacrificial anodes will be fixed to the walls to provide protection to the steel against corrosion. This is usually, but not necessarily, one of the last items to be completed. Installation is usually by diver, who will initially fix steel fixing brackets to the steel piles of the wall via underwater welding. Once brackets are installed, anodes are placed within them and fixed by means of welding to provide electrical continuity between the anode, the bracket and the wall.

Given the weight of the anodes, these will usually be lowered into the water and held in place via a suitably sized crane sited on the quay structure, before being fixed in position by a diver.

2.3.6 Onshore Works

To prepare the onshore works, the net developable area will be cleared of all buildings and trees, stripped of unsuitable material, the subsoil reworked and graded where necessary (so that nowhere does the gradient exceed 2%), then compacted and surfaced with crushed rock.

The stripped topsoil (assumed to be an average of 150mm deep) will be placed in a bund around the north and east perimeter of the site. The bund will be approximately 14m wide at its base and up to 2m high with side slopes of 1 vertical to 2 horizontal giving a crest width of around 7m.

The entire site will have an external perimeter security fence 2.5m high with an access and double gate provided to retain the existing access point to the north. Feature gate pillars 2.5m high will be formed using suitable sandstone recovered from the building demolitions associated with the Dunskeath House outbuildings.

Drainage will be provided using a system of French drains and soakaways with high level overflow facilities to be provided to allow filtered surface water to overflow to the marine environment during extreme conditions.

Lighting towers (downlighters) of approximately 30m in height will be provided around the perimeter of the site to provide general lighting to the interior to allow the safe movement of components. Work areas would be lit temporarily by mobile tower light units, and be of an appropriate specification as not to adversely disrupt ecological receptors.

2.4 Alternatives Considered

The consideration of alternatives is in general terms limited to alternative locations, alternative development types, alternative development features or alternative construction techniques. The first three considerations are not relevant in relation to the proposed development, given that it has been identified to meet a particular operational need at that particular location, where relatively modest capital dredging would allow the construction and operation of the proposed development. A 'do nothing' approach is also not applicable.

In relation to alternative construction techniques, due to the design and build nature of the construction contract that will be procured by the Applicant, project engineers Arch Henderson have considered a parameter based approach which will be dependent upon the Contractor's final choices. This EIA is written in such a way that accommodates a worst case scenario based on current information. Considerations in respect of re-use and disposal, as well as the requirement to protect the existing wall (see section 2.3.2.3) contain some degree of flexibility, and accordingly the EIA technical chapters account for this as appropriate.

3 CHAPTER 3: EIA METHODOLOGY AND SCOPING

3.1 Introduction

The purpose of an EIA is to identify and evaluate the likely significant effects of a proposed development on the environment and to identify measures to mitigate or manage any significant adverse effects before a planning application is determined. The EIA process provides an opportunity to 'design out' adverse effects wherever possible. Where adverse effects cannot be designed out, mitigation measures can be proposed to avoid, compensate or reduce significant environmental effects to an acceptable level. EIA is an iterative process which allows feedback from stakeholder consultation and the results from baseline studies to be fed into the design process of the proposed development.

As the proposed development contains elements which are above and below Mean Low Water Springs (MLWS), consents will be required from The Highland Council (THC) and Marine Scotland (MSLOT). Accordingly, this EIA covers both consents under the TCP EIA Regulations and the Marine EIA Regulations.

In determining the requirement for an EIA, Schedule 1 of the TCP and Marine EIA Regulations sets out the types of development for which EIA is a mandatory requirement, whilst Schedule 2 lists the projects where the need for EIA is judged on a case-by-case basis, depending on whether a proposal is likely to cause significant environmental effects or is located in a sensitive area as defined by the EIA Regulations.

In this instance, the proposed development is considered to constitute Schedule 1 development as defined by both EIA Regulations as it falls under Regulation 8 (2) "*Trading ports, piers for loading and unloading connected to land and outside ports (excluding ferry piers) which can take vessels of over 1,350 tonnes*". This was confirmed during a pre-consultation meeting between the Applicant and the Council (18/01549/PREAPP), with a pre-application advice pack issued on 30th April 2018.

By virtue of its nature, size and location, the proposed development could potentially have (if unmitigated) significant adverse effects on the environment. The proposed development has been subject to both a Screening Decision and Scoping Opinion by THC and Scoping Opinion by MSLOT. Schedule 4 of the EIA Regulations specifies the information that should be included in an EIAR, and this chapter discusses where and how the EIAR meets the requirements of the EIA Regulations and the scoping exercise.

3.2 General EIA Methodology

Whilst each environmental topic discussed within the EIAR establishes its own methodology based upon good practice and relevant industry guidance, there is a basic methodological framework which is applied to EIA chapters.

This EIAR identifies, describes and assesses the likely significant impacts and their effects of the proposed development on the environment, both direct and indirect. The EIA process involves the following key stages:

- Baseline Studies – identification of existing environmental conditions through review of existing information, monitoring and field studies as required, to provide a baseline against which to assess the likely impacts of the proposed development;
- Potential impacts – identification of potential impacts and their resulting effects across the construction and operational phase (decommissioning of the proposed development itself is inappropriate to the proposed development), in relation to the design mitigation already implemented and where applicable, taking alternatives into account;

- Significance Assessment – evaluation of the effects, resulting from the identified potential impacts, to determine their significance, both positively and negatively, and incorporating cumulative effects;
- Mitigation and Monitoring – the identification of measures to avoid, reduce or compensate likely significant effects and the steps taken to monitor these potential environmental effects; and
- Residual Effects – identification of residual effects assuming successful implementation of mitigation.

For consistency where possible, the same headings have been used within the technical sections of this EIAR.

3.3 EIA Regulations 2017

As the proposed development is seeking consent under both TCPA EIA Regulations and Marine EIA Regulations and the Scoping process was commenced after the date the new Regulations were adopted, 16th May 2017, the 2017 Regulations supersede the 2011 Regulations across all elements of this project.

Following guidance set out in the Scottish Government's Planning Advice Note 1/2017, this EIAR follows the amendments and additions to the EIA Regulations. Notable additions to the EIA Regulations include:

- The requirement for the EIA to be based upon the Scoping Opinion which was provided (Regulation 5(3));
- A requirement to consider a *comparison* of environmental effects when considering alternatives (Regulation 5(2) (d));
- A replacement of the environmental factors to be considered as been amended from 'human being' to 'population and human health', and 'flora and fauna' replaced by 'biodiversity' (Schedule 4(4)).
- Discussion of the relevant baseline and predicted evolution of that baseline in the absence of the proposed development (Schedule 4(3));
- Cumulative assessment should take place in relation to existing and/or approved development (Schedule 3(1)(b)); and
- The requirement for a Competent Authority (i.e. Marine Scotland and THC for marine and terrestrial matters as appropriate) to include a 'reasoned conclusion' on the significant effects upon the environment within the Decision Notice published (Regulation 29(2)).

This EIAR discusses each of these points in turn within the relevant assessments, where applicable. It is the aim of the EIAR to allow sufficient information to allow both Competent Authorities to meet a 'reasoned conclusion' on the significance of effects.

3.4 The EIA Process

3.4.1 Sensitivity/Importance of Receptors

The sensitivity of the baseline conditions/receptors was defined according to the relative importance of existing environmental features on or in the vicinity of the site, or by the sensitivity of receptors which would potentially be affected by the proposed development.

Criteria for the determination of sensitivity (e.g. high, medium or low) or of importance (e.g. international, national, regional or authority area) were established for each topic assessment based on prescribed guidance, legislation, statutory designation and/or professional judgement. The criteria for each environmental parameter are provided in the relevant specialist chapters of this EIAR and may differ between technical topics dependent upon guidance which defines that approach (e.g. Chartered Institute of Ecology and Environmental Management).

3.4.2 Magnitude of Impact/Change

The methods for predicting the nature and magnitude of potential impacts vary according to the subject area. Quantitative methods of assessment can predict values that can be compared against published thresholds and indicative criteria in Government guidance and standards. However, it is not always possible to ascribe values to environmental assessments and therefore qualitative assessments are sometimes used. Such assessments rely on previous experience and professional judgement. The methodologies used for assessing each topic area are described within the specialist chapters of this EIAR.

In general terms, the magnitude of impact on environmental baseline conditions was identified through detailed consideration of the proposed development, taking due cognisance of any legislative or policy standards or guidelines, and/or the following factors:

- The degree to which the environment is affected, e.g. whether the quality is enhanced or impaired;
- The scale or degree of change from the existing situation;
- Whether the impact is temporary or permanent, indirect or direct, short-term, medium-term or long-term; and
- Any in-combination effects and potential cumulative effects.

In some cases the likelihood of impact occurrence may also be relevant and, where this is a determining feature of the assessment, this is clearly stated.

3.4.3 Significance of Effect

Significant effects are predicted where important resources, or numerous or sensitive receptors, could be subject to impacts of considerable magnitude. Effects are unlikely to be significant where low value or non-sensitive resources are subject to minor effects.

The criteria for determining the significance of an effect has been developed giving due regard to the following, where applicable;

- Sensitivity, importance or value of the resource or receptor;
- Extent and magnitude and duration of the impact; and
- Performance against environmental quality standards.

The criteria and assessment methodology used for each topic considered within this EIAR are set out within the 'Methodology' section of the respective EIAR chapter.

Unless otherwise stated, reported effects are considered to be adverse. It is however possible that some effects may be positive and these are stated and explained where appropriate.

The EIAR reports on the significance of the environmental effects as per the EIA Regulations. Although a significant effect does not always have to equate to an unacceptable effect, in order to ensure impartiality the EIAR does not comment on acceptability. The Planning Statement which accompanies this application (but is separate to the EIA process) makes a judgement on the acceptability of significant effects.

3.4.4 Design Mitigation and Residual Effects

There is a widely accepted strategy for mitigation outlined in Planning Advice Note (PAN) 1/2013 (and continued within Planning Circular 1/2017) which has been followed when considering the environmental effects of the proposed development. This comprises (in order of preference): avoidance, reduction and offsetting. Through

the evolution of the design, the Applicant has sought to identify appropriate mitigation measures and strategies as part of the proposed development.

Design mitigation is integral to providing an environmentally robust development whereby suggestions for mitigation have been taken into the design by SPA prior to 'design freeze'. This in-built mitigation represents, where applicable, environmental good practice and places a responsibility upon the Applicant to provide environmentally sustainable design solutions. Design rationale is further discussed within the Design and Access Statement which accompanies the wider application, along with a section within each EIAR chapter that comments on design mitigation incorporated into the development, and therefore individual assessments, before assessment is carried out. Therefore, where design mitigation has been employed, the impact assessment is carried out with this design mitigation in place as it forms a constituent part of the proposed development. Residual effects are generally then the effects that follow the assessment of proposed development with design incorporated.

Where complete avoidance of significant effects was not feasible during refinement of the site design, additional measures are identified in the relevant specialist chapters to reduce or offset effects where practical to do so. If no design mitigation has been identified, the assessment assumes no design mitigation and therefore effects are prior to any mitigation.

Residual effects of the proposed development are those that remain, assuming successful implementation of the identified mitigation measures. All remaining effects of the proposed development, following the application of mitigation measures, are summarised clearly and their significance stated, within the 'Residual Effects' section of each specialist chapter.

Where applicable, the EIAR also reports measures for enhancement which would be enshrined by planning/marine licence condition.

3.4.5 Cumulative Impact Assessment

Consideration of cumulative effects is a requirement of the EIA Regulations. By definition these are effects that result from incremental changes caused by past, present and reasonably foreseeable actions together with the proposed development. There are different types of cumulative effects (such as in-combination and sequential effects) and typically cumulative impact assessment is a key part of the EIA process which are assessed throughout each chapter. The sites which are incorporated into cumulative assessment are clearly highlighted within each technical chapter however in summary are restricted to developments which may have cumulative interaction in the marine environment as follows:

- Port of Cromarty Firth - Invergordon Service Base Phase 4 Development – Marine Licences consented in August 2018;
- Ardersier Port Ltd – Whiteness (Ardersier) Redevelopment of Former Fabrication Yard – Planning Permission in Principle granted by Highland Council in February 2019 (18/04552/PIP), Marine Licences (construction and capital dredge) pending; and
- Aberdeen Harbour Board – Aberdeen Harbour Expansion (Nigg Bay) – Marine Licences (dredging and construction) consented in November 2016.

It should be noted that the South Quay development which was consented in 2015 is fully built out and forms part of the baseline conditions incorporated into each environmental assessment.

3.5 Scoping as part of the EIA Process

Schedule 2 of the TCP and Marine EIA Regulations lists developments for which an EIA must be undertaken where there are likely to be significant effects on the environment by virtue of factors such as the nature, size or location of a proposed development. The sections below therefore set out the EIA Scoping process and accordingly documents how the EIAR was shaped into what is currently included and offers rationale to why other topics have been excluded, based on the likelihood of likely potential significant effects.

3.6 Scoping Requests and Opinions

3.6.1 Pre-Application Guidance

A Pre-Application Meeting was held on 30th April 2018 and was attended by the Applicant, THC and GH Johnston Planning Consultants. The meeting provided guidance upon statutory EIA procedure and associated timescales; clarification of marine and terrestrial consenting regimes and boundaries; and key issues to be presented at pre-application consultation. Key issues raised by THC and those bodies consulted at the Pre-Application Stage are set out below within Table 3.1:

Table 3.1: Summary of Pre-Application Issues

Environmental topic	Consultee(s)	Issues raised / discussed	Where Addressed
Natural Heritage	SNH	SNH stated the requirement for Designated Sites in proximity to the proposed development to be fully considered. The designated sites and their important ecological features to be included in the assessment are Moray Firth SAC (Bottlenose dolphin & subtidal sandbanks); Dornoch Firth and Morrich More SAC (Common seal); Cromaty Firth SPA & Ramsar (birds); Cromarty Firth Ramsar (habitats); Proposed Moray Firth SPA; Cromarty Firth SSSI; and European Protected Species (cetaceans)	Chapter 4: Marine Ecology sets out the impacts of the proposed development of the receptor designations, and their associated important ecological features. Technical Appendices 4.1 to 4.3 within Volume 3 of this EIAR set out a mitigation plan for marine mammals, the underwater noise modelling associated with marine mammal effects and the HRA.
Bats	SNH	European Protected Species – Bats and bat roosts are protected in Scotland. An appropriate level of survey is required to assess bat usage of outbuildings associated with Dunskeath House.	Chapter 8: Other Issues sets out bat survey findings, and results are contained within Technical Appendix 8.2. One bat was found using a building earmarked for demolition and will require licencing provision.
Landscape	SNH,THC	The site is a major feature within East Ross Special Landscape Area	Chapter 8: Other Issues summarises the findings of a Landscape and Visual Appraisal (LVA), which is contained within

Environmental topic	Consultee(s)	Issues raised / discussed	Where Addressed
		(SLA), and consideration of potential impacts are required within the EIA.	Technical Appendix 8.5 of Volume 3, with associated figures within Volume 2. The LVA discusses the inaccuracy of this response.
Cumulative	SNH	The EIA should consider other marine developments in the area which use the same waters in terms of vessel movements and potential impacts upon marine natural heritage. Collaboration of shared vessel movements for Invergordon (PoCF) and Nigg Energy Park should be undertaken. Supporting assessments of piling, underwater noise, sediment dispersion, vessel movement, construction lighting, EPS Licences for bats/cetaceans should inform the cumulative assessment.	Chapter 8: Other Issues, Section 8.7 Vessel Movement – details the cumulative impact of vessel movements and potential disturbance upon Marine Mammals. The associated Marine Mammal Mitigation is outlined in Chapter 4: Marine Ecology and further detailed within Appendices 4.1-4.3 contained within Volume 2 of this EIAR.
Water	SEPA,THC	SEPA requested that Works below Mean High Water Springs (MHWS), Site Layout, SuDS, Flood Risk, Existing Wastewater Outfalls, Pollution Prevention during Construction and Regulatory Requirements are considered within the Assessment	These items are addressed in full within Chapter 5: Water Environment and Coastal Processes.
Impacts upon the Marine Environment	Marine Scotland	MS outlined the need for Habitats Regulations Appraisal (HRA) and EPS in light of designations in proximity, Marine Non-Native Species, Water Framework Directive Assessment, pre-disposal sampling and analysis in addition to a cumulative assessment with PoCF Phase 4 works at Invergordon.	HRA, EPS and MNNS are outlined in Chapter 4: Marine Ecology and detailed within its relevant Technical Appendices. WFD and sediment findings are addressed in Chapter 5: Water Environment and Coastal Processes, with further sediment analysis outlined in the Best Practicable Environmental Option (BPEO) Report which accompanies this EIAR.
Historic Environment	THC	Built and Cultural Heritage	Built and Cultural Heritage impacts are considered in Chapter 8: Other Issues and within the Desk Based

Environmental topic	Consultee(s)	Issues raised / discussed	Where Addressed
			Assessment contained within Technical Appendix 8.4.
Noise	THC - EHO	The Highland Council request that Construction Noise (Airborne) and Operational Noise (Airborne) are accounted for within the Assessment.	Chapter 6: Airborne Noise assesses construction and operational noise impacts of the proposed development.
Transport	THC	Assessment of Impacts upon Existing Conditions, Proposed Development, Access, Section 96, Trunk Road Network. Requirement for Construction Traffic Management Plan (CTMP) and Operational Traffic Management Plan (OTMP).	These items are addressed within Chapter 7: Traffic and Transport.

3.6.2 Requests and Reponses

A request for a formal Scoping Opinion was submitted to The Highland Council on 5th February 2019 and registered on 14th February 2019 under Part 4, Regulation 17(1) of the TCPA EIA Regulations. This was accompanied by an EIA Scoping Report provided to assist the Council and statutory and non-statutory consultees to form an opinion upon the likelihood of potentially significant environmental effects and hence the topics to be assessed in the EIA (i.e. those topics where significant environmental effects could potentially result if unmitigated). The Scoping Report also provided an opportunity for consultees to comment upon suggested methodologies for technical assessment.

A Scoping Opinion was provided by THC dated 25th March 2019 and is included within Technical Appendix 3.1 of this EIAR. Formal responses were received from internal Council departments, SNH and SEPA.

A Scoping Request was also submitted to Marine Scotland on 5th February 2019 in respect of those elements of the proposed development being carried out below Mean Low Water Springs (MLWS)). A marine-based Scoping Opinion was provided by Marine Scotland on 1st May 2019 and is also included within Technical Appendix 3.1 within Volume 3 of this EIAR.

The primary issues addressed throughout the Scoping Responses from both THS and Marine Scotland are set out within Table 3.2 and Table 3.3 below, along with discussion of where these issues have been addressed, or where applicable why they have been Scoped out of the EIA. Table 3.2 discusses wider EIA requirements, whilst Table 3.3 directs the reader to where specific technical issues have been addressed. Where the same issue has been raised by more than one consultation body, it has only been referred to once in order to avoid duplication. Further information is available within each technical chapter regarding where this information is held within that chapter.

Table 3.2: Summary of Scoping Responses – general EIA considerations

Environmental Topic	Organisation	Scoping comment	How and where addressed?
General EIA Issues / Engineering			
Site Layout	SEPA	All maps must be based on an adequate scale with which to assess the information. This could range from OS 1:10,000 to a more detailed scale in more sensitive locations. Each of the maps must detail all proposed upgraded, temporary and permanent access tracks, excavations, buildings, borrow pits, pipelines, site compounds, laydown areas, storage areas and any other built elements.	It is not appropriate to detail these matters on all maps. All figures are provided at an appropriate scale. Figures 2.1 onwards within Volume 2 contain details of the proposed development and its engineering detail.
Mitigation	THC	Mitigation should be provided by design. A description of the measures envisaged to prevent, reducing and where possible offset any significant adverse effects on the environment must be set out within the EIA and be followed through within the application for development. The EIA should present a clear summary table of all mitigation measures associated with the development proposal. This table should be entitled draft Schedule of Mitigation.	A description of the mitigation measures for each technical discipline are contained within each technical chapter, whilst the overall Schedule of Mitigation is contained within Chapter 9 of this Volume.
Significant Effects	THC	The EIA needs to describe the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development. The effects of the development upon baseline data should be provided in clear summary points. The Council requests that when measuring the positive and negative effects of the development a four point scale is used advising any effect to be either strong positive, positive, negative or strong negative.	Each chapter covers the likely significant effects and uses methodology specific to that discipline whilst still being underpinned by the EIA Regulations. Each chapter contains commentary on residual effects and a statement of significance. The Applicant rejects the request to categorise all effects into a 'four point scale' as this is not appropriate to industry-recognised good practice EIA guidance for individual topics.

Environmental Topic	Organisation	Scoping comment	How and where addressed?
		The Applicant should provide a description of the forecasting methods used to assess the effects on the environment.	
Alternatives	THC	A statement is required which outlines the main development alternatives studied by the applicant and an indication of the main reasons for the final project choice. This is expected to highlight some or all of the following: • locational criteria and economic parameters used in the initial site selection; and • the environmental effects of the different options examined	Chapter 2: Proposed Development sets out how the Applicant has arrived at the design for which consent is being sought.
Dredge material	Marine Scotland	Modelling of the dredge impacts (i.e. including the dredge disposal site) should be undertaken to assess the impact on nearby shellfish aquaculture sites. All disposal of dredge material associated with the works should be in accordance with the standard dredging best practice protocol applied by Marine Scotland to all dredging operations in the Moray Firth. Dredge and disposal operations and coastal construction works have the potential to impact upon marine habitats and associated benthic communities i.e. pollution from mobilising site contaminants, alteration to marine habitats and smothering. A dredging plan may be included as part of the CEMP, detail protection of sub-tidal sand banks and other IEF.	These matters are considered in full within Chapter 4: Marine Ecology, Technical Appendix 4.3: Habitats Regulations Appraisal and Chapter 5: Water Environment and Coastal Processes. The accompanying Best Practicable Environmental Option (BPEO) Report provides analysis of all disposal options.
Regulatory Advice	SEPA, Marine Scotland	CAR - Authorisation is required for under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) for any discharges or works in the vicinity of inland surface waters. Also required for the general management of surface water run-off from a construction site, including access tracks.	Chapter 5: Water Environment, Soils and Coastal Processes considers advice and discussion pertaining to surface water, run-off and soil management.

Environmental Topic	Organisation	Scoping comment	How and where addressed?
		Peat/Soils – Management of surplus may require an exemption under The Waste Management Licensing (Scotland) Regulations 2011. Proposed crushing or screening will require a permit under The Pollution Prevention and Control (Scotland) Regulations 2012.	
Cumulative	SEPA, Marine Scotland	Other terrestrial and marine based developments which are committed through the planning and marine licencing systems should be considered as part of the cumulative assessment; namely Invergordon Phase 4 Works, Ardersier and Nigg Bay, Aberdeen.	Cumulative impacts have been addressed where relevant within each technical chapter of this EIAR.
Marine Planning and Scotland's National Marine Plan (NMP) 2015	Marine Scotland	The EIA for the proposed development should be in accordance with the UK Marine Policy Statement and the National Marine Plan.	It is not for the EIA to assess its level of compliance and accordance with plans and policies. The accompanying Planning and Design Statement prepared by GH Johnston Ltd discusses this.

Subject-specific comments are included within Table 3.3 as per the below. Full descriptions and rationale for how and where the comments are addressed are contained within the relevant EIAR chapter.

Table 3.3: Subject-specific Scoping issues

Environmental topic	Consultee(s)	Issues raised / discussed	Where Addressed
Marine Ecology	Marine Scotland Science (MSS), SNH, THC	Impacts upon designated sites and European Protected Species, including cumulative assessment of other developments. Habitats Regulations Appraisal (HRA) required. Consideration of Priority Marine Features also required. Understanding of impact upon shellfish sites should be understood.	Chapter 4: Marine Ecology sets out assessment of impacts and effects upon receptors and associated mitigation, whilst Technical Appendices 4.1 to 4.3 within Volume 3 of this EIAR set out a mitigation plan for marine mammals, the underwater noise modelling associated with marine mammal effects and the HRA
Ornithology	THC	Impacts upon designated sites.	Ornithology was scoped out of full EIA assessment, and an appraisal of ornithological interests is contained in Technical Appendix 8.3 within Volume 3 of this EIAR. Appropriate Assessment is contained within Technical Appendix 4.3, and the main findings summarised in Chapter 8: Other Issues.
Airborne Noise	THC	Construction noise assessment would be required under certain circumstances under BS5228 guidelines, operational noise assessment should be undertaken to understand current and future emissions.	Both assessments have been carried out and reported within Chapter 6: Airborne Noise and associated documents.
Water and Coastal Processes	SEPA, THC	Matters to consider within the hydrological assessment include flood risk, surface water drainage, wave direction, geomorphology and pollution prevention.	These matters are considered in full within Chapter 5: Water and Coastal Processes.
Traffic and Transport	THC, Marine Scotland	THC required consideration of site access, current and future traffic levels with respect to the road network, core paths and recreational routes and construction phasing.	These items are addressed within Chapter 7: Traffic and Transport.
Cultural Heritage	THC, Historic Environment	Assessment is required in respect of the former Dunskeath House, as well as Scheduled Monuments, Conservation Areas, Listed	These matters are addressed within Chapter 8: Other Issues, as well as

	Scotland, Marine Scotland	Buildings and Gardens and Designed Landscapes.	within Technical Appendix 8.4: Desk Based Assessment.
Landscape and visual	THC, Marine Scotland	THC require a landscape and visual appraisal to be undertaken in respect of representative views and users within the Cromarty Firth.	Full landscape and visual impact assessment was scoped out (see Chapter 8: Other Issues) however a Landscape and Visual Appraisal is contained within Technical Appendix 8.5 of Volume 3, with associated figures within Volume 2.
Bats	SNH	Consideration of bats with regards to the potential demolition of buildings should be considered.	Bats have been considered and relevant surveys and results are contained within Technical Appendix 8.2.
Other terrestrial ecology	THC	Consideration should be given to trees, vegetation and other potential habitats on site.	This is addressed within Chapter 8: Other Issues and within Technical Appendix 8.1: Phase 1 Habitat and Protected Species Report.

3.7 Final Content and Structure of the EIA Report

Accordingly based on the above summary of consultation responses and initial baseline collection, it was possible to complete the EIA with a clear focus on the main topics requiring full and detailed impact assessment. These topics are listed below and this Volume contains a chapter for each:

- Marine Ecology (including Underwater Noise);
- Water Environment, Soils and Coastal Processes;
- Noise;
- Traffic and Transport; and
- Other Issues.

For clarity, Terrestrial Ecology; Ornithology; Air Quality; Landscape and Visual; and Cultural Heritage have been scoped out of full assessment.

The chapters which are scoped in are supported by technical assessment reports where necessary and which ae contained within Volume 3: Technical Appendices of the EIAR. Those environmental topics which are not considered at EIA level given the either the level of project information available at this stage, or based upon an unlikely event of significant effects, are included for information within Chapter 8: Other Issues. This includes discussion of Terrestrial Ecology, Ornithology, Air Quality, Landscape and Visual, Cultural Heritage, Navigation and Vessel Movement, Population and Human Health, Climate Change and Natural Disasters.

The EIAR also contains chapters on the schedule of mitigation associated with the EIA (Chapter 9: Schedule of Mitigation) and a brief chapter (Chapter 10: Conclusions) which summarises the EIA and contains a statement of significance.

4 CHAPTER 4: MARINE ECOLOGY

4.1 Introduction

EnviroCentre Ltd was commissioned by the Applicant to undertake a Marine Ecological Impact Assessment (EcIA) of the proposed development, in order to identify and describe any likely significant effects arising from it. This chapter details the specialist studies undertaken and the results of the assessment.

Terrestrial ecological baseline survey has been undertaken at the site (Technical Appendix 8.1); and targeted assessments have been undertaken for bats (Technical Appendix 8.2) and birds (Technical Appendix 8.3), with the summary held within the EIAR 'Other Issues' chapter. Reporting is contained within standalone reports accompanying the application to the Council.

The assessment has been carried out according to the latest guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM)[3] by experienced and competent ecologists who are all Members of CIEEM and follow its Code of Professional Conduct. It is supplemented by the figures and background information contained within the following:

- Technical Appendix 4.1: Marine Mammal Protection Plan (MMPP);
- Technical Appendix 4.2: Underwater Noise Report (undertaken by Irwin Carr); and
- Technical Appendix 4.3: Habitats Regulations Appraisal (HRA).

Figure 1.1 shows the site boundary, which is referred to as 'the site' throughout this chapter. Details of the site and the proposed development are provided in Chapter 2: Proposed Development.

The purpose of this chapter is to:

- Identify and describe all potentially significant ecological effects associated with the proposed development;
- Set out the mitigation measures required to ensure compliance with nature conservation legislation and to address any potentially significant ecological effects;
- Identify how mitigation measures will be secured; and
- Provide an assessment of the significance of any residual effects.

4.2 Scoping and Consultation

Based on the results of the initial desk-based assessments, the proposed scope of the Marine EcIA included the following:

- Designated sites;
  - Moray Firth Special Area of Conservation (SAC) (bottlenose dolphins and sub-tidal sandbanks);
  - Dornoch Firth and Morrich More SAC (Harbour seal); and
  - Cromarty Firth Site of Special Scientific Interest (SSSI) (mudflats, sandflats and saltmarsh habitats).
- Marine mammals (cetaceans and seals);
- Migratory fish (salmon and trout; European eel, sea lamprey and river lamprey); and
- Cromarty Bay and Udale Bay Shellfish Water Protected Area.

[3] CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, 2nd edition. Available online: https://cieem.net/resource/guidelines-for-ecological-impact-assessment-ecia/ last accessed 15/04/2019

The following habitats and species were scoped out of the assessment for the following reasons:

- Terrestrial ecology – Impacts on terrestrial habitat will be mitigated by design. Further targeted assessments have been undertaken for bats, with the summary held within the EIAR 'Other Issues' chapter. Reporting is contained within a standalone bat report accompanying the application to the Council, however based on baseline survey, a full EcIA is not required.
- Marine fish – Any occurrence of spawning or utilisation of benthic habitat in the vicinity of the proposed development as a nursery ground by marine fish species is envisaged to be small and of low significance. Furthermore, there are no known species of marine fish resident within the Cromarty Firth that are currently classified as rare, or afforded any legal protection at either International or National level. Species present within the Moray Firth include flounder, wrasse and sea bass. These will all spawn in deeper water and therefore it is predicted that these species will not be affected by the proposed development.
- Intertidal and benthic ecology - Desktop assessment of benthic ecology has been previously undertaken to inform an Environmental Statement (ES), relating to the extension of Nigg South Quay[4]. It was assessed that due to extensive dredging and disturbance both in the past and presently, to maintain approach channels, the benthic ecology would be in poor condition as a result.

In order to finalise and agree the scope of the EcIA, a Scoping Report was prepared and a Scoping Request was submitted to THC (February 2019). A summary of the relevant responses is provided in Table 4-1 below:

Table 4.1: Summary of Consultation Responses

Organisation	Consultation Response	How and where addressed
Marine Scotland Science (MSS), SNH, THC	Impacts upon designated sites and European Protected Species, including cumulative assessment of other developments. Habitats Regulations Appraisal (HRA) required. Consideration of Priority Marine Features also required. Understanding of impact upon shellfish sites should be understood.	Chapter 4: Marine Ecology sets out assessment of impacts and effects upon receptors and associated mitigation, whilst Technical Appendices 4.1 to 4.3 within Volume 3 of this EIAR set out a mitigation plan for marine mammals, and the underwater noise modelling associated with marine mammal effects and the HRA. The impacts of the development upon shellfish sites in the vicinity are assessed, by collating information presented in Chapter 5: Water Environment and Coastal Processes, and the Best Practicable Environmental Option (BPEO) report, present within the Non-Technical Summary.
Marine Scotland	The Scottish Ministers concur with the view that marine ecology should be scoped in to the EIA Report to address marine mammals, migratory fish and also benthic ecology to address the points raised by the consultees.	Chapter 4: Marine Ecology sets out the assessment of impacts and effects upon receptors and associated mitigation, whilst Technical Appendices 4.1 to 4.3 within Volume 3 of this EIAR set out mitigation strategies.

[4] Grontmij (2013) South Quayside Extention, Nigg Energy Park, Nigg

Organisation	Consultation Response	How and where addressed
University of Aberdeen Lighthouse Field Station	A conference call was held on 11th June 2019 with Dr Paul Thompson of the Aberdeen University Lighthouse Field Station, who is a recognised expert in marine mammals in the north-east of Scotland. The call discussed the approach the assessment and associated mitigation proposes.	The mitigation measures proposed within this chapter and within Technical Appendix 4.1: Marine Mammal Protection Plan, have been derived in consultation with Dr Thompson.

4.2.1 Zone of Influence

The CIEEM Guidelines identify the zone of influence as the area over which ecological features may be subject to significant effects as a result of the proposed development and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries. Activities associated with the construction, operation (best and worst-case operating conditions), decommissioning and restoration phases should be separately identified. The zone of influence will vary for different ecological features depending on their sensitivity to an environmental change. It may be appropriate to identify different zones of influence for different features. The features affected could include habitats, species, and ecosystems and the processes on which they depend.

The scoping exercise narrowed down the important ecological features. The zone of influence has been set for each one (see section 4.2.3 below).

4.2.2 Key Ecological Impacts

The proposed development would comprise the following main activities prior to, during and after the construction period, which could potentially have a significant negative impact on ecology in the absence of effective mitigation:

Construction phase

- Direct loss of intertidal and subtidal habitats in the footprint of the development;
- Underwater noise which could cause lethal or sub-lethal effects on bottlenose dolphin which are a qualifying feature of the Moray Firth SAC;
- Underwater noise which could cause lethal or sub-lethal impacts on marine mammals and fish;
- Underwater noise or above ground noise disturbance to harbour seals which are a qualifying feature of the Dornoch Firth and Morrich More SAC;
- Increases in suspended sediment and/or deposition from dredging and construction activities altering the sandflat and mudflat habitats, which are qualifying features of the Cromarty Firth SSSI;
- The spread of Invasive Non-Native Species (INNS) as a result of dredging activities and an increase in vessel movement at the site;
- Cumulative impacts from other ongoing developments (primarily underwater noise) causing lethal or sub-lethal impacts on marine mammals and fish;
- Cumulative impacts from other ongoing developments (above ground noise) causing disturbance to seals using haul-out sites in the vicinity;
- Light disturbance to marine mammals and fish during the hours of darkness through the use of artificial lighting;
- Increases in suspended sediment and/or deposition from dredging and construction activities creating physical disturbance to marine mammals and fish, particularly bottlenose dolphins at The Sutors;
- Release of contaminants from disturbed sediments;

- Pollution from fuels, oils etc. into the marine environment;
- Changes to coastal processes including tidal flows, local current and sediment movement; and
- Impacts on marine habitats and the associated intertidal and benthic; namely shellfish, communities during dredging and disposal operations.

Operational phase

It is anticipated that the proposed development will comprise activities with the potential to impact on marine ecology in the area post-completion as follows:

- The increase in vessel movement occurring throughout the Moray Firth SAC and the known range of bottlenose dolphin;
- The increase in vessel movement occurring in proximity to the Dornoch Firth and Morrich More SAC and seal haul-out sites in the vicinity of the proposed development site;
- The spread of INNS as a result of an increase in the number of vessels utilising the proposed development; and
- Increased vessel numbers post construction causing disturbance and/or potentially death or injury to marine mammals.

4.2.3 Important Ecological Features

Table 4-2 below lists the Important Ecological Features (IEFs) and their respective zones of influence.

Table 4-1: IEFs and Zones of Influence

IEF	Zone of Influence
Moray Firth SAC	Within the SAC and the furthest extent from the proposed development where underwater noise affects bottlenose dolphin.
Dornoch Firth and Morrich More SAC	Within the furthest extent from the proposed development where underwater noise affects harbour seals within the Moray Firth that frequent the Dornoch Firth and Morrich More SAC.
Cromarty Firth SSSI	Within the Cromarty Firth SSSI and the furthest extent from the proposed development where sediments making up the SSSI's features, sandbank and mudflat habitats, could be altered.
Bottlenose dolphin	Within the Moray Firth (adjacent to the proposed development) and the furthest extent from the proposed development where underwater noise affects dolphin species.
Harbour porpoise	Within the Moray Firth (adjacent to the proposed development) and the furthest extent from the proposed development where underwater noise affects harbour porpoise.
Harbour seal	Within the Moray Firth (adjacent to the proposed development) and the furthest extent of where underwater noise affects seal species.
Grey seal	Within the Moray Firth (adjacent to the proposed development) and the furthest extent of where underwater noise affects seal species.
Atlantic salmon	Within the migratory paths to the Conon, Alness, Balnagowan and Glass Rivers through or adjacent to the proposed development.
Sea trout	Within the migratory paths to the Conon and Alness rivers through or adjacent to the proposed development.
European eel	Within the migratory path to and from the Moray Firth through or adjacent to the proposed development.

IEF	Zone of Influence
Sea lamprey	Within the migratory path to and from the Moray Firth through or adjacent to the proposed development.
River lamprey	Within the migratory path to and from the Moray Firth through or adjacent to the proposed development.
Cromarty South and Udale Bay Shellfish Waters Protected Area	Within Cromarty Bay and Udale Bay.

4.3 Policy, Legislation and Guidance

The compilation of this chapter has taken cognisance of the legislation, planning policies, conservation initiatives and general guidance presented in Table 4-3 below.

Table 4-2: Legislation, Planning Policies, Conservation Initiatives and General Guidance Related to Ecology

Scope	Document
International	• International Union for the Conservation of Nature (IUCN) Red List of Threatened Species • The Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention)
European	• Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (The Habitats Directive) • Environmental Impact Assessment (EIA) Directive (2014/52/EU) on assessing the potential effects of projects on the environment
National (UK)	• The Marine and Coastal Access Act 2009 (MCAA)
Scottish	• The Conservation (Natural Habitats, &c.) Amendments (Scotland) Regulations 2007 (The Habitats Regulations) • The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 • The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 • The Marine (Scotland) Act 2010 • The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 • The Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. • The Water Environment (Shellfish Water Protected Areas: Environmental Objectives etc.) (Scotland) Regulations 2013.

Scope	Document
Planning Policy & Other Advice Documents	• BS 42020:2013: Biodiversity Code of Practice for Planning and Development 2013 • Scottish Biodiversity List • The Ross and Cromarty (East) Biodiversity Action Plan (RCBAP) (2004), part of the wider Highland Biodiversity Action Plan (HBAP) 2015-2020 • The Scottish Biodiversity Strategy 2004 and 2013 • Scottish Planning Policy (SPP) 2014 • The Highland Council Local Development Plan 2012; and the Highland Wide Local Development Plan – Post Main Issues Report Interim Position (2016) • The Inner Moray Firth Local Development Plan (LDP) (2015) • CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition

The regulatory and policy context most relevant to ecology is described below.

4.3.1 International Union for the Conservation of Nature (IUCN) Red List of Threatened Species

The IUCN Red List provides taxonomic, conservation status and distribution information on plants, fungi and animals that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those plants and animals that are facing a higher risk of global extinction (i.e. those listed as Critically Endangered, Endangered and Vulnerable). The IUCN Red List also includes information on plants, fungi and animals that are categorized as Extinct or Extinct in the Wild; on taxa that cannot be evaluated because of insufficient information (i.e., are Data Deficient); and on plants, fungi and animals that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme (i.e., are Near Threatened).

4.3.2 Council Directive 92/43/EEC on the conservation of Natural Habitats and of Wild Flora and Fauna (The Habitats Directive)

Adopted in 1992, the Habitats Directive aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. It forms the cornerstone of Europe's nature conservation policy with the Birds Directive and establishes the EU wide Natura 2000 ecological network of protected areas, safeguarded against potentially damaging developments.

Over 1,000 animal and plant species, as well as 200 habitat types, listed in the Directive's Annexes are protected in various ways:

- Annex II species (about 900): core areas of their habitat are designated as Sites of Community Importance (SCIs) and included in the Natura 2000 network. These sites must be managed in accordance with the ecological needs of the species.
- Annex IV species (over 400, including many Annex II species): a strict protection regime must be applied across their entire natural range within the EU, both within and outside Natura 2000 sites.

Annex V species (over 90): Member States must ensure that their exploitation and taking in the wild is compatible with maintaining them in a favourable conservation status.

4.3.3 The Marine and Coastal Access Act 2009

The disposal of sediments to sea and any dredging for navigational purposes are regulated by the MCAA as licensable activities. Therefore, any application would need to consider impacts from both the dredging and the disposal activities. S69 of the MCAA states that in determining an application for a licensable activity, the appropriate licensing authority must have regard to a) the need to protect the environment, b) the need to protect human health, c) the need to prevent interference with legitimate uses of the sea, and such matters as the authority thinks relevant.

4.3.4 The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014

It is an offence to intentionally or recklessly harass seals at significant haul-out sites.

4.3.5 The Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003

Section 23 (3) of the Act makes it an offence to obstruct or impede salmon in their passage to any spawning bed, bank or shallow during the annual close time. With regard to activities undertaken by companies that have the potential to negatively impact upon migratory salmonids, Section 57 (1) of the Act also states that: "Where an offence under any of the provisions of this Act committed by a body corporate is proved to have been committed with the consent or connivance of, or to be attributable to any neglect on the part of, any director, manager, secretary or other similar officer of the body corporate, or any person who was purporting to act in any such capacity, that person as well as the body corporate shall be guilty of the offence and shall be liable to be proceeded against and punished accordingly".

4.4 Methodology

The final scope of the EcIA includes the following elements, which are further described in the sections below:

- A description of the zone of influence of the proposed development;
- The identification of key ecological impacts that should be addressed through project design; and
- A list of the important ecological features to be considered in the EcIA.

In order to anticipate the potential marine ecological sensitivities at the site, a desk study was conducted at the Scoping stage. This included gathering information from the following sources:

- The SNH Sitelink website[5] to search for sites considered to be ecologically connected to the proposed development site;
- The Ross and Cromarty (East) Biodiversity Action Plan (RCBAP)[6] (2004), part of the wider Highland Biodiversity Action Plan (HBAP)[7] 2015-2020;
- The Highland Council Local Development Plan 2012[8]; and the Highland Wide Local Development Plan – Post Main Issues Report Interim Position (2016)[9];
- The Inner Moray Firth Local Development Plan (LDP) (2015)[10];

[5] SNH SiteLink available at: http://gateway.snh.gov.uk/sitelink/ last accessed 16/04/2019
[6] RCBAP available at: http://www.highlandbiodiversity.com/userfiles/file/acion-plans/ross_cromarty.pdf last accessed 31/05/2019
[7] HBAP available at: http://www.highlandbiodiversity.com/highland-bap.asp last accessed 16/04/2019
[8] Highland Council LDP available at: https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/199/highland-wide_local_development_plan last accessed 16/04/2019
[9] Interim Issues Report available at: https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/199/highland-wide_local_development_plan last accessed 16/04/2019
[10] Inner Moray Firth LDP available at: https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/202/inner_moray_firth_local_development_plan last accessed 16/04/2019

- UK BAP[11];
- Scottish Biodiversity List (SBL)[12];
- Scottish Natural Heritage (SNH)[13, 14 & 15];
- Highland Biological Recording Group (HBRG)[16];
- Seawatch Foundation[17 & 18];
- Whale and Dolphin Conservation (WDC)[19];
- The Joint Nature Conservation Committee (JNCC)[20 & 21];
- Scottish Government Designated Sites: Seal Haul out Sites[22]; and
- Marine Scotland Fisheries Data (MS)[23].

4.4.1 Field Studies

No field studies were undertaken to inform the marine ecology chapter of the EIAR; the baseline information relating to designated sites, marine mammals, fish and shellfish sites was gained from the desk study using the above listed sources of information.

4.4.2 Evaluation of Important Ecological Features

The evaluations are applied to those sites, habitats and species that have been scoped in to the assessment and those that are predicted to be affected by the proposed development. These are termed Important Ecological Features (IEFs).

European, national and local governments and specialist organisations have together identified a large number of sites, habitats and species that provide the key focus for biodiversity conservation in the UK and Ireland, supported by policy and legislation. These provide an objective starting point for identifying the important ecological features that need to be considered. Table 5-4 shows a procedure for determining the geographical level of importance of site designations, habitats and species. Where a feature is important at more than one level in the table, its overriding importance is that of the highest level. Usually only the highest level of legal protection is listed.

Table 4-3: Geographical Level of IEFs

Level of Importance	Sites	Habitats	Species
International	Designated, candidate or proposed SAC, SPAs and	A viable area of habitat included in Annex I of the EC	A European Protected Species; an IUCN Red Data

[11] UKBAP available at: http://jncc.defra.gov.uk/ukbap last accessed 16/04/2019
[12] SBL available at: http://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL last accessed 16/04/2019
[13] SNH: Marine Mammals available at: https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammals last accessed 16/04/2019
[14] SNH Site Condition Monitoring of bottlenose dolphins within the Moray Firth Special Area of Conservation 2014-2016 (2018) available online at: https://www.nature.scot/snh-research-report-1021-site-condition-monitoring-bottlenose-dolphins-within-moray-firth-special last accessed 16/04/2019
[15] SNH Seals in Scotland available at: https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammals/seals last accessed 16/04/2019
[16] HBRG available at: www.hbrg.org.uk/ last accessed 09/04/2019
[17] Seawatch Foundation Cetaceans of Western Scotland available at: http://seawatchfoundation.org.uk/wp-content/uploads/2012/07/WesternScotland.pdf last accessed 16/04/2019
[18] Seawatch recent sightings available at: http://seawatchfoundation.org.uk/legacy_tools/region.php?output_region=3 last accessed 16/04/2019
[19] WDC sightings data available at: http://www.whaledolphintrust.co.uk/sightings-recent-sightings.asp last accessed 16/04/2019
[20] JNCC Statutory Nature Conservation Agency Protocol for Minimising the Risk of Injury to Marine Mammals from Piling Noise (2010) available at: http://jncc.defra.gov.uk/pdf/JNCC_Guidelines_Piling%20protocol_August%202010.pdf last accessed 19/03/2019
[21] Reid, J B, Evans, P G H, and Northridge, S P. JNCC Atlas of Cetacean Distribution in north-west European waters (2003) available at: http://jncc.defra.gov.uk/page-2713#download last accessed 02/04/2019
[22] Scottish Government seal Haul-out maps available at: http://www.gov.scot/Topics/marine/marine-environment/species/19887/20814/maps last accessed 16/04/2019
[23] MS fisheries data https://data.marine.gov.scot/dataset/salmon-and-sea-trout-fishery-statistics-2017-season-reported-catch-and-effort-method last accessed 16/04/2019

Level of Importance	Sites	Habitats	Species
	Ramsar sites; UNESCO (Ecological) World Heritage Sites; UNESCO Biosphere Reserves; Biogenetic Reserves.	Habitats Directive; a habitat area that is critical for a part of the life cycle of an internationally important species.	Book species that is globally Vulnerable, Endangered or Critically Endangered; a Category An internationally important bryophyte assemblage[24].
National (UK)	SSSI/Areas of Scientific Interest (ASSI); National Nature Reserves (NNR); Nature Conservation Review Sites; Marine Conservation Zones (MCZ) (UK offshore).	A viable area of priority habitat listed in the UKBAP; an area of habitat fulfilling the criteria for designation as an SSSI/ASSI or MCZ; a habitat area that is critical for a part of the life cycle of a nationally important species.	An IUCN Red Data Book species that is Vulnerable, Endangered or Critically Endangered in the UK; a species that is Rare in the UK (<15 10km grid squares); a priority species in the UKBAP; a Schedule 5 (animal) or Schedule 8 (plant) species included in the Wildlife and Countryside Act 1981; a Category A nationally important bryophyte assemblage.
National (Scotland)	National Parks; MPA; Marine Consultation Areas	Habitats of principal importance for biodiversity in Scotland.	Species of principal importance for biodiversity in Scotland.
County / Metropolitan	Local Nature Reserves; Wildlife Trust Reserves; Woodland Trust Sites; Royal Society for the Protection of Birds Sites; Local Wildlife Sites.	HBAP habitats noted as requiring protection.	A species that is included in the HBAP; an assemblage of species that are scarce at the county level.

4.4.3 Impact Assessment

The assessment of impacts describes how the baseline conditions would change as a result of the project and its associated activities and from other developments. The term 'impact' is used commonly throughout the EIA process and is usually defined as a change experienced by a receptor (this can be positive, neutral or negative). The term 'effect' is commonly used at the conclusion of the EIA process and is usually defined as the consequences for the receptor of an impact after mitigation measures have been taken into account. The EIA Regulations specifically require all likely significant effects to be considered. Therefore, impacts and effects are described separately and the effects for the IEFs are assessed as being either significant or not according to the importance of the IEF.

Significant cumulative effects can result from the individually insignificant but collectively significant effects of actions taking place over a period of time or concentrated in a location, for example:

- Additive / incremental: multiple activities/projects (each with potentially insignificant effects) added together to give rise to a significant effect due to their proximity in time and space; or

[24] Averis, A.B.G, Genney, D.R, Hodgetts, N.G, Rothero, G.P. & Bainbridge, I.P. 2012. Bryological assessment for hydroelectric schemes in the west highlands – 2nd edition. Scottish Natural Heritage Commissioned Report No. 449b (available online at www.snh.org.uk/pdfs/publications/commissioned_reports/449b.pdf)

- Associated / connected - a development activity 'enables' another development activity e.g. phased development as part of separate planning applications. Associated developments may include different aspects of the project which may be authorised under different consent processes.

Ongoing development associated with the Port of Invergordon, Ardersier Port and Aberdeen (South) Harbour was scoped in to be assessed cumulatively with the proposed development. The combined magnitude of impact and significance is assessed for each IEF if construction events take place simultaneously.

Assessment Criteria - Magnitude

The CIEEM guidance states that when describing changes/activities and positive or negative impacts on ecosystem structure and function, reference should be made to the following parameters:

- Magnitude;
- Extent;
- Duration;
- Reversibility; and
- Timing and frequency.

Magnitude: refers to the size, amount, intensity and volume of an impact, determined on a quantitative basis if possible, but typically expressed in terms of relative severity, such as major, moderate, low or negligible. Extent, duration, reversibility, timing and frequency of the impact can be assessed separately but they tie in to determine the overall magnitude.

Extent: the area of which the impact occurs. When the IEF is the habitat itself, magnitude and extent may be synonymous.

Duration: the time for which the impact is expected to last prior to recovery or replacement of the IEF. This is defined in relation to ecological characteristics, rather than human timeframes. The duration of an activity may differ from the duration of the resulting impact caused by the activity and this is taken into account.

Reversibility: an irreversible (permanent) impact is one from which recovery is not possible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it. A reversible (temporary) impact is one from which spontaneous recovery is possible or for which effective mitigation is possible and an enforceable commitment has been made.

Timing and frequency: the number of times an activity occurs will influence the resulting impact. The timing of an activity or change may cause an impact if it happens to coincide with critical life-stages or seasons.

Criteria for describing the magnitude of an impact are presented in Table 5-5 below:

Table 4-4: Criteria for Describing Magnitude of Impact

Magnitude	Description
Major	Total or major loss or alteration to the IEF, such that it will be fundamentally changed and may be lost from the site altogether; and/or loss of a very high or high proportion of the known population or range of the IEF.
Moderate	Loss or alteration to the IEF, such that it will be partially changed; and/or loss of a moderate proportion of the known population or range of the IEF.
Low	Minor shift away from the existing or predicted future baseline conditions. Change arising from the loss or alteration will be discernible but the condition of the IEF will be similar to the pre-development conditions; and/or having a minor impact on the known population or range of the IEF.
Negligible	Very slight change from the existing or predicted future baseline conditions. Change barely discernible, approximating to the 'no change' situation; and/or having a

Magnitude	Description
	negligible impact on the known population or range of the IEF.

Assessment Criteria – Significance

Significance is a concept related to the weight that is attached to effects when decisions are made. For the purposes of EcIA, a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for IEFs. In broad terms, significant effects encompass effects on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution).

Significant effects are quantified with reference to an appropriate geographic scale (see Table 5-4 above). The CIEEM guidance has one 'level of importance' and a geographical 'scale of significance'. This is to deal with the fact that the geographical scale at which the effect is significant is not necessarily the same as the geographic level of importance of the IEF.

The scientific evidence gathered during the assessment process is used along with professional judgement where appropriate to determine the significance of effects according to the guidance above. Where it is not possible to justify a conclusion of no significant effect, a significant effect is assumed based on the Precautionary Principle.

Assessment Criteria – Confidence in Predictions

CIEEM does not cover levels of confidence in predictions, therefore an approach has been adopted based on river conservation evaluation[25]. A simple, qualitative index based on professional judgement is assigned to each predicted effect as follows:

A: high confidence.
B: intermediate confidence.
C: low confidence.

Factors influencing confidence include:

- The frequency and effort of field sampling;
- Constraints to the field survey;
- The completeness of the data (field and desk);
- The age of the data (although recent data are not necessarily always more reliable than old data);
- The state of scientific knowledge relating to the predicted effects of development activities on the IEF (the accuracy of the magnitude assessment); and
- The accuracy of the assessment of significance.

Assessment Criteria – Success of Mitigation

The word 'mitigation' has developed a wider meaning and common usage in environmental assessment than its strict meaning related to reducing the severity of something. Mitigation can sometimes be used as a generic term for a wide range of counter-acting measures, all of which, as the Directive and Regulations prescribe, are intended to *prevent, reduce and where possible offset any significant adverse effect on the environment*. Mitigation can be used to encompass measures intended to avoid, cancel or reduce adverse effects (this is the 'mitigation hierarchy').

Mitigation and compensation measures often carry a degree of uncertainty. The following objective scale is used for the success of mitigation:

[25] SERCON: System for Evaluating Rivers for Conservation, Version 2, Technical Manual. Scottish Natural Heritage (2001).

- Certain/near certain: probability estimated at 95% chance or higher.
- Probable: probability estimated above 50% but below 95%.
- Unlikely: probability estimated above 5% but less than 50%.
- Extremely unlikely: probability estimated at less than 5%.

4.5 Baseline

4.5.1 Designated Sites

Table 4-6 provides a list of scoped in designated sites for nature conservation, considered to be ecologically connected to the site, and states their linkages to the site and the features of the sites thought to be relevant to the site. Figure 1.2 shows the locations of statutory designated sites in the vicinity of the site.

Table 4-5: Designated Sites

Site Name	Designation	Distance and Orientation	Comment
Moray Firth	Special Area of Conservation (SAC)	Adjacent to the east of the site	Designated for bottlenose dolphin *(Tursiops truncatus)* and subtidal sandbanks.
Dornoch Firth and Morrich More	SAC	Approximately 15km north	Harbour seal *(Phoca vitulina)*
Cromarty Firth	SSSI	Approximately 0.59km west of the site	Designated for mudflats and sandflats
Ardersier (MF-001[26])	Seal haul-out site	Approximately 12km south	Key site based on August breeding survey counts
Cromarty Firth (MF-005)	Seal haul-out site	Approximately 13km west	Key site based on August breeding survey counts
Findhorn (MF-003)	Seal haul-out site	Approximately 25km south east	Key site based on August breeding survey counts
Dornoch Firth and Morrich More SAC	SAC	Approximately 36km north east	Harbour seal (*Phoca vitulina*), otter, reefs, dune grassland,
Beauly (MF-002)	Seal haul-out site	Approximately 42km south west	Key site based on August breeding survey counts
Cromarty Bay and Udale Bay	Shellfish Waters Protected Area	Approximately 2.6km south	Mussel *(Mytilus edulis)*

[26] Moray Firth (MF) 001 – List of Seal Haul-out sites across Scotland available at: https://www2.gov.scot/Topics/marine/marine-environment/species/19887/20814/haulouts/list last accessed 29/01/2019

4.5.2 Marine Mammals: Cetaceans and Seals

For further details refer to Technical Appendix 4.1: Marine Mammal Protection Plan, within Volume 3 of this EIAR, however a summary is provided within the following sections.

4.5.2.1 Moray Firth SAC: Bottlenose Dolphins

The Moray Firth SAC comprises an area of 151,274ha. It extends from the estuary north of Inverness, along the eastern coast to Lossiemouth and the northern coast to Helmsdale. The qualifying features for this site are subtidal sandbanks and bottlenose dolphins. The Moray Firth SAC supports the only known resident population of bottlenose dolphin in the North Sea and is one of only two UK sites designated for the species as a primary qualifying feature. The north east of Scotland population is estimated to comprise approximately 200 individuals. Bottlenose dolphins are present within the Moray Firth year round, although abundance and distribution varies between summer and winter with the number of animals peaking in the summer months; and animals appearing more dispersed and ranging further down the east coast in winter. Although dolphins are found throughout the Moray Firth they seem to prefer certain parts of the Inner Firth, the southern Moray Firth coastline and the mouth of the Cromarty Firth. The population also ranges outside of the Moray Firth, with small groups regularly occurring off the Aberdeenshire, Fife and East Lothian coasts and occasionally as far as Northumberland. The SAC is adjacent to the site boundary, as demonstrated in Figure 1.2.

SNH monitors and reports on the condition of the bottlenose dolphin population in the SAC every six years. The most recent report was produced by the University of Aberdeen, who have been carrying out research on the population since 1989, in collaboration with the Sea Mammal Research Unit at the University of St Andrews. The abundance of dolphins along the East Coast was estimated by mark-recapture analysis[27] of photo-identification data; and the usage of the SAC was estimated by using Passive Acoustic Monitoring (PAM). C-PODs[28] were deployed at The Sutors (approximately 2.8km south east of the site), Chanonry Point (approximately 18km south of the site); and Lossiemouth (approximately 45km east of the site).

The main findings of the report were:

- Mark-recapture photograph analysis indicated that the estimated number of individual dolphins using the SAC during the summer of 2016 was 103, which is over half of the estimated 200 bottlenose dolphins which frequent the coastal North Sea off Scotland.
- Despite inter-annual variability, the number of animals using the SAC between 2001 and 2016 appears to be stable.
- A Bayesian capture-recapture[29] assessment of the total abundance of the east coast population suggests that this population is increasing.
- During the period of 2001-2015, >50% of the population used the SAC in most years.
- PAM from 2011-2016 highlighted that there was inter-annual and seasonal variation in the amount of time, and number of days, dolphins spend at three long-term monitoring sites in the SAC (as listed above). There was a summer peak occurrence at all sites (in particular the site at The Sutors), however dolphins were also frequently present during the winter months.
- The east coast of Scotland bottlenose dolphin population remains small and potentially vulnerable. Nevertheless as a result of the data collected, it was assessed that no change be made to the SAC condition status (Favourable (recovered)). This was also the case according to the previous assessment in 2010.

[27] Mark-recapture analysis is undertaken to estimate the number of bottlenose dolphins using the SAC, and captures unique, identifiable marks on individual dolphins, in order to track them over long periods of time.
[28] C-PODs are PAM instruments that detect toothed whales, dolphins and porpoises by identifying echo-location sounds they produce.
[29] The Bayesian mark-recapture method is undertaken to estimate the population of bottlenose dolphins along the entire coastline; and uses a similar approach to the mark-recapture method; however only uses information on whether or not an individual was seen in each year.

Since August 2018, Seawatch Foundation have received 255 records of bottlenose dolphin sightings between Nigg and Lossiemouth; the closest of which being submitted in October 2018, when 10 individuals were observed off the coast of Cromarty within 1.5km of the site.

Chanonry Point, approximately 17km south of the site, is a well-known bottlenose dolphin hotspot. PAM is ongoing in this area to monitor the status of the SAC feature. Between 2011 and 2016, during the summer months (May – September), the percentage of days that dolphins were detected was over 90%.

Bottlenose dolphins are protected as features of the SAC whether in the site or not, thus any animals within the zone of influence should be considered to be a part of the SAC.

4.5.2.2 Harbour Porpoise

Harbour porpoises are the most commonly sighted species in Scotland. They are seen all year round with a peak in summer, when they are known to breed. Areas which are particularly important for the harbour porpoise include: Mousa Sound, in Shetland; Inner Hebrides; Outer Moray Firth and Firth of Clyde. These areas, as well as many others, are thought to be crucial for feeding, breeding and calving.

During the 2011-2016 PAM monitoring (detailed above) of the SAC, Harbour porpoise *(Phocoena phocoena)* were detected regularly at Chanonry Point, only rarely at Lossiemouth, and at an intermediate level at The Sutors. Recent sightings submitted to Seawatch Foundation indicate that harbour porpoise are more frequently observed along the Moray Coast, in areas such as Hopeman, Covesea and Burghead, approximately 30km east of the site. Between February 21st and 24th 2019, 52 Harbour porpoise sighting records were submitted to Seawatch Foundation between Covesea and Burghead.

Two harbour porpoise were observed by EnviroCentre ecologists during the first bat hibernation survey on 17th January 2019, approximately 1km south of the site in the Cromarty Firth (off Cromarty).

4.5.2.3 Seals

Both harbour seal (also known as common seal) and grey seal can be seen all around Scotland on many of the offshore islands and along much of the mainland coast. Because seals range widely in their search for food, single seals of either species might be spotted anywhere along the Scottish coastline. The harbour seal pupping season is between June and July in Scotland; and they undertake an annual moult at a haul-out site between July and September. The grey seal pupping season is between September and December on remote beaches or islands; and their annual moult is undertaken between December and March.

The Dornoch Firth and Morrich More SAC is designated for its population of harbour seal which is currently classed as 'Unfavourable – declining' (2013)[30]. The SAC comprises an area of 8701.22ha and extends along the Dornoch Firth from Bonar Bridge in the west, to the mouth of the estuary in the east to Dornoch. The Dornoch Firth is the most northerly large estuary in Britain and supports a significant proportion of the inner Moray Firth population of the Harbour seal. The seals, which utilise sand-bars and shores at the mouth of the estuary as haul-out and breeding sites, are the most northerly population to utilise sandbanks. Their numbers represent almost 2% of the UK population.

The development lies approximately 15km south of the SAC, which is within the range of observed harbour seal movements between haulout areas (the locations on land where seals come ashore to rest) and also well within the 'normal' range of foraging trips.

There is a designated haulout site at Ardersier, approximately 12km south of the proposed development site. This site holds 20% of the Moray Firth population of harbour seal and is seen as the most important haulout for

[30] Site details for Dornoch Firth and Morrich More SAC available at: https://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8242#features last accessed 25/01/2019

this species not only in the Moray Firth but on the east coast of Scotland. The average moult counts (during August) are around 200 animals and this has been steady since 1992. The location is also used for pupping with a count undertaken in June 2011 having 216 adult harbour seal and 28 mean number of pups (56 pups was higher figure). The location is also used by large numbers of grey seal; 204 animals during the June count in 2011 and 297 during the August count 2010. Harbour seals routinely travel 40-50km from their haul-out sites to forage and prefer more sheltered waters, meaning harbour seals are more likely to be encountered in The Moray Firth than grey seals, which prefer offshore feeding areas, however both species could be present.

4.5.3 Fish

Several rivers (Alness, Balnagowan, Conon, Glass and Peffery) flow into the Cromarty Firth, The nearest of these rivers, the Balnagowan, culminates approximately 4km west of the proposed development. The Alness is situated approximately 13.5 km west, The Conon and Peffery are approximately 17km south west; and the Glass is approximately 40km south. To reach either the Alness, Balnagowan, Peffery or Conon, fish would have to migrate within approximately 1km of the site, through the strait.

These rivers support populations of one or more of the following diadromous fish species that return to these rivers annually.

4.5.3.1 Atlantic Salmon

Publically available catch record data, relating to angling effort on the local Conon and Alness rivers from Marine Scotland shows conclusively that Salmon primarily run into these rivers between March and October, peaking between May and June on the Conon and August and October on the Alness.

A separate Grilse run arrives in these rivers from July to October, peaking between July and August on the Conon and between August and October on the Alness.

It must be stated that rod and line catch data can be subject to short term variables including level of angling pressure and the accuracy of data reporting. That being said, using a 10-year sample set of the most recent data minimises the effects of this variation to the point of virtual elimination.

Marine Scotland data also indicates populations of Atlantic Salmon on both the Balnagowan and Glass rivers are exceptionally small, with catch records showing average annual catch of just six fish on the Balnagowan and 14 fish on the Glass for the period 2013 – 2017.

Killing of Atlantic Salmon in inland waters in Scotland is subject to a number of voluntary agreements put in place by District Salmon Fishery Boards, proprietors and angling clubs. The Salmon Conservation Regulations exist as a regulatory backstop to these agreements, ensuring that salmon can only be killed by fishermen in areas where the stocks can be shown to be in good conservation status (Grade 1 or 2). Provisional assessment for the 2019 fishing season have applied Grade 1 status to both the Alness and Conon rivers, with the Balnagowan and Glass receiving Grade 3 status. There is no data to indicate any Salmon catch on the Peffery, therefore it is ungraded.

Data obtained from the Cromarty District Salmon Fisheries Board (DSFB) states that the emigration of juvenile Salmon (Smolts) in the local area is between May and early June annually. Due to their decline, Salmon have been given legal protection. Salmon are listed in; Annexes IIa and Va of the Habitats Directive; Appendix III of the Bern Convention; The OSPAR List of Threatened and/or Declining Species and Habitats; As a priority species on the UK BAP and SBL.

4.5.3.2 Sea Trout

Brown Trout (*Salmo trutta*) exhibit a wide range of migratory behaviour that is thought to be influenced by genetics and environment. At the extreme, Brown Trout have the ability to migrate into the marine environment

where they are known as Sea Trout (*Salmo trutta trutta*). In contrast to Salmon, Sea Trout post-Smolts do not migrate rapidly out to sea from inshore coastal areas. Instead they tend to use near shore sea loch and fjord areas where available. It is uncertain what happens to Sea Trout Smolts on the east coast where no such areas exist.

Publically available catch record data, relating to angling effort on the local Conon and Alness rivers from Marine Scotland, shows these rivers support a small population of Sea Trout, which migrate into them between June and September, peaking in their numbers between July and August.

The latest population estimate defines Sea Trout as threatened in some areas of the UK, particularly north-west Scotland. Ancestral Trout populations are under threat from habitat deterioration and stocking. Sea Trout is listed as a priority species under the UKBAP.

4.5.3.3 European Eel

European Eel (*Anguilla anguilla*) are found throughout the Cromarty Firth and it's connecting rivers. Comparatively little is known with regard to the reproductive cycle of the European Eel. It is however widely accepted that mature adult Eels migrate to the Sargasso Sea to reproduce, with the juvenile Elvers returning to mature within UK Rivers between the months of April and May annually. Unlike in some rivers of southern England, the juvenile Eels (Elvers) of the rivers of northern Scotland are not commercially fished for, and there is no evidence of any targeted recreational angling for the species occurring within rivers in the vicinity of the proposed development.

The European Eel is classified as Critically Endangered on the IUCN Red List and listed as a priority species on the UK BAP. They are also on the OSPAR List of Threatened and/or Declining Species and on the SBL.

4.5.3.4 Sea Lamprey and River Lamprey

Sea Lamprey *(Petromyzon marinus)* and River Lamprey *(Lampetra fluviatilis)* are known to migrate through the Cromarty Firth both from and to connected rivers. Due to their decline in recent years, both Sea and River Lamprey have been given some legal protection. Sea lamprey migrate between May and July; and river lamprey migrate between April and May.

Sea Lamprey are listed in; Annexes IIa and Va of the Habitats Directive; As a Priority Species in the UK Biodiversity Action Plan; Appendix III of the Bern Convention and; On the Scottish Biodiversity List of species of principal importance for biodiversity conservation[2].

River Lamprey are listed in; Annexes IIa and Va of the European Union Habitats Directive as a species of community interest; Appendix III of the Bern Convention and; As a priority species on the UKBAP.

4.5.4 Invasive Non-Native Species (INNS)

There are records of the marine invasive species wireweed (*Sargassium muticum*) in the Moray Firth and EnviroCentre has knowledge of wireweed being present in the vicinity of Ardersier. This species is native to the Asian Pacific regions but has spread throughout the Pacific region. Wireweed prefers areas of calm waters where it quickly reproduces, out competing native seaweed species, reducing light and increasing sedimentation. Other INNS to note, that are widespread and well-established in Scotland are:

- green sea-fingers *(Codium fragile subsp. tomentosoides);*
- common cordgrass *(Spartina anglica);*
- red alga *(Heterosiphonia japonica);*
- acorn barnacle *(Austrominius modestus);*

- Japanese skeleton shrimp *(Caprella mutica);* and
- leathery sea squirt *(Styela clava).*

4.5.5 Cromarty South and Udale Bay Shellfish Waters Protected Area

The Cromarty Firth and Udale Bay shellfish waters protected area is approximately 2.6km south of the proposed development (Figure 4.2). The area is 6km long by a maximum of 2km wide with a maximum charted depth of 5m; approximately half of the area is <0 m chart depth, i.e. intertidal area exposed at low tide. The substrate consists mainly of fine sand and mud material. This part of the Firth is sheltered from prevailing winds by the Black Isle but is very exposed from north and north-easterly winds, which a produces a fetch that suspends a lot of fine material into the water column.

4.5.6 Prediction of future Baseline

The need for the proposed development is set out in Chapter 2: Proposed Development. This EcIA has been undertaken using the current baseline. With the absence of development, it is predicted that the current use of the land would remain the same. Industrial activity is a noted and continued feature of the Moray Firth, as such future baseline would likely be affected by industrial activities. Climate change will also impact coastal habitats; climate change is discussed in detail below.

4.5.7 Climate Change

Coastal habitats are complex, dynamic and interdependent. They are important in providing sea defences, areas for recreation, biodiversity and a range of other ecosystem services.

Increased air- and sea-surface temperatures have resulted in changes in the distribution of marine and coastal species.

Changes in the phenology of coastal species have been observed[31], with the rates of change in marine species being considerably greater than those in terrestrial and freshwater systems. Recent advances in the phenology of species have not all occurred at the same rate, in some cases resulting in mismatches of timing of annual cycles of animals and their food organisms.

Rising sea levels have been associated with the loss of coastal habitats. Predicted future rises will have significant impacts on coastal and intertidal habitats, including changing geomorphological processes, further habitat loss and increasing the vulnerability of infrastructure. However, coastal systems are dynamic and have the potential to adapt to rising sea levels, but only if there is an adequate supply of sediment to allow accretion and if there is landward space for the coast to roll-back into. Sea defences and other coastal management interrupt the movement of sediment between systems and prevent natural coastal realignment.

Future changes are hard to predict because it is difficult to separate the impacts of rising sea levels from those of coastal management, including sea defences. Coastal zone management and adaptation, and the interactions with other climate drivers, nutrient deposition and habitat management, will have significant influence on the quantity, quality and location of future coastal habitats.

[31] National Centre for Ecological Analysis and Synthesis definition available at: https://www.nceas.ucsb.edu/science/climate# last accessed 16/04/2019

4.6 Evaluation

The evaluations have been applied only to those designated sites, habitats and species that have been scoped in to the assessment and those where there is the potential for impacts that could result in significant adverse ecological effects as a result of the proposed development. The IEFs and the evaluations are presented in Table 4-7 below.

Table 4-6: Evaluation of Important Ecological Features

IEF	Present on site?	Present in wider area?	Importance	Justification
Moray Firth SAC	No	Yes	International	The SAC is adjacent to the east of the proposed development. An SAC is an internationally designated site.
Dornoch Firth and Morrich More SAC	No	Yes	International	The SAC is located approximately 15km north of the proposed development. An SAC is an internationally designated site.
Cromarty Firth SSSI	No	Yes	National	The SSSI is located approximately 0.59km west of the proposed development. A SSSI is a nationally designated site.
Bottlenose dolphin	No	Yes	International	Bottlenose dolphin is an EPS.
Harbour porpoise	No	Yes	International	Harbour porpoise is an EPS.
Harbour seal	No	Yes	National	Harbour seal is listed under both the UKBAP and SBL.
Grey seal	No	Yes	County / Metropolitan	Grey seal is listed under the RCBAP.
Atlantic salmon	Yes	Yes	National	Atlantic salmon is listed under the UKBAP.
Sea trout	Yes	Yes	National	Sea trout is listed as a priority species under the UKBAP.
European eel	Yes	Yes	International	European eel is listed as critically endangered on the IUCN Red List.
Sea lamprey	Yes	Yes	National	Sea lamprey is listed as a priority species under the UKBAP.
River lamprey	Yes	Yes	National	River lamprey is listed as a priority species under the UKBAP.
Cromarty South and Udale Bay Shellfish Waters Protected Area	No	Yes	National	Protected under The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013

4.7 Impact Assessment

4.7.1 Construction Phase

4.7.1.1 Predicted negative construction impacts

Moray Firth SAC: Bottlenose Dolphins and Subtidal Sandbanks

Nature of Impacts

Impact and vibratory piling, and dredging operations cause an increase in underwater noise, which could result in disturbance, altered behaviour, injury and/or death to bottlenose dolphins. Dredging and vibratory piling operations are also likely to increase turbidity and sedimentation; which could alter the behaviour of fish, the prey of bottlenose dolphins.

The increase in vessel movement, as a result of construction activities, has the potential to increase the risk of collisions with bottlenose dolphins, which could result in injury or death; The Sutors, a favoured location of bottlenose dolphins, is to be used as the licenced disposal site for dredged material.

Additional floodlighting, required during construction may alter the natural behaviour of bottlenose dolphins and/or their prey species.

The proposed development may lead to contamination of coastal water and sediments from accidental pollution incidents (see Chapter 5: Water Environment and Coastal Processes). The main risk is posed by refuelling activities. Oil spillages to the water environment would be detrimental to both water and sediment quality, and could affect the qualifying features of the SAC.

Dredging and an increase in vessel movement may cause the spread of the INNS wireweed, known to be present in the Cromarty Firth, as well as other species that are becoming widespread in Scotland.

The increase in turbidity and sedimentation may alter coastal processes, which could cause loss or damage to subtidal sandbanks.

Duration of Impacts

The proposed development is scheduled to begin in Q4 2019, with an estimated timetable of approximately 253 days from initial contractor mobilisation to completion, thus a programme of approximately 10 months construction period is anticipated. Impacts arising from construction activities will therefore be temporary.

INNS could remain in the environment indefinitely, therefore this impact is considered permanent.

Importance of IEF

The Moray Firth SAC is of international importance.

Magnitude of Impacts

The possible effects of underwater noise on bottlenose dolphins include temporary threshold shifts (TTS) or permanent threshold shifts (PTS) in hearing (recoverable (TTS) or permanent (PTS) damage) and disturbance (masking and/or habitat avoidance). The exact measurement of the noise levels that will be reached during construction are not yet known, therefore have been predicted for the purposes of underwater noise modelling (Technical Appendix 4.2), based on Irwin Carr's in-house experience and published literature. High impact (worst case) parameters, provided by project engineers, will be used to design mitigation to account for all eventualities.

The underwater noise model indicates that none of the potential impact piling situations demonstrated present a PTS risk to bottlenose dolphin further than approximately 150m from the source of the noise. This is including the high impact situation (Figure 10, Technical Appendix 4.2) of 1 hour 12 minutes of impact piling per 12 hour period, i.e. 10% of a 12 hour working day, with an animal remaining stationary throughout. It is unlikely impact piling will be required for this long in any given day and/or that an animal would remain in the area for the duration. In a more likely situation (still assuming the high impact noise levels emitted) presuming an animal would be stationary for 1 minute, there is no risk of PTS to bottlenose dolphins presented (Figure 12, Technical Appendix 4.2). The works are also likely to be scheduled for the winter months, during which dolphins are observed using the SAC less than during the summer months.

In the same high impact situation (Figure 10, Technical Appendix 4.2), the TTS risk zone extends approximately 1km, across to Cromarty, meaning the strait is 'blocked' by noise disturbance. However this is again assuming that an animal will be stationary for over an hour, which is extremely unlikely. Assuming the high impact noise levels for 1 minute (Figure 12, Technical Appendix 4.2), the TTS risk zone would be approximately <50m. In either the high impact or low impact situations, the TTS risk does not extend to The Sutors, a preferred feeding area for bottlenose dolphins.

The detailed mitigation, Marine Mammal Observation Protocol (MMOP) and Passive Acoustic Monitoring (PAM) Protocol, within the Marine Mammal Protection Plan (MMPP) (Technical Appendix 4.1) will include a mitigation zone of 500m, in order to cover the whole strait monitor animals moving in and out of the strait. No impact piling works will commence if marine mammals are observed within the mitigation zone; and a soft start (a gradual ramp up of power) will be undertaken before impact piling commences at full power, giving animals the chance to move away from the noise, therefore it is extremely unlikely bottlenose dolphins would experience PTS during impact piling works; and the risk of TTS will be tolerable.

The high impact situation modelled for vibratory piling (HZ-M vibration piling for 3 hours per day and AZ sheet vibration piling for 6 hours per day), showed no risk of PTS to bottlenose dolphin, and a TTS zone of <100m for both methods of vibratory piling (Figure 16 and 18, Technical Appendix 4.2). It is not considered necessary to conduct an MMO protocol prior to vibratory piling due to there being no risk of PTS and only small risks of TTS, however a soft start will be undertaken to allow animals to move away from the noise before it is emitted at full power.

The high impact scenario modelled for dredging, showed no risk of PTS to bottlenose dolphin, and a TTS zone of <100m (Figure 20, Technical Appendix 4.2). Because the noise source here is mainly from the vessel, a familiar noise in the Cromarty Firth, it is considered bottlenose dolphins would continue using the strait, largely unaffected by the noise resulting from dredging activities. It is not considered necessary to conduct an MMO protocol prior to dredging due to there being no risk of PTS and only small risks of TTS.

Monitoring via PAM was undertaken during 2014 impact piling operations[32] at Nigg Energy Park to determine the effects of the increased underwater noise on bottlenose dolphins. Bottlenose dolphins were not excluded from sites in the vicinity of the site. Only small effects were observed; with dolphins spending a reduced period of time in the vicinity of construction works.

Mitigation and a site specific MMOP as detailed in the MMPP (Technical Appendix 4.2) will be followed, therefore the **magnitude of the impact of underwater noise from impact piling on the bottlenose dolphin feature of the SAC is low**. **The magnitude of the impact of underwater noise from vibratory piling and dredging on the bottlenose dolphin feature of the SAC is negligible**.

As stated in Chapter 5: Water Environment and Coastal Processes, sand transport modelling results indicate that the majority of sand and silt lost to the water column during dredging will remain within the dredge area,

[32] Graham, I. M., E. Pirotta, N. D. Merchant, A. Farcas, T. R. Barton, B. Cheney, G. D. Hastie, and P. M. Thompson. 2017. Responses of bottlenose dolphins and harbour porpoises to impact and vibration piling noise during harbour construction. Ecosphere 8(5):e01793. 10.1002/ecs2.1793

therefore increased sedimentation during the dredging will be very localised and short term and therefore it is assessed turbidity would not impact bottlenose dolphins or their prey. As the sediment is predominantly sand with a very small level of fines (silt or clay), turbidity impacts will be small and very local. Marine mammals resident to the UK often reside in turbid waters and as the area affected will be minimal, therefore **the magnitude of the impact from increased turbidity from the dredging on the bottlenose dolphin feature of the SAC is negligible.**

An increased number of vessels travelling through the SAC during construction would increase the risk of collision with bottlenose dolphins, resulting in death or injury to individuals. Dredge vessels move slowly and dolphins travel at an average speed of approximately 1.7-2.3 m/s, therefore this is unlikely. Further information and mitigation relating to vessel movement, including specific measured whilst disposing of dredged materials at The Sutors, is included in Chapter 8: Other Issues and the MMPP (Technical Appendix 4.2). **The magnitude of the impact of collision from increased vessel movement on the bottlenose dolphin feature of the SAC is negligible.**

Nigg Energy Park is currently well lit due to a 24 hour, 365 day working programme, therefore it is not considered additional floodlighting will change the behaviour of bottlenose dolphins already utilising the area, therefore **the magnitude of disturbance from increased lighting on the bottlenose dolphin feature of the SAC is negligible.**

During construction, chemical pollutants released into the water (as a result of dredging, spilled material from vessels, spillage from onshore storage of fuel or chemicals) could have impacts on bottlenose dolphins either directly, or indirectly. Toxic pollutants could result in habitat avoidance, injury or death of individuals and/or reduced prey availability leading to loss of condition. The material to be dredged has been assessed as being clean sand and therefore there should be no chemical pollution risks with the dredged material. Overall with good practice mitigation for pollution, as will be detailed in the CEMP (post-consent and pre-commencement), **the magnitude of the impact of water pollution on both the bottlenose dolphin and subtidal sandbank features of the SAC is considered to be negligible.**

All dredged material will either be brought ashore and stockpiled ahead of use as infill to the new quay, deposited directly within the footprint of the quay or disposed of to The Sutors licensed disposal site; therefore there is a risk of spreading the INNS wireweed or other non-native marine species. The increase in vessels associated with construction works has the potential to increase the risk of the spread of INNS, as INNS can also be spread via hull fouling and transfer in ballast water. Biosecurity measures will be included in the Construction Environmental Management Plan (CEMP), post-concent. **The magnitude of the impact of INNS on the subtidal sandbanks feature of the SAC is considered to be low.**

Coastal morphology is discussed in Chapter 5: Water Environment Coastal Processes. Sand transport modelling results indicate that the majority of sand and silt lost to the water column during dredging will remain within the dredge area, with a modelled maximum depth of deposition of just over 50mm along the face of the new quay. Outside the dredge area the modelling indicates that deposition depths will be insignificant, generally less than 1mm. **The magnitude of the impact of sedimentation on the subtidal sandbanks feature of the SAC is considered to be negligible.**

Significance of Effects

Table 4-7: Significance of Effects

Effect	IEF	Significance
Underwater noise resulting from impact piling	Moray Firth SAC: Bottlenose dolphins	Not significant
Underwater noise resulting from vibratory piling and dredging	Moray Firth SAC: Bottlenose dolphins	Not significant

Effect	IEF	Significance
Increased turbidity and sedimentation	Moray Firth SAC: Bottlenose dolphins	Not significant
Increased vessel movement	Moray Firth SAC: Bottlenose dolphins	Not significant
Increased lighting	Moray Firth SAC: Bottlenose dolphins	Not significant
Pollution of coastal water	Moray Firth SAC: Bottlenose dolphins and subtidal sandbanks	Not significant
The spread of INNS	Moray Firth SAC: Subtidal sandbanks	Significant effect assumed based on the Precautionary Principle
Sedimentation and the alteration of coastal processes	Moray Firth SAC: Subtidal sandbanks	Not significant

Confidence in Assessments

Standard guidance and recognised sources of information were consulted to make assessments on underwater noise, turbidity, vessel movement, lighting, pollution and sedimentation, therefore these assessments are made with **High Confidence**.

A site specific assessment for INNS was not undertaken; and although it is known that the species considered are widespread in Scotland, the rate and extent is difficult to predict, therefore the assessment of INNS is made with **Intermediate Confidence.**

Dornoch Firth and Morrich More SAC

Nature of Impacts

Impact and vibratory piling, and dredging operations cause an increase in underwater noise, which can result in disturbance, altered behaviour, injury and/or death to seals. There is also a risk of over ground noise disturbance to hauled-out seals. Dredging and vibratory piling operations are also likely to increase turbidity and sedimentation; which may alter the behaviour of fish, the prey of harbour seals.

The increase in vessel movement, as a result of construction activities, has the potential to increase the risk of collisions with harbour seals, which could result in injury or death.

Additional floodlighting, required during construction may alter the natural behaviour of harbour seals and/or their prey species.

The proposed development may lead to contamination of coastal water and sediments from accidental pollution incidents (see Chapter 5: Water Environment and Coastal Processes). The main risk is posed by refuelling activities. Oil spillages to the water environment would be detrimental to both water and sediment quality, and could affect the qualifying features of the SAC.

Dredging and an increase in vessel movement may cause the spread of the INNS wireweed, known to be present in the Cromarty Firth, as well as other species that are becoming widespread in Scotland. This could affect the qualifying features of the SAC; invasive species is listed as a negative pressure under the coastal dune heathland feature.

Duration of Impacts

The proposed development is scheduled to begin in Q4 2019, with an estimated timetable of approximately 253 days from initial contractor mobilisation to completion, thus a programme of approximately 10 months construction period is anticipated. Impacts arising from construction activities will therefore be temporary.

INNS could remain in the environment indefinitely, therefore this impact is considered permanent.

Importance of IEF

The Dornoch Firth and Morrich More SAC is of international importance.

Magnitude of Impacts

The possible effects of underwater noise on harbour seals include TTS and PTS. The exact measurement of the noise levels that will be reached during construction are not yet known, therefore have been predicted for the purposes of underwater noise modelling (Technical Appendix 4.2), based on Irwin Carr's in-house experience and published literature. High impact (worst case) parameters, provided by project engineers, will be used to design mitigation to account for all eventualities.

The underwater noise model indicates that there is a risk of PTS to seals, which extends ~1km across the strait, however this is modelled on the worst case scenario of 1 hour, 12 minutes of piling over a 12 hour period (Figure 10, Technical Appendix 4.2). It is highly unlikely a seal would be stationary for this length of time in the vicinity of increased underwater noise; the nearest haul-out site is approximately 12km south at Ardersier; and the SAC is approximately 15km north. It is also unlikely that 1 hour 12 minutes of continuous impact piling would be required during the course of construction works; and if 1 hour 12 minutes of impact piling was required over a 12 hour period, it would likely be spread out, meaning seals would have the opportunity to commute through the strait during times the impact hammer was not operational. A more likely situation (still assuming the worst case in terms of noise emitted), presuming an animal would be stationary for 1 minute, the PTS risk zone is approximately <100m, therefore not extending outside of the 500m MMO mitigation zone, as per the MMO protocol outlined in the MMPP (Technical Appendix 4.2). Because the nearest haul-out sites are 12km and 15km away, the risk of over ground noise as a result of impact piling is considered unlikely.

The TTS risk zone in the high impact situation, extends to approximately 1.5km (Figure 10, Technical Appendix 4.2) across to Cromarty, meaning the strait is 'blocked' by noise disturbance. However this is again assuming that an animal will be stationary for over an hour, which is extremely unlikely. Assuming the high impact noise levels for 1 minute of impact piling (Figure 12, Technical Appendix 4.2), the TTS risk zone would extend out to approximately 1km.

The high impact parameters of the vibratory piling model showed small risk zones of PTS (<50m) and a TTS risk zone of approximately 1km and ~900m during HZ-M vibration piling and AZ sheet vibration piling, respectively (Figure 16 and 18, Technical Appendix 4.2). The low impact situations (Figure 15 and 17, Technical Appendix 4.2) display no PTS risk zones; and TTS risk zones of approximately <300m for both methods. It is not considered necessary to conduct an MMO protocol prior to vibratory piling due to there being no risk of PTS and only small risks of TTS, however a soft start will be undertaken to allow animals to move away from the noise before it is emitted at full power.

The high impact situation modelled to represent dredging operations showed no risk of PTS to seals, and a TTS zone of <100m (Figure 20, Technical Appendix 4.2). Because the noise source here is mainly from the vessel, a familiar noise in the Cromarty Firth, it is considered seals would continue using the strait, largely unaffected by the noise resulting from dredging activities. It is not considered necessary to conduct an MMO protocol prior to dredging due to there being no risk of PTS and only small risks of TTS.

Mitigation and a site specific MMOP are detailed in the MMPP (Technical Appendix 4.2) will be followed, therefore the **magnitude of the impact of underwater noise from impact piling on the harbour seal feature of**

the SAC is low. **The magnitude of the impact of underwater noise from vibratory piling and dredging on the harbour seal feature of the SAC is negligible**.

As stated in Chapter 5: Water Environment Coastal Processes, sand transport modelling results indicate that the majority of sand and silt lost to the water column during dredging will remain within the dredge area, therefore increased sedimentation during the dredging will be very localised and short term and therefore it is assessed turbidity would not impact harbour seals or their prey. As the sediment is predominantly sand with a very small level of fines (silt or clay), turbidity impacts will be small and very local. Marine mammals resident to the UK often reside in turbid waters and as the area affected will be minimal, therefore **the magnitude of the impact from increased turbidity on the harbour seal feature of the SAC is negligible.**

An increased number of vessels travelling through the SAC during construction would increase the risk of collision with harbour seals, resulting in death or injury to individuals. Dredge vessels move slowly and harbour seals travel at an average speed of approximately 2 m/s, therefore this is unlikely. Further information and mitigation relating to vessel movement, is included in Chapter 8: Other Issues and the MMPP (Technical Appendix 4.2). **The magnitude of increased vessel movement on the qualifying the harbour seal feature of the SAC is negligible.**

Nigg Quay is currently well lit due to a 24 hour, 365 day working programme, therefore it is not considered additional floodlighting will change the behaviour of harbour seals already utilising the area, therefore **the magnitude of increased lighting on the harbour seal feature of the SAC is negligible.**

During construction, chemical pollutants released into the water (as a result of dredging, spilled material from vessels, spillage from onshore storage of fuel or chemicals) could have temporary impacts on harbour seals either directly, or indirectly. Toxic pollutants could result in habitat avoidance, injury or death of individuals and/or reduced prey availability leading to loss of condition. The dredged material has been assessed as being clean sand and therefore there should be no chemical pollution risks with the material. Overall with mitigation detailed in the CEMD, **the magnitude of the impact of water pollution on the harbour seal feature of the SAC is considered to be negligible.**

All dredged material will either be brought ashore and stockpiled ahead of use as infill to the new quay, deposited directly within the footprint of the quay or disposed of to The Sutors licensed disposal site; therefore there is a risk of spreading the INNS wireweed or other non-native marine species. INNS can also be spread via hull fouling and transfer in ballast water. Biosecurity measures will be included in the CEMP. **The magnitude of the impact of the spread of INNS on the SAC is considered to be negligible.**

Significance of Effects

Table 4-8: Significance of Effects

Effect	IEF	Significance
Underwater noise resulting from impact piling	Dornoch Firth and Morrich More SAC: Harbour seal	Not significant
Underwater noise resulting from vibratory piling and dredging	Dornoch Firth and Morrich More SAC: Harbour seal	Not significant
Increased turbidity and sedimentation	Dornoch Firth and Morrich More SAC: Harbour seal	Not significant
Increased vessel movement	Dornoch Firth and Morrich More SAC: Harbour seal	Not significant
Increased lighting	Dornoch Firth and Morrich More SAC: Harbour seal	Not significant
Pollution of coastal water	Dornoch Firth and Morrich More SAC: Harbour seal	Not significant

Effect	IEF	Significance
The spread of INNS	Dornoch Firth and Morrich More SAC	Significant effect assumed based on the Precautionary Principle

Confidence in Assessments

Standard guidance and recognised sources of information were consulted to make assessments on underwater noise, turbidity, vessel movement, lighting, pollution and sedimentation, therefore these assessments are made with **High Confidence**.

A site specific assessment for INNS was not undertaken; and although it is known that the species considered are widespread in Scotland, the rate and extent is difficult to predict, therefore the assessment of INNS is made with **Intermediate Confidence.**

Cromarty Firth SSSI

Nature of Impacts

Dredging and an increase in vessel movement may cause the spread of the INNS wireweed, known to be present in the Cromarty Firth, as well as other species that are becoming widespread in Scotland. This may affect the sandflat and mudflat features of the SSSI.

The increase in turbidity and sedimentation may alter coastal processes, which could cause loss or damage to the sandflat and mudflat features of the SSSI.

Duration of Impacts

The proposed development is scheduled to begin in Q4 2019, with an estimated timetable of approximately 253 days from initial contractor mobilisation to completion, thus a programme of approximately 10 months construction period is anticipated. Impacts arising from construction activities will therefore be temporary.

INNS could remain in the environment indefinitely, therefore this impact is considered permanent.

Importance of IEF

The Cromarty Firth SSSI is of national importance.

Magnitude of Impacts

All dredged material will either be brought ashore and stockpiled ahead of use as infill to the new quay, deposited directly within the footprint of the quay or disposed of to The Sutors licensed disposal site; therefore there is a risk of spreading the INNS wireweed or other non-native marine species. The increase in vessels associated with construction works has the potential to increase the risk of the spread of INNS, as INNS can also be spread via hull fouling and transfer in ballast water. Biosecurity measures will be included in the CEMP. **The magnitude of the impact of INNS on the features of the SSSI is considered to be low.**

Coastal morphology is discussed in Chapter 5: Water Environment and Coastal Processes. Sand transport modelling results indicate that the majority of sand and silt lost to the water column during dredging will remain within the dredge area, with a modelled maximum depth of deposition of just over 50mm along the face of the new quay. Outside the dredge area the modelling indicates that deposition depths will be insignificant, generally

less than 1mm. **The magnitude of the impact of sedimentation on the features of the SSSI is considered to be negligible.**

Significance of Effects

Table 4-9: Significance of Effects

Effect	IEF	Significance
The spread of INNS	Cromarty Firth SSSI	Significant effect assumed based on the Precautionary Principle
Sedimentation and the alteration of coastal processes	Cromarty Firth SSSI	Not significant

Confidence in Assessments

A site specific assessment for INNS was not undertaken; and although it is known that the species considered are widespread in Scotland, the rate and extent is difficult to predict, therefore the assessment of INNS is made with **Intermediate Confidence.**

Information within Chapter 5 of the EIAR, standard guidance and recognised sources of information were consulted to make assessments on sedimentation, therefore these assessments are made with **High Confidence**.

Bottlenose Dolphin

The construction phase impacts of underwater impact piling, vibratory piling and dredging noise, increased turbidity, pollution to the water, increased lighting and increased vessel movement on bottlenose dolphin are assessed in the ***Moray Firth SAC: Bottlenose Dolphins and Subtidal Sandbanks*** section, above.

Harbour Porpoise

Nature of Impacts

Impact and vibratory piling, and dredging operations cause an increase in underwater noise, which could result in disturbance, altered behaviour, injury and/or death to harbour porpoise. Dredging and vibratory piling operations are also likely to increase turbidity and sedimentation; which could alter the behaviour of fish, the prey of harbour porpoises.

The increase in vessel movement, as a result of construction activities, has the potential to increase the risk of collisions with harbour porpoises, which could result in injury or death.

Additional floodlighting, required during construction may alter the natural behaviour of harbour porpoises and/or their prey species.

The proposed development may lead to contamination of coastal water and sediments from accidental pollution incidents (see Chapter 5: Water Environment and Coastal Processes). The main risk is posed by refuelling activities. Oil spillages to the water environment would be detrimental to both water and sediment quality, and could affect harbour porpoises either directly, or via their prey.

Duration of Impacts

The proposed development is scheduled to begin in Q4 2019, with an estimated timetable of approximately 253 days from initial contractor mobilisation to completion, thus a programme of approximately 10 months construction period is anticipated. Impacts arising from construction activities will therefore be temporary.

Importance of IEF

Harbour porpoise are of international importance.

Magnitude of Impacts

The possible effects of underwater noise on harbour porpoises include temporary threshold shifts (TTS) or permanent threshold shifts (PTS) in hearing (recoverable (TTS) or permanent (PTS) damage) and disturbance (masking and/or habitat avoidance). The exact measurement of the noise levels that will be reached during construction are not yet known, therefore have been predicted for the purposes of underwater noise modelling (Technical Appendix 4.2), based on Irwin Carr's in-house experience and published literature. High impact (worst case) parameters, provided by project engineers, will be used to design mitigation to account for all eventualities.

The underwater noise model indicates that the risk zone for PTS has the potential to extend out to >1km from the source of the noise, during high impact situations (Figure 10, Technical Appendix 4.2). This is assuming 1 hour 12 minutes of impact piling per 12 hour period, with an animal remaining stationary throughout. It is unlikely impact piling will be required for this long in any given day and/or that an animal would remain in the area for the duration. A more likely situation (still assuming the high impact noise levels emitted) presuming an animal would be stationary for 1 minute, the PTS risk zone is reduced to approximately 200m.

In the same high impact situation (Figure 10, Technical Appendix 4.2), the TTS risk zone extends approximately >2km, across to Cromarty and out into the main channel of the Moray Firth past the Cromarty Sutors, meaning the strait is 'blocked' by noise disturbance. Assuming the high impact noise levels for 1 minute (Figure 12, Technical Appendix 4.2), the TTS risk zone would be approximately 1km, therefore the strait would still be blocked by noise disturbance. Given that impact piling is not considered to be required often, due to the soft nature of the sediments, the TTS risks are assessed to be tolerable with appropriate mitigation.

The detailed mitigation, MMOP and Passive Acoustic Monitoring (PAM) Protocol, within the MMPP (Technical Appendix 4.2) will include a mitigation zone of 500m. No impact piling works will commence if marine mammals are observed within the mitigation zone; and a soft start (a gradual ramp up of power) will be undertaken before impact piling commences at full power, giving animals the chance to move away from the noise, therefore it is extremely unlikely harbour porpoises would experience PTS during impact piling works; and the risk of TTS will be tolerable.

The high impact situation modelled for vibratory piling (HZ-M vibration piling for 3 hours per day and AZ sheet vibration piling for 6 hours per day), showed minimal risk of PTS to bottlenose dolphin (<50m from the source of the noise). The TTS risk zones for these situations would be approximately 1km, therefore 'blocking' the strait with noise disturbance (Figure 16 and 18, Technical Appendix 4.2). It is not considered necessary to conduct an MMO protocol prior to vibratory piling due to there being no risk of PTS, however a soft start will be undertaken to allow animals to move away from the noise before it is emitted at full power.

The high impact scenario modelled for dredging, showed a risk of PTS to harbour porpoises out to approximately 300m, and a TTS zone of approximately 1km (Figure 20, Technical Appendix 4.2), however this model assumes an animal would be in the vicinity for 12 hours which is extremely unlikely. Because the noise source here is mainly from the vessel, a familiar noise in the Cromarty Firth, it is considered harbour porpoises would continue using the strait, largely unaffected by the noise resulting from dredging activities. It is not considered necessary to conduct an MMO protocol prior to dredging due to the low risks of PTS and TTS involved.

Monitoring via PAM was undertaken during 2014 impact piling operations[33] at Nigg Energy Park to determine the effects of the increased underwater noise on harbour porpoise. Harbour porpoise were not excluded from sites in the vicinity of the site.

Mitigation and a site specific MMOP are detailed in the MMPP (Technical Appendix 4.2) will be followed, therefore the **magnitude of the impact of underwater noise from impact piling on harbour porpoise is low**. **The magnitude of the impact of underwater noise from vibratory piling and dredging on harbour porpoise is negligible**.

As stated in Chapter 5: Water Environment and Coastal Processes, sand transport modelling results indicate that the majority of sand and silt lost to the water column during dredging will remain within the dredge area, therefore increased sedimentation during the dredging will be very localised and short term and therefore it is assessed turbidity would not impact harbour porpoises or their prey. As the sediment is predominantly sand with a very small level of fines (silt or clay), turbidity impacts will be small and very local. Marine mammals resident to the UK often reside in turbid waters and as the area affected will be minimal, therefore **the magnitude of the impact from increased turbidity from the dredging harbour porpoise is negligible.**

An increased number of vessels travelling through the SAC during construction would increase the risk of collision with harbour porpoises, resulting in death or injury to individuals. Dredge vessels move slowly and harbour porpoises travel at an average speed of approximately 1.4 m/s m/s, therefore this is unlikely. Further information and mitigation relating to vessel movement, is included in Chapter 8: Other Issues and the MMPP (Technical Appendix 4.2). **The magnitude of the impact of collision from increased vessel movement on harbour porpoise is negligible.**

Nigg Energy Park is currently well lit due to a 24 hour, 365 day working programme, therefore it is not considered additional floodlighting will change the behaviour of harbour porpoises already utilising the area, therefore **the magnitude of disturbance from increased lighting on harbour porpoise is negligible.**

During construction, chemical pollutants released into the water (as a result of dredging, spilled material from vessels, spillage from onshore storage of fuel or chemicals) could have impacts on harbour porpoises either directly, or indirectly. Toxic pollutants could result in habitat avoidance, injury or death of individuals and/or reduced prey availability leading to loss of condition. The material to be dredged has been assessed as being clean sand and therefore there should be no chemical pollution risks with the dredged material. Overall with mitigation detailed in the CEMD, **the magnitude of the impact of water pollution on harbour porpoise is considered to be negligible.**

Significance of Effects

Table 4-10: Significance of Effects

Effect	IEF	Significance
Underwater noise resulting from impact piling	Harbour porpoise	Not significant
Underwater noise resulting from vibratory piling and dredging	Harbour porpoise	Not significant
Increased turbidity and sedimentation	Harbour porpoise	Not significant
Increased vessel movement	Harbour porpoise	Not significant
Increased lighting	Harbour porpoise	Not significant
Pollution of coastal water	Harbour porpoise	Not significant

Confidence in Assessments

[33] Graham, I. M., E. Pirotta, N. D. Merchant, A. Farcas, T. R. Barton, B. Cheney, G. D. Hastie, and P. M. Thompson. 2017. Responses of bottlenose dolphins and harbour porpoises to impact and vibration piling noise during harbour construction. Ecosphere 8(5):e01793. 10.1002/ecs2.1793

Standard guidance and recognised sources of information were consulted to make assessments on underwater noise, turbidity, vessel movement, lighting, pollution and sedimentation, therefore these assessments are made with **High Confidence**.

Harbour Seal

The construction phase impacts of underwater impact piling, vibratory piling and dredging noise, increased turbidity, pollution to the water, increased lighting and increased vessel movement on harbour seal are assessed in the ***Dornoch Firth and Morrich More SAC*** section, above.

Grey Seal

Nature of Impacts

Impact and vibratory piling, and dredging operations cause an increase in underwater noise, which can result in disturbance, altered behaviour, injury and/or death to seals. There is also a risk of over ground noise disturbance to hauled-out seals. Dredging and vibratory piling operations are also likely to increase turbidity and sedimentation; which may alter the behaviour of fish, the prey of grey seals.

The increase in vessel movement, as a result of construction activities, has the potential to increase the risk of collisions with grey seals, which could result in injury or death.

Additional floodlighting, required during construction may alter the natural behaviour of grey seals and/or their prey species.

The proposed development may lead to contamination of coastal water and sediments from accidental pollution incidents (see Chapter 5: Water Environment, Soils and Coastal Processes). The main risk is posed by refuelling activities. Oil spillages to the water environment would be detrimental to both water and sediment quality, and could affect grey seals directly or via their prey.

Duration of Impacts

The proposed development is scheduled to begin in Q4 2019, with an estimated timetable of approximately 253 days from initial contractor mobilisation to completion, thus a programme of approximately 10 months construction period is anticipated. Impacts arising from construction activities will therefore be temporary.

Importance of IEF

Grey seal are of County / Metropolitan importance.

Magnitude of Impacts

The possible effects of underwater noise on grey seals include TTS and PTS. The underwater noise model indicates that there is a risk of PTS to seals, which extends ~1km across the strait, however this is modelled on the worst case scenario of 1 hour, 12 minutes of piling over a 12 hour period (Figure 10, Technical Appendix 4.2). It is highly unlikely a seal would be stationary for this length of time in the vicinity of increased underwater noise; the nearest haul-out site is approximately 12km south at Ardersier. It is also unlikely that 1 hour 12 minutes of continuous impact piling would be required during the course of construction works; and if 1 hour 12 minutes of impact piling was required over a 12 hour period, it would likely be spread out, meaning seals would have the opportunity to commute through the strait during times the impact hammer was not operational. A more likely situation (still assuming the worst case in terms of noise emitted), presuming an animal would be stationary for 1 minute, the PTS risk zone is approximately <100m, therefore not extending outside of the 500m MMO mitigation zone, as per the MMO protocol outlined in the MMPP (Technical Appendix 4.2). Because the nearest

haul-out sites are 12km and 15km away, the risk of over ground noise as a result of impact piling is considered unlikely.

The TTS risk zone in the high impact situation, extends to approximately 1.5km (Figure 10, Technical Appendix 4.2) across to Cromarty, meaning the strait is 'blocked' by noise disturbance. However this is again assuming that an animal will be stationary for over an hour, which is extremely unlikely. Assuming the high impact noise levels for 1 minute of impact piling (Figure 12, Technical Appendix 4.2), the TTS risk zone would be approximately 500m, with certain areas experiencing TTS up to approximately 1km.

The high impact parameters of the vibratory piling model showed small risk zones of PTS (<50m) and a TTS risk zone of approximately 1km and ~900m during HZ-M vibration piling and AZ sheet vibration piling, respectively (Figure 16 and 18, Technical Appendix 4.2). The low impact situations (Figure 15 and 17, Technical Appendix 4.2) display no PTS risk zones; and TTS risk zones of approximately <300m for both methods. It is not considered necessary to conduct an MMO protocol prior to vibratory piling due to there being no risk of PTS and only small risks of TTS, however a soft start will be undertaken to allow animals to move away from the noise before it is emitted at full power.

The high impact situation modelled to represent dredging operations showed no risk of PTS to seals, and a TTS zone of <100m (Figure 20, Technical Appendix 4.2). Because the noise source here is mainly from the vessel, a familiar noise in the Cromarty Firth, it is considered seals would continue using the strait, largely unaffected by the noise resulting from dredging activities. It is not considered necessary to conduct an MMO protocol prior to dredging due to there being no risk of PTS and only small risks of TTS.

Mitigation and a site specific MMOP are detailed in the MMPP (Technical Appendix 4.2) will be followed, therefore the **magnitude of the impact of underwater noise from impact piling on grey seal is low**. **The magnitude of the impact of underwater noise from vibratory piling and dredging on grey seal is negligible**.

As stated in Chapter 5: Water Environment, and Coastal Processes, sand transport modelling results indicate that the majority of sand and silt lost to the water column during dredging will remain within the dredge area, therefore increased sedimentation during the dredging will be very localised and short term and therefore it is assessed turbidity would not impact grey seals or their prey. As the sediment is predominantly sand with a very small level of fines (silt or clay), turbidity impacts will be small and very local. Marine mammals resident to the UK often reside in turbid waters and as the area affected will be minimal, therefore **the magnitude of the impact from increased turbidity on grey seal is negligible.**

An increased number of vessels travelling through the Cromarty Firth during construction would increase the risk of collision with grey seals, resulting in death or injury to individuals. Dredge vessels move slowly and grey seals travel at an average speed of approximately 1.3 m/s, therefore this is unlikely. Further information and mitigation relating to vessel movement, is included in Chapter 8: Other Issues and the MMPP (Technical Appendix 4.2). **The magnitude of increased vessel movement on grey seal is negligible.**

Nigg Quay is currently well lit due to a 24 hour, 365 day working programme, therefore it is not considered additional floodlighting will change the behaviour of grey seals already utilising the area, therefore **the magnitude of increased lighting on the grey seal feature of the SAC is negligible.**

During construction, chemical pollutants released into the water (as a result of dredging, spilled material from vessels, spillage from onshore storage of fuel or chemicals) could have temporary impacts on grey seals either directly, or indirectly. Toxic pollutants could result in habitat avoidance, injury or death of individuals and/or reduced prey availability leading to loss of condition. The dredged material has been assessed as being clean sand and therefore there should be no chemical pollution risks with the material. Overall with mitigation detailed in the CEMD, **the magnitude of the impact of water pollution on the grey seal feature of the SAC is considered to be negligible.**

Significance of Effects

Table 4-11: Significance of Effects

Effect	IEF	Significance
Underwater noise resulting from impact piling	Grey seal	Not significant
Underwater noise resulting from vibratory piling and dredging	Grey seal	Not significant
Increased turbidity and sedimentation	Grey seal	Not significant
Increased vessel movement	Grey seal	Not significant
Increased lighting	Grey seal	Not significant
Pollution of coastal water	Grey seal	Not significant

Confidence in Assessments

Standard guidance and recognised sources of information were consulted to make assessments on underwater noise, turbidity, vessel movement, lighting, pollution and sedimentation, therefore these assessments are made with **High Confidence**.

Migratory Fish: Salmonids: Atlantic Salmon and Sea Trout

Nature of Impacts

Impact and vibratory piling, and dredging operations cause an increase in underwater noise, which can result in disturbance, altered behaviour, injury and/or death to salmonids. Dredging and vibratory piling operations are also likely to increase turbidity and sedimentation; which may alter the behaviour of salmonids, and/or their prey species.

Additional floodlighting, required during construction may alter the natural behaviour of migrating fish.

The proposed development may lead to contamination of coastal water and sediments from accidental pollution incidents (see Chapter 5: Water Environment and Coastal Processes). The main risk is posed by refuelling activities. Oil spillages to the water environment would be detrimental to both water and sediment quality, and could affect salmonids directly or via their prey.

Duration of Impacts

The proposed development is scheduled to begin in Q4 2019, with an estimated timetable of approximately 253 days from initial contractor mobilisation to completion, thus a programme of approximately 10 months construction period is anticipated. Impacts arising from construction activities will therefore be temporary.

Importance of IEF

Atlantic salmon and sea trout are of national importance.

Magnitude of Impacts

The underwater noise model indicates there will be no risk of PTS to fish species during impact piling, vibratory piling or dredging (Figures 10, 16, 18 and 19, Technical Appendix 4.2). High impact piling situation, i.e. the worst case scenario (Figure 10), indicates a TTS risk zone of approximately 500m, meaning there is approximately half of the strait that will be unaffected by underwater noise which salmonids can use to migrate through freely; therefore **magnitude of the impact of underwater noise from impact piling, vibratory piling and dredging on salmonids is negligible**.

As stated in Chapter 5: Water Environment and Coastal Processes, results of sand transport modelling indicate that the majority of sand and silt lost to the water column during dredging will remain within the dredge area. Increased sedimentation during the dredging will therefore be very localised and short term. Consequently, it is assessed that turbidity would not impact salmonids or their prey. As the sediment is predominantly sand with a very small level of fines (silt or clay), the localised turbidity impacts will be small. Fish species resident to the UK often reside in turbid waters and as the area affected will be minimal, it is considered that **the magnitude of the impact from increased turbidity on salmonids is negligible.**

During construction, chemical pollutants released into the water (as a result of dredging, spilled material from vessels, spillage from onshore storage of fuel or chemicals) could have temporary impacts on salmonids either directly, or indirectly. Toxic pollutants could result in habitat avoidance, injury or death of individuals and/or reduced prey availability, leading to loss of condition. The dredged material has been assessed as being clean sand and therefore there should be no chemical pollution risks with the material. Overall with mitigation detailed in the CEMP, **the magnitude of the impact of water pollution on salmonids is considered to be negligible.**

Nigg Energy Park is currently well lit due to a 24 hour, 365 day working programme. Consequently, it is not considered additional floodlighting will change the behaviour of migratory fish species already utilising the area. **The magnitude of increased lighting on salmonids is therefore considered to be negligible.**

Significance of Effects

Table 4-12: Significance of Effects

Effect	IEF	Significance
Underwater noise resulting from impact piling, vibratory piling and dredging	Salmonids	Not significant
Increased turbidity and sedimentation	Salmonids	Not significant
Increased lighting	Salmonids	Not significant
Pollution of coastal water	Salmonids	Not significant

Confidence in Assessments

Standard guidance and recognised sources of information were consulted to make assessments on underwater noise, turbidity, lighting, pollution and sedimentation, therefore these assessments are made with **High Confidence**.

Migratory Fish: European Eel

Nature of Impacts

Impact and vibratory piling, and dredging operations cause an increase in underwater noise, which can result in disturbance, altered behaviour, injury and/or death to European eel. Dredging and vibratory piling operations are also likely to increase turbidity and sedimentation; which may alter the behaviour of salmonids, and/or their prey species.

Additional floodlighting, required during construction may alter the natural behaviour of migrating fish.

The proposed development may lead to contamination of coastal water and sediments from accidental pollution incidents (see Chapter 5: Water Environment, Soils and Coastal Processes). The main risk is posed by refuelling activities. Oil spillages to the water environment would be detrimental to both water and sediment quality, and could affect European eel directly or via their prey.

Duration of Impacts

The proposed development is scheduled to begin in Q4 2019, with an estimated timetable of approximately 253 days from initial contractor mobilisation to completion, thus a programme of approximately 10 months construction period is anticipated. Impacts arising from construction activities will therefore be temporary.

Importance of IEF

European eel is of international importance.

Magnitude of Impacts

The underwater noise model indicates there will be no risk of PTS to fish species during impact piling, vibratory piling or dredging (Figures 10, 16, 18 and 19, Technical Appendix 4.2). High impact piling situation, i.e. the worst case scenario (Figure 10), indicates a TTS risk zone of approximately 500m, meaning that approximately half of the strait will be unaffected by underwater noise, which European Eels can use to migrate through freely. It is therefore considered that **magnitude of the impact of underwater noise from impact piling, vibratory piling and dredging on European Eels is negligible**.

As stated in Chapter 5: Water Environment and Coastal Processes, results of sand transport modelling indicate that the majority of sand and silt lost to the water column during dredging will remain within the dredge area. Increased sedimentation during the dredging will therefore be very localised and short term. Consequently, it is assessed that turbidity would not impact European Eel or their prey. As the sediment is predominantly sand with a very small level of fines (silt or clay), the localised turbidity impacts will be small. Fish species resident to the UK often reside in turbid waters and as the area affected will be minimal, it is considered that **the magnitude of the impact from increased turbidity on European Eel is negligible.**

During construction, chemical pollutants released into the water (as a result of dredging, spilled material from vessels, spillage from onshore storage of fuel or chemicals) could have temporary impacts on European eels either directly, or indirectly. Toxic pollutants could result in habitat avoidance, injury or death of individuals and/or reduced prey availability leading to loss of condition. The dredged material has been assessed as being clean sand and therefore there should be no chemical pollution risks with the material. Overall with mitigation detailed in the CEMD, **the magnitude of the impact of water pollution on European eel is considered to be negligible.**

Nigg Energy Park is currently well lit due to a 24 hour, 365 day working programme. Consequently, it is not considered additional floodlighting will change the behaviour of migratory fish species already utilising the area. **The magnitude of increased lighting on European Eel is therefore considered to be negligible.**

Significance of Effects

Table 4-13: Significance of Effects

Effect	IEF	Significance
Underwater noise resulting from impact piling, vibratory piling and dredging	European eel	Not significant
Increased turbidity and sedimentation	European eel	Not significant
Increased lighting	European eel	Not significant
Pollution of coastal water	European eel	Not significant

Confidence in Assessments

Standard guidance and recognised sources of information were consulted to make assessments on underwater noise, turbidity, lighting, pollution and sedimentation, therefore these assessments are made with **High Confidence**.

Migratory Fish: River Lamprey and Sea Lamprey

Nature of Impacts

Impact and vibratory piling, and dredging operations cause an increase in underwater noise, which can result in disturbance, altered behaviour, injury and/or death to salmonids. Dredging and vibratory piling operations are also likely to increase turbidity and sedimentation; which may alter the behaviour of lampreys, and/or their prey species.

Lampreys tend to migrate at night, therefore additional floodlighting, required during construction may alter the natural behaviour of migrating fish.

The proposed development may lead to contamination of coastal water and sediments from accidental pollution incidents (see Chapter 5: Water Environment and Coastal Processes). The main risk is posed by refuelling activities. Oil spillages to the water environment would be detrimental to both water and sediment quality, and could affect lampreys directly or via their prey.

Duration of Impacts

The proposed development is scheduled to begin in Q4 2019, with an estimated timetable of approximately 253 days from initial contractor mobilisation to completion, thus a programme of approximately 10 months construction period is anticipated. Impacts arising from construction activities will therefore be temporary.

Importance of IEF

River lamprey and sea lamprey are of international importance.

Magnitude of Impacts

The underwater noise model indicates there will be no risk of PTS to fish species during impact piling, vibratory piling or dredging (Figures 10, 16, 18 and 19, Technical Appendix 4.2). High impact piling situation, i.e. the worst case scenario (Figure 10), indicates a TTS risk zone of approximately 500m, meaning that approximately half of the strait will be unaffected by underwater noise, which Lamprey can use to migrate through freely. It is therefore considered that **magnitude of the impact of underwater noise from impact piling, vibratory piling and dredging on Lamprey is negligible**.

As stated in Chapter 5: Water Environment and Coastal Processes, results of sand transport modelling indicate that the majority of sand and silt lost to the water column during dredging will remain within the dredge area. Increased sedimentation during the dredging will therefore be very localised and short term. Consequently, it is assessed that turbidity would not impact Lamprey or their prey. As the sediment is predominantly sand with a very small level of fines (silt or clay), the localised turbidity impacts will be small. Fish species resident to the UK often reside in turbid waters and as the area affected will be minimal, it is considered that **the magnitude of the impact from increased turbidity on Lamprey is negligible.**

During construction, chemical pollutants released into the water (as a result of dredging, spilled material from vessels, spillage from onshore storage of fuel or chemicals) could have temporary impacts on Lamprey either directly, or indirectly. Toxic pollutants could result in habitat avoidance, injury or death of individuals and/or reduced prey availability leading to loss of condition. The dredged material has been assessed as being clean sand and therefore there should be no chemical pollution risks with the material. Overall with mitigation detailed in the CEMD, **the magnitude of the impact of water pollution on Lamprey is considered to be negligible.**

Nigg Energy Park is currently well lit due to a 24 hour, 365 day working programme. Consequently, it is not considered additional floodlighting will change the behaviour of migratory fish species already utilising the area. **The magnitude of increased lighting on Lamprey is therefore considered to be negligible.**

Significance of Effects

Table 4-14: Significance of Effects

Effect	IEF	Significance
Underwater noise resulting from impact piling, vibratory piling and dredging	River lamprey and sea lamprey	Not significant
Increased turbidity and sedimentation	River lamprey and sea lamprey	Not significant
Increased lighting	River lamprey and sea lamprey	Not significant
Pollution of coastal water	River lamprey and sea lamprey	Not significant

Confidence in Assessments

Standard guidance and recognised sources of information were consulted to make assessments on underwater noise, turbidity, lighting, pollution and sedimentation, therefore these assessments are made with **High Confidence**.

Cromarty South and Udale Bay Shellfish Waters Protected Area

Nature of Impacts

Dredging and vibratory piling operations are likely to increase turbidity and sedimentation. The increase in turbidity and sedimentation may alter coastal processes and damage or destroy mussel beds. The sediment in the water column as a result of dredging may also be contaminated due to historic development activities in the Cromarty Firth.

The proposed development may lead to contamination of coastal water and sediments from accidental pollution incidents (see Chapter 5: Water Environment, Soils and Coastal Processes). The main risk is posed by refuelling activities. Oil spillages to the water environment would be detrimental to both water and sediment quality, and could affect shellfish directly or via their food source.

Dredging and an increase in vessel movement may cause the spread of the INNS wireweed, known to be present in the Cromarty Firth, as well as other species that are becoming widespread in Scotland, which could alter the substrate upon which the mussel beds inhabit.

Duration of Impacts

The proposed development is scheduled to begin in Q4 2019, with an estimated timetable of approximately 253 days from initial contractor mobilisation to completion, thus a programme of approximately 10 months construction period is anticipated. Impacts arising from construction activities will therefore be temporary.

Importance of IEF

Shellfish Waters protected areas are of national (Scottish) importance.

Magnitude of Impacts

As stated in Chapter 5: Water Environment and Coastal Processes, sand transport modelling results indicate that the majority of sand and silt lost to the water column during dredging will remain within the dredge area, therefore increased sedimentation during the dredging will be very localised and short term and therefore it is assessed turbidity would not impact mussel beds. The material to be dredged has been assessed as being clean sand and there are very low levels of key contaminants of concern, therefore there should be no chemical pollution risks with the dredged material. **The magnitude of the impact of increased turbidity and sedimentation on Cromarty South and Udale Bay Shellfish Waters Protected Area is considered to be negligible.**

During construction, chemical pollutants released into the water (as a result of dredging, spilled material from vessels, spillage from onshore storage of fuel or chemicals) could have impacts on mussel beds either directly, or indirectly. Toxic pollutants could cause bioaccumulation and/or reduced prey availability leading to loss of condition. Overall with mitigation detailed in the CEMP, **the magnitude of the impact of pollution on Cromarty South and Udale Bay Shellfish Waters Protected Area is considered to be negligible.**

All dredged material will either be brought ashore and stockpiled ahead of use as infill to the new quay, deposited directly within the footprint of the quay or disposed of to The Sutors licensed disposal site; therefore there is a risk of spreading the INNS wireweed or other non-native marine species. The increase in vessels associated with construction works has the potential to increase the risk of the spread of INNS, as INNS can also be spread via hull fouling and transfer in ballast water. Biosecurity measures will be included in the CEMP, post-consent. **The magnitude of the impact of INNS on Cromarty South and Udale Bay Shellfish Waters Protected Area is considered to be low.**

Significance of Effects

Table 4-15: Significance of Effects

Effect	IEF	Significance
Turbidity and sedimentation	Mussel beds of the Cromarty South and Udale Bay Shellfish Protected Area	Not significant
Pollution	Mussel beds of the Cromarty South and Udale Bay Shellfish Protected Area	Not significant
Spread of INNS	Mussel beds of the Cromarty South and Udale Bay Shellfish Protected Area	Significant effect assumed based on the Precautionary Principle

Confidence in Assessments

Standard guidance and recognised sources of information were consulted to make assessments on turbidity and sedimentation and contamination/pollution, therefore these assessments are made with **High Confidence**.

Although it is known that the species considered are widespread in Scotland, the rate and extent is difficult to predict, therefore the assessment of INNS is made with **Intermediate Confidence.**

4.7.2 Operational Phase

4.7.2.1 Predicted negative operational impacts

Moray Firth SAC: Bottlenose Dolphins and Subtidal Sandbanks

Nature of Impacts

The increase in vessel movement upon completion of the quay, has the potential to increase the risk of collisions with bottlenose dolphins, which could result in injury or death.

An increase in vessel movement may cause the spread of the INNS wireweed, known to be present in the Cromarty Firth, as well as other species that are becoming widespread in Scotland.

Duration of Impacts

The increase in vessel movement and the risk of the spread of INNS will be permanent impacts.

Importance of IEF

The Moray Firth SAC is of international importance.

Magnitude of Impacts

An increased number of vessels travelling through the SAC upon completion of the proposed development may increase the risk of collision with bottlenose dolphins, resulting in death or injury to individuals. Bottlenose dolphins travel at an average speed of approximately 1.7-2.3 m/s, therefore this is unlikely. Further information and mitigation relating to vessel movement, is included in Chapter 8: Other Issues and the MMPP (Technical Appendix 4.2). **The magnitude of the impact of collision from increased vessel movement on the bottlenose dolphin feature of the SAC is negligible.**

The increase in vessels upon completion of construction works has the potential to increase the risk of the spread of INNS, as INNS can be spread via hull fouling and transfer in ballast water. Good practice biosecurity measures, which shall be implemented during construction and operation, will be included in the CEMP, post-consent. **The magnitude of the impact of INNS on the subtidal sandbanks feature of the SAC is considered to be low.**

Significance of Effects

Table 4-16: Significance of Effects

Effect	IEF	Significance
Increased vessel movement	Moray Firth SAC: Bottlenose dolphin	Not significant
Spread of INNS	Moray Firth SAC: Subtidal sandbanks	Significant effect assumed based on the Precautionary Principle

Confidence in Assessments

Standard guidance and recognised sources of information were consulted to make assessments on the impacts of vessel movement, therefore these assessments are made with **High Confidence**.

Although it is known that the species considered are widespread in Scotland, the rate and extent is difficult to predict, therefore the assessment of INNS is made with **Intermediate Confidence.**

Dornoch Firth and Morrich More SAC

Nature of Impacts

The increase in vessel movement, as a result of construction activities, has the potential to increase the risk of collisions with harbour seals, which could result in injury or death.

An increase in vessel movement may cause the spread of the INNS wireweed, known to be present in the Cromarty Firth, as well as other species that are becoming widespread in Scotland. This could affect the qualifying features of the SAC; invasive species is listed as a negative pressure under the coastal dune heathland feature.

Duration of Impacts

The increase in vessel movement and the risk of the spread of INNS will be permanent impacts.

Importance of IEF

The Dornoch Firth and Morrich More SAC is of international importance.

Magnitude of Impacts

An increased number of vessels travelling through the SAC upon completion of the proposed development may increase the risk of collision with harbour seals, resulting in death or injury to individuals. Harbour seals travel at an average speed of approximately 2 m/s, therefore this is unlikely. Further information and mitigation relating to vessel movement, is included in Chapter 8: Other Issues and the MMPP (Technical Appendix 4.2). **The magnitude of the impact of collision from increased vessel movement on the harbour seal feature of the SAC is negligible.**

The increase in vessels upon completion of construction works has the potential to increase the risk of the spread of INNS, as INNS can be spread via hull fouling and transfer in ballast water. Good practice biosecurity measures, which shall be implemented during construction and operation, will be included in the CEMP, post-consent. **The magnitude of the impact of INNS on the SAC is considered to be low.**

Significance of Effects

Table 4-17: Significance of Effects

Effect	IEF	Significance
Increased vessel movement	Dornoch Firth and Morrich More SAC: Harbour seal	Not significant
Spread of INNS	Dornoch Firth and Morrich More SAC	Significant effect assumed based on the Precautionary Principle

Confidence in Assessments

Standard guidance and recognised sources of information were consulted to make assessments on the impacts of vessel movement, therefore these assessments are made with **High Confidence**.

Although it is known that the species considered are widespread in Scotland, the rate and extent is difficult to predict, therefore the assessment of INNS is made with **Intermediate Confidence.**

Cromarty Firth SSSI

Nature of Impacts

An increase in vessel movement may cause the spread of the INNS wireweed, known to be present in the Cromarty Firth, as well as other species that are becoming widespread in Scotland. This could affect the qualifying features of the SSSI.

Duration of Impacts

Permanent

Importance of IEF

The Cromarty Firth SSSI is of national importance.

Magnitude of Impacts

The increase in vessels upon completion of construction works has the potential to increase the risk of the spread of INNS, as INNS can be spread via hull fouling and transfer in ballast water. Biosecurity measures to be implemented will be suggested in Section 4.8: Mitigation. **The magnitude of the impact of INNS on the SAC is considered to be low.**

Significance of Effects

Table 4-18: Significance of Effects

Effect	IEF	Significance
Spread of INNS	Cromarty Firth SSSI	Significant effect assumed based on the Precautionary Principle

Confidence in Assessments

Although it is known that the species considered are widespread in Scotland, the rate and extent is difficult to predict, therefore the assessment of INNS is made with **Intermediate Confidence.**

Bottlenose Dolphin

The operational impacts of increased turbidity, pollution to the water, increased vessel movement on bottlenose dolphin are assessed in the ***Moray Firth SAC: Bottlenose Dolphins and Subtidal Sandbanks*** section, above.

Harbour Porpoise

Nature of Impacts

The increase in vessel movement upon completion of the quay, has the potential to increase the risk of collisions with harbour porpoise, which could result in injury or death.

Duration of Impacts

The increase in vessel movement will be a permanent impact.

Importance of IEF

Harbour porpoise is of international importance.

Magnitude of Impacts

An increased number of vessels travelling through the Moray Firth upon completion of Nigg East Quay may increase the risk of collision with harbour porpoises, resulting in death or injury to individuals. Harbour porpoises travel at an average speed of approximately 1.4 m/s, therefore this is unlikely. Mitigation relating to vessel movement is included in the MMPP (Technical Appendix 4.2). **The magnitude of the impact of collision from increased vessel movement on harbour porpoise is negligible.**

Significance of Effects

Table 4-19: Significance of Effects

Effect	IEF	Significance
Increased vessel movement	Harbour porpoise	Not significant

Confidence in Assessments

Standard guidance and recognised sources of information were consulted to make assessments on the impacts of vessel movement, therefore these assessments are made with **High Confidence**.

Harbour Seal

The operational impacts of increased vessel movement on harbour seal are assessed in the ***Dornoch Firth and Morrich More SAC*** section, above.

Grey Seal

Nature of Impacts

The increase in vessel movement upon completion of the quay, has the potential to increase the risk of collisions with grey seals, which could result in injury or death.

Duration of Impacts

The increase in vessel movement will be a permanent impact.

Importance of IEF

Grey seal is of Metropolitan/County importance.

Magnitude of Impacts

An increased number of vessels travelling through the Moray Firth upon completion of Nigg East Quay would increase the risk of collision with grey seals, resulting in death or injury to individuals. Grey seals travel at an average speed of approximately 1.3 m/s, therefore this is unlikely. Mitigation relating to vessel movement is included in the MMPP (Technical Appendix 4.2). **The magnitude of the impact of collision from increased vessel movement on grey seal is negligible.**

Significance of Effects

Table 4-20: Significance of Effects

Effect	IEF	Significance
Increased vessel movement	Grey seal	Not significant

Confidence in Assessments

Standard guidance and recognised sources of information were consulted to make assessments on the impacts of vessel movement, therefore these assessments are made with **High Confidence**.

Cromarty South and Udale Bay Shellfish Waters Protected Area

Nature of Impacts

An increase in vessel movement may cause the spread of the INNS wireweed, known to be present in the Cromarty Firth, as well as other species that are becoming widespread in Scotland.

Duration of Impacts

The risk of the spread of INNS will be a permanent impact.

Importance of IEF

The Cromarty South and Udale Bay Shellfish Waters Protected Area is of national (Scotland) importance.

Magnitude of Impacts

The increase in vessels upon completion of construction works has the potential to increase the risk of the spread of INNS, as INNS can be spread via hull fouling and transfer in ballast water; and could have a negative effect on the substrate mussels inhabit. Good practice biosecurity measures, which shall be implemented during construction and operation, will be included in the CEMP, post-consent. **The magnitude of the impact of INNS on Cromarty South and Udale Bay Shellfish Waters Protected Area is considered to be low.**

Significance of Effects

Table 4-22: Significance of Effects

Effect	IEF	Significance
Spread of INNS	Cromarty South and Udale Bay Shellfish Waters Protected Area	Significant effect assumed based on the Precautionary Principle

Confidence in Assessments

Although it is known that the species considered are widespread in Scotland, the rate and extent is difficult to predict, therefore the assessment of INNS is made with **Intermediate Confidence.**

4.7.3 Cumulative Assessment

The cumulative assessment will take into consideration the following ongoing development projects:

- Port of Cromarty Firth – Phase 4 Development, Invergordon Service Base;
- Ardersier Port Development; and
- Aberdeen Harbour – South Harbour Development.

4.7.3.1 Potential Cumulative Construction Effects

The above noted developments will be under construction when works commence at Nigg East Quay, therefore several areas of the Moray Firth will be subject to increased underwater noise which has the potential to cause PTS/TTS to marine mammals. The bottlenose dolphin population that reside in the Moray Firth are known to also spend time off the coast of Aberdeen. Although the distance between the two sites is large, bottlenose dolphins may choose to avoid both areas of important habitat, as a result of increased underwater noise occurring at each site simultaneously. A cumulative working plan will be implemented during construction (Section 4.8.4) therefore **the magnitude of the impact of collision from increased vessel movement, cumulatively, on the bottlenose dolphin feature of the SAC is negligible.**

The increase in vessels and the movement of dredged materials as a result of these developments occurring at the same time, increases the risk of the spread of INNS, notably wireweed. **The magnitude of the impact of INNS on the subtidal sandbanks feature of the SAC is considered to be low.**

4.7.3.2 Potential Cumulative Operational Effects

Once completed, the above noted developments will be operational in conjunction with Nigg East Quay, therefore several areas of the Moray Firth will be subject to increased vessel movement. As such the risk of collisions with marine mammals will potentially be increased. Good practice measures will be implemented, such as speed restrictions, once Nigg East Quay is operational (Technical Appendix 4.2), therefore **the magnitude of the impact of collision from increased vessel movement, cumulatively, on the bottlenose dolphin feature of the SAC is negligible.**

The increase in vessels using the new infrastructure associated with the developments noted above and the movement of any dredged materials, which may be required for maintenance purposes, has the potential to increase the risk of the spread of INNS, notably wireweed. **The magnitude of the impact of INNS on the subtidal sandbanks feature of the SAC is considered to be low.**

4.8 Mitigation

4.8.1 Standard Mitigation

The following standard mitigation practices will be followed during the construction and operational phase of the proposed development:

- Pollution of the marine environment should be prevented in order to safeguard water quality and marine life which marine mammals rely on within these habitats;
- A Construction Environmental Management Plan (CEMP) detailing pollution prevention measures will be agreed with the regulatory authority prior to works commencing;
- The CEMP will incorporate a marine INNS biosecurity protocol for both construction and operational phases;
- The following good practice guidelines shall be adhered to and incorporated into the CEMP:
    - GGP 5: Works and maintenance in or near water;
    - PPG 6: Working at construction and demolition sites;
    - PPG 7: Safe Storage – The safe operation of refuelling facilities;
    - GPP 21: Pollution and incident response planning;
    - PPG 22: Incident response – dealing with spills;
    - The Water Environment (Controlled Activities) (Scotland) Regulations 2011[34];
    - Code of Practice on Non-Native Species Made by the Scottish Ministers under section 14C of the Wildlife and Countryside Act 1981[35];
    - SEPA Guidance to prevent the introduction or spread of INNS when undertaking controlled activities[36]; and
    - The Firth of Clyde Biosecurity Plan (2012-2016)[37].

[34] https://www.sepa.org.uk/media/34761/car_a_practical_guide.pdf
[35] https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2012/08/non-native-species-code-practice/documents/00398608-pdf/00398608-pdf/govscot%3Adocument
[36] https://www.sepa.org.uk/media/163480/biosecurity-and-management-of-invasive-non-native-species-construction-sites.pdf
[37] http://www.clydemarineplan.scot/wp-content/uploads/2016/05/FoCF-Biosecurity-plan.pdf

4.8.2 Construction Phase Mitigation

The Marine Mammal Observation Protocol (MMOP), as per Technical Appendix 4.1 of this EIA, will be implemented so that the impact piling works do not cause injury or unnecessary disturbance to marine mammals. Although not an EPS, as good practice and as they are known to be present in the general area, this will extend to pinnipeds including harbour seal (also a feature of the Dornoch Firth and Morrich More SAC) and grey seal. This section has been designed with reference to current JNCC guidance 'Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise' (August 2010)[38].

4.8.2.1 Impact piling protocol

The standard[39] JNCC protocol is outlined below:

1. The MMO will not initiate this protocol during periods of darkness or poor visibility (such as fog) or during periods when the sea state is not conducive to visual mitigation (above sea state 4 is considered not conducive[40]) as there is a greater risk of failing to detect the presence of marine mammals[41]. Harbour porpoise have small dorsal fins, therefore the MMO shall take additional precautions if the sea state exceeds 2. An elevated platform for the MMO to monitor from would be beneficial when the sea state is 2 or above, the impact piling works could also be scheduled on a day where the sea is expected to be calm.

2. The mitigation zone of 500m will be monitored visually by the MMO for an agreed period prior to the commencement of piling. This will be a minimum of 30 minutes.

3. The MMO will scan the waters using binoculars or a spotting scope and by making visual observations. Sightings of marine mammals will be appropriately recorded in terms of date, time, position, weather conditions, sea state, species, number, adult/juvenile, behavior, range etc. on the JNCC standard forms. Communication between the MMO and the contractor and the start/end times of the activities will also be recorded on the forms.

4. Piling will not commence if marine mammals are detected within the mitigation zone or until 20 minutes after the last visual detection. The MMO will track any marine mammals detected and ensure they are satisfied the animals have left the mitigation zone before they advise the crew to commence piling activities.

5. A soft-start will be employed, with the gradual ramping up of piling power incrementally over a set time period until full operational power is achieved. The soft-start duration will be a period of between 10 and 20 minutes, depending on machinery used. This will allow for any marine mammals to move away from the noise source.

6. If a marine mammal enters the mitigation zone during the soft-start then, whenever possible, the piling operation will cease, or at least the power will not be further increased until the marine mammal exits the mitigation zone and there is no further detection for 10 - 20 minutes.

[38] It should be noted that this protocol does not document measures to mitigate disturbance effects, but has been developed to reduce to negligible levels of risk of injury or death to marine mammals in close proximity to piling operations.
[39] There is a 'variation of standard piling protocol' allowed in the guidance if required.
[40] Detection of marine mammals, particularly porpoises, decreases as sea state increases. According to the JNCC guidance ideally sea states of 2 or less are required for optimal visual detection.
[41] There is a 'variation of standard piling protocol' allowed in the guidance if required.

7. When piling at full power this will continue if a marine mammal is detected in the mitigation zone (as it is deemed to have entered voluntarily[42]).

8. If there is a pause in the piling operations for a period of greater than 10 minutes, then the pre-piling search and soft-start procedure will be repeated before piling recommences. If a watch has been kept during the piling operation, the MMO should be able to confirm the presence or absence of marine mammals, and it may be possible to commence the soft-start immediately. If there has been no watch, the complete pre-piling search and soft-start procedure will be undertaken.

As per the JNCC guidance, reports detailing the piling activity and marine mammal mitigation (the MMO reports) will be sent to Marine Scotland at the conclusion of piling activity. Reports will include:

- Completed MMRFs;
- Date and location of the piling activities;
- A record of all occasions when piling occurred, including details of the duration of the pre-piling search and soft-start procedures, and any occasions when piling activity was delayed or stopped due to presence of marine mammals;
- Details of watches made for marine mammals, including details of any sightings, and details of the piling activity during the watches;
- Details of any problems encountered during the piling activities including instances of non-compliance with the agreed piling protocols; and
- Any recommendations for amendment of the protocols.

4.8.2.2 PAM protocol

This protocol will be followed when works are to commence during periods of low visibility (i.e. when sea states are not conducive to visual monitoring, fog or darkness).

PAM systems can only be used to detect vocalising species of marine mammals, which includes bottlenose dolphin and harbour porpoise, and they are not as accurate as visual observations for determining range. As such, the most accurate system available will be used and the PAM Operative will factor in a realistic estimate of the range accuracy.

PAM systems will be deployed at a location in the vicinity of the proposed quay which allows uninterrupted and realistic background underwater noise measurements prior to the commencement of the activity. The hydrophones will be calibrated to receive cetacean (dolphin, porpoise and whale) calls, both whistles and clicks over a frequency range of 1 to 20kHz and 15kHz to 150kHz. Whilst less vocal, the hydrophones will also be calibrated to intercept and recognise grey seal and harbour seal, typically vocal over a frequency range of 100kHz to 150kHz.

The PAM system will be appropriately placed with sufficient spatial coverage to measure and monitor construction noise generation within the marine mammal mitigation zone. Underwater noise levels at this mitigation perimeter must be less than the values prescribed within the CEMP.

PAM activities will be carried out in consultation with the University of Aberdeen and Marine Scotland to ensure that the information collected is suitable to be assessed against the longer term studies in the wider area. The results of the PAM will be appropriately recorded and reported, and in accordance with JNCC guidance.

[42] The guidance states that there is no scientific evidence for this voluntary hypothesis; instead it is based on a common sense approach. Factors such as food availability may result in marine mammals approaching piling operations; in particular, the availability of prey species stunned by loud underwater noise may attract seals into the vicinity.

4.8.2.3 Vibratory Piling Mitigation Protocol

The requirement of an MMO for Vibratory Piling is not considered necessary due to the underwater noise modelling displaying only negligible risks of PTS to bottlenose dolphin, harbour porpoise and seals. A soft-start method/gradual ramp- up of power will likely deter marine mammals from staying within, or moving into the area where vibratory piling is ongoing.

4.8.2.4 Dredging Mitigation Protocol

The requirement of an MMO for dredging is not considered necessary due to the small TTS zones associated with the noise generated. Instead, contractors should be made aware that marine mammals may be present within the working area, and suggested vessel movement mitigation (Technical Appendix 4.1) should be implemented.

4.8.2.5 Dredge Disposal Protocol

An MMO will be present on the dredge vessel during disposal at The Sutors site. A scan of the water within an approximate 250m radius shall be undertaken prior to dredge material being disposed of to ensure there are no marine mammals, particularly bottlenose dolphin which frequently utilise this habitat, are in proximity to the vessel. The search will be conducted for a minimum of ten minutes.

4.8.3 Vessel Movement

Speed restrictions shall be implemented on vessels travelling to and from the proposed development, and will continue throughout construction and operation. Chapter 8: Other Issues includes further information regarding vessel movements and mitigation; and Technical Appendix 4.2 includes detailed mitigation. Good practice measures that will be followed include:

- Keep a safe distance. Never get closer than 100m (200m if another boat is present) if within 100m, switch the engine to neutral;
- Never drive head on to, or move between, scatter or separate marine mammals or sharks. If unsure of their movements, simply stop and put the engine into neutral;
- Spend no longer than 15 minutes near the animals;
- Special care must be taken with mothers and young;
- Maintain a steady direction and a slow ‘no wake’ speed; and
- Avoid sudden changes in speed.

4.8.4 Cumulative Working

In the event of overlap between underwater noise producing activities at the development sites noted in Section 4.7.3, a ‘Works Dialogue Protocol’ shall be implemented which would involve active communication between the four projects.

Assuming that all parties agree to a collaborative working approach, an initial meeting would be arranged with respective Ecological Clerk of Works present, where the programmes for both projects would be reviewed to identify any overlaps of potential concern, along with the mitigation and monitoring measures in place. The performance of the mitigation measures and findings from the monitoring of activities to date would be considered along with the measures set out in the MMPP. This collaborative working would aim to review, and if necessary update the MMPP in order to minimise and mitigate potential impacts identified. Regular communication would continue through any period of programme overlap, with minutes of meetings being made available as required.

Mitigation outlined within the CEMP regarding INNS shall be implemented during operation as well as construction.

4.8.5 Success of Mitigation

The above mitigation measures are assessed as having a certain/near certain level of success. The measures have been appraised by the Aberdeen University Lighthouse Field Station.

Supporting evidence from similar developments have been used as well as standard guidelines for pollution prevention control.

4.9 Residual Effects

Residual effects are described within Table 4.23 below.

Table 4.23: Residual Effects

IEF	Importance of IEF	Nature	Duration	Magnitude	Significance of Effect	Confidence	Success of Mitigation
Construction Phase							
Moray Firth SAC	International	Underwater noise (piling and dredging)	Temporary	Low	Not significant	High	Certain/near certain
Dornoch Firth and Morrich More SAC	International	Underwater noise (piling and dredging)	Temporary	Low	Not significant	High	Certain/near certain
Bottlenose dolphin	International	Underwater noise (piling and dredging)	Temporary	Low	Not significant	High	Certain/near certain
Harbour porpoise	International	Underwater noise (piling and dredging)	Temporary	Low	Not significant	High	Certain/near certain
Harbour seal	National	Underwater noise (piling and dredging)	Temporary	Low	Not significant	High	Certain/near certain
Grey seal	County/metropolitan	Underwater noise (piling and dredging)	Temporary	Low	Not significant	High	Certain/near certain
Atlantic Salmon	National	Underwater noise (piling and dredging)	Temporary	negligible	Not significant	High	Certain/near certain
Sea Trout	National	Underwater noise (piling and dredging)	Temporary	negligible	Not significant	High	Certain/near certain
European Eel	International	Underwater noise (piling and dredging)	Temporary	negligible	Not significant	High	Certain/near certain
Sea Lamprey	National	Underwater noise (piling and dredging)	Temporary	negligible	Not significant	High	Certain/near certain
River Lamprey	National	Underwater noise (piling and dredging)	Temporary	negligible	Not significant	High	Certain/near certain
Moray Firth SAC	International	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain
Dornoch Firth and Morrich More SAC	International	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain

IEF	Importance of IEF	Nature	Duration	Magnitude	Significance of Effect	Confidence	Success of Mitigation
Bottlenose dolphin	International	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain
Harbour porpoise	International	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain
Harbour seal	National	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain
Grey seal	County/metropolitan	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain
Atlantic salmon	National	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain
Sea trout	National	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain
European Eel	International	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain
Sea Lamprey	National	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain
River Lamprey	National	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain
Cromarty South and Udele Bay Shellfish Waters Protected Area	National (Scottish)	Dredging (Increased turbidity and sedimentation)	Temporary	negligible	Not significant	High	Certain/near certain
Moray Firth SAC	International	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain
Dornoch Firth and Morrich More SAC	International	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain
Bottlenose dolphin	International	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain
Harbour porpoise	International	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain

IEF	Importance of IEF	Nature	Duration	Magnitude	Significance of Effect	Confidence	Success of Mitigation
Harbour seal	National	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain
Grey seal	County/metropolitan	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain
Atlantic salmon	National	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain
Sea trout	National	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain
European Eel	International	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain
Sea Lamprey	National	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain
River Lamprey	National	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain
Cromarty South and Udele Bay Shellfish Waters Protected Area	National (Scotland)	Pollution to water	Temporary	negligible	Not significant	High	Certain/near certain
Moray Firth SAC	International	Dredging and increase in vessels movement (spread/introduction of INNS)	Permanent	negligible	Significant based on the precautionary principal	Intermediate	Probable
Dornoch Firth and Morrich More SAC	International	Dredging and increase in vessels movement (spread/introduction of INNS)	Permanent	negligible	Significant based on the precautionary principal	Intermediate	Probable
Cromarty Firth SSSI	National	Dredging and increase in vessels movement (spread/introduction of INNS)	Permanent	negligible	Significant based on the precautionary principal	Intermediate	Probable

IEF	Importance of IEF	Nature	Duration	Magnitude	Significance of Effect	Confidence	Success of Mitigation
Cromarty South and Udele Bay Shellfish Waters Protected Area	National (scotland)	Dredging and increase in vessels movement (spread/introduction of INNS)	Permanent	negligible	Significant based on the precautionary principal	Intermediate	Probable
Moray Firth SAC	International	Increased lighting (disturbance during hours of darkness)	Temporary	negligible	Not significant	High	Certain/near certain
Dornoch Firth and Morrich More SAC	International	Increased lighting (disturbance during hours of darkness)	Temporary	negligible	Not significant	High	Certain/near certain
Bottlenose dolphin	International	Increased lighting (disturbance during hours of darkness)	Temporary	negligible	Not significant	High	Certain/near certain
Harbour porpoise	International	Increased lighting (disturbance during hours of darkness)	Temporary	negligible	Not significant	High	Certain/near certain
Harbour seal	National	Increased lighting (disturbance during hours of darkness)	Temporary	negligible	Not significant	High	Certain/near certain
Grey seal	County/metropolitan	Increased lighting (disturbance during hours of darkness)	Temporary	negligible	Not significant	High	Certain/near certain
Atlantic salmon	National	Increased lighting (disturbance during hours of darkness)	Temporary	negligible	Not significant	High	Certain/near certain
Sea trout	National	Increased lighting (disturbance during hours of darkness)	Temporary	negligible	Not significant	High	Certain/near certain
European Eel	International	Increased lighting (disturbance during hours of darkness)	Temporary	negligible	Not significant	High	Certain/near certain
Sea Lamprey	National	Increased lighting (disturbance during hours of darkness)	Temporary	negligible	Not significant	High	Certain/near certain
River Lamprey	National	Increased lighting (disturbance during hours of darkness)	Temporary	negligible	Not significant	High	Certain/near certain
Moray Firth SAC	International	Increase in vessel movement (collision)	Temporary	negligible	Not significant	High	Certain/near certain

IEF	Importance of IEF	Nature	Duration	Magnitude	Significance of Effect	Confidence	Success of Mitigation
Dornoch Firth and Morrich More SAC	International	Increase in vessel movement (collision)	Temporary	negligible	Not significant	High	Certain/near certain
Bottlenose dolphin	International	Increase in vessel movement (collision)	Temporary	negligible	Not significant	High	Certain/near certain
Harbour porpoise	International	Increase in vessel movement (collision)	Temporary	negligible	Not significant	High	Certain/near certain
Harbour seal	National	Increase in vessel movement (collision)	Temporary	negligible	Not significant	High	Certain/near certain
Grey seal	County/metropolitan	Increase in vessel movement (collision)	Temporary	negligible	Not significant	High	Certain/near certain
Bottlenose dolphin	International	Dredge disposal at The Sutors (collision/disturbance)	Temporary	negligible	Not significant	High	Certain/near certain
Moray Firth SAC	International	Dredging (Changes to coastal processes)	Temporary	negligible	Not significant	High	Certain/near certain
Cromarty Firth SSSI	National	Dredging (Changes to coastal processes)	Temporary	negligible	Not significant	High	Certain/near certain
Harbour seal	National	Impact piling (above ground noise disturbance)	Temporary	negligible	Not significant	High	Certain/near certain
Grey seal	County/metropolitan	Impact piling (above ground noise disturbance)	Temporary	negligible	Not significant	High	Certain/near certain
Operational Phase							
Moray Firth SAC	International	Increased vessel movement (collision)	Permanent	negligible	Not significant	High	Certain/near certain
Dornoch Firth and Morrich More SAC	International	Increased vessel movement (collision)	Permanent	negligible	Not significant	High	Certain/near certain
Bottlenose dolphin	International	Increased vessel movement (collision)	Permanent	negligible	Not significant	High	Certain/near certain
Harbour porpoise	International	Increased vessel movement (collision)	Permanent	negligible	Not significant	High	Certain/near certain

IEF	Importance of IEF	Nature	Duration	Magnitude	Significance of Effect	Confidence	Success of Mitigation
Harbour seal	National	Increased vessel movement (collision)	Permanent	negligible	Not significant	High	Certain/near certain
Grey seal	County/metropolitan	Increased vessel movement (collision)	Permanent	negligible	Not significant	High	Certain/near certain
Moray Firth SAC	International	Increase in vessels movement (spread/introduction of INNS)	Permanent	negligible	Not significant	High	Probable
Dornoch Firth and Morrich More SAC	International	Increase in vessels movement (spread/introduction of INNS)	Permanent	negligible	Not significant	High	Probable
Cromarty Firth SSSI	National	Increase in vessels movement (spread/introduction of INNS)	Permanent	negligible	Not significant	High	Probable

4.10 Statement of Significance

This chapter concludes that following the proposed mitigation, which has been designed upon review of engineering design and construction techniques, adverse effects will not be significant with the exception of a precautionary assessment of significant effects in relation to the spread of INNS.

5 CHAPTER 5: WATER ENVIRONMENT AND COASTAL PROCESSES

5.1 Introduction

This chapter of the EIAR provides an assessment of the implications of the proposed development on the water environment, soils and coastal processes. The water environment is considered to encompass hydrology, hydrogeology and water quality, whilst coastal processes are considered to encompass tides, waves and sediment transport processes.

The Water Framework Directive (WFD) (Council Directive 2000/60/EC) aims to protect and enhance water bodies within Europe and covers all estuarine and coastal waters out to 1 nautical mile. This requires that there is no deterioration in the quality of surface or groundwater bodies and aims to achieve good ecological status or potential. The implications of the WFD must be considered when assessing this project and the details of how compliance will be achieved provided in the EIAR.

Details of the site and the proposed development are provided in Chapter 2: Proposed Development. The assessment will identify sensitive issues within the site by establishing the current baseline and examining the proposed development within this context.

This chapter is supplemented by the following appendices within Volume 3 of this EIAR, along with the relevant figures within Volume 2:

- Technical Appendix 5.1: Simplified Index Approach (SIA) Calculation.; and
- Technical Appendix 5.2: Previous Modelling Reports.

Technical Appendix 5.2 includes previous modelling reports undertaken for the adjacent, South Quay development by Royal Haskoning DHV in 2013. The modelling results have been used to inform the baseline and impacts of this chapter, due to the proximity to the proposed development, the extent of the models covering the proposed development and the surrounding areas, and the comprehensive nature of the reports.

5.2 Scoping and Consultation

Scoping Opinions have been received from Marine Scotland, SEPA, SNH and The Highland Council (THC). A summary of the relevant scoping responses is set out below in Table 5.1, with details of how the scoping consultation has been taken into consideration when conducting this assessment.

Table 5.1: Summary of Consultation Responses

Organisation	Consultation Response	How and where addressed
Marine Scotland (20th May 2019)	Water environment and coastal processes, including tidal current, wave action, and associated sediment transport processes, to be included in EIAR. Information from earlier developments may form the basis of the assessment water environment and coastal processes chapter.	Addressed throughout chapter. The assessment draws on coastal modelling undertaken for the adjacent South Quay development.
	The assessment should include detailed modelling of the level of change with	Considered as a result of the modelling outputs reviewed throughout the Chapter, and assessed within the Tidal Regime, Wave

Organisation	Consultation Response	How and where addressed
	regard to coastal squeeze in the Cromarty Firth.	Climate, and Sediment Transport impact assessments with Section 5.6.
	Proposed land reclamation has the potential to alter wave direction and local coastal geomorphological characteristics, so should be assessed in the EIAR along with proposed mitigation measures for pollution prevention.	Addressed throughout chapter, with wave direction and coastal geomorphological (sediment processes) assessed in Section 5.6.3.4 and Section 5.6.3.5, respectively. Mitigation measures are outline in Section 5.7.
	Vulnerability of the project to climate change concerned with the water environment, including flood risk and wave overtopping due to increases in sea level, should be covered within the EIAR.	Vulnerability of the project to climate change concerned with the water environment, including flood risk due to increases in sea level is considered within Section 5.5.13.
SEPA (20th March 2019)	Surface water run-off must be treated by sustainable drainage systems (SuDS) and meet the requirements of CIRIA C753.	Surface water run-off will be treated by sustainable drainage systems (SuDS) and will meet the requirements of CIRIA C753.
	The Simple Index Approach (SIA) calculation should be used for the lower risk areas within the site. For areas where there is a higher pollution risk, a detailed risk assessment should be submitted.	Simple Index Approach (SIA) calculation undertaken within Technical Appendix 5.1.
	Existing surface water discharges and their treatment systems must be shown on a site map.	Surface water discharges are shown on Figure 5.6.
	The estimated 1 in 200 year flood level is 3.37mAOD based on extreme still water level calculations using the Coastal Flood Boundary (CFB) Method. A minimum 600mm freeboard recommended to be added to the CFB levels to allow for modelling uncertainties.	For operational reasons the quay design level is 3.9mAOD, this is identical to the level of the recent South Quay and 530mm above the estimated 1 in 200 year RP extreme sea level.
	Land reclamation may alter wave direction and local geomorphology characteristics, which may increase flood risk. Therefore the risk of increasing flood risk should be assessed.	Flood risk is considered in section 5.5.8, local overtopping of the quay during extreme westerly storm events may occur. This is an accepted risk and regarded as a maintenance and operational burden by the Developer, for which appropriate mitigation will be implemented.

Organisation	Consultation Response	How and where addressed
	All existing outfalls should be identified and details of how each will be accommodated included on the site plans.	Outfalls are shown on Figure 5.6. Detailed drainage design will be undertaken in the pre-construction phase of the proposed development.
	All proposed mitigation should be detailed within a suitably robust schedule of mitigation for the construction, operation, maintenance, demolition and restoration periods.	Mitigation and monitoring is considered within Section 5.7 of this chapter. A detailed schedule will be prepared in in the pre-construction phase of the proposed development.
SNH (18th April 2018)	Sediment modelling to assess potential alteration to extent, distribution and composition of marine habitats and species as a result of changes in hydrographic/coastal processes. Previous sediment modelling carried out for the South Quay development, together with any monitoring data held by Marine Scotland, should be sufficient.	Previous sediment modelling carried out for the South Quay development is considered throughout the chapter and has been used to inform the assessment.
The Highland Council (4th March 2019)	Assessment should include detailed modelling of the level of change with regard to coastal squeeze.	Considered as a result of the modelling outputs reviewed throughout the Chapter, and assessed within the Tidal Regime, Wave Climate, and Sediment Transport impact assessments with Section 5.6.
	Cumulative impacts with recent and any proposed works current within the planning/licencing system with Cromarty Firth ports should be considered	Cumulative impacts assessed in Section 5.6.5.
	The dredge disposal site should be clarified and modelling of dredge impacts should include an assessment of any potential impacts on the relatively nearby large shellfish sites	Dredge impacts are considered in Section 5.6.
	Qualifying features in the numerous adjacent designated sites should be considered.	Cumulative impacts assessed in Section 5.6.5.

5.3 Policy, Legislation and Guidance

The assessment for the water environment and coastal processes has been undertaken with reference to the following relevant planning policy, legislation and guidance.

5.3.1 Relevant Planning Policy

- Scottish Planning Policy (SPP) (2014);
- UK Marine Policy Statement (2011);
- Scotland's National Marine Plan (2015); and
- The Inner Moray Firth Local Development Plan (2015).

5.3.2 Relevant Legislation

- Water Framework Directive (WFD) 2000;
- Water Environment and Water Services (Scotland) Act 2003;
- Marine (Scotland) Act 2010;
- Coast Protection Act 1949;
- Flood Risk Management (Scotland) Act 2009;
- Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended (CAR);
- Water Environment (Miscellaneous) (Scotland) Regulations 2017;
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (The Habitats Directive);
- Environmental Impact Assessment (EIA) Directive (2014/52/EU);
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- The Marine Works (Environmental Impact Assessment) Regulations (Scotland) 2017;

5.3.3 Relevant Guidance

- Guidelines for Water Pollution Prevention from Civil Engineering Contracts;
- Land Use Planning System (LUPS) SEPA Guidance CC1: Climate change allowances for flood risk assessment in land use planning;
- LUPS-GU24: Flood Risk and Land Use Vulnerability Guidance;
- Pollution Prevention Guidance 1 (PPG): General guide to the prevention of pollution;
- PPG3: Use and design of oil separators in surface water drainage systems (to be read in conjunction with 'Oil Separator Manufacturers – Version 7 – November 19th 2007);
- PPG 6: Working at construction and demolition sites;
- PPG 7: Refuelling facilities;
- PPG 18: Managing for water and major spillages;
- PPG 22: Incident response – dealing with spills;
- PPG26: Storage & handling of drums & intermediate bulk containers;
- Guidance for Pollution Prevention (GPP) 2: Above ground oil storage tanks;
- GPP 5: Works and maintenance in or near water;
- GPP 8: Safe storage and disposal of used oils;
- GPP 13: Vehicle washing and cleaning;
- GPP 21: Pollution incident response planning;
- WAT-SG-26: Good Practice Guide – Sediment Management; and
- WAT-SG-29: Good Practice Guide – Construction Methods.

5.4 Methodology

5.4.1 General

The assessment follows standard EIA procedures which include:

- Desk based review of the design of the proposed development in relation to the local water environment, soils and coastal processes;
- Consultation with key stakeholders to obtain relevant information and to ensure their concerns are addressed within the study;
- Establishing the existing baseline conditions:
  - Review topography, soils, geology and ground conditions at the site and environs;
  - Review of hydrology, catchment characteristics, and water quality conditions;
  - Review of coastal processes including bathymetry, tidal levels, river and tidal flow currents, wave action, bed sediment type and distribution, sediment transport and deposition, geology;
  - Review of detailed hydrodynamic, wave, and sediment dispersion modelling reports displayed within Technical Appendix 5.2: Previous Modelling Reports, due to the similarity with the proposed development – which is likely to result in similar impacts; and
  - Reporting of baseline conditions to provide a basis for assessment of the potential impact.
- Impact Assessment:
  - Identification of sensitive receptors and environmental constraints;
  - Identification of potential impacts;
  - Assessment of impact magnitude;
  - Identification and assessment of mitigation measures to reduce or avoid any potential impacts of the proposed development; and
  - Statement of residual effects.

Potential impacts arising from the proposed development have been predicted and evaluated. The observed baseline data was used along with professional opinion to qualitatively assess the potential impacts and the significance to receptors.

5.4.2 Assessment Criteria

The assessment criteria set out in Table 5.2 and Table 5.3 has been used to develop a matrix to assess the significance of effects from the proposed development on the local water environment (Table 5.4). The assessment of residual effects also takes into consideration the probability of the effect occurring (certain, likely, possible or unlikely) and the duration of the effect (short (less than 2 years), medium (2 - 5 years), long term (more than 5 years) or permanent.

All direct and indirect impacts causing moderate or major effects as identified in Table 5.4 are considered to be significant.

Table 5.2: Criteria for Assessing Receptor Sensitivity

Receptor Sensitivity	Description
Low	Receptors with a high capacity to accommodate change, low value or poor condition and no significant uses, for example: • Receptor is not an internationally, nationally or locally designated site. • Not classified as a surface water body for the River Basin Management Plan (RBMP). • Surface water body not significant in terms of fish spawning and no other sensitive aquatic ecological receptors e.g. freshwater pearl mussels. • Surface water body not used for abstraction. • Surface water body not used for recreation directly related to water quality e.g. angling, swimming, watersports. • Surface water body not used by commercial or recreational vessels. • Low or very low productivity aquifer with no identified abstractions.
Medium	Receptors with a moderate capacity to accommodate change, medium value or condition and limited use, for example: • Receptor is not an internationally or nationally designated site. May be a locally designated site. • Salmonid species may be present and surface water body may be locally important for spawning. No other sensitive aquatic ecological receptors e.g. freshwater pearl mussels. • Surface water body used for private water supply or medium scale industrial/ agricultural abstractions. • Surface water body used for occasional or local recreation e.g. local angling clubs. • Navigable surface water body used by commercial or recreational vessels. • Moderate productivity aquifer. • Groundwater body supports identified private water supplies or medium scale industrial/ agricultural abstractions.
High	Receptors with a low capacity to accommodate change, high value or condition and significant use, for example: • Receptor is an internationally or nationally designated site. • Surface water body supports sensitive aquatic ecological receptors e.g. freshwater pearl mussels. • Surface water body used for public water supply or large scale industrial/ agricultural abstractions. • Surface water body important for recreation directly related to water quality e.g. swimming, watersports, angling. • High or very high productivity aquifer. • Groundwater body supports public water supply or large scale industrial/ agricultural abstractions.

Table 5.1: Criteria for Assessing Impact Magnitude

Definition	Impact Magnitude
Negligible	Very light change from baseline conditions. Change barely distinguishable, approximating to the 'no change' situation.
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of the baseline condition will be similar to pre-development circumstances/patterns.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post-development character/ composition/ attributes of baseline will be partially changed.
High	Total loss or major alteration to key elements/features of the baseline (pre-development) conditions such that post-development character/composition/attributes will be fundamentally changed.

Table 5.2: Criteria for Assessing Effects

Sensitivity of Receptor	Magnitude of Impact	Predicted Effect
High	High	Major
High	Medium	
Medium	High	
High	Low	Moderate
Low	High	
Medium	Medium	
Medium	Low	Minor
Low	Medium	
Low	Low	
High, Medium or Low	Negligible	Negligible

5.5 Baseline

5.5.1 Site Description

The proposed development is situated on the south-western side of the Fearn Peninsula, approximately 2.6km south of the village of Nigg and immediately west of the village of Balnapaling. The proposed development is located to the east and adjacent to the existing Nigg Energy Park and extends to approximately 11.27 hectares (ha). It is located at on the northern shore at the mouth of the Cromarty Firth. The Cromarty Firth has a surface area in excess of 78km² and extends over 28km in length. At the mouth, near the proposed development, the Firth is approximately 1.5km in width, and is around 12km in width at its widest point.

Existing and historic land uses at the proposed development include derelict buildings associated with Dunskeath House, with the operational Nigg Energy Park adjacent.

5.5.2 Designated Areas

The following designated sites, with designations associated to the water environment, soils and coastal processes contents of this EIAR, are located within 5km of the proposed development:

- The proposed development is adjacent to the Moray Firth Special Area of Conservation (SAC), which has been selected for its bottlenose porpoise and subtidal sandbanks interests.

- The proposed development is within 650m of the Cromarty Firth Site of Scientific Special Interest (SSSI), which has been selected for its breeding and non-breeding birds and mudflats, and within 900m of the Rosemarkie to Shandwick Coast SSSI for earth sciences, coast and breeding birds.
- The proposed development is within 650m of the Cromarty Firth Special Protection Area (SPA), which has been selected for its breeding and non-breeding birds interests.
- The proposed development is within 650m of the Cromarty Firth Special Protection RAMSAR Site, which has been selected for its breeding and non-breeding birds and intertidal mudflats and sandflats interests.

Further information on designated areas is presented within Chapter 4: Marine Ecology and Figure 1.2, Volume 2 of the EIAR.

5.5.3 Topography and Bathymetry

A topographic survey of the proposed development and the surrounding area has been undertaken. Existing ground levels across the proposed development range between 3.5 – 8.5m Above Ordnance Datum (mAOD), with the exception the lower portions of slipway and shoreline.

A multi-beam bathymetric survey of Nigg East Bank was undertaken by Clydeside Surveys Ltd during April 2018 and on 19th February 2019. Surveyed depths vary between 0m Chart Datum (mCD) (-2.1mAOD) and -14mCD (11.9mAOD). The greater depths within the survey are associated with the deep channel of the Sutors extending along the southern areas of the survey, between the proposed development and Cromarty, and the dredged area related to the Nigg South Quay development, to the west of the proposed development.

The bathymetry of the wider area, including the Cromarty Firth and the Moray Firth, is shown in Figure 5.1, Volume 2 of the EIAR. The bathymetry in the vicinity of the proposed development is shown in Figure 5.2, Volume 2 of the EIAR.

5.5.4 Geology and Soils

5.5.4.1 Bedrock Geology

British Geological Survey (BGS) mapping[43] shows that the proposed development is underlain by sandstone of the Raddery Formation, formed in a fluvial or estuary setting during the Devonian Period (383 – 393 million years ago). Coastal outcrops of the Devonian Period Cromarty Fish Bed Limestone are present to the west of the site. Further west metamorphic rocks (psammite and pelite) from the Moine Supergroup are present, these rocks were formed during the Neoproterozoic Era (541 – 1,000 million years ago). There is no exposed bedrock at the proposed development or the immediate surrounding area.

The bedrock geology is shown on Figure 5.3, Volume 2 of the EIAR.

5.5.4.2 Superficial Deposits

British Geological Survey (BGS) mapping[44] shows that the coastal superficial deposits in the vicinity of the site take the form of marine beach deposits, gravel, sand and silt formed up to 3 million years ago during the Quaternary Period. Immediately inland wind-blown sand deposits are present across the proposed development, also of the Quaternary Period, with glacial till present further inland.

The superficial deposits are shown in Figure 5.4, Volume 2 of the EIAR.

[43] British Geological Survey (2019). GeoIndex Onshore [Online]. Available at: http://mapapps2.bgs.ac.uk/geoindex/home.html
[44] British Geological Survey (2019). GeoIndex Onshore [Online]. Available at: http://mapapps2.bgs.ac.uk/geoindex/home.html

5.5.4.3 Soils

Soil Scotland mapping[45], available through Scotland's Environment, shows the soils of the proposed development's soils to consist of windblown sands. The Map of Topsoil Organic Carbon Concentrations indicates that soils across the majority of the proposed development have moderate organic carbon concentrations (between 1.5 – 3.0%). The soils present are not considered to be natural, as due to previous developments they are likely to have been disturbed and replaced.

Due to the non-natural nature of the soils underlying the proposed development, as a result of previous land-use, soils are not considered further within this EIAR.

5.5.5 Hydrogeology

The proposed development is underlain by a moderately low productivity aquifer from the Middle Old Red Sandstone (undifferentiated) rock unit. The aquifer locally yields small amounts of groundwater, due to consisting of sandstones (flaggy), with siltstones, mudstones and conglomerates and interbedded lavas[46].

Due to the superficial deposits described in Section 5.5.4.2, the groundwater underlying the proposed development is expected to be tidally influenced.

5.5.6 Hydrology

Within the wider Cromarty Firth, the River Conon represents the largest watercourse discharging to the wider Cromarty Firth, draining into the firth near Dingwall, at the western extremity. This has a contributing catchment in excess of 1,000km².

The three main inflows of freshwater discharging into the Outer Cromarty Firth are the Balnagown River, Fearn Canal and Pollo Burn. The Balnagown River and Fearn Canal are larger watercourses with catchment areas in excess of 50km², and are located approximately 4.3km north and 4.1km northwest of the proposed development, respectively. The Pollo Burn discharges into the Outer Cromarty Firth approximately 5.3km north east of the proposed development.

Due to the location of the site, the inflow of freshwater remains insignificant relative to the much larger volume of seawater exchanged within the Cromarty Firth embayment.

There are a number of mapped freshwater inflows to the Cromarty Firth although local discharges from piped drainage systems are present. A review of the master drainage drawing for the South Quay development of Nigg Energy Park and the surface water drainage drawing for the West Quay of Nigg Energy Park indicates that there is a surface water outfall into the south west corner of the existing graving dock and two foul sewer discharges located either side and south of the entrance to the graving dock, all to the north of the proposed development. Additionally are three surface water outfalls to the east of the south quay development, north-west of the proposed development.

The proposed development is located in a small surface water catchment extending to approximately 32,500m². There is no defined watercourse within this catchment. The B9175 to the north-west of the proposed development is raised approximately 1m above the level of the north-eastern area of the proposed development. As a result, this is likely to result in negligible inflows from the catchment to the proposed development.

[45] Scotland's Environment (2019). National Soil Map of Scotland [Online]. Available at: http://map.environment.gov.scot/Soil_maps/?layer=1
[46] British Geological Survey (2019). GeoIndex Onshore [Online]. Available at: http://mapapps2.bgs.ac.uk/geoindex/home.html

The hydrological features of the wider area, including the Cromarty Firth and the Moray Firth, are shown in Figure 5.5, Volume 2 of the EIAR. The hydrological features in the vicinity of the proposed development is shown in Figure 5.6, Volume 2 of the EIAR.

5.5.7 Water Quality and Water Body Status

The receiving coastal waters of the proposed development are classified under the Water Framework Directive (WFD) monitoring programme as the Outer Cromaty Firth (ID 200442). This waterbody is classified as being of overall 'Good' status in 2017, with a hydromorphological status of 'Good' and an overall physico-chemistry status of 'High' (SEPA, n.d.)[47].

The WFD classified groundwater body underlying the proposed development is the Strath Peffer and Alness Coastal is a groundwater (ID: 150805). The ground waterbody is classified as being of overall 'Good' status in 2017, with a hydromorphological status of 'Good' and chemical status of 'Good'[48].

5.5.8 Tidal Water Levels

The nearest standard port to the development site is Invergordon, situated 8km to the west, within the Cromarty Firth. Tidal levels at Invergordon as presented within the Admiralty Tide Tables[49] are shown in Table 5.3. The mean tidal range at Invergordon is 3.6m during spring tides, and 1.7m during neap tides.

Table 5.3: Tidal Range – Invergordon

Tide Condition	Chart Datum (mCD)*	Ordnance Datum (mOD)
Highest Astronomical Tide (HAT)	5.0	2.9
Mean High Water Spring (MHWS)	4.3	2.2
Mean High Water Neap (MHWN)	3.3	1.2
Mean Low Water Neap (MLWN)	1.6	-0.5
Mean Low Water Spring (MLWS)	0.7	-1.4
Lowest Astronomical Tide (LAT)	0.0	-2.1

* Chart Datum correction for Ordnance Datum is -2.1m (relative to OD at Newlyn)

Extreme sea levels have been predicted around the whole UK coastline and published by the Environment Agency/Department for Environmental Food and Rural Affairs report[50]. These extreme levels include the effects of both tides and storm surge but not the effect of amplification within estuaries or sea lochs. In order to provide better estimates around the Scottish coastline, SEPA have updated the original estimates[51]. The SEPA derived extreme sea levels, predicted at a point adjacent to Nigg, are 3.37m Above Ordnance Datum (AOD) for the 1 in 200 year return period event and 3.53mAOD for the 1 in 1,000 year return period event and are presented in Table 5.4.

Table 5.4: Cromarty Extreme Sea Levels (SEPA Dataset)

Return Period (Years)	Water Level (mCD)	Water Level (mAOD)
2	5.00	2.90
5	5.09	2.99

[47] SEPA (1018). Water Classification Hub – Outer Cromarty Firth [Online]. Available at: https://www.sepa.org.uk/data-visualisation/water-classification-hub/
[48] SEPA (1018). Water Classification Hub - Strath Peffer and Alness Coastal [Online]. Available at: https://www.sepa.org.uk/data-visualisation/water-classification-hub/
[49] UKHO (2019). Admiralty Tide Tables Volume 1B: United Kingdom and Ireland (Excluding Isles of Scilly, English Channel to River Humber, Channel Islands and European Channel Ports) (Vol. 1).
[50] McMillan, A.; Batstone, C.; Worth, D.; Tawn, J.; Horsburgh, K. & Lawless, M. (2011). Coastal flood boundary conditions for UK mainland and islands; Project: SC060064/TR2: Design sea levels
[51] SEPA (2014). Scottish Coastal Flood Boundary (CFB) Dataset

Return Period (Years)	Water Level (mCD)	Water Level (mAOD)
10	5.17	3.07
50	5.33	3.23
100	5.40	3.30
200	5.47	3.37
1000	5.63	3.53

5.5.9 Tidal Currents

The prevailing tidal currents within the Inner Moray Firth are of generally low velocity, flowing parallel to the shoreline across the mouth of the Cromarty Firth, where they are locally influenced by flows entering and leaving the firth.

At the entrance to the Cromarty Firth both flood and ebb tidal currents follow the alignment of the main channel (east – west), between the opposing headlands known as the Sutors. Here peak tidal velocities of 0.75m/s occur on both the flood and ebb tide. However, generally the ebb tide currents are greater in magnitude than those on the flood tide. To the west, between the proposed development and Cromarty, the ebb currents have been reported as increasing to over 1m/s, whilst further west between Cromarty and Invergordon velocities rarely exceed 0.6m/s[52].

Previous assessments have shown that the wider pattern of the flooding and ebbing tides is affected by temporary perturbations in current speed and does not follow a typical 'smooth' flooding or ebbing tide curve, due to the complex pattern of eddies that form at different states of the tidal cycle in the Cromarty Firth.

A gyre exists across Nigg Bay, acting to circulate currents locally. Further west as the Cromarty Firth widens the tidal currents are generally low. This is also the case over the intertidal flats, such as those of Nigg Bay, current speeds are generally low but can increase within drainage channels. As the proposed development is located adjacent to the existing quay, which was reclaimed from the estuary in the 1970's, 'natural' flows are considered to be locally affected[53].

5.5.10 Wind and Wave Climate

5.5.10.1 Wind Climate

In the Moray Firth the prevailing wind direction is from the south-west, whilst the offshore wave direction is predominantly from the north-east. The prevailing wind direction in the wider Cromarty Firth is from the southwest. Average wind speeds in excess of 5m/s occur during winter months at Tain[54], the nearest Meteorological Office (MET Office) climate station which is located approximately 13km north of the proposed development.

5.5.10.2 Wave Climate

The dominant offshore wave direction within the Moray Firth is from the north and northeast (0 to 40°). Given the orientation of the Moray Firth coastline and the entrance to the Cromarty Firth, there is limited swell wave penetration from the Moray Firth into the Cromarty Firth. The wave climate within the Cromarty Firth is dominated by wind waves generated within the Cromarty Firth, with longest fetches from the south-west[10].

[52] Ramsay, D.L. & Brampton, A.H. (2000) Coastal Cells in Scotland: Cell 3 – Cairnbulg Point to Duncansby Head. Scottish Natural Heritage Research, Survey & Monitoring Report, No. 145.
[53] Royal Haskoning DHV (2013). Nigg Energy Park: Sedimentation and Wave Modelling (Main Report & Appendices). Global Energy Nigg Ltd.
[54] Met Office (2019). Tain Range climate. https://www.metoffice.gov.uk/public/weather/climate/gfm0vv8h1

Wave modelling undertaken for the South Quay development at Nigg Energy Park[55] showed significant wave heights between 0.5 - 1.0m under 1 in 1 year return period conditions and between 1.0 - 1.5m under 1 in 50 year return period conditions for the area seaward of the proposed development. In the immediate vicinity of the existing Nigg Energy Park localised disturbance to the wave climate occurs as a result of diffraction and reflection from quay walls and the surrounding shoreline.

Further details of wave climate and modelling undertaken are presented within Technical Appendix 5.2: Previous Modelling Reports.

5.5.11 Sediment Processes

The Cromarty Firth is a glacial valley formed during the last Ice Age and subsequently flooded as a result of post-glacial sea level rise. Significant sediment deposits are present within the firth as a result of post-glacial erosion and sedimentation processes, with present day sediment processes within the firth largely relating to the re-working of this material[56].

Review of historical mapping[57], as well as the Dynamic Coast National Coastal Change Assessment map[58] and associated reports[59], highlights the local changes to the coastline at the development site as a result of land reclamation and hard engineering during previous phases of development. It is also highlights that the coastline to the east of the development site, and on the opposite shore of the firth to the south, has remained relatively stable throughout the mapped record.

Previous assessments of sediment transport in the vicinity of the proposed development site indicate that sediment can move from sandbanks in the Inner Moray Firth to the Cromarty Firth episodically as a result of storm wave driven transport, with sand stirred as a result of wave action off the shallower areas of seabed. This material then subsequently becomes re-worked by wave action towards the shoreline, with resultant long-shore transport westwards into the Cromarty Firth. These processes result in sediment being deposited within deeper waters of the dredged channels at the proposed development site. These sediment deposits therefore originate predominately from the Inner Moray Firth, with limited sediment input from the Nigg Bay to the west.

Bathymetric survey data described within previous assessments (Technical Appendix 5.2: Previous Modelling Reports) indicated that average deposition rates within dredged areas in the vicinity of the development site are around 100mm/year[60]. It is also acknowledged that in some places sedimentation can be higher than average and there will be some variation in values.

5.5.12 Flood Risk

There are no watercourses on or adjacent to the site, so there is no risk of river flooding. The SEPA flood maps indicate that two small areas within the centre and north of the proposed development lie within the medium likelihood (0.5% annual exceedance probability (AEP) or 1 in 200 year return period) surface water flood extents. These areas represent topographic low points that are no longer present due to recent groundworks.

The flood maps also show that proposed development lies within the high likelihood (10% AEP or 1 in 10 year return period) coastal flood extent, and may therefore be at high risk of coastal flooding - with the areas shown

[55] Royal Haskoning DHV (2013). Nigg Energy Park: Sedimentation and Wave Modelling (Main Report & Appendices). Global Energy Nigg Ltd.
[56] Ramsay, D.L. & Brampton, A.H. (2000) Coastal Cells in Scotland: Cell 3 – Cairnbulg Point to Duncansby Head. Scottish Natural Heritage Research, Survey & Monitoring Report, No. 145.
[57] National Library of Scotland (https://maps.nls.uk/)
[58] The Scottish Government (2017). Dynamic Coast: Scotland's National Coastal Change Assessment. Retrieved from http://www.dynamiccoast.com/webmap.html
[59] Hansom, J.D., Rennie, A.F. & Fitton, J. M. (2017). Dynamic Coast - National Coastal Change Assessment: Cell 3 - Cairnbulg Point to Duncansby Head. CREW.
[60] Royal Haskoning DHV (2013). Nigg Energy Park: Sedimentation and Wave Modelling (Main Report & Appendices). Global Energy Nigg Ltd.

as high likelihood located in the tidal zone. However, as outlined in the scoping response received from SEPA (Table 5.1), the proposed development is water compatible and therefore suitable for development in this location.

SEPA highlighted the requirement for all new development, unless operational reasons require otherwise, to be situated above the 1 in 200 year extreme sea level of 3.37mAOD (5.47mCD) as presented in Table 5.4, and including a recommended additional 0.6m freeboard. The development has been designed in line with these stated levels, with a platform level of 3.9mAOD adopted for operational reasons. This level is exactly the same level adopted within the recent South Quay development, and is 530mm above the 1 in 200 year RP extreme sea level.

Surface water flooding is not considered due to the B9175 road, north-west of the proposed development, being raised approximately 1m above the level of the north-eastern area of the proposed development, reducing the ingress of surface water run-off into the site. Therefore flood risk is not considered further within this EIAR.

5.5.13 Future Projections and Effects of Climate Change

The UK government has published a range of climate projection reports and data for use in the assessment of climate change risks to help plan how to adapt to a changing climate. The latest set of comprehensive reports produced by UK Climate Projections (UKCP18)[61] was published in 2018 and provides future climate projections for land and marine regions for the UK.

The UKCP18 projections are presented for a range of different scenarios or Representative Concentration Pathways (RCPs). RCPs are a method for capturing assumptions required on future economic, social and physical changes to our environment that will influence climate change. The increase in in global mean surface temperature (°C) by 2081 – 2100 for the different RCP's is outlined below:

- RCP2.6 = 1.6°C (0.9 – 2.3°C)
- RCP4.5 = 2.4°C (1.7 – 3.2°C)
- RCP6.0 = 2.8°C (2.0 – 3.7°C)
- RCP8.5 = 4.3°C (3.2 – 5.4°C)

Diagram 5.1 presents the UKCP18 RCP predictions for carbon dioxide concentrations, along with resulting changes in global mean surface temperatures. Diagram 5.2 presents UKCP18 RCP predictions for time-mean sea level change based on an average of UK ports, along with the spatial pattern of sea level change around the UK coastline at year 2100. Review of these predictions highlights that the proposed development is within a zone of lower sea level change in a UK context.

[61] UKCP18 (2018). UK Climate Projections. https://www.metoffice.gov.uk/research/collaboration/ukcp: Environment Agency & Met Office.

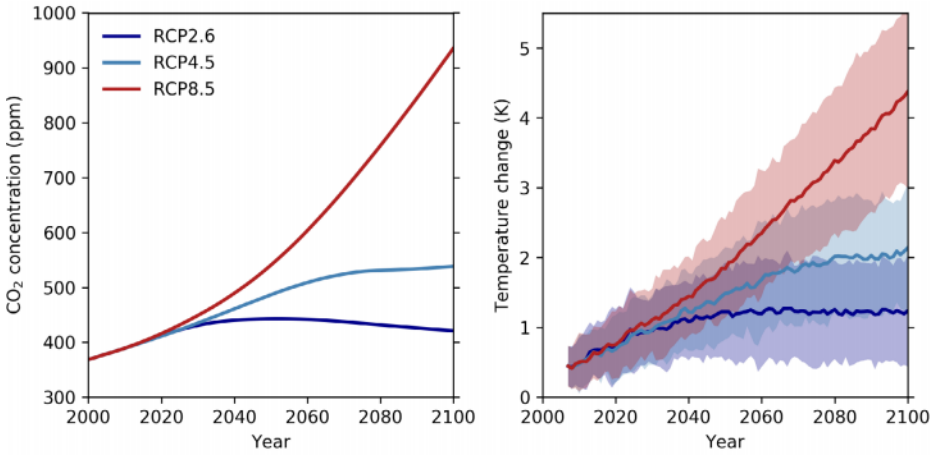

Diagram 5.1: UKCP18 RCP predictions over the 21st century for carbon dioxide concentrations (left) and global mean surface temperature change resulting from carbon dioxide and other climate forcings (right)

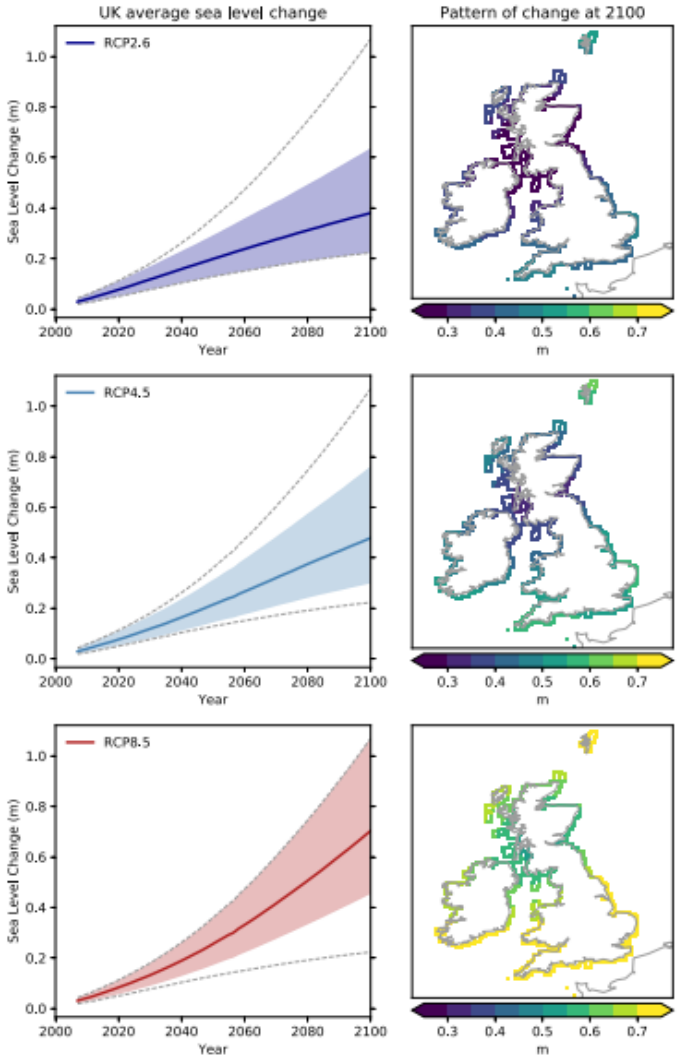

Diagram 5.2: UKCP18 time series of time-mean sea level change for RCPs based on average of UK ports (left) and the spatial pattern of change at 2100 (right)

The UKCP18 future projections of relative sea-level rise were obtained for the nearest gauging station to the proposed development (located in the Moray Firth) for 2020 and 2100, with the results shown in Diagram 5.3. It should be noted that there is a wide range of uncertainty associated with these projections, and that these values represent an average relative sea-level rise across a range of return period scenarios.

Under the United Nations Climate Change Paris Agreement the UK is committed to attempt to hold the increase in global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit warming to 1.5°C. These targets are in line with those allowed for within UKCP18 RCP 2.6, or the lower end of RCP 4.5, in terms of median global temperature increase by 2100.

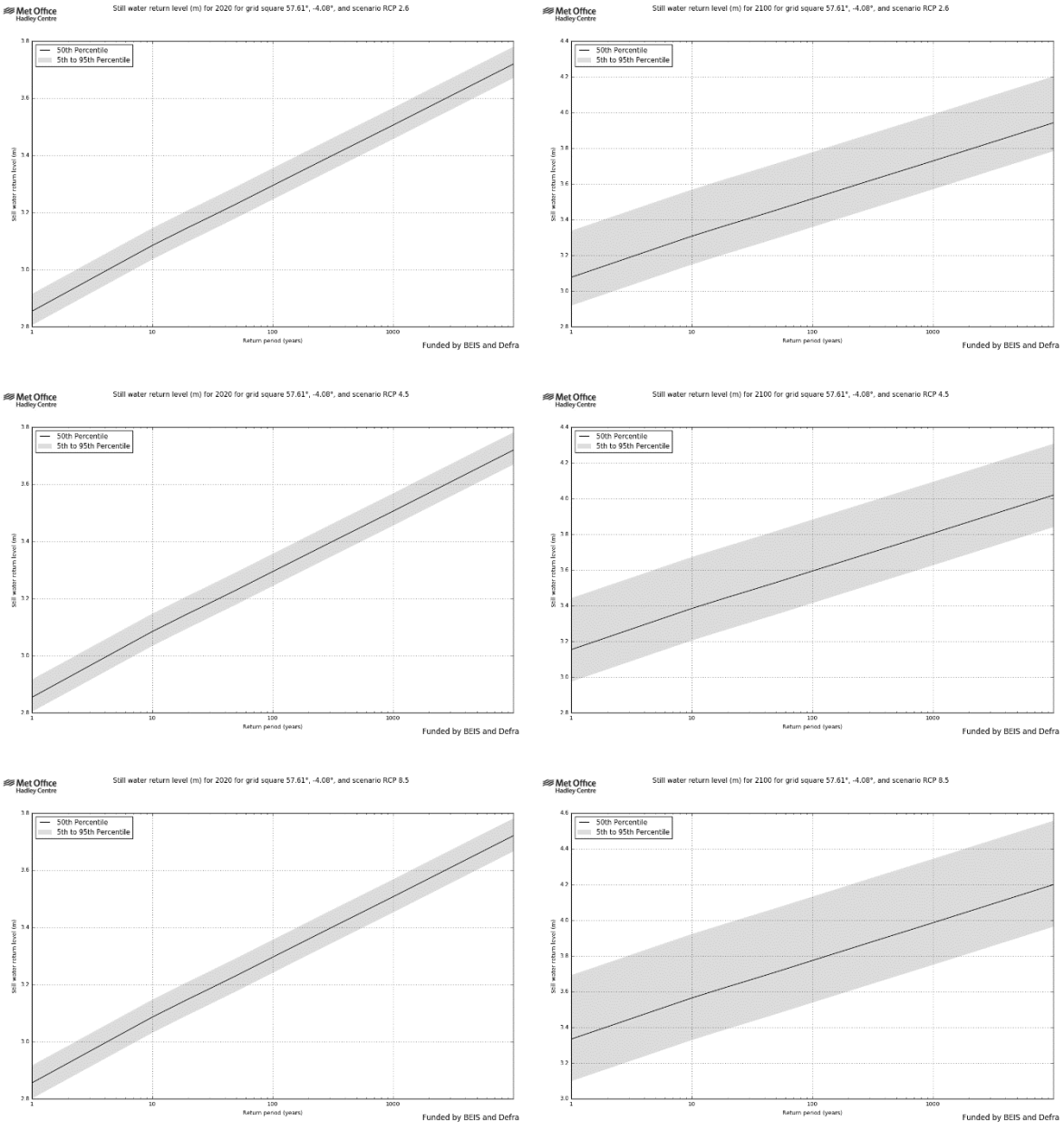

Diagram 5.3: UKCP18 projected relative sea-level rise at the Moray Firth for 2020 left) and 2100 (right)

The UKCP18 values for sea-level rise at the proposed development have been obtained based on the best available guidance. Cumulative rise from 2017 to 2100 for the region within which the proposed development is located (North Highlands) is 0.89m, derived from the 95th percentile estimate for RCP8.5[62].

5.5.14 Sensitive Receptors

On the basis of the baseline assessment the sensitive receptors (SR) to potential impacts on the water environment, soils and coastal processes have been identified as the coastal waters and sediment of the proposed development and the wider Outer Cromarty Firth, including the associated designated areas in the vicinity of the proposed development, and the existing outfalls in the vicinity of the site.

5.6 Impact Assessment

5.6.1 Receptor Sensitivity

On the basis of the baseline assessment, Table 5.7 identifies the receptor sensitivity using the criteria outlined in Table 5.2.

Table 5.7: Receptor Sensitivity

Receptor	Sensitivity	Comment
Operational coastal waters and sediment of Outer Cromarty Firth within the vicinity of the proposed development	Medium	Classified waterbody under WFD. Navigable waterbody used by commercial & recreational vessels.
Cromarty Firth SSSI	High	Internationally or nationally designated sites.
Rosemarkie to Shandwick Coast SSSI	High	Internationally or nationally designated sites.
Moray Firth SAC	High	Internationally or nationally designated sites.
Cromarty Firth SPA	High	Internationally or nationally designated sites.
Cromarty Firth RAMSAR	High	Internationally or nationally designated sites.
Existing outfalls	Medium	Of local importance.

5.6.2 Potential Impacts

This section identifies the potential environmental impacts on the water environment, soils and coastal processes, at and around the site during the construction and operational phases of the proposed development.

The proposed works will involve the following key activities which have the potential to impact the water environment within the site and environs:

- Dredging of navigation channel and berths;
- Construction activities (bulk excavations, port infrastructure including quay and platform);
- Site surface water drainage; and
- Port operations.

The potential impacts on the water environment, soils and coastal processes include:

[62] SEPA (2019). Land Use Planning System SEPA Guidance LUPS-CC1. *Climate change allowances for flood risk assessment in land use planning.*

Water Environment:

- Hydrology alterations including increased run-off and alteration of flow patterns.
- Contamination of coastal water and sediments through spillages, leakages and/or sediment transfer (oils, fuels, welfare facilities, and suspended solids).

Coastal Processes:

- Changes in local wave climate.
- Changes in local tidal regime.
- Changes in local sediment transport regime.

The potential interactions between water environment impacts and ecology are assessed within Chapter **Error! Reference source not found.**: Marine Ecology.

The following sections consider the potential impacts and provide an assessment of likely level of significance.

5.6.3 Construction Phase

The potential impacts identified are assessed under the following headings:

- Hydrology;
- Water and sediment quality;
- Tidal regime;
- Wave climate;
- Sediment transport; and
- Existing outfalls.

The degree of potential environmental impact is provided as appropriate.

5.6.3.1 Hydrology

During construction there is potential for increased run-off due to the introduction of impermeable and semi-permeable surfaces arising from the compaction of soils and construction of proposed infrastructure. This will reduce the infiltration capacity and increase the rate and volume of direct surface run-off, and potentially concentrate diffuse flows. The potential environmental effect of this is to increase or alter groundwater and surface water flow rates and routes, potentially leading to increases in erosion and sediment transport.

However due to the small catchment and the hydrological barrier of the B9175, the potential impacts of surface water flow alterations and increased run-off to coastal waters would be of a negligible magnitude.

5.6.3.2 Water and Sediment Quality

Sediment Discharge and Dispersion from Dredging Works and the Disposal of Dredged Sediment

The proposed dredging works could potentially cause plumes of suspended solids and a reduction in water quality with a resultant impact on aquatic life.

The dredge volume is estimated to be 165,000m^3, based on the bathymetry surveys and proposed channel design. As outlined in Section 5.5.4.2 the sediment within the dredge pocket consists predominantly of marine beach deposits, gravel, sand and silt. Of the dredge volume, 15,000m^3 to 30,000m^3 of dredged material is earmarked for reuse as engineering fill as part of the development which is understood to be the maximum capacity within the development design for fill material. The remaining volume is to be disposed of in the existing licensed disposal site. Dredge disposal modelling in Technical Appendix 5.2: Previous Modelling Reports, reported that localised plumes of suspended sediment tended to take the form of more intense concentration plumes than those predicted to cover a wider area, which were expected to be less than 1mg/l.

Given the relatively coarse nature of the dredge budget it is considered that any plumes generated as a result of the dredging works and their disposal will be very localised and short term in duration.

Overall it is considered that prior to mitigation the magnitude of impact of sediment discharge and dispersion from dredging works will be low within the immediate dredge area, and negligible out with this area.

Excavation and Reclamation

The proposed excavation and reclamation fill could potentially result in plumes of suspended solids and a reduction in water quality with a resultant impact on aquatic life. As outlined above the fill material will be a mixture of sediment locally generated by excavation methods, the nature of which will limit the duration and spread of any plume generated.

It is considered that prior to mitigation the magnitude of impact of sediment discharge and dispersion from excavation and reclamation works will be low within the immediate vicinity of the reclamation area, and negligible out with this area.

Pollution Incidences

During construction there is a risk of accidental pollution incidences affecting the water environment (i.e. coastal waters and sediment and associated designations) from the following sources:

- Spillage or leakage of oils and fuels stored on site;
- Spillage or leakage of oils and fuels from construction machinery or site vehicles;
- Spillage of oil or fuel from refuelling machinery on site;
- Spillage or leakage from on-site toilet facilities;
- Suspended solids from construction works; and
- The use of concrete and cement in construction works.

The main risk is considered to be posed by refuelling activities. Oil or fuel spillages to the water environment would be detrimental to water/sediment quality and could affect fauna and flora.

Concrete (specifically the cement component) is generally highly alkaline and any spillage to the water environment and/or soils could be detrimental to water/sediment quality, fauna and flora.

The effect of the potential pollution incidences during construction on water quality would be dependent on the scale and nature of the incident, therefore the magnitude of impact prior to mitigation may range from low to high.

5.6.3.3 Tidal Regime

The proposed construction works, including the proposed capital dredge requirement, could result in alterations to the local tidal regime. Hydrodynamic modelling[63] was undertaken on the adjacent South Quay development using a MIKE21 HD model, to simulate over one month of tidal conditions with and without the South Quay development. Details of tidal water levels within the vicinity of the proposed development are presented in Section 5.5.8. Due to the similarities spatially between the developments, this previous modelling exercise has been used to inform the assessment of the likely impact on tidal regime at the proposed development.

The proposed development is located on the eastern edge of the existing developed area, including the Nigg Oil Terminal and the South Quay development, and is considered to form an extension of similar character to these existing developments. As a result of the presence of these existing developments, and their associated dredge channels and quay walls, the alteration to tidal currents as a result of the proposed development is expected to

[63] Royal Haskoning DHV (2013). Nigg Energy Park: Sedimentation and Wave Modelling (Main Report & Appendices). Global Energy Nigg Ltd.

represent a minor change from existing conditions, resulting in impacts of low magnitude within the immediate vicinity of the proposed development and negligible magnitude within the wider Cromarty Firth on tidal regime.

Comparison of the hydrodynamic modelling results for the South Quay development, with and without the development, highlighted that at time of maximum tidal current velocities the development impacts were minor and localised in their extent, with a slight reduction of velocity (-0.2 to – 0.7 m/s) within the newly formed basin to the west of Nigg Oil Terminal, and slight increases in velocity immediately west of the quay (+0.1 to +0.2m/s). The overall scheme was displayed to have no significant far-reaching effect on maximum tidal velocities within the wider Cromarty Firth, with only minor changes shown to be confined locally to the development.

Whilst the modelling results indicated that the South Quay development would produce localised changes in current velocities, it is considered that these variations are insignificant in terms of the wider hydrodynamic regime of the Cromarty Firth. These changes are considered to be representative of changes which would result from the proposed development.

Overall, during the construction phase the impact of the proposed development on the tidal regime is considered to be of low magnitude within the immediate vicinity of the site and negligible magnitude within the wider Cromarty Firth.

5.6.3.4 Wave Climate

The proposed development, including the proposed capital dredge requirement, could result in alterations to local wave climate within the immediate vicinity of the proposed development, and the wider Cromarty Firth. Spectral wave modelling was recently undertaken for the adjacent South Quay development using the MIKE by DHI software platform, to inform the assessment of the likely impact on the wave climate[64].

The proposed development site is most exposed to wind waves originating from within the Cromarty Firth, with limited swell wave penetration from the Moray Firth into the Cromarty Firth. It is anticipated that the proposed development quay will result in local reflections and diffraction of waves from the south west into the existing south quay basin, whilst the South Quay basin and dry dock entrance will be largely sheltered from waves from the east by the proposed development. Due to the localised nature of the wave reflections and diffraction as a result of the proposed development, the alterations to wave climate are expected to be a minor change from existing conditions, resulting in impacts of low magnitude within the immediate vicinity of the proposed development and negligible magnitude within the wider Cromarty Firth.

Previous modelling results for the South Quay development show that the development would result in localised disturbance to the wave climate within the newly formed basin and adjacent to the dry dock gate, as a result of the reflection and diffraction of waves from both the south-west and east. During 1 in 1 month return period wave conditions, model results for waves from the east show reflection from the vertical quay walls within the South Quay's basin, resulting in localised superimposition with incident wave heights, elevating significant wave heights to approximately 1.0 – 1.2m. However, outside the immediate vicinity of the proposed development and dredge zone the modelling indicated that the proposed development will have no significant impact on wave climate. It is considered that these results are representative of the impacts which would result from the current development proposals.

Overall, during the construction phase the impact of the proposed development on the wave climate is considered to be of low magnitude within the dredge zone and immediate vicinity and of negligible magnitude within the wider Cromarty Firth.

[64] Royal Haskoning DHV (2013). Nigg Energy Park: Sedimentation and Wave Modelling (Main Report & Appendices). Global Energy Nigg Ltd.

5.6.3.5 Sediment Transport

As a result of previous developments located to the west of the proposed development, including the South Quay and dredge channels, it is expected that there will be a restriction on sediment moving from Nigg Bay eastwards. Episodic sediment transport from the Moray Firth currently contributes to sediment deposition in the vicinity of the proposed development. However, with the alignment of the proposed development extruding from the shoreline into the Cromarty Firth, the area to the east of the quay, and the associated dredge channels, are expected to capture sediment being transported westwards via longshore drift, reducing the sediment input to the South Quay basin. This represents a minor localised variation in existing deposition patterns, and will result in a continued requirement for maintenance dredging to ensure clear entrance into the proposed development.

The location of the licensed dredge disposal site is within the existing sediment transport system, whilst the proposed dredge forms a relatively small volume of sediment in relation to the overall system volume. Therefore, the changes to sediment transport as a result of the proposed development are expected to be a minor and localised, resulting in impacts of low magnitude within the immediate vicinity of the proposed development and negligible magnitude within the wider Cromarty Firth.

Previous sediment transport modelling[65], shown in Technical Appendix 5.2: Previous Modelling Reports, recently undertaken using a MIKE21-Sand Transport (ST) module has investigated existing transport patterns and pathways in the vicinity of the development site under present day conditions. The results indicated a reduction in tidal currents from the south west as a result of the development of the South Quay, leading to the increased deposition of sediment within the South Quay basin and adjacent to the dry dock gate. A rate of deposition of sediment of approximately 100mm per year (average) was predicted to occur around the proposed development. It is considered that the mechanisms demonstrated by this previous modelling are representative of the likely impacts of the proposed development.

Overall it is considered that during the construction phase the impact of the proposed development on sediment transport within the immediate vicinity of the proposed dredge zones will be of low magnitude, and of negligible magnitude within the wider Cromarty Firth.

5.6.3.6 Existing Outfalls

The majority of existing outfalls present within the vicinity of the development site are outside the footprint of the proposed works and will therefore not be physically impacted. However, there is one treated wastewater outfall that is located within the footprint of the proposed bund with a rock armoured slope. As outlined in Sections 5.6.3.3 and 5.6.3.4, the proposed development will have limited impact upon the tidal regime and wave climate within the local area, and no significant impact within the wider Cromarty Firth. As the outfall is associated with the wider development and is to be retained, it will be amended as necessary, subject to required licencing procedures.

Overall, the impact of the proposed development on the existing outfalls described in Section 5.5.6 during the construction phase is considered to be of minor magnitude.

5.6.4 Operational Phase

The potential impacts identified are assessed under the following headings:

- Hydrology;
- Water and sediment quality;
- Tidal regime;
- Wave climate;

[65] Royal Haskoning DHV (2013). Nigg Energy Park: Sedimentation and Wave Modelling (Main Report & Appendices). Global Energy Nigg Ltd.

- Sediment transport; and
- Existing outfalls.

The degree of potential environmental impact is provided as appropriate.

5.6.4.1 Hydrology

As during construction, there is potential for increased run-off due to the presence of impermeable and semi-permeable surfaces. The impact of surface water flow alterations and increased run-off would be of a negligible magnitude prior to mitigation measures due to the small contributing catchment and coastal location of the proposed development.

5.6.4.2 Water and Sediment Quality

Maintenance dredging will be required, the likely effects of which would be of a similar nature, albeit lower order, than that of the capital dredge during construction.

There is unlikely to be any groundworks during the operational phase, and therefore the risk of erosion and sedimentation will be much lower than during construction. The potential risk of pollution from the disposal of dredgings, and as a result of spillages, will however remain during the operational phase. Additionally, there is the potential risk of contamination of surface water run-off from the proposed development platform, as well as contamination of coastal waters as a result of discharges from boats.

The impacts on water quality would therefore range from low to high magnitude prior to mitigation measures.

5.6.4.3 Tidal Regime

The impact of the proposed development during the operational phase on the tidal regime is considered to be the same as during the construction phase. Therefore the magnitude of impact on the tidal regime is considered to be of low magnitude within the immediate vicinity of the site, low magnitude in the surrounds and negligible magnitude within the wider Cromarty Firth.

5.6.4.4 Wave Climate

The impact of the proposed development during the operational phase on the wave climate is considered to be the same as during the construction phase. Therefore the magnitude of impact on the wave climate is considered to be of low magnitude within the immediate vicinity of the site and negligible magnitude within the wider Cromarty Firth.

5.6.4.5 Sediment Transport

The impact of the proposed development during the operational phase on sediment transport is considered to be the same as during the construction phase, with a reduction in the impact of the disposal of dredging due to the reduction in volume of dredge required. Therefore the magnitude of impact on sediment transport is considered to be of low magnitude within the immediate vicinity of the site and negligible magnitude within the wider Cromarty Firth.

5.6.4.6 Existing Outfalls

The impact of the proposed development during the operational phase on existing outfalls is considered to be negligible during the operational phase, with no distinguishable change from baseline conditions. Therefore the magnitude of impact on existing outfalls is considered to be negligible.

5.6.5 Cumulative Assessment

From the sites identified in the cumulative assessment provided in Chapter 3 of the EIAR, the proposed development is not predicted to add to the associated impacts from any of these sites, due to the localised nature of predicted impacts and the distance between the proposed development and those sites considered in the cumulative assessment.

5.7 Mitigation and Monitoring

Mitigation aims to avoid, manage, control and further minimise environmental impacts and is discussed within the following sections.

5.7.1 Construction Phase Mitigation

5.7.1.1 General Management

A Construction Environmental Management Plan (CEMP) will be developed to ensure that the mitigation measures outlined in the EIAR are followed during the proposed construction works. The CEMP includes surface water management and pollution prevention measures (e.g. Pollution Prevention Plan), and will be in place during construction and operation. The CEMP will remain a live document and will be continually updated as the work progresses. The CEMP is a practical tool to facilitate the management of environmental mitigation measures and to provide a clear roadmap of the key roles and responsibilities during construction.

A suitably qualified Environmental Clerk of Works (EnvCoW) will monitor the construction works to ensure that the CEMP and associated mitigation measures are being implemented effectively.

Best practice will be adopted throughout all phases of development, following current guidance. The programme of works, including timing, direction and method of capital dredge, will be planned, monitored and managed to minimise the potential negative environmental impacts.

A Pollution Incident Response Plan will be developed relating to the construction of the proposed development, statutory requirements and identification of areas of highest sensitivity. This will provide site spill response procedures, emergency contact details and equipment inventories and their location. All staff will be made aware of this document and its content during site induction. A copy will be available in the site office at all times.

All activities above Mean High Water Springs (MHWS) with potential to affect the water environment require to be authorised under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). The level of authorisation required is dependent on the anticipated environmental risk posed by the activity to be carried out. These activities could include construction drainage. Construction activities below MHWS with potential to affect the water environment require to be authorised under a Marine Licence.

5.7.1.2 Dredged Material

Mitigation measures will be delivered by the principal contractor through detailed Construction Environment Management Plans (CEMPs) that will be produced following appointment. The contractor will be responsible for producing a site specific Pollution Prevention Plan (PPP) that will apply the principles of the agreed mitigation to show how the mitigation is implemented effectively down to the specific site.

5.7.1.3 Surface Water Management

The surface water drainage will be designed to ensure that there are no untreated surface water discharges directly to surrounding coastal waters. It is proposed to replicate natural drainage around construction areas and to use source control to deal with rainwater in proximity to where it hits the ground in line with current

Sustainable Drainage Systems (SuDS) guidance. Suitable prevention measures will be in place at all times to prevent the release of pollutants to the water environment, including adjacent coastal waters. These will be regularly inspected and maintained to ensure optimal performance.

5.7.1.4 Site Compounds

Run-off from compounds will be captured and passed through construction drainage features prior to discharge. Foul drainage will either be contained in a closed system and disposed of at a suitable off-site facility with private treatment and discharge or, where possible, directed via a connection to the Nigg Energy Park foul drainage treatment system.

5.7.1.5 Concrete

In the case that concrete batching was to be undertaken on-site the following mitigation measures would be implemented to minimise the potential impact of concrete batching on the water environment in line with PPG6:

- Concrete batching will take place on an impermeable designated area and at least 10m from any waterbody.
- Equipment and vehicles will be washed out in a designated area that has been specifically designed to contain wet concrete/ wash water.
- A closed loop system will be used for wash waters. Wash waters will be stored in a contained lined pond for settlement before being reused (e.g. for mixing and washing).
- No discharge of wash waters will occur on-site. All excess wash water that cannot be reused will be disposed of off-site.

The following mitigation is proposed for concrete handling and placement:

Pouring of concrete will take place within well shuttered pours to prevent egress of concrete from the pour area. Pouring of concrete during adverse weather conditions will be avoided.
The CEMP will include a Pollution Incident Response Plan, and drivers of vehicles carrying concrete will be informed so as to raise awareness of potential effects of concrete and of the procedures for clean-up of any accidental spills.

Concrete acidity (pH) will be as close to neutral (or site-specific pH) as practicable as a further precaution against spills or leakage.

5.7.1.6 Oil, Fuel, Site Vehicle Use and Storage

The risk of oil contamination will be minimised by good site working practice (further described below) but should a higher risk of oil contamination be identified then installation of an oil separator will be considered.

The storage of oil is considered a Controlled Activity which will be deemed to be authorised if it complies with the Regulations. The mitigation measures to minimise any risk of contaminant release are in line with SEPA PPG and GPP documents and include the following:

Storage:

- Storage for oil and fuels on site will be designed to be compliant with GPP2 and GPP8.
- The storage and use of loose drums of fuel on site will not bepermitted.
- Bunded tanks will provide storage of at least 110% of the tank's maximum capacity.

Refuelling and maintenance:

- Fuelling and maintenance of vehicles and machinery, and cleaning of tools, will be carried out in a designated area where possible in line with PPG7.
- Multiple spill kits will be kept on site.
- Drip trays will be used while refuelling.

- Regular inspection and maintenance of vehicles, tanks and bunds will be undertaken.

Emergency procedure: The Pollution Incident Response Plan will include measures to deal with accidental spillages.

5.7.2 Operational Phase Mitigation

5.7.2.1 General Management

An Operational Environmental Management Document (OEMD) will be in place throughout the operational phase. Best practice will be followed throughout the operational phase, with reference to the SEPA Guidance for Pollution Prevention (GPPs), and best practice guidance.

5.7.2.2 Surface Water Management

It is proposed that drainage of surface water will adopt SuDS principles and be by means of infiltration through a permeable surface, and the underlying permeable reclamation fill, providing treatment.

Details of the operational surface water management proposals and methodology will be included within the OEMD and will be submitted to SEPA's operations team for agreement consent. Plans of the surface water management system will be located within the Site office, with foul water systems clearly marked.

Where a site use or development proposal is such that it will require a Pollution Prevention and Control (PPC) authorisation from SEPA, then specific processes, techniques and technologies will be included within the surface water management system in that location in order to meet the requirements of the PPC authorisation. Such measures would be in line with best practice guidance.

5.7.2.3 Oil, Fuel, Site Vehicle Use and Storage

The proposed development's Pollution Incident Response Plan will be updated for the operational phase of the development, taking full consideration of best practice, statutory requirements and identification of areas of highest sensitivity. It will provide site spill response procedures, emergency contact details and equipment inventories and their location. All operation staff will be made aware of this document, and its contents, and it will be available in the port office. Appropriate spill kits and absorbent materials will be stored in a suitable location which is easy to access. Staff/contractors will be trained in the use of spill kits and other pollution control equipment and the operation of pollution control devices.

5.7.3 Monitoring and Enhancement

Global Energy Nigg Ltd shall undertake a planned programme of compliance monitoring to verify the effectiveness of the project's environmental management. Monitoring plans will be established and implemented with the agreement of SEPA, SNH and Marine Scotland.

Specific auditing and monitoring plans will be developed by the contractor and will cover the following:

- The contractor's own Environmental Management System;
- The CEMP, schedule of mitigation register, relevant legislation and industry good practice;
- All project activity;
- Roles and responsibilities for those undertaking audits and monitoring;
- Frequency of inspection activities (i.e. daily, weekly, monthly);
- Process to deal with corrective actions/non-compliance; and
- Reporting procedures (including non-compliance).

Additionally, as construction activities at Ardersier, Invergordon, Aberdeen South Harbour and the proposed development may overlap, a 'Works Dialogue Protocol' would involve active communication between the various projects and consultation with the relevant Ecological Steering Groups (ESG) should be undertaken. An initial meeting should be arranged between stakeholders with respect to Ecological Clerk of Works' (ECoW) present and the programmes for both projects reviewed to identify any overlaps of potential concern, along with the mitigation and monitoring measures in place. This collaborative working would aim to review, and if necessary update the respective Marine Mammal Protection Plans in order to minimise and mitigate potential impacts identified. Regular communication would continue through any period of programme overlap, with minutes of meetings being made available to all stakeholders.

5.8 Residual Effects

The residual effects expected to arise following implementation of the mitigation measures detailed above are summarised in Table 5.8. These residual effects reflect receptor sensitivity, the post-mitigation magnitude and detail the resultant effect on each receptor. The residual effects are considered to be either minor or negligible, and accordingly no significant effects have been identified.

Table 5.8: Residual Effects

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
Construction Phase									
Hydrology	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Terrestrial construction works	Negative	Short	Possible	Negligible	Negligible	Negligible
Water and sediment quality - excavation and reclamation	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction Works	Negative	Short	Possible	Low	Negligible	Negligible
	Cromarty Firth SSSI	High	Construction Works	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Rosemarkie to Shandwick Coast SSSI	High	Construction Works	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Moray Firth SAC	High	Construction Works	Negative	Short	Unlikely	Low	Negligible	Negligible
	Cromarty Firth SPA	High	Construction Works	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction Works	Negative	Short	Unlikely	Negligible	Negligible	Negligible

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
Water and Sediment Quality - Sediment discharge and dispersion	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction including capital dredge	Negative	Short	Possible	Low	Negligible	Negligible
	Cromarty Firth SSSI	High	Construction including capital dredge	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Rosemarkie to Shandwick Coast SSSI	High	Construction including capital dredge	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Moray Firth SAC	High	Construction including capital dredge	Negative	Short	Possible	Low	Negligible	Negligible
	Cromarty Firth SPA	High	Construction including capital dredge	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction including capital dredge	Negative	Short	Unlikely	Negligible	Negligible	Negligible

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
Pollution incidences	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction oils, fuels & concrete	Negative	Short	Possible	Low - High	Negligible	Negligible
	Cromarty Firth SSSI	High	Construction oils, fuels & concrete	Negative	Short	Possible	Low - High	Negligible	Negligible
	Rosemarkie to Shandwick Coast SSSI	High	Construction oils, fuels & concrete	Negative	Short	Unlikely	Low - High	Negligible	Negligible
	Moray Firth SAC	High	Construction oils, fuels & concrete	Negative	Short	Possible	Low - High	Negligible	Negligible
	Cromarty Firth SPA	High	Construction oils, fuels & concrete	Negative	Short	Possible	Low - High	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction oils, fuels & concrete	Negative	Short	Possible	Low - High	Negligible	Negligible
Changes to tidal regime	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction including capital dredge	Negative	Permanent	Certain	Low	Low	Minor

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
	Cromarty Firth SSSI	High	Construction including capital dredge	Negative	Permanent	Possible	Negligible	Negligible	Negligible
	Rosemarkie to Shandwick Coast SSSI	High	Construction including capital dredge	Negative	Permanent	Possible	Negligible	Negligible	Negligible
	Moray Firth SAC	High	Construction including capital dredge	Negative	Permanent	Possible	Negligible	Negligible	Negligible
	Cromarty Firth SPA	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
Changes to wave climate	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction including capital dredge	Negative	Permanent	Certain	Low	Low	Minor
	Cromarty Firth SSSI	High	Construction including capital dredge	Negative	Permanent	Possible	Negligible	Negligible	Negligible

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
	Rosemarkie to Shandwick Coast SSSI	High	Construction including capital dredge	Negative	Permanent	Possible	Negligible	Negligible	Negligible
	Moray Firth SAC	High	Construction including capital dredge	Negative	Permanent	Possible	Negligible	Negligible	Negligible
	Cromarty Firth SPA	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
Sediment transport	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction including capital dredge	Negative	Permanent	Certain	Low	Low	Minor
	Cromarty Firth SSSI	High	Construction including capital dredge	Negative	Permanent	Possible	Negligible	Negligible	Negligible
	Rosemarkie to Shandwick Coast SSSI	High	Construction including capital dredge	Negative	Permanent	Possible	Negligible	Negligible	Negligible

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
	Moray Firth SAC	High	Construction including capital dredge	Negative	Permanent	Possible	Negligible	Negligible	Negligible
	Cromarty Firth SPA	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
Existing outfalls	Existing Outfalls	Medium	Construction	Negative	Short	Certain	Minor	Minor	Minor
Operational Phase									
Hydrology	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Operational activities	Negative	Short	Short - Permanent	Negligible	Negligible	Negligible
Water and sediment quality - excavation and reclamation	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction Works	Negative	Short	Possible	Low	Negligible	Negligible
	Cromarty Firth SSSI	High	Construction Works	Negative	Short	Unlikely	Negligible	Negligible	Negligible

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
	Rosemarkie to Shandwick Coast SSSI	High	Construction Works	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Moray Firth SAC	High	Construction Works	Negative	Short	Unlikely	Low	Negligible	Negligible
	Cromarty Firth SPA	High	Construction Works	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction Works	Negative	Short	Unlikely	Negligible	Negligible	Negligible
Water and Sediment Quality - Sediment discharge and dispersion	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction including capital dredge	Negative	Short	Possible	Low	Negligible	Negligible
	Cromarty Firth SSSI	High	Construction including capital dredge	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Rosemarkie to Shandwick Coast SSSI	High	Construction including capital dredge	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Moray Firth SAC	High	Construction including capital dredge	Negative	Short	Possible	Low	Negligible	Negligible

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
	Cromarty Firth SPA	High	Construction including capital dredge	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction including capital dredge	Negative	Short	Unlikely	Negligible	Negligible	Negligible
Pollution incidences	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction oils, fuels & concrete	Negative	Short	Possible	Low - High	Negligible	Negligible
	Cromarty Firth SSSI	High	Construction oils, fuels & concrete	Negative	Short	Possible	Low - High	Negligible	Negligible
	Rosemarkie to Shandwick Coast SSSI	High	Construction oils, fuels & concrete	Negative	Short	Unlikely	Low - High	Negligible	Negligible
	Moray Firth SAC	High	Construction oils, fuels & concrete	Negative	Short	Possible	Low - High	Negligible	Negligible
	Cromarty Firth SPA	High	Construction oils, fuels & concrete	Negative	Short	Possible	Low - High	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction oils, fuels & concrete	Negative	Short	Possible	Low - High	Negligible	Negligible

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
Changes to tidal regime	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction including capital dredge	Negative	Permanent	Possible	Low	Low	Minor
	Cromarty Firth SSSI	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Rosemarkie to Shandwick Coast SSSI	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Moray Firth SAC	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth SPA	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
Changes to wave climate	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction including capital dredge	Negative	Permanent	Possible	Low	Low	Minor
	Cromarty Firth SSSI	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Rosemarkie to Shandwick Coast SSSI	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Moray Firth SAC	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth SPA	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
Sediment transport	Operational coastal waters and sediment within the vicinity of the proposed development	Medium	Construction including capital dredge	Negative	Permanent	Certain	Low	Low	Minor
	Cromarty Firth SSSI	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Rosemarkie to Shandwick Coast SSSI	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Moray Firth SAC	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth SPA	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
	Cromarty Firth RAMSAR	High	Construction including capital dredge	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible
Existing outfalls	Existing Outfalls	Medium	Construction	Negative	Short	Certain	Minor	Minor	Minor

5.9 Statement of Significance

Overall the effects of the proposed development on the water environment, soils and coastal processes are not considered to be significant.

6 CHAPTER 6: AIRBORNE NOISE

6.1 Introduction

This chapter has been prepared by EnviroCentre and contains a Noise Impact Assessment (NIA) of construction and operational activities at the proposed development as described and discussed within Chapter 2: Proposed Development. The purpose of the assessment is to identify and describe any likely significant effects arising from construction and operational activities at the proposed development. This chapter details the noise monitoring, modelling and the results of the impact assessments, which have been carried out for the proposed development. It is supplemented by the figures contained within Volume 2 and summarises the noise impact assessment technical report contained within Technical Appendix 6.1 within Volume 3 of this EIAR.

Figure 1.1 within Volume 2 of this EIAR shows the site boundary, which is referred to as 'the site' throughout this chapter.

The purpose of this chapter is to summarise the full technical noise impact assessment report contained within Technical Appendix 6.1 within Volume 3 of this EIAR, and to provide a level of significance in line with EIA assessment.

Please note that this chapter relates to airborne noise only, underwater noise arising from the proposed development is assessed within Chapter 4 (Marine Ecology) and Technical Appendix 4.2 within Volume 3 of this EIAR.

6.2 Scoping and Consultation

A summary of the relevant information contained within the Pre-Application Advice Pack for the Site, responses to the Scoping Report submitted by EnviroCentre, and further email consultation with The Highland Council's (THC) Environmental Health Department, is shown in Table 6-1.

Table 6-1: Summary of Consultation Responses

Organisation	Consultation Response	How and where addressed
Highland Council (THC) EHO	Within the Pre-Application Advice Pack dated 30/04/2018, and the Scoping Opinion dated 25/03/2019, Environmental Health Department has confirmed there are nearby receptors which have the potential to be affected during operational phase. It is agreed that operational noise impacts should be addressed within the EIA.	Operational noise is scoped into the EIA.

Organisation	Consultation Response	How and where addressed
	Within the Pre-Application Advice Pack dated 30/04/2018 and the Scoping Opinion dated 25/03/2019, THC Environmental Health Department has confirmed that a construction noise assessment will be required in the following circumstances:- • Where it is proposed to undertake work, which is audible at the site boundary, out with the hours Mon-Fri 8am to 7pm; Sat 8am to 1pm. Or • Where noise levels during the above periods are likely to exceed 75dB(A) for short term works or 55dB(A) for long term works. Both measurements to be taken as a 1hr L_{Aeq} at the curtilage of any noise sensitive receptor. (Generally, long term works is taken to be more than 6 months. If an assessment is submitted, it should be carried out in accordance with BS 5228-1:2009, Part 1[66].	Proposed construction activities are proposed to occur outwith the specified hours therefore a construction noise assessment in accordance with BS5228-1:2009 has been carried out, the results of which are presented in Section 6.6 of this chapter.
	Within the Scoping Opinion dated 25/03/2019, THC Environmental Health Department has confirmed that regardless of whether a construction noise assessment is required, it is expected that the developer / contractor will employ the best practicable means to reduce the impact of noise from construction activities. Attention should be given to construction traffic and the use of tonal reversing alarms.	Construction noise mitigation is discussed in Section 6.8.1 of this chapter.

[66] British Standards Institution, BS5228-1:2009+A1 – 2014; *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise*.

Organisation	Consultation Response	How and where addressed
	THC Environmental Health Department issued a consultation responses on 07th, 12th & 18th February 2019 based on initial requests by EnviroCentre on 11th January and 6th February 2019 to establish the methodology for noise assessment. This included baseline monitoring, operational and construction noise assessment methodology / noise criteria. HC Environmental Health Department confirmed within their emails of 07th, 12th & 18th February 2019 that this approach was acceptable.	The methodology and noise criteria proposed by EnviroCentre was accepted by THC Environmental Health Department and is fully explained within Section 6.4 of this chapter.
	Within the Scoping Opinion dated 25/03/2019, Environmental Health Department has confirmed that to reduce the likelihood of future complaints, the target should be to prevent any increase over existing operational noise levels; *It should be noted that the main source of ambient noise is from this site already so I would be very wary of accepting a noise level based on any exceedance above the existing background level. It is noted that previous monitoring for another similar development at this location indicated that noise levels from the site were already quite high, and the recommendation at the time was that the applicant should look at reducing noise levels from the site in general to reduce the likelihood of a Statutory Nuisance as described by the Environmental Protection Act 1990. Depending on the outcome of the round of monitoring for this application the advice is likely to be the same.*	An assessment of the change noise levels with vs without the proposed development has been carried out as presented in Section 6.7.1 of this chapter. Site-wide noise management / mitigation recommendations for existing and proposed operations at Nigg Energy Park are presented in Section 6.8.2 of this chapter.

6.3 Legislation, Policy and Guidance

6.3.1 BS5228-1:2009+A1:2014; Code of Practice for Noise and Vibration Control on Construction and Open Sites.

Methods for calculating noise produced by construction and open sites are provided in BS5228-1:2009+A1:2014. Annexes C and D of Part 1 provide generic source data for different types of noise source, as well as methods for calculating noise from stationary and mobile plant. Specific advice on noise from sources such as piling is provided.

6.3.2 PAN 1/2011 Planning and Noise[67]

Advice on the role of the planning system in helping to prevent and limit the adverse effects of noise is provided in *Planning Advice Note (PAN) 1/2011 'Planning and Noise'* (The Scottish Government, 2011a). The associated *Technical Advice Note (TAN) 1/2011 'Assessment of Noise*' (The Scottish Government, 2011b) provides guidance on noise impact assessment methods.

The methodology provided in Technical Advice Note (TAN) 1/2011 *'Assessment of Noise'*[68] (The Scottish Government, 2011b) is used to assess the impact of noise on residential properties.

6.3.3 BS4142:2014, Methods for rating and assessing industrial and commercial sound[69]

BS4142:2014 provides methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

a) Sound from industrial and manufacturing processes;
b) Sound from fixed installations which comprise mechanical and electrical plant and equipment;
c) Sound from loading and unloading of goods and materials at industrial and/or commercial premises; and
d) Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements in or around an industrial and/or commercial site.

The methods described use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

The standard is applicable to the determination of the following levels at outdoor locations:

a) Rating levels for sources of sound of an industrial and/or commercial nature;
b) Ambient, background and residual sound levels;
c) Investigating complaints;
d) Assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and /or commercial nature; and
e) Assessing sound at proposed new dwellings or premises used for residential purposes.

[67] The Scottish Government (2011), *PAN 1/2011 Planning and Noise*
[68] The Scottish Government (2011), *TAN 1/2011 Technical Advice Note: Assessment of Noise*
[69] British Standards Institution (2014), *BS4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound. Pub. L No. BS4242:2014. BSI*

6.4 Methodology

The noise assessment was undertaken to establish the impact of construction and operational activities on noise sensitive receptors surrounding the Site. The assessment involved the following stages;

- Consultation with THC Environmental Health Department to agree assessment methodology and noise criteria (refer to Section 6.2)
- Measurement of existing baseline noise environment at a sample of 5 areas representative of the most exposed noise sensitive receptors surrounding the proposed East Quay; the location of the monitoring locations are shown in Figures 6.1A & B, within Volume 2 of this EIAR.
- Review of construction activities, locations and noise data;
- Calculation and assessment of construction noise at the most exposed sensitive receptors, following guidance provided in BS5228-1:2009+A1:2-014; Code of Practice for Noise and Vibration on Construction and Open Sites. 3D computer noise modelling using CadnaA software has been used in the calculation of construction noise at sensitive receptors;
- Measurement of existing operational noise generating activities within Nigg Energy Park;
- Review of existing and proposed operational activities, locations and noise data;
- Prediction of operational noise using CadnaA software at location of most exposed sensitive receptors;
- PAN 1/2011 assessment of operational noise, using principles defined in BS4142:2014;
- Provision of operational noise mitigation advice to East Quay design team to inform proposed site design; and
- Provision of recommended noise mitigation and management measures for site-wide existing and proposed operations at Nigg Energy Park.

6.4.1 BS5228-1:2009+A1: 2014 – Methodology (ABC Method)

Consultation, as described in Section 6.2, stated that where work is proposed out with the hours of Monday to Friday 8am – 7pm or Saturday 8am – 1pm, a full construction noise impact assessment is required. As work is proposed for a seven day working week, a full assessment is presented.

The assessment of construction noise is carried out in accordance with guidance provided in BS 5228-1:2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise'. The standard describes methods for evaluating the potential significant effects of construction noise, one of which is the 'ABC' method which is based on exceedance of fixed noise limits. The ABC method, as detailed within Annex E.3.2 has been used within this noise assessment, as it considers the pre-existing industrial noise climate at the receptors.

The ABC method considers that a potential significant effect occurs when the total noise level at a dwelling, including construction activity, exceeds the appropriate category values shown in Table 6-2. The table is used as follows;

- The ambient noise is determined and rounded to the nearest 5dB;
- The rounded ambient noise level is then compared with the total noise level, including construction. A significant effect at a noise sensitive receptor is considered to occur when the total noise, including construction activity exceeds the appropriate category values, shown in Table 6-2.
- The ABC method of BS5228-1:2009+A1:2014 does not provide specific guidance on determining the magnitude and significance of noise impacts above the threshold values shown in Table 6-2. In order to determine the level of significance, guidance provided in the Technical Advice Note (TAN) 1/2011 has been used. The significance criteria adopted within this noise assessment are shown in Table 6-3.

Table 6-2: Threshold of Significant Effect at Dwellings

Period	Threshold Value, in decibels (dB)		
	Category A	Category B	Category C
Night-time (23:00 to 07:00)	45	50	55
Evenings weekday (19:00-23:00), Saturdays (13:00-23:00) and Sundays (07:00-23:00)	55	60	65
Daytime weekday (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75
Note 1: A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level. Note 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total L_{Aeq}, T noise level for the period increases by more than 3 dB due to site noise. Note 3: Applied to residential receptors only.			
Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.			

Table 6-3: Significance Criteria for the Assessment of Construction Noise

Significance	Level Above Threshold Value dB(A)	Definition
Neutral	< 0	No effect, not significant, noise need not be considered as a determining factor in the decision making process.
Slight adverse	≤ 0 to < 3	These effects may be raised but are unlikely to be of importance in the decision making process.
Moderate adverse	≤ 3 to < 5	These effects, if adverse, while important, are not likely to be key decision making issues.
Large adverse	≤ 5.0 to < 10	The effects are likely to be important considerations but where mitigation may be effectively employed such that resultant adverse effects are likely to have a moderate or slight significance.
Very large adverse	≥ 10	These effects represent key factors in the decision making process. They are generally, but not exclusively, associated with impacts where mitigation is not practical or would be ineffective.

6.4.2 PAN 1/2011 Assessment Methodology

Proposed activities from the operations within the East Quay are assessed following guidance provided in PAN 1/2011 (as the associated document TAN 1/2011 'Technical Assessment of Noise'), using principles defined in BS4142:2014.

The noise criteria to be applied to operational industrial noise is summarised in Table 6-4. The table is used as follows;

- Calculate the difference between the rated operational noise level ($L_{Ar,T}$) and the background noise ($L_{A90,T}$) at each noise sensitive receptor, following principles defined in BS4142:2014. This difference in levels is used to define the Sensitivity of Receptor, as shown in Table 6-4.
- Calculate the total noise at each noise sensitive receptor, including operational activity ($L_{Aeq,T}$). The difference between the total noise including operational activity, and that before development at each sensitive receptor is used to define the Magnitude of Impact, as shown in Table 6-4.
- The Significance of Impact is then defined, as shown in Table 6-4.

Table 6-4: Significance of Effects; Operational Industrial Noise

Magnitude of Impact (After – Before) L_{AeqT} dB	**Sensitivity of Receptor based on likelihood of complaint X = (Rating ($L_{Ar,Tr}$) – Background ($L_{A90,T}$)) dB**		
	Low (x < 5)	**Medium (5 ≤ x < 10)**	**High (x ≥ 10)**
Major (≥ 5)	Slight / Moderate	Moderate / Large	Large / Very Large
Moderate (3 to 4.9)	Slight	Moderate	Moderate / Large
Minor (1 to 2.9)	Neutral	Slight	Slight / Moderate
Negligible (0.1 to 0.9)	Neutral / Slight	Neutral / Slight	Slight
No Change (0)	Neutral	Neutral	Neutral

6.4.3 Baseline Noise Monitoring Methodology

Noise surveys were carried out in the area surrounding Nigg Energy Park, comprising of the adjacent hamlets of Balnabruaich & Balnapaling, and in the town of Cromarty to the south. The surveys were completed during the day and night-time periods on Tuesday 26th and Wednesday 27th February 2019. The purpose of the surveys was to establish day and night-time background noise levels at areas representative of the most exposed properties in Balnabruaich, Balnapaling and Cromarty. The noise monitoring locations and methodology were agreed with THC Environmental Health department through consultation.

6.4.3.1 Noise Monitoring Locations

The noise monitoring locations are described in Table 6-5, and shown in Figures 6.1A & B, within Volume 2 of this EIAR.

Table 6-5: Noise Monitoring Locations

No.	Grid Reference	Location
01A	279451 869831	Balnabruaich; on verge next to B9175, roughly 70 metres north of entrance to Nigg Energy Park. Position used on first round of day and night-time monitoring (26/02/19). Road traffic noise on B9157 dominant, due to close proximity of position to the road.
01B	279410 869877	Balnabruaich; roughly 50 metres north of position 01A, 12.5 metres west of B9175 to reduce influence of traffic noise to/from Nigg Energy Park. Position used on second round of day and night-time monitoring (27/02/19). Chosen at similar distance back from road as noise sensitive receptors, therefore considered to be more representative of baseline noise at houses than Position 1A.
02	279645 868817	Balnapaling; at southern extent of B9175, roughly 1.5 metres from east boundary fence.
03	278710 867724	Cromarty; on grass next to George Street.
04A	278942 867572	Cromarty; between two properties on corner of Forsyth Place and Shore Street. Position used on first round of daytime monitoring on 26/02/19.
04B	278918 867603	Cromarty; roughly 35 metres north west of position 04A. Selected on west side of properties to give better line of site to Nigg Energy Park and reduce influence of traffic noise from Shore Street and bus stop on Forsyth Place.
05	279169 867340	Cromarty; on grass at south eastern corner of Shore Street.

6.4.3.2 Noise Monitoring Details

Fully calibrated Type 1 sound levels meters were used to undertake all the noise monitoring events as detailed in Table 6-6. The sound level meters were calibrated both before and after measurements were taken and no significant drift was noted.

Table 6-6: Investigative Equipment Utilised and Technical Details

Time Intervals:	Daytime = 1 x 1hr intervals at each of the five noise monitoring locations, repeated over two separate days. Night time = 1 x 30 minute intervals at each of the five noise monitoring locations, repeated over two separate days.
Monitoring Periods:	14:20hrs – 17:45hrs on 26/02/2019; 23:01hrs – 03:06hrs on 26/02/2019 to 27/02/2019; 14:02hrs – 17:27hrs on 27/02/2019; and 23:41hrs – 01:58hrs on 27/02/2019 to 28/02/2019.
Instrument:	Norsonic 118 and 140 sound analysers
Calibration:	At the start and finish of each monitoring event calibration was completed using a Norsonic NOR-1251 Sound Calibrator
Measurement Settings:	Environmental logging mode: A-weighted sound pressure level with time weighting F
Measurement Positions:	Measurements were taken between 1.2m and 1.5m above the ground.

The weather conditions during the monitoring events were recorded and are summarised in Table 6-7.

Table 6-7: Monitoring Periods and Weather Conditions

Monitoring period/ event	Date	Weather Conditions
Weekday Day	26/02/ 2019	Very mild, 11 - 12°C, dry, clear skies, wind speeds < 2 m/s.
Weekday Night	26/02/2019 & 27/02/2019	Between 3 and 4°C, dry, light airs

Weekday Day	27/02/ 2019	Staying mild, 10 - 11°C, dry, clear skies, wind speeds < 2 m/s.
Weekday Night	27/02/2019 & 28/02/2019	Between 3 and 4°C, dry, light airs

6.4.4 Existing Operational Noise Monitoring Methodology

Noise monitoring was carried out inside Nigg Energy Park on the 27/02/2019 to capture levels from existing operational plant and activities within the site.

6.4.4.1 Existing Operational Noise Monitoring Details

The same investigative equipment shown in Table 6-6 was used for the measurements, the daytime weather conditions on the 27th are shown in Table 6-7. Measurements were taken at various positions around the yard whilst noise generating activities were occurring, and recorded on a Trimble GPS logger.

6.4.5 Noise Sensitive Receptors

A sample of five noise sensitive receptors have been chosen as being representative of those most exposed to noise from construction and operational activities at the proposed development. These are described in Table 6-8, and shown in Figures 6.2A & B, within Volume 2 of this EIAR.

Table 6-8: Noise Sensitive Receptor Locations; Construction and Industrial Noise

NSR ID	Location	Grid Reference
NSR 1	Balnabruich, north-east of NEP entrance	279468 / 869831
NSR 2	Balnapaling, east of proposed East Quay	279676 / 868834
NSR 3	Cromarty; George Street	278687 / 867725
NSR 4	Cromarty; Forsyth Place	278927 / 867598
NSR 5	Cromarty; Shore Street	279190 / 867333

6.4.6 Construction Noise Model Input Parameters

6.4.6.1 Construction Schedule and Modelled Scenarios

Details of the proposed construction schedule at the Site have been supplied by Arch Henderson. A summary of the proposed construction schedule is shown in Table 6-9.

Table 6-9: East Quay, Proposed Construction Schedule

Ref	Construction Stage	Start Month	Finish Month
1	Temporary bund / working platform	1	2
2	Piling	2	7
3	Rock armour revetment	6	7
4	Dredging	6	10
5	Infill within quay structure to tie rod level	5	6
6	Tie rod / anchor walls	4	7
7	Infill within quay structure above tie rod level	7	8
8	Services installation	7	9
9	Placing final structure	9	9
10	Concrete copes	7	10
11	Deck furniture installation	9	10

Ref	Construction Stage	Start Month	Finish Month
1	Temporary bund / working platform	1	2
12	Cathodic protection	9	10
13	General activities	1	12
14	Deliveries to site	1	12

As can be seen in Table 6-9, in many cases more than one stage of construction will occur during the same months. Noise modelling scenarios have been set up to account for the cumulative impact of the concurrent stages. The scenarios have been set up to model the worst-case potential combination of construction activities for each set of months considered, periods where fewer noisy activities are expected, or general site levels are expected to be lower have not been modelled. A summary of the months, associated combined construction stages and relevant assessment periods for each of the modelled scenarios is shown in Table 6-10. It should be noted that while the modelling has predicted all operations within a month-long period to be concurrent, this is a conservative assumption and some activities will in fact be contiguous.

Table 6-10: Modelled Scenarios; Construction Noise

Modelled Scenario	Months	Modelled Combination of Construction Stages (Worst Case)	Relevant Assessment Periods
1A	6	Piling (king piles only)	Day, Evening, Night, Weekend
		Rock armour revetment	
		Dredging	
		Infill within quay structure to tie rod level	
		Tie rod / anchor walls	
		General activities	
		Deliveries to site	
1B	6	Piling (king piles and sheet piles)	Day, Evening, Night, Weekend
		Rock armour revetment	
		Dredging	
		Infill within quay structure to tie rod level	
		Tie rod / anchor walls	
		General activities	
		Deliveries to site	
2A	7	Piling (king piles only)	Day, Evening, Night, Weekend
		Rock armour revetment	
		Dredging	
		Tie rod / anchor walls	
		Infill within quay structure above tie rod level	
		Services installation	
		Concrete copes	
		General activities	
		Deliveries to site	
2B	7	Piling (king piles and sheet piles)	Day, Evening, Night, Weekend
		Rock armour revetment	
		Dredging	
		Tie rod / anchor walls	
		Infill within quay structure above tie rod level	
		Services installation	
		Concrete copes	
		General activities	
		Deliveries to site	

Modelled Scenario	Months	Modelled Combination of Construction Stages (Worst Case)	Relevant Assessment Periods
3	9	Dredging	Day, Evening, Night, Weekend
		Services installation	
		Placing final structure	
		Concrete copes	
		Deck furniture installation	
		Cathodic protection	
		General activities	
		Deliveries to site	

6.4.6.2 Evening and Night-time Construction Noise

With reference to the assessment periods included in Table 6-10, only in the case of dredging are works scheduled to be carried out over a 24-hour period. However, it is expected that onsite generators and temporary lighting could be operational throughout the evening and night, and therefore these assessment periods have been considered for all scenarios. All other activities are expected to have finished by 7pm on a daily basis, and therefore evening and night time levels are expected to be the same.

6.4.6.3 Weekend Construction Noise

The proposed construction schedule includes working during daytime hours during the weekdays and the weekends. The implication of this is that works associated with higher noise levels are likely to be carried out during weekend hours (Saturday 13:00 – 19:00 and Sunday 08:00 – 19:00), which are subject to more stringent noise limits than during the weekdays (refer to Table 6-2).

6.4.6.4 Piling

Piling will be carried out between the hours of 08:00 and 19:00.

Tubular steel king piles with profiled steel sheets will be installed at specified locations. To reduce the overall duration of the works, it is proposed that two separate piling rigs may be operational simultaneously. One rig will operate from a floating barge, while the other may operate from a temporary bund constructed at the shore end of the new quay.

The installation of piles will comprise “HZM” type steel king piles at specified centres, with profiled sheet piles spanning between to form a high modulus retaining wall. The HZM piles will be primarily driven using a vibrating pile hammer to the required depth. Where bedrock is encountered and hard driving is required, an impact hammer will be used to drive the pile into its final position. Impact piling typically generates higher noise levels than vibratory piling, the maximum period that impact piling is predicted to be used in any one daytime period is 15% of the construction site operating hours, with vibratory methods being used for the remaining 85%. The noise modelling of piling carried out at the proposed development contains this assumption.

The noise associated with the installation of sheet piles is greater than that associated with king piles. Variants on the construction scenarios (refer to Table 6-10) have been produced to predict levels during periods of only installing king piles (A) and periods where sheet piles are also being installed (B).

6.4.6.5 Dredging

Dredging is anticipated to include the use of both a suction dredger and a barge-mounted excavator. The operation of the suction dredger would be continuous over a 24 hour period, while operation of the barge-mounted long-reach excavator would be daytime only.

The suction dredging would be used for loose materials and involves a specialised vessel which lowers dredge pumps and hoses to the seabed to remove material. The material will then either be deposited on shore, within any required fill area or to a hopper barge for disposal at a licensed sea disposal site. Ground investigation works indicated that the bed material is mostly granular, and so will be dredged with the suction dredger.

Where more cohesive materials, such as sandy clay, are encountered, the contractor may dredge using a barge-mounted long-reach excavator. The dredged material will be disposed of in the same manner as that extracted with the suction dredger.

6.4.6.6 Construction Noise Model Data

3D computer noise modelling of the various stages of construction activity at the Site has been carried out using CadnaA software. Details on worst case construction activities, durations, operating times, and associated items of noise generating plant for each stage of construction used within the noise models have been supplied by Arch Henderson.

Calculations were carried out using noise data and guidance provided in BS5228-1:2009+A1:2014, to derive predicted noise levels at noise sensitive receptors. Where data was not available within BS5228 it has been sourced from the Environmental Protection Department of Hong Kong's Technical Memorandum on Noise from Construction Work[70]. Noise data for suction dredging was taken from Royal Haskoning DHV, Memo on Swansea Channel Noise Impact Assessment, dated 25th June 2014[71]. Impact wrench noise data was taken from a study of impact wrench noise, Markesino et al[72].

Full details of the items of modelled construction plant, noise data (including data source), operating times, durations and source heights for each of the considered scenarios is shown in Appendix C of Technical Appendix 6.1, within Volume 3 of this EIAR.

6.4.6.7 ABC Category Thresholds

The appropriate ABC category thresholds above which there is considered to be a noise impact from construction noise have been calculated following guidance provided in BS5228-1:2009+A1:2014. Details of the calculations are shown in Appendix B of Technical Assessment 6.1, within Volume 3 of this EIAR.

6.4.7 Operational Noise Model Input Parameters

6.4.7.1 Proposed East Quay / Laydown Area Operational Activities

During the operational stage, there is the potential for noise from ships berthing, loading/unloading activities, and transfer to/from materials to the laydown area to impact upon existing residents. In summary, the noise generating operational activities as a result of the proposed East Quay / Laydown Area will comprise of;

- Ship berthing (including on-board generators) and cargo loading / unloading activities;
- Laydown and storage of cargo and offshore structures such as wind farm components using a combination of Self Propelled Modular Transporters SMPTs and 16ton Fork Lift Trucks;
- HGV movements of materials to/from quay and laydown area.

It is understood that it is proposed to use the laydown area predominantly for the storage of wind turbine jacket (foundation) structures. These structures shall be loaded / unloaded directly from the ship using pairs of SPMTs. Three pairs of SPMTs shall be driven onto the ship to load / unload each jacket, with approximately one

[70] Environmental Protection Department of Hong Kong (1989), *Technical Memorandum on Noise from Construction Work other than Percussive Piling*
[71] Royal Haskoning DHV (25th June 2014), *Swansea Channel Noise Impact Assessment,* Memo
[72] Markesino et al (2004), *Study of Noise Transmission from an Electric Impact Wrench*, Noise-Con 2004

movement within a 10 hour shift. The noise model has assumed a worst case one movement per hour during the day and night-time period.

An additional circa 300t mobile crane, and two 16 ton Fork Lift Trucks are likely to be present on the quay to service the vessels and move materials. Circa two HGV movements in and out of the East Quay or Laydown Area are likely to occur per 24 hour period. The noise model has assumed a worst case two movements per hour during the day and night-time period.

6.4.7.2 Operational Noise Data

3D computer noise modelling of operational activity at the proposed development has been carried out using CadnaA software.

Calculations were carried out using plant manufacturer's noise data provided by the Applicant, and published data in BS5228:2009+A1:2014, to derive predicted noise levels at noise sensitive receptors. Full details of the items of modelled operational plant, noise data (including data source), operating times, durations and source heights for the modelled East Quay operations are shown in Appendix D of Technical Appendix 6.1, within Volume 3 of this EIAR.

6.4.8 BS4142:2014 Acoustic Feature Correction

CadnaA software has been used to model the specific sound level from operational activities at the location of the most exposed sensitive receptors. To calculate the rated sound level, the assessment considers the character of the sound being assessed at the receptor location. If present, corrections for impulsivity, intermittency and/or tonality are added to the specific sound level to calculate the rated sound level.

A sound source may exhibit acoustic characters at source, however, the prominence of these features may be masked at the location of the noise sensitive receptors by the residual (background) sound at these locations. The amount by which the residual sound masks these features varies as the residual sound changes in level and possible character. Similarly, the sources acoustic character may also vary with time.

In the case of ships loading/unloading, the movement of cargo and wind turbine components has the potential to create sound which is impulsive in nature. The modelled specific sound from these activities is predicted to be below, or close to the measured background noise at the most exposed sensitive receptors, which is an indication that the sound is predicted to be mostly inaudible. Despite this, due to the high transient peak levels that the movement of cargo and wind turbine components may create it is considered likely that some sound from these activities may be just perceptible at the most exposed sensitive receptors. For this reason, a correction of 3dB(A), for impulsivity that is just perceptible, has been applied to the specific noise levels all receptor locations.

6.4.8.1 Assessment of Tonality

The proposed development will employ the same, or similar noise generating plant to that currently being employed for existing operations at Nigg Energy Park. In order to determine if there is a tonal component to existing industrial / commercial noise emissions from the Site, analysis has been carried out of day and night-time measured levels, following guidance provided in BS4142:2014 (Annex C). The purpose of the analysis is to determine if any existing operations exhibit prominent tonality, which would in turn suggest that tonality may also be present for proposed East Quay operations.

Analysis has been carried out on noise measurements carried out on the operational ambient noise measurements carried out at noise sensitive receptor locations in Balnabruaich, Balnapaling and Cromarty to account for propagation of any tonal components with distance, including low frequency noise. The tonal analysis has been carried out on all day and night-time ambient operational noise measurements described within Table 6-11.

The third octave band data along with the tonal analysis calculations are shown in Appendix E of Technical Appendix 6.1, within Volume 3 of this EIAR. The results show that there are no tonal components identifiable in the one-third octave band spectra that would indicate a 6 dB tonal penalty at noise sensitive receptors within Balnabruich, Balnapaling and Cromarty.

Despite the analysis that there are no prominent tones present, it was observed subjectively on site that noise from ship and oil rig generators created audible low frequency noise at surrounding noise sensitive receptors, which was most noticeable during the night-time. Although not considered prominently tonal when assessed with one-third octave bands, a slight degree of low frequency generator tonality is subjectively considered to be present at existing receptors surrounding NEP, suggesting a 2 dB tonal penalty could be applicable.

With regards to proposed East Quay operational activities (as described in Section 6.4.7.1), the sound generated is anticipated to be predominantly broadband in nature. Noise modelling has predicted that individual items of noise generating plant will have lower modelled partial specific noise levels than the measured background sound at all receptor locations, therefore are predicted to be largely inaudible. Despite this, it is considered likely that a slight degree of subjective tonality from the vehicle reverse alarms and ship generators may be just audible at receptor locations during the day and night-time periods. For this reason a conservative +2dB(A) tonal penalty has been applied to the specific noise levels from the proposed East Quay at all receptor locations.

6.4.9 Site Design Mitigation

As part of the site design process for the proposed development, EnviroCentre modelled scenarios of operational activities provided by the Applicant in order to inform noise mitigation measures. As part of this process, and in order to reduce noise from the operational activities described in Section 6.4.7.1, an acoustic bund of up to 2m height is proposed, located between the Laydown Area and noise sensitive receptors to the north (Balnabruaich) and east (Balnapaling). The extent and height of the acoustic bund is shown in Figure 6.3, within Volume 2 of this EIAR.

The most exposed properties to noise are identified as being those located to the east of the proposed development in Balnapaling. The topographic level of the ground on which the acoustic bund is proposed is between 1.2m and 1.8m higher than that of the East Quay itself, therefore the proposed bund effectively reduces noise from both the Laydown Area and operational activities on the southern half of the quay, on which the majority of loading / unloading activities are likely to take place. It also provides a reduction in noise levels from existing operations in Nigg Energy Park, including parts of the Graving Dock, southern sections of the main yard/berths and South Quay activities, at receptors in Balnapaling.

6.4.10 Assumptions and Limitations

Consultation with Arch Henderson and the Applicant has been carried out to determine and agree assumed construction and operational activities, schedules and associated noise generating plant which are considered likely. The assumptions are considered to provide a worst case scenario in terms of potential noise generating activities, however, a number of construction noise assumptions regarding proposed activities may change following the employment of a contractor.

6.4.10.1 Construction and Operational Assessment Baseline Noise Assumptions

In order to assume a worst-case scenario, the lowest measured background (L_{A90}) noise levels have been assumed within the operational noise assessment.

Existing ambient noise measurements taken at Noise Monitoring Locations (NML) 1A have been discounted from use in the construction and operational noise assessments due to the close proximity of the monitoring location to the B9175, which was noted to be the dominant source of noise at this location. NML 1B was chosen on the

second round of monitoring to be at similar distance back from the B9175 to houses in Balnabruaich, and therefore is considered to be more representative of industrial noise levels at sensitive receptors in this location.

Existing ambient noise measurements taken at NML 4A have been discounted from use in the operational and construction noise assessments due to the increased influence of road traffic noise on Shore Street and Forsyth Place, and the line of sight to Nigg Energy Park. NML 4B was chosen on the second round of monitoring to reduce the influence of existing road traffic noise, and increase the line of sight to Nigg Energy Park, and is therefore considered to be more representative of industrial noise levels at sensitive receptors in this location.

In summary the existing ambient noise levels used in the operational noise assessment at each noise sensitive receptor location are as follows;

- NSR 1; That of Noise Monitoring Location (NML) 1B on 27th Feb 2019;
- NSR 2; The average of noise monitoring levels measured on 26th & 27th Feb 2019 at NML 2;
- NSR 3; The average of noise monitoring levels measured on 26th, 27th & 28th Feb 2019 at NML 3;
- NSR 4; That of NML 4B on 27th & 28th Feb 2019; and
- NSR 5; The average of noise monitoring levels measured on 26th, 27th & 28th Feb 2019 at NML 5.

6.4.10.2 Noise Model Assumptions

A number of assumptions have been established during the CadnaA modelling exercise, as summarised below. Full details on noise modelling assumptions are provided in the Noise Model Input Parameters section of Technical Appendix 6.1, within Volume 3 of this EIAR.

- The ground model uses Lidar 1m resolution terrain height data for existing parts of Nigg Energy Park and the surrounding area. Topographic levels for the proposed development have been provided by Arch Henderson.
- The heights of buildings have been estimated from site visits and photographs;
- Ground absorption has been set to 0.5 for mixed soft/hard ground, areas of water have been set to 1 for reflective surface;
- Predicted levels are calculated in the free-field environment;
- Receptors at ground floor level have been taken to be at 1.5m height. Those at second floor level have been assumed to be at 4m height (i.e 1st floor bedrooms);
- At one storey noise sensitive receptors, day and night-time noise levels have been calculated at 1.5m height. At two storey or above, day and night-time noise levels have been calculated at 4m height.

Construction Noise

- The noise model assumes locations of plant based on descriptions of construction activities provided by Arch Henderson;
- Worst case scenario combinations of construction activities likely to occur in any one day during the considered assessment periods have been assumed;
- Weekend daytime noise levels generated by construction activities have been assumed to be the same as those generated during weekday hours representing a worst case scenario;
- Articulated dump truck and HGV deliveries have been assumed to take 12.5 mins to arrive within the site, and 12.5 mins to depart;
- Articulated dump truck deliveries have been assumed to take 1 minute to tip;
- Spud-leg barges on which piling equipment is intended to be located have been assumed to have a height of 1m above sea level. The height of equipment located on the barges (e.g. piling excavators) has been assumed as relative to the height of the barge (e.g. a 1m high noise source height located on the 1m high barge, has a total height of 2m);
- The following sources have been modelled as line sources within CadnaA;
    - Heavy goods vehicles (HGVs) and dump trucks;

- Concrete trucks;
- Moving construction plant;
- Tugs / work boats.

- Barges have been modelled within CadnaA as area sources;
- All remaining sources (not outlined above) have been modelled within CadnaA as point sources.
- A number of the phases include the use of excavators. With the exception of dredging activities, all excavator use has been collated and included in the general onsite activities, with the number and type of excavators supplied by Arch Henderson.

Operational Noise

- The noise model assumes locations of plant based on descriptions of construction activities provided by the Applicant;
- Worst case scenario combinations of operational activities likely to occur in any one day during the considered assessment periods have been assumed;
- Items of moving plant have been modelled as line sources within CadnaA. All remaining operational plant has been modelled as point sources.

6.4.11 Noise Definitions

The following definitions relating to noise are used in this report:-

$L_{Aeq, T}$: Equivalent continuous A-weighted sound pressure level. This is the single number that represents the average sound energy over that time period. It is the sound level of a notionally steady sound that has the same energy as a sound that fluctuates over a specified measurement period.

$L_{A90, T}$: The noise level exceeded for 90% of the measurement period.

$L_{A10, T}$: The noise level exceeded for 10% of the measurement period.

$L_{AF, max}$: The A-weighted maximum sound pressure level over the measurement period. The measurement is taken using the fast time weighting of the sound level meter.

Free-field: As sound propagates from the source it may do so freely, or it may be obstructed in some way by a wall, a fence, building, earth bund, etc. The former is known as free-field propagation.

Ambient Sound Level, L_a: As defined in BS4142:2014; equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.

Façade Effect: When sound is reflected back towards its source, off a surface, such a wall, the reflected and incident sound waves interfere constructively, causing what is known as façade effect, or pressure doubling. This increases the noise, compared to that which exists in free-field, by approximately 2.5 dB(A).

Octave: A range of frequencies whose upper frequency limit is twice that of its lower frequency limit.

Octave Band: Sound pressure level is often measured in octave bands, the centre frequencies of the bands are defined by ISO – 31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz, 16kHz to divide the audio spectrum into 10 equal parts. The sound pressure level of sound that has been passed through an octave band pass filter is termed the octave band sound pressure level.

6.5 Baseline

A summary of the noise monitoring results can be found in Table 6-11. Full details on monitoring results, including octave band levels and on-site observations, are detailed in Technical Appendix 6.1: Noise Assessment, within Volume 3 of this EIAR.

Table 6-11: Baseline Noise Monitoring Data

Date	Period	Noise Monitoring Location	Start time/ Duration (hrs:mins)	L_{Aeq} (dB_A)	L_{AFmax} (dB_A)	L_{A90} (dB_A)
26/02/2019	Daytime	01A	16:44 / 01:00	63.9	86.4	41.0
		02	15:27 / 01:00	49.1	66.9	46.3
		03	14:20 / 01:00	47.7	75.2	40.6
		04A	15:32 / 01:00	52.1	78.6	41.2
		05	16:42 / 01:00	51.3	73.1	42.8
26/02/2019 – 27/02/2019	Night-time	01A	23:41 / 00:30	52.6	82.4	35.4
		02	23:01 / 00:30	46.7	55.9	45.4
		03	01:16 / 00:30	42.3	48.7	41.2
		04A	01:56 / 00:30	47.7	60.6	45.5
		05	02:36 / 00:30	39.6	51.5	37.7
27/02/2019	Daytime	01B	14:50 / 01:00	54.5	76.4	34.1
		02	15:59 / 01:00	46.1	63.7	42.7
		03	14:02 / 01:00	45.4	66.6	41.2
		04B	15:14 / 01:00	46.7	64.3	42.3
		05	16:27 / 01:00	51.0	72.3	42.2
27/02/2019 – 28/02/2019	Night-time	01B	00:20 / 00:30	47.6	76.4	31.1
		02	23:41 / 00:30	45.0	57.1	42.3
		03	23:50 / 00:30	41.8	63.8	40.2
		04B	00:52 / 00:30	44.8	56.2	40.3
		05	01:28 / 00:30	40.1	62.6	37.8

6.5.1 Nigg Energy Park Operational Activities

During the day and night-time noise monitoring events, operational activities within Nigg Energy Park were confirmed by site management to be representative of a typical busy period. Operational activities at the time of visiting included;

- Ships berthed at Berth 4 (South) & 5 (South Quay), including operational on-board generators. Associated 24 hour loading / unloading of wind turbine components and cargo to / from and laydown / storage areas using cranes and various items of mobile plant;
- 24 hour repair / refurbishment works on Ocean Endeavour drilling rig within Graving Dock (Berth 1). On-board generators and cranes were operational during the day and night-time;

- 24 hour assembly, fabrication and repair works of large marine structures and offshore assets within workshop buildings;
- 24 hour movement of cargo / offshore assets within yard using various items of mobile plant; and
- HGV and LGV delivery / pick-ups and associated loading/unloading activities.

6.5.2 Baseline Observations

Notes of noise sources characterising the background noise environment at each of the monitoring locations for the monitoring periods were recorded and have been summarised in order of dominance (greatest first). This information is contained within Technical Appendix 6.1: Noise Assessment, within Volume 3 of this EIAR.

6.5.3 Existing Operational Noise Data

A summary of the operational noise monitoring results can be found in Table 6-12.

Table 6-12: Operational Noise Data

Start Time (hrs:mins)	Duration (min:secs)	Grid Reference	Notes	L_{Aeq} (dB_A)	L_{AFmax} (dB_A)
10:20	01:04	278921 869073	Yard at Berth 4; Pacific Orca large crane loading wind turbine towers onto boat. Ship engine & generator noise. Hammering in yard.	60.7	67.1
10:22	03:22	278921 869073	Yard at Berth 4; Pacific Orca large crane loading wind turbine towers onto boat. Ship engine & generator noise.	59.9	64.1
10:30	02:29	278812 869000	Berth 5; Rotra Mare ship berthing. Ship generator noise.	63.8	66.3
10:41	01:51	279057 869004	Yard at Berth 4; Pacific Orca small rear crane moving life raft from boat to yard.	67.1	74.5
10:46	03:30	279057 869004	Yard at Berth 4; Pacific Orca small rear crane loading contaminated waste skip from yard to boat.	66.5	75.5
11:20	01:10	278937 869409	2m from Fabrication Shop 6 open doors; Fork lift truck movements and fabrication works inside unit.	65.8	79.7
11:31	02:00	279082 869474	2m from Fabrication Shop 4 open east doors; fork lift truck movements and fabrication works inside unit	71.7	77.6
11:42	02:00	279200 869570	North of graving dock, looking towards Ocean Endevour; works on rig, yard noise, noise from paint and blast unit	52.2	58.6
11:47	01:32	279307 869582	2m from paint and blast open side doors; compressor hiss.	77.2	92.7
11:58	01:00	279312 869681	2m from fabrication shop 1 open doors; Manual palate truck movements, birds cawing within unit.	60.9	66.2
12:03	01:02	279353 869549	1m from generator by paint and blast unit; generator noise.	71.1	73.4

Start Time (hrs:mins)	Duration (min:secs)	Grid Reference	Notes	L_{Aeq} (dB_A)	L_{AFmax} (dB_A)
12:07	01:19	279347 869514	2m from paint and blast unit extract; extract noise, approx 0.5m high.	78.3	79.3
12:12	00:30	279397 869445	Climavent outside unit 12 (rig fabrication); extract noise	78.2	79.5
12:21	02:02	279386 869449	2m from unit 12 (rig fabrication) open doors; fabrication works inside unit	80.6	93.5
12:27	01:16	279397 869331	East of graving dock N; generator noise on rig. no fabrication works (workers on lunch break)	54	61.1
12:45	02:00	279400 869191	East of graving dock S; generator noise on rig. No fabrication works (workers on lunch break)	56.6	58.6
12:52	00:30	279389 869029	2m from pipe extract on ground at end of graving dock; extract noise	86.9	88.2
14:22	03:17	279189 869213	West of graving dock S; 2 x cranes on rig, 1 x FLT in yard, generator noise on rig, clattering	67.6	74
14:27	02:29	279183 869296	West of graving dock N; 2 x cranes on rig, generator noise on rig	66.7	73.7
14:38	02:17	279401 869273	East of graving dock; 2 x cranes on rig, generator noise on rig	58.1	64.6

6.6 Construction Noise Impact Assessment

The noise model results for each modelled scenario of construction activity, along with the BS5228 assessment at each of the considered noise sensitive receptors are summarised in Table 6-13 to Table 6-17.

Table 6-13: Noise Model Results and BS5228 Assessment; Noise Sensitive Receptor No. 1

NSR 01	Weekday Daytime			Weekend Daytime			Evening			Night-time		
Scenario	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance
1A	65	48	Neutral	55	48	Neutral	55	36	Neutral	55	36	Neutral
1B	65	49	Neutral	55	49	Neutral	55	36	Neutral	55	36	Neutral
2A	65	49	Neutral	55	49	Neutral	55	36	Neutral	55	36	Neutral
2B	65	49	Neutral	55	49	Neutral	55	36	Neutral	55	36	Neutral
3	65	44	Neutral	55	44	Neutral	55	35	Neutral	55	35	Neutral

Table 6-14: Noise Model Results and BS5228 Assessment; Noise Sensitive Receptor No. 2

NSR 02	Weekday Daytime			Weekend Daytime			Evening			Night-time		
Scenario	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance
1A	65	58	Neutral	55	58	Moderate adverse	55	50	Neutral	50	50	Slight adverse
1B	65	60	Neutral	55	60	Large adverse	55	50	Neutral	50	50	Slight adverse
2A	65	59	Neutral	55	59	Moderate adverse	55	50	Neutral	50	50	Slight adverse
2B	65	60	Neutral	55	60	Large adverse	55	50	Neutral	50	50	Slight adverse
3	65	56	Neutral	55	56	Slight adverse	55	50	Neutral	50	50	Slight adverse

Table 6-15: Noise Model Results and BS5228 Assessment; Noise Sensitive Receptor No. 3

NSR 03	Weekday Daytime			Weekend Daytime			Evening			Night-time		
Scenario	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance
1A	65	45	Neutral	55	45	Neutral	55	36	Neutral	45	36	Neutral
1B	65	48	Neutral	55	48	Neutral	55	36	Neutral	45	36	Neutral
2A	65	46	Neutral	55	46	Neutral	55	36	Neutral	45	36	Neutral
2B	65	48	Neutral	55	48	Neutral	55	36	Neutral	45	36	Neutral
3	65	44	Neutral	55	44	Neutral	55	35	Neutral	45	35	Neutral

Table 6-16: Noise Model Results and BS5228 Assessment; Noise Sensitive Receptor No. 4

NSR 04	Weekday Daytime			Weekend Daytime			Evening			Night-time		
Scenario	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance
1A	65	45	Neutral	55	45	Neutral	55	35	Neutral	50	35	Neutral
1B	65	47	Neutral	55	47	Neutral	55	35	Neutral	50	35	Neutral
2A	65	45	Neutral	55	45	Neutral	55	35	Neutral	50	35	Neutral
2B	65	47	Neutral	55	47	Neutral	55	35	Neutral	50	35	Neutral
3	65	45	Neutral	55	45	Neutral	55	35	Neutral	50	35	Neutral

Table 6-17: Noise Model Results and BS5228 Assessment; Noise Sensitive Receptor No. 5

NSR 05	Weekday Daytime			Weekend Daytime			Evening			Night-time		
Scenario	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance	Threshold Level dB(A)	Predicted Level dB(A)	Significance
1A	65	43	Neutral	55	43	Neutral	55	34	Neutral	45	34	Neutral
1B	65	44	Neutral	55	44	Neutral	55	34	Neutral	45	34	Neutral
2A	65	44	Neutral	55	44	Neutral	55	34	Neutral	45	34	Neutral
2B	65	45	Neutral	55	45	Neutral	55	34	Neutral	45	34	Neutral
3	65	42	Neutral	55	42	Neutral	55	33	Neutral	45	33	Neutral

6.6.1 Discussion of Results

The worst case noise impacts for each of the modelled scenarios on concurrent construction stages and relevant assessment periods are summarised below (refer to Table 6-10).

Scenario 1 (Month 6): The combined construction stages of the piling, the rock armour revetment, dredging, infill within quay structure to tie rod level and the tie rod / anchor walls are predicted to result in noise impacts of Neutral significance at all noise sensitive receptors during weekday daytime and evening hours.

At NSR 2 (Balnapaling), work during the weekend daytime hours is expected to result in a Moderate Adverse impact during king pile installation and a Large Adverse impact during sheet pile installation. For all other receptors weekend daytime works are predicted to result in a Neutral impact.

This phase of work is expected to meet the night time threshold levels as defined using the ABC method of BS 5228 at all noise sensitive receptors. At NSR 2 (Balnapaling) the expected noise levels are equal to the threshold indicating a Slight Adverse impact. The impact is predicted to be Neutral at all other receptors.

Scenario 2 (Month 7): The combined construction stages of the piling, rock armour revetment, dredging, tie rod / anchor walls, the infill within quay structure above tie rod level, services installation and concrete copes are expected to result in noise impacts of Neutral significance for all receptors during the weekday daytime and evening hours.

At NSR 2 (Balnapaling), work during the weekend daytime hours is expected to result in a Moderate Adverse impact during king pile installation and a Large Adverse impact during sheet pile installation. For all other receptors it is predicted that weekend daytime works will result in a Neutral impact.

This phase of work is expected to meet the night time threshold levels as defined using the ABC method of BS 5228 at all noise sensitive receptors. At NSR 2 (Balnapaling) the expected noise levels are equal to the threshold indicating a Slight Adverse impact. The impact is predicted to be Neutral at all other receptors.

Scenario 3 (Month 9): The combined construction stages of the dredging, services installation, placing the final structure, concrete copes, deck furniture installation and cathodic protection are expected to result in noise impacts of Neutral significance for all receptors during the weekday daytime and evening hours.

Weekend daytime works are expected to result in a Slight Adverse impact at NSR 2 (Balnapaling). Neutral significance is predicted at all other receptors.

This phase of work is expected to meet the night time threshold levels as defined using the ABC method of BS 5228 at all noise sensitive receptors. At NSR 2 (Balnapaling) the expected noise levels are equal to the threshold indicating a Slight Adverse impact. The impact is predicted to be Neutral at all other receptors.

6.6.2 Greatest Weekday Daytime Noise Impacts

The greatest noise generating activities for weekday daytime works are expected to be during a crossover of piling and dredging works. This crossover is expected to last approximately two weeks. Piling works largely dominate levels when taking place, with the greatest impact predicted during the installation of sheet piles. However, the impact from construction works during the weekday daytime hours is predicted to be Neutral at all receptors. There are no significant adverse effects in terms of the EIA Regulations during the daytime.

6.6.3 Greatest Weekend Daytime Noise Impacts

The greatest noise generating activities for weekend daytime works are expected to be during a crossover of piling and dredging works. This crossover is expected to last approximately two weeks. Piling works largely dominate levels when taking place, with the greatest impact predicted during the installation of sheet piles, where Large Adverse impacts are predicted at NSR 2 (Balnapaling). Moderate Adverse impacts are also predicted during the weekend daytime hours at NSR 2 during the installation of king piles. Impacts at all other receptors during the weekend daytime are predicted to be Neutral. The majority of piling will be carried out over a two month period during the Piling and Rock Armour Revetment construction stages. A Moderate or Large Adverse impact is considered to be a significant effect (refer to Table 6-3).

6.6.4 Greatest Evening Noise Impacts

Evening noise throughout the project will largely be due to the operation of onsite generators associated with works or lighting. However, during the course of dredging it is expected that the suction dredger would operate for 24 hours per day. The dredger has been modelled in its position closest to NSR 2 (Balnapaling) to ensure worst case modelling, which has shown that levels are predicted to be within the thresholds defined in the ABC method of BS 5228 by at least 5dB. A Neutral impact is therefore predicted at all receptors during the evening. There are no significant adverse effects in terms of the EIA Regulations during the evening.

6.6.5 Greatest Night-time Noise Impacts

Night time noise throughout the project will largely be due to the operation of onsite generators associated with works or lighting. However, during the course of dredging it is expected that the suction dredger would operate for 24 hours per day. The dredger has been modelled in its position closest to NSR 2 (Balnapaling) to ensure worst case modelling, which has shown that levels are predicted to meet the thresholds defined in the ABC method of BS 5228. This indicates a Slight Adverse impact at NSR 2 in accordance with TAN 1/2011, with Neutral impacts predicted at all other receptors. The maximum duration that suction dredging would be carried out at night is five months, however, in reality the dredger will only be this close to the NSR 2 for a small portion of the dredging works. There are no significant adverse effects in terms of the EIA Regulations during the night-time.

6.7 Operational Noise Impact Assessment

6.7.1 East Quay Operational Activities

The noise model results and TAN 2011 assessments for the day and night-time periods for operational activities are shown in Table 6-18 and

Table 6-19. The results include the effects of the site design mitigation measures described in Section 6.4.9.

Table 6-18: Noise Model Results and TAN 1/2011 Assessment; Daytime

Noise Sensitive Receptor ID	1	2	3	4	5
Modelled Specific Level $L_{S, (1\ hour)}$ dB	34.4	43.5	32.7	32.2	30.8
Acoustic Feature Correction dB(A)	5.0	5.0	5.0	5.0	5.0
Rated Noise $L_{Ar, (1\ hour)}$ dB	39.4	48.5	37.7	37.2	35.8

Noise Sensitive Receptor ID	1	2	3	4	5
Background Noise $L_{A90, (1\ hour)}$ dB	34.1	42.7	40.6	41.2	42.2
Rated - Background Noise dB(A)	5.3	5.8	-2.9	-4	-6.4
Sensitivity of Receptor	Medium	Medium	Low	Low	Low
Existing Level $L_{Aeq, (1\ hour)}$ dB	54.5	47.9	46.7	46.7	51.2
Specific Level + Existing Level $L_{Aeq, (1\ hour)}$ dB	54.5	49.2	46.9	46.9	51.2
Change in level	0.0	1.3	0.2	0.2	0.0
Magnitude of Impact (After – Before)	No change	Minor	Negligible	Negligible	No change
Significance of Effects	Neutral	Slight	Neutral / Slight	Neutral / Slight	Neutral

Table 6-19: Noise Model Results and TAN 1/2011 Assessment; Night-time

Noise Sensitive Receptor ID	1	2	3	4	5
Modelled Specific Level $L_{S, (1\ hour)}$ dB	32.6	41.8	31.6	31.4	30.2
Acoustic Feature Correction dB(A)	5.0	5.0	5.0	5.0	5.0
Rated Noise $L_{Ar, (1\ hour)}$ dB	37.6	46.8	36.6	36.4	35.2
Background Noise $L_{A90, (1\ hour)}$ dB	31.1	42.3	40.2	40.3	37.7
Rated - Background Noise dB(A)	6.5	4.5	-3.6	-3.9	-2.5
Sensitivity of Receptor	Medium	Low	Low	Low	Low
Existing Level $L_{Aeq, (1\ hour)}$ dB	47.6	45.9	42.1	44.8	39.9
Specific Level + Existing Level $L_{Aeq, (1\ hour)}$ dB	47.7	47.3	42.5	45.0	40.3
Change in level	0.1	1.4	0.4	0.2	0.4
Magnitude of Impact (After – Before)	Negligible	Minor	Negligible	Negligible	Negligible
Significance of Effects	Neutral / Slight	Neutral / Slight	Neutral / Slight	Neutral / Slight	Neutral / Slight

The results show that the daytime noise from proposed operations at the East Quay and Laydown Area is predicted to result in an increase in noise levels at sensitive receptors of between 0.2dB(A) at NSRs 3 & 4 (George Street & Forsyth Place, Cromarty) and 1.3dB(A) at NSR 2 (Balnapaling). The significance of the increases in noise level varies between Neutral/Slight at NSRs 3 & 4 (George Street & Forsyth Place, Cromarty) and Slight at NSR 2 (Balnapaling). The noise levels are predicted to be unchanged at NSRs 1 (Balnabruaich) and 05 (Shore Street, Cromarty). There are no significant adverse effects in terms of the EIA Regulations during the daytime.

At night the noise from proposed operations at the East Quay and Laydown Area is predicted to result in an increase in noise levels at sensitive receptors of between 0.1dB(A) at NSR1 (Balnabruaich) and 1.4dB(A) at NSR 2 (Balnapaling). The increase in noise levels in receptors in Cromarty varies between 0.2dB(A) at NSR 4 (Forsyth Place) and 0.4dB(A) at NSRs 3 & 5 (George Street and Shore Street). The significance of the increases in night-time noise levels are Neutral/Slight at all receptors. There are no significant adverse effects in terms of the EIA Regulations during the night-time.

6.7.2 Discussion of Results

The maximum increase in daytime noise levels is predicted to be 1.3dB(A) at NSR 02 (Balnapaling), the significance of which is Slight, at night the increase is predicted to be 1.4dB(A) at the same receptor, the significance of which is Neutral/Slight. In terms of human perception of sound, an increase of 3dB(A) is considered to be barely perceptible, therefore the predicted increase of 1.4dB(A) at receptors in Balnapaling is considered likely to be mostly imperceptible.

At receptors in Balnabruaich and Cromarty during the day and night-time there is predicted to be no change, or an increase of less than 0.4dB(A), the significance of any increases being Neutral / Slight. An increase in noise levels of this amount will not be perceptible.

Despite the prediction that the worst case increase in noise levels as a result of the East Quay is likely to be mostly imperceptible, any small numerical increase in noise levels will contributes to the cumulative industrial noise emissions from the site. It is therefore it is recommended that site-wide (i.e existing and proposed East Quay operations) noise mitigation measures are implemented throughout Nigg Energy Park to offset this predicted increase in noise levels from the East Quay, as discussed in Section 6.8.2. These recommendations are in line with the Scoping Consultation Response received from THC, in which it was requested that site-wide mitigation measures be considered as part of this assessment.

6.8 Mitigation and Monitoring

6.8.1 Construction Noise Mitigation

Construction activities during weekday daytime and evening hours are predicted to have a Neutral level of significance at all noise sensitive receptors surrounding the site. At the weekend, the worst case daytime significance of effect from construction activities are predicted to be of Large Adverse significance when carrying out sheet piling, and Moderate Adverse significance when carrying out king piling (NSR 2, Balnapaling). Neutral weekend impacts are predicted at the remaining noise sensitive receptors.

Impacts of Large adverse significance are likely to be important considerations, however, mitigation may be effectively employed such that resultant adverse effects may have a Moderate or Slight significance (refer to Table 6-3). Impacts of Moderate Adverse significance are defined in TAN 2011 as undesirable, but not likely to be key decision making issues. If piling were to be carried out at the weekend, the maximum duration would be two months. To reduce the level of impact from Large Adverse significance during the weekend daytime, noise mitigation measures relating to piling are recommended in Section 6.8.1.1.

At night, the worst case impacts are predicted to be of Slight significance (NSR 2, Balnapaling). Neutral night-time impacts are predicted at the remaining noise sensitive receptors. The maximum duration that suction dredging would be carried out at night is five months, however, as mentioned previously the dredger will only be this close to the NSR 2 for a small portion of the dredging works. Impacts of Slight significance may be raised but are unlikely to be of importance in the decision making process (refer to Table 6-3).

6.8.1.1 Piling

As discussed previously, the majority of piling will be carried out using a vibratory hammer with the impact hammer being used to drive the sheet and king piles into their final position if needed. The use of the impact hammer, particularly when driving the sheet piles generates the greatest level of noise during this process (Large Adverse significance). In order to reduce the level of impact during the most sensitive weekend daytime period at receptors in Balnapaling the following measures are recommended;

- The use of impact hammers on sheet piles should, where practicable, be scheduled for weekdays and avoided at weekends.
- The use of quiet hammer systems and acoustic shrouding techniques should be considered during impact piling.

6.8.1.2 Construction Noise Management

It is recommended that best practice construction noise management techniques should be employed following guidance provided in BS5228-1:2009, and that the general principles of the Considerate Constructors Scheme be incorporated into the Construction Environmental Management Plan (CEMP).

6.8.2 Operational Noise Mitigation

The following noise mitigation measures have been discussed with the Applicant and are recommended to be incorporated into the site-wide noise management plan for both existing and proposed East Quay operations (to be prepared post-consent). These recommendations are in addition to the proposed site design mitigation measures described in Section 6.4.9.

6.8.2.1 General Noise Management

- Minimise, and if feasible avoid plant movements or loading / unloading activities on the southern half of the East Quay (due to line of sight to receptors in Balnapaling) during the most sensitive night-time period;
- Use of centralised and temporary quiet generator systems positioned on or near to the South and East Quaysides;
- Where practicable, switch off vessel and rig generators when not required;
- Where practicable, selection of low noise plant / equipment for works on the South Quay and proposed East Quayside;
- Restrict the operation of loud speaker communication systems to daytime periods only;
- Schedule high noise generating activities to occur during daytime hours, with restrictions on high noise activities at night;
- Where maintenance activities are to be carried out at night, ensure maintenance areas are remote, or isolated from areas of noise sensitivity;
- Keep internal haul routes well maintained and avoid steep gradients;
- Keep doors to fabrication and workshop units closed when not in use;
- When plant/equipment is due for replacement/renewal, or when hiring, give preference to selection of low noise options;
- Carry out regular and effective maintenance on plant/equipment to reduce noise from wear and tear of components;
- Provide training to existing and new start employees (through incorporation into the site induction process) in best practice noise management techniques / make familiar with the operational noise management plan; and
- Carry out weekly scheduled monitoring of on-site noise levels. Log measured levels, along with description of activities occurring at time of monitoring. The log may be used to determine particularly high noise generating activities, or combinations of activities to inform further refinement of the

operational noise management plan (if required), or provide information in the event of noise complaints in the surrounding community.

6.8.2.2 Mobile Plant

- Design traffic routing and vehicle selection to avoid / minimise the requirement for vehicle reversing;
- Where vehicle reversing alarms are required, they should be designed to cause the lowest practical environmental impact; preferably they should be directional broadband noise emitters or automatically adjusted to ambient noise levels;
- Avoid unnecessary revving of engines and shut down idling plant and equipment when not in use;
- Acoustic covers to engines should be kept closed; and
- Noise from plant which is known to be particularly directional, where practicable, should be orientated such that the noise is directed away from noise sensitive areas.

6.9 Residual Effects

6.9.1 Construction Noise

Noise generated by construction activities is temporary in nature, therefore there are no predicted long-term residual effects.

6.9.2 Operational Noise

During the daytime, the worst case residual effects, with the design mitigation in place (refer to Section 6.4.9) as a result of operational industrial noise are predicted to be of Slight Adverse significance at receptors in Balnapaling, and Neutral/Slight at receptors on George Street and Forsyth Place in Cromarty. There are no daytime residual effects predicted at receptors in Balnabruaich. There are no significant adverse effects in terms of the EIA Regulations during the daytime.

During the night-time, the worst case residual effects as a result of operational industrial noise are predicted to be of Slight Adverse significance at receptors in Balnapaling, and Neutral/Slight at receptors in Balnabruaich and Cromarty. There are no significant adverse effects in terms of the EIA Regulations during the night-time.

If the operational mitigation measures recommended in Section 6.8.2 are successfully implemented into the operational noise management plan, the significance of the effects are anticipated to be reduced from those currently predicted.

6.10 Statement of Significance

6.10.1 Weekday Daytime Construction Noise

The greatest noise generating activities for weekday daytime works are expected to be during a crossover of piling and dredging works. This crossover is expected to last approximately two weeks. Piling works largely dominate levels when taking place, with the greatest impact predicted during the installation of sheet piles. However, the impact from construction works during the weekday daytime hours is predicted to be Neutral at all receptors. There are no significant adverse effects in terms of the EIA Regulations during the daytime.

6.10.2 Weekend Daytime Construction Noise

The greatest noise generating activities for weekend daytime works are expected to be during a crossover of piling and dredging works. This crossover is expected to last approximately two weeks. Piling works largely dominate levels when taking place, with the greatest impact predicted during the installation of sheet piles, where Large Adverse impacts are predicted at NSR 2 (Balnapaling). Moderate Adverse impacts are also predicted during the weekend daytime hours at NSR 2 during the installation of king piles. Impacts at all other receptors during the weekend daytime are predicted to be Neutral. In terms of the EIA Regulations, a Moderate or Large Adverse impact is considered to be a significant effect (refer to Table 6-3).

6.10.3 Evening Construction Noise

Evening noise throughout the project will largely be due to the operation of onsite generators associated with works or lighting. However, during the course of dredging it is expected that the suction dredger would operate for 24 hours per day. The dredger has been modelled in its position closest to NSR 2 (Balnapaling) to ensure worst case modelling, which has shown that levels are predicted to be within the thresholds defined in the ABC method of BS 5228 by at least 5 dB. A Neutral impact is therefore predicted at all receptors during the evening. There are no significant adverse effects in terms of the EIA Regulations during the evening.

6.10.4 Night-time Construction Noise

Night time noise throughout the project will largely be due to the operation of onsite generators associated with works or lighting. However, during the course of dredging it is expected that the suction dredger would operate for 24 hours per day. The dredger has been modelled in its position closest to NSR 2 (Balnapaling) to ensure worst case modelling, which has shown that levels are predicted to meet the thresholds defined in the ABC method of BS 5228. This indicates a Slight Adverse impact at NSR 2 in accordance with TAN 1/2011, with Neutral impacts predicted at all other receptors. The maximum duration that suction dredging would be carried out at night is five months, however, in reality the dredger will only be this close to the NSR 2 for a small portion of the dredging works. There are no significant adverse effects in terms of the EIA Regulations during the night-time.

6.10.5 Daytime Operational Noise

Daytime noise from proposed operations at the East Quay and Laydown Area is predicted to result in an increase in noise levels at sensitive receptors of between 0.2dB(A) at NSRs 3 & 4 (George Street & Forsyth Place, Cromarty) and 1.3dB(A) at NSR 2 (Balnapaling). The significance of the increases in noise level varies between Neutral/Slight at NSRs 3 & 4 (George Street & Forsyth Place, Cromarty) and Slight at NSR 2 (Balnapaling). The noise levels are predicted to be unchanged at NSRs 1 (Balnabruaich) and 05 (Shore Street, Cromarty). An increase in noise levels of less than 1dB(A) at Receptors in Cromarty shall not be perceptible to the listener, and is therefore considered as insignificant. The predicted increase in noise levels of 1.3dB(A) at receptors in Balnapaling is considered likely to be mostly imperceptible, and therefore also insignificant. There are no significant adverse effects in terms of the EIA Regulations during the daytime.

6.10.6 Night-time Operational Noise

Night-time noise from proposed operations at the East Quay and Laydown Area is predicted to result in an increase in noise levels at sensitive receptors of between 0.1dB(A) at NSR1 (Balnabruaich) and 1.4dB(A) at NSR 2 (Balnapaling). The increase in noise levels in receptors in Cromarty varies between 0.2dB(A) at NSR 4 (Forsyth Place) and 0.4dB(A) at NSRs 3 & 5 (George Street and Shore Street). The significance of the increases in night-time noise level are Neutral/Slight at all receptors. An increase in noise levels of less than 1dB(A) at Receptors in Balnabruaich and Cromarty shall not be perceptible to the listener, and is therefore considered as insignificant.

The predicted increase in noise levels of 1.4dB(A) at receptors in Balnapaling is considered likely to be mostly imperceptible, and therefore also insignificant. There are no significant adverse effects in terms of the EIA Regulations during the night-time.

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7 CHAPTER 7: TRAFFIC AND TRANSPORT

7.1 Introduction

This chapter considers the potential effects on the surrounding road network and nearby sensitive receptors as a result of the construction and operation of a new quay to the south-east of the existing Nigg Energy Park, hereafter referred to as the 'proposed development'. The key objectives of the chapter are to:

- Describe the assessment methodology and significance criteria used in completing the assessment;
- Describe the study area and existing local and strategic road networks;
- Identify and assess the likely impact of increased traffic levels and associated environmental effects;
- Identify and describe the mitigation measures proposed to address any significant effects; and
- Assess any residual effects post mitigation implementation.

This Traffic and Transport chapter and the accompanying Figures (Figure 7.1 and Figure 7.2 within Volume 2 of this EIA Report) along with the Construction Traffic Management Plan contained within Technical Appendix 7.1 of Volume 3, have been prepared by SYSTRA Ltd (SYSTRA).

7.2 Scoping and Consultation

In undertaking the assessment, consideration has been given to the responses received to the Scoping Report from The Highland Council (THC) Roads in relation to the public roads within the identified study area and Transport Scotland in relation to the trunk road network (A9) within the study area. Further consultation discussions have been undertaken between SYSTRA and THC Roads and Transport Scotland respectively to agree the scope of this assessment. The consultation responses are detailed in Table 7.1.

Table 7.1: Summary of Consultation Responses

Organisation	Consultation Response	How and where addressed
THC Roads Pre-Application Response 30/04/18	Cumulative impact with any other developments in progress or committed, including other renewable energy projects, should be considered in the TS.	SYSTRA is not aware of any other developments of a scale that would have a cumulative impact with the proposed development.
	Prior to preparation of the TS, the applicant shall undertake a detailed scoping exercise in consultation with the Council's Transport Planning team and, as necessary, Transport Scotland.	Further discussions with THC Roads and Transport Scotland as part of a detailed scoping exercise have been undertaken in the preparation of this chapter.
	An Operational Traffic Management Plan (OTMP) and Construction Traffic Management Plan (CTMP) are required with a framework plan submitted with the Transport Statement.	Through further scoping discussion it was agreed that only a CTMP will be required for the proposed development and a framework plan is included in Technical Appendix 7.1.

Organisation	Consultation Response	How and where addressed
Transport Scotland Pre-Application Response 30/04/18	Transport Scotland would seek a Transport Assessment which includes an indication of the proposed vehicle trip generation, distribution and assignment, as well as a threshold assessment of the adjacent A9 (T) trunk road junctions.	Through further discussions with Transport Scotland (and THC Roads) it has been agreed that a Traffic and Transport EIA Report Chapter is sufficient to support the proposed development instead of a Transport Assessment and that no junction modelling is required.
THC Roads Response to Scoping Report (12/03/19) Further scoping discussions between SYSTRA and THC Roads (08/04/19)	Use of Caslecraig Quarry and the private road at Dunskeath will impact substantially on the core path and raises concerns regarding maintenance of the route shared use by walkers and heavy traffic. This impact requires assessment.	Use of Castlecraig Quarry and the private access road which is identified as a core path has been considered in this chapter.
	Establish the current conditions of the B9175 including road widths, location and dimensions of any footways and cycleways and details of adjacent communities.	These details are included in Section 7.5.
	The Transport Statement shall include parking strategy including justification for the proposed levels and dimensions plans showing the proposed provision. Cycle parking shall be considered.	The proposed development will require a minimal number of staff during both construction and operation. It is proposed that a works mini-bus operates during the construction stage. Appropriate levels of parking will be agreed with THC post planning consent. Appropriate provision of cycle parking will be agreed with THC post planning consent.
	Both the vehicular and active travel circulation routes for the development shall be indicated.	Vehicular routes for the development are indicated in this chapter. Given the nature and location of the proposed development, it is considered that no staff or visitors will travel by active travel modes.
	Two-week traffic surveys will be required.	Further scoping discussions between SYSTRA and THC Roads were undertaken on 08/04/19 whereby the date and duration of the traffic surveys were agreed. More details are included in section 7.4.2 of this chapter.
	Accident data for the previous 5 years should be obtained from THC's Road Safety Officer.	Accident data (including full accident report for fatal incidents) has been obtained from the '*Crashmap'* website which reflects official Department for Transport data submitted by Police Scotland.
	An Operational Traffic Management Plan (OTMP) and Construction Traffic Management Plan (CTMP) are required with a framework plan submitted with the Transport Statement.	Through further scoping discussion it was agreed that only a CTMP will be required for the proposed development and a framework plan is included in Technical Appendix 7.1.
	A threshold value of 10% will be assumed as requiring more detailed investigations.	The assessment has been undertaken in accordance with this approach.

Organisation	Consultation Response	How and where addressed
Transport Scotland (Comments over and above those raised by THC Roads' Scoping Response)	All HGVs transporting construction material to and from the site should be sheeted and require passing through a wheel washing facility prior to exiting the proposed development site.	This can be implemented. Further details are in the framework CTMP included in Technical Appendix 7.1.
	A worst-case scenario of trunk road network impacts in relation to the quantity of re-usable dredge material and the source of any additional material.	A worst-case approach to the assessment has been undertaken.
	Baseline traffic count data should be requested from Transport Scotland to inform this assessment.	Baseline traffic data for the A9 has been obtained from Transport Scotland traffic counters, as requested.
	Details of the number and type of vehicle movements, proposed construction programme and proposed site operating hours should be included.	These details have been provided in this chapter, where known.

7.3 Policy, Legislation and Guidance

This chapter has been prepared taking cognisance of The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations). The following data sources and guidelines have been used to inform this assessment:

- Department for Transport (DfT) Design Manual for Roads and Bridges (DMRB) Vol 15, "The NESA Manual", 2013;
- Institute of Environmental Management and Assessment (IEMA) "Guidelines for the Environmental Assessment of Road Traffic", 1993;
- The Scottish Government "Scottish Planning Policy" (SPP), 2014;
- The Highland Council "Highland-wide Local Development Plan" (HwLDP), Adopted 2012;
- The Highland Council "Guidance on the Preparation of Transport Assessments", November 2014; and
- Transport Scotland – "Transport Assessment Guidance" (TAG), 2012;

7.4 Methodology

The methodology used in this assessment adheres to that set out in the IEMA Guidelines, but in addition, has been ensured to meet the requirements stipulated by THC's guidelines for preparing Transport Assessments in accordance with THC's scoping response.

The IEMA guidelines suggest that to determine the scale and extent of the assessment and the level of effect the development will have on the surrounding road network, the following two 'rules' should be followed:

- Rule 1 - Include road links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%); and
- Rule 2 - Include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

Paragraph 2.5 of the IEMA Guidelines identifies groups, locations and special interests which may be sensitive to changes in traffic conditions as follows:

- People at home;
- People in work places;
- Sensitive groups including children, elderly and disabled;
- Sensitive locations, e.g. hospitals, churches, schools, historic buildings;
- People walking or cycling;
- Open spaces, recreational sites, shopping areas; and
- Sites of ecological / nature conservation value tourist attractions.

The significance of each impact is considered against the criteria within the guidelines, where possible however, the guidelines state that:

> "For many effects there are no simple rules or formulae which define the thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact as well as the assessment of the damage to various natural resources."

Rules 1 and 2 are used to determine whether a full assessment of effects on routes within the study area is required as a result of intensification of road traffic. In accordance with THC's scoping response, this assessment adopts the thresholds stated under 'Rule 2' whereby a 10% change in traffic flows will require further consideration at each of the road links.

The significance falls into two categories; significant and not significant. The latter corresponds to significant effects in accordance with the EIA Regulations.

7.4.1 Study Area

The study area for the access, traffic and transport assessment is effectively the public road network in the vicinity of the proposed development and the route to the site from the wider strategic road network, therefore comprises the A9 and the B9175. The unclassified road linking the B9175 and Castlecraig Quarry is also considered within this assessment, albeit, traffic count surveys have not been undertaken along this route. The extent of the study area is indicated by Figure 7.1 within Volume 2 of this EIA Report.

7.4.2 Desk Based Research and Data Sources

The traffic and transport study area characteristics have been determined by a desk-based assessment, a site visit (January 2019), and annual average weekly traffic (AAWT) flow data sourced from two commissioned automatic traffic count (ATC) surveys and provided by Transport Scotland for the trunk road network (A9). Described below is the source of the traffic count information at each of the road links identified in the study area. Figure 7.2 indicates the location of the traffic counters:

- 16-day (24-hour) ATC survey along the B9175 in the vicinity of the Nigg Energy Park access point (surveyed 22/04/2019 – 06/04/2019);
- 16-day (24-hour) ATC survey along the B9175 within Arabella; and
- AAWT flows for the A9 in the vicinity of Kildary obtained from Transport Scotland (survey period 28/02/2019 – 19/04/2019).

7.4.2.1 Sensitive Receptors

Based on the descriptions in Section 9.3 of the IEMA guidelines, the village of Arabella is considered to be a sensitive receptor and would be subject to Rule 2 (10% change in traffic flows) whilst the other receptors within the study area would typically be subject to Rule 1 (30% change in traffic flows). However, in accordance with THC's guidelines and scoping response, all receptors within the study area will be subject to Rule 2. This presents a robust assessment of traffic impact across the study area.

7.4.3 Assessing Significance

The following paragraphs set out the methodology used to assess the significance of effects at locations along the routes within the study area where total traffic levels or the level of HGV traffic exceeds the Screening thresholds set out by IEMA Rules 1 or 2 (depending on the sensitivity of the receptor) described in Section 9.4 above.

7.4.4 Sensitivity

The sensitivity to change in traffic levels of any given road segment or junction is generally assessed by considering the residual capacity of the network under existing conditions. Where there is a high degree of residual capacity, the network may readily accept and absorb an increase in traffic and therefore the sensitivity may be said to be low. Conversely, where the existing traffic levels are high compared to the road capacity, there is little spare capacity and the sensitivity to any change in traffic levels would be considered high.

The criteria that has been used to make judgements on the importance / sensitivity of the receptor(s) is presented in Table 7.2.

Table 7.2: Receptor Sensitivity

Receptor Sensitivity / Importance	Description
High	Receptors of greatest sensitivity to traffic flow: schools, colleges, playgrounds, accident blackspots, retirement homes, urban/residential roads without footways that are used by pedestrians. (Paragraph 2.5 IEMA Guidelines, 1993)
Medium	Traffic flow sensitive receptors including: congested junctions, doctors' surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, un-segregated cycleways, community centres, parks, recreation facilities.
Low	Receptors with some sensitivity to traffic flow: places of worship, public open space, nature conservation areas, listed buildings, tourist attractions and residential areas with adequate footway provision.
Negligible	Receptors with low sensitivity to traffic flows and those sufficiently distant from affected roads and junctions.

7.4.5 Magnitude

The magnitude of traffic impacts is a function of the existing traffic volumes, the percentage increase and change due to a development, the changes in type of traffic, and the temporal distribution of traffic (day of the week, time of day). The determination of magnitude has been undertaken by reviewing the proposed development, establishing parameters of the road that may be affected and quantifying these effects utilising IEMA Guidelines and professional judgement.

The criteria that has been used to make judgement on the magnitude of the effect on the receptor(s) is presented in Table 7.3.

Table 7.3: Magnitude of Effect

Magnitude	Description
Substantial	The proposals could result in a significant change in terms of length and / or duration to the present traffic routes or schedules or activities, which may result in hardship. Generally regarded as a change in traffic flow over 90% (or over 70% in sensitive areas).
Moderate	The proposals could result in changes to the existing traffic routes or activities such that some delays or rescheduling could be required, which cause inconvenience. Generally regarded as a change in traffic flow between 60% and 90% any given road link (or between 40% and 70% in sensitive areas).
Slight	The proposals could occasionally cause a minor modification to routes, or a very slight delay in present schedules, or on activities in the short term. Generally regarded as a change in traffic flow between 30% and 60% any given road link (or between 10 – 40% in sensitive areas).
Negligible	No effect on movement of road traffic above normal level. Generally regarded as a change in traffic flow below 30% any given road link (or below 10% in sensitive areas).

7.4.6 Significance

As a guide to inform the assessment, but not as a substitute for professional judgement, criteria for determining the significance of traffic related effects are set out in the matrix in Table 7.4. This is based on combining the magnitude of the effect with the receptor sensitivity.

Table 7.4: Significance Criteria

Magnitude of Effect	Sensitivity of Receptor			
	High	**Medium**	**Low**	**Negligible**
Substantial	Major	Major to Moderate	Moderate	Minor
Moderate	Major to Moderate	Moderate	Minor	Minor
Slight	Moderate	Minor	Minor	Negligible
Negligible	Minor	Minor	Negligible	None

The significance falls into two categories; Significant and Not Significant. The latter corresponds to significant effects in accordance with the EIA Regulations.

Significance is categorised as major, moderate, minor, negligible or none. Effects judged to be of major or moderate significance are considered to be Significant in accordance with the EIA Regulations. Effects judged to be of minor, negligible or none significance are considered Not Significant.

7.5 Baseline

The baseline traffic and transport characteristics of the study area have been determined by a comprehensive desk-based assessment, a site visit undertaken by SYSTRA in January 2019 and traffic count information obtained from two commissioned ATCs and Transport Scotland AAWT data. The following paragraphs detail the baseline conditions.

7.5.1 A9 Trunk Road

The A9 in the vicinity of the B9175 is a good standard derestricted single carriageway (speed limit 60mph). The A9 provides a link south to Inverness, the nearest city to the proposed development, and continues north from the four-arm roundabout with the B9175 (Nigg Roundabout) to Thurso and Scrabster.

It is anticipated that staff vehicle trips and a small number of construction HGV traffic will utilise the A9 to reach the B9175 to route towards the proposed development. There is a ready-mix concrete plant in the town of Alness, approximately 16km south-west along the A9 from the roundabout with the B9175, and it is proposed that concrete for the proposed development is sourced from this plant.

7.5.2 B9175

The B9175 is a single carriageway road that is rural in nature and generally of a good standard throughout. The B9175 is derestricted (speed limit 60mph) except for a small section of the road through the villages of Nigg Station and Arabella, whereby the speed limit is reduced to 40mph.

There is street lighting within the villages and there are intermittent sections of footway along the length of the B9175. The characteristics of the footways is variable in terms of standard and width with sections of uneven surfacing and overgrown verges. In the vicninty of Nigg Energy Park, the B9175 provides direct access to approximately four isolated properties which constitute the hamlet of Balnapaling.

Given that the proposed development will take access from the B9175, all staff vehicle trips and construction HGV traffic will route along the B9175 at some point, albeit, the length of the route will vary depending on the origin of staff / source of the materials. Castlecraig Quarry is located approximately 1.8km to the east of the proposed development (direct distance) and it is proposed that the stone requirement is sourced from this quarry. HGVs routing between the proposed development and Castlecraig Quarry will only be required to travel a short distance along the B9175 and public road network (approximately 350m).

7.5.3 Site Access

The main entrance and vehicular access point to the current Nigg Energy Park facility is gained from the B9175 approximately 1km north from the Nigg to Cromarty Ferry pier (hereafter referred to as the “Nigg Ferry” pier). Once operational, access to the proposed development will be from the same main entrance and vehicles will route through the existing Nigg Energy Park facility to reach the proposed development.

There is an existing junction further south of Nigg Energy Park’s main entrance, approximately 500m to the north of the Nigg Ferry pier, which currently provides direct access into the proposed development site. This access will be used by general construction traffic to gain access to the site during the construction stage. This access would then operate as an emergency access only once the proposed development is operational.

7.5.4 Castlecraig Quarry Road (Unclassified)

Castlecraig Quarry is accessible from the B9175 via a junction immediately to the east of the proposed development. Castlecraig Quarry was reopened to supply crushed rock products for the redevelopment of the former Nigg Yard into the current Nigg Energy Park facility. The quarry now supplies a wide range of quarry products into the local market.

The total length of road between the B9175 and the quarry entrance is approximately 1.6km in length, however, only approximately 500m of this route is within the public road network and the remainder is a private access

road. The road is single track with passing places, lined by grass verges on either side. The road is subject to a 20mph speed limit.

It is noted that the route between the B9175 and Castlecraig Quarry forms part of THC's core path[73] network and is identified as core path RC35.02. Given that this road is largely a private access road to Castlecraig Quarry and Castlecraig Farm only, it is predicted that the AAWT flow is very low, albeit, there will be a high proportion of HGV levels due to the quarry activities.

7.5.5 Nigg – Cromarty Ferry Pier

The Nigg Ferry operates between May / June and September from the pier which is located immediately to the east of the proposed development site to Cromarty on the southern side of the Cromarty Firth. The pier is accessed via the B9175, approximately 1km along the road from the Nigg Energy Park access and 500m from the construction site access point. Ferry services run every 30 minutes between 08:00 until 18:15.

The nearest bus stop to the site is located at the Nigg Ferry pier, approximately 450m south-east of the construction site access point. Service 29 operates from this stop and is a circular route between Tain and the Nigg Ferry slipway, stopping in Nigg village and Arabella. There are 3 services operating per day Monday – Friday and no services on Saturdays and Sundays.

7.5.6 Baseline Traffic Flows

Table 7.5 indicates the two-way 24-hr AAWT flows along the road links within the study area and the percentage of traffic which is classified as HGVs for the baseline year (2019). The location of these traffic count points are indicated by Figure 7.2.

Table 7.5: Study Area Baseline Traffic Flows

Count Point	AAWT	HGVs	% HGV
1. B9175 at Nigg Energy Park	1,024	135	13%
2. B9175 at Arabella	2,486	328	13%
3. A9	9,714	1,817	19%

7.5.7 Road Safety

The *Crashmap*[74] website has been utilised to determine the number of accidents that have occurred in the previous five years (2014-2018) within the study area. *Crashmap* uses official data published by the DfT which is based on records submitted by police forces. The collisions are categorised as 'slight', 'serious' and 'fatal'. Definitions from *Crashmap* are as follows:

- Slight Injury - An injury of a minor character such as a sprain (including neck whiplash injury), bruise or cut which are not judged to be severe, or slight shock requiring roadside attention. This definition includes injuries not requiring medical treatment.
- Serious Injury - An injury for which a person is detained in hospital as an "in patient", or any of the following injuries whether or not they are detained in hospital: fractures, concussion, internal injuries, crushing, burns (excluding friction burns), severe cuts, severe general shock requiring medical treatment and injuries causing death 30 or more days after the accident. An injured casualty is recorded as

[73] Under the Land Reform (Scotland) Act 2003, every local authority in Scotland is required to have a system of paths that is sufficient for the purpose of giving the public reasonable access throughout their area by all non-motorised means.
[74] http://www.crashmap.co.uk (accessed May 2019).

seriously or slightly injured by the police on the basis of information available within a short time of the accident. This generally will not reflect the results of a medical examination but may be influenced according to whether the casualty is hospitalised or not. Hospitalisation procedures will vary regionally.

- Fatal Injury - A collision which caused fatality.

The results of this process are indicated by Table 7.6 with additional commentary provided on serious and fatal accidents where applicable.

Table 7.6: Accident Statistics

Count Point	Slight	Serious	Fatal	Comment
1. B9175 at Nigg Energy Park	-	-	-	-
2. B9175 at Arabella	1	-	2	A fatal accident involving 2 vehicles and 1 casualty occurred in 2014 on a left-hand bend. The accident report finds this accident to be caused by human error and not the characteristics of the road. Another fatal accident occurred in 2015 approx. 500m north of the junction to Ankerville involving 2 vehicles and 1 casualty. This was caused by an HGV reversing into an access during hours of darkness. This HGV was not associated with Nigg Energy Park.
3. A9	5	-	-	-

Table 7.6 indicates that between 2014 and 2018 there were six slight and two fatal accidents within the study area. The fatal accidents were not caused by the condition of the road or in association with Nigg Energy Park and were caused by human error. The accidents statistics also indicate that there is no identifiable accident 'hot-spots' within the study area.

7.6 Impact Assessment

7.6.1 Prediction and Evaluation of Effects

The following paragraphs provide a description of each potential environmental effect which has been assessed where appropriate within this chapter.

7.6.1.1 Severance

The IEMA Guidelines advise that *"severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery".*

The potential for traffic associated with the proposed development to cause severance is assessed on a case by case basis using professional judgement where non-negligible traffic increases are predicted on roads through residential settlements.

Increased severance can result in the isolation of areas of a settlement or individual properties. Severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. Severance effects could equally be applied to residents, motorists or pedestrians.

7.6.1.2 Driver Delay

Driver delay may be experienced when construction traffic is accessing the site. The IEMA Guidelines advise *"delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system".*

Traffic delay to non-development traffic may occur at several points on the network surrounding the development site including:

- At the development entrances where there will be additional turning movements;
- At intersections along the local road network which might be affected by increased traffic; and
- At side roads where the ability to find gaps in traffic may be reduced, thereby lengthening delays.

7.6.1.3 Pedestrian Delay and Amenity

Traffic volumes, traffic composition, traffic speed, the existence of pedestrian footways and the existence of pedestrian crossings all contribute to the level of general pleasantness, fear, intimidation and delay experienced by pedestrians and other vulnerable road users.

7.6.1.4 Accidents and Safety

The likelihood of an accident occurring is commonly expressed in accidents per million vehicle-km. Accidents that are appraised in relation to transport are predominantly those in which personal injury is sustained by those involved (personal injury accidents (PIAs)). An approximate calculation will be undertaken to quantify the level of accident risk that could be expected due to an increase in traffic associated with the proposed development during the construction and operational stages respectively.

7.6.1.5 Dust and Dirt

IEMA Guidelines acknowledge that it is not practical to quantify the level of dust and dirt that can be anticipated from development traffic. Therefore, a quantitative description of dust and dirt effects from construction traffic is not provided here.

It is acknowledged that HGVs would have the potential to collect debris on their tyres when accessing the proposed development during the construction stage. This could be transferred to the road surface when vehicles travel away from the development and can be deposited on the road in the form of either dust or mud depending on weather conditions.

7.6.2 Construction Stage Impact Assessment

7.6.2.1 Construction Traffic Generation

It is anticipated that construction of the proposed development would take approximately 10 months (approximately 253 working days, covering the period from initial contractor mobilisation to the date of handover).

In general, working hours on the landward element of the proposed development are expected to be between 07:00 and 19:00 on weekdays and 07:00 to 13:00 on Saturdays during the construction stage. Deliveries during the working day are likely to be staggered across the day. Staff are likely to arrive and depart before the network peak AM and PM periods (which are generally 08:00 – 09:00 and 17:00 – 18:00 respectively).

Engineering consultancy, Arch Henderson, have provided information in relation to the construction activities, number of associated HGV loads, and number of staff required during the construction stage. It is understood that a significant proportion of the construction materials will arrive to the site by sea and, therefore, will not

result in any HGV movements. Further details of the construction activities and methods are included in Chapter 2: Proposed Development.

Considering the materials that require to be imported to the site via the public road network, the following number of HGV loads and vehicle trips are estimated:

- Imported crushed rock from Castlecraig Quarry – 912 loads (1,824 two-way vehicle movements);
- Imported concrete from ready-mix plant in Alness – 155 loads (310 two-way vehicle movements); and
- Construction staff – 20 at most, likely to arrive in two works mini-buses.

7.6.2.2 Construction Traffic Distribution and Assignment

In order to assess the impact of construction traffic on the receptors within the identified study area, it is necessary to determine the distribution of generated trips across the local road network.

In relation to staff, it is expected that a works minibus is put in place, however, this assessment assumes a worst-case scenario that all staff travel by single occupancy car, equating to 40 two-way vehicle trips daily. It is assumed that all staff would approach the site via the A9 and the B9175, albeit, some staff may come from the nearby villages to the north of the proposed development and not be required to travel along the A9.

As discussed, the construction materials transported to the site via the public road network (as opposed to by sea) will originate from either Castlecraig Quarry or the ready-mix plant in Alness. Materials from Castlecraig Quarry will only be required to travel along a short section of the public road network between the quarry and the construction access point (approximately 350m). Therefore, only staff vehicle trips (maximum of 40 two-way vehicle trips) and HGVs importing concrete from Alness (310 two-way HGV movements throughout the construction stage) will travel through the largest part of the study area along the A9 and B9715, including through the sensitive receptor of Arabella.

It is likely that concrete importation to the proposed development from the plant in Alness will be concentrated over one month of the construction stage as it is typical for construction contracts to supply products on a campaign basis. It is understood that stone importation to the proposed development would take place over a period of 8 – 12 weeks during the construction stage.

7.6.2.3 Construction Traffic Effects

In order to consider a worst-case and robust scenario, the assessment considers the impact of all staff travelling by single-occupancy car (40 two-way vehicle movements) and concrete importation concentrated over a two week period of the 12 month construction stage to account for supply of material on a campaign basis.

Table 7.7 details the worst-case daily percentage increase in total traffic and HGV levels at the traffic counter locations within the study area during construction of the proposed development, based upon the distribution and assignment assumptions discussed in Section 7.6.2.2 above. The traffic impact along the route between Castlecraig Quarry and the Nigg Energy Park access point is considered separately below the table.

Table 7.7: Construction Traffic Impact on Routes within the Study Area on Worst-Case Day

	1. B9175 at Nigg Energy Park	**2. B9175 at Arabella**	**3. A9**
Existing AAWT	1,024	2,486	9,714
Existing HGV count	135	328	1,817
Worst-cast daily construction total traffic flows (staff plus HGVs)	70	70	70
Worst-case daily construction HGV traffic	30	30	30

	1. B9175 at Nigg Energy Park	2. B9175 at Arabella	3. A9
Existing AAWT + worst-case daily construction total traffic	1,094	2,556	9,784
Existing HGV count + worst-case HGV traffic	165	385	1,847
Percentage increase in total traffic due to the Proposed development	7%	3%	1%
Percentage increase in HGVs due to the proposed development	22%	9%	2%

Note: all traffic flows reflect two-way movements

Table 7.8 indicates that proposed development traffic is anticipated to result in a negligible increase (<10%) in both total traffic and HGV levels along the B9175 at Arabella and along the A9 during the busiest week(s) of the construction stage. It is estimated that during this time there would also be a negligible increase in total traffic levels along the B9175 at the Nigg Energy Park, however, there would be an increase in HGV traffic levels of 22%, therefore exceeding the 10% threshold in accordance with IEMA and THC guidelines. Further assessment of the potential environmental effects associated with HGV traffic routing along the B9175 at the Nigg Energy Park is undertaken in the following section.

In addition to the vehicle movements included in Table 7.8, there will be 1,824 two-way HGV movements between Castlecraig Quarry and the access point to the Nigg Energy Park which will provide access into the proposed development. Assuming that stone is transported to the proposed development over the course of 8 weeks, this would equate to approximately 946 two-way HGV trips per day (assuming 5 delivery days per week). The potential environmental effects of these movements are considered in Section 7.6.3.6 below.

It is important to note that construction traffic effects will be temporary in nature and this assessment considers the impact of the busiest period during the construction stage in terms of vehicle trip generation. The largest proportion of materials required for construction of the proposed development will be imported to the site by sea, as such, the average day during the construction stage will see significantly fewer traffic movements and the level which has been assessed in within this chapter.

7.6.3 Evaluation of Construction Traffic Effects

The environmental effects associated with increased HGV traffic as identified in the IEMA Guidelines and by THC's Transport Assessment Guidelines are addressed in the following paragraphs for the B9175 adjacent to the Nigg Energy Park and for the section of public road between Castlecraig Quarry and the Nigg Energy Park. A description of each environmental effect is provided in Section 7.6.

7.6.3.1 Severance

Along the B9175 at Nigg Energy Park the increase in HGV levels is 22% and considered to be of 'slight' magnitude in reference to the indicators in Table 7.3 (10% - 40% threshold for a sensitive receptor). The baseline conditions of the road network are discussed under Section 7.5 which notes that the area surrounding the Nigg Energy Park is rural in nature and the B9175 provides direct access to approximately four isolated properties. Each of these properties is situated on the eastern side of the carriageway and the existing footways are on the eastern side only (intermittently). There will be limited pedestrian activity along the section of the B9175 in the vicninty of Nigg Energy Park as there are no local facilities or amenities within walking distance for these residents to access and pedestrians have no need to cross the B9175 with the lack of footway provision. As a result, the sensitivity of the receptor to an increase severance effect is considered to be 'negligible' in accordance with the descriptors in Table 7.2. Combining a slight magnitude of effect with a negligible receptor sensitivity equates to a severance effect which is classed as 'negligible' and Not Significant in accordance with the matrix in Table 7.4. No mitigation is required for Not Significant effects.

7.6.3.2 Driver Delay

The magnitude of a 22% increase in HGVs along the B9175 at the Nigg Energy Park is considered to be 'slight' in reference to the indicators in Table 7.3. The worst-case assessment predicts that 30 two-way HGVs would be travelling daily between the Nigg Energy Park access and the concrete plant in Alness (concentrated over a two week period). Weekday working hours will be 07:00 – 19:00, therefore, if concrete was transported during half of the working day (six hours), this would equate to 5 HGV movements per hour and approximately one HGV movements per 15-minute period only. This level of vehicle trip generation is negligible and will not result in capacity issues or delay to the network. The sensitivity of the receptor to an increased driver delay effect is therefore considered to be negligible. Combining a slight magnitude of effect with a negligible receptor sensitivity equates to a severance effect which is classed as 'negligible' and Not Significant in accordance with Table 7.4. No mitigation is required for Not Significant effects.

7.6.3.3 Pedestrian Delay and Amenity

The magnitude of a 22% increase in HGVs along the B9175 at the Nigg Energy Park is 'slight' in reference to the indicators in Table 7.3. As discussed under the severance effect, there will be limited pedestrian activity along the section of the B9175 in the vicninty of Nigg Energy Park as there are no local facilities or amenities within walking distance for these residents to access. As a result, the sensitivity of the receptor to an increase delay and reduce pedestrian amenity effect is considered to be 'negligible' in accordance with the descriptors in Table 7.2. Combining a slight magnitude of effect with a negligible receptor sensitivity equates to a severance effect which is classed as 'negligible' and Not Significant in accordance with Table 7.4. No mitigation is required for Not Significant effects.

It is noted that the B9175 forms part of National Cycle Network Route (NCR) 1 which passes Nigg Energy Park. An increase in traffic along the B9175 could therefore potentially increase delay and reduce amenity for cyclists. As outlined in section 7.6.7.2 above, the worst-case assessment predicts that 30 two-way HGVs would be travelling daily between the Nigg Energy Park access and the concrete plant in Alness (concentrated over a two week period). If concrete was transported during half of the working day (six hours), this would equate to 5 HGV movements per hour and approximately one HGV movements per 15-minute period only. NRC 1 routes along the B9175 for a short section between the Nigg Ferry pier and the junction to Nigg village and Pitcalnie where the route continues north-east along this single-track road. The approximate length of the journey between the Nigg Energy Park access and the junction where cyclists turn off the B9175 is 2 minutes cycling. As a result, there will be very limited interaction (if any) between any cyclists and the construction traffic. The magnitude of the impact is considered to be 'slight' and the sensitivity of the receptor is considered to be 'negligible'. The effect of delay and reduced amenity for cyclists is therefore classed as 'negligible and Not Significant in accordance with the EIA Regulations.

7.6.3.4 Accidents and Safety

An approximate calculation has been undertaken to quantify the level of accident risk that could be expected due to an increase in traffic along the B9175 during the construction stage of the proposed development. The B9175 can be classified under the DMRB as 'rural – typical single 6m' which has a corresponding accident rate of 0.381 accidents PIA/MVkm[75].

In six weeks of the construction stage (two weeks concrete importation plus four weeks stone importation) the maximum total of two-way vehicle trips could be generated:

- 1,200 two-way staff movements (40 per day, 5 days per week);
- 1,824 two-way HGVs transporting concrete; and
- 310 two-way HGVs transporting stone.

[75] Personal injury accidents per million vehicle-km

This equates to 3,334 two-way vehicle movements in total. For the purposes of this assessment it is assumed that the total length of road within the study area is 15km, therefore, a total distance travelled of 50,010km is obtained. Based on the accident rate (0.381 PIA/MVkm) and the number of kilometres travelled, it is estimated that 0.019 accidents would occur during the busiest six weeks of the construction stage in terms of vehicle movements. The magnitude of this change is therefore considered to be 'negligible', however, receptor sensitivity to accidents and safety is always considered as 'high'. When combined, the effect can be classified as 'minor' and Not Significant**.**

7.6.3.5 Dust and Dirt

Based on a 22% increase in HGV levels along the B9175 at Nigg Energy Park, the magnitude of the change is considered as 'slight', however, standard good practice working methods will be put in place on-site to minimise dust and dirt from vehicles (e.g. use of wheel washes and covering any loads likely to generate dust) being transferred onto the public road network. As a result, the magnitude of effect will be 'negligible' rather than 'slight'. The sensitivity of the receptor to an increased dust and dirt effect is considered to be 'low' as the majority of other road traffic utilising this section of the B9175 will be associated with existing operations at Nigg Energy Park, albeit, from June – September there will be a slight increase in traffic levels associated with the operation of the Nigg Ferry. The overall significance of the environmental effect of dust and dirt along the B9175 (and all road links within the study area) is classed as "negligible" and therefore Not Significant as per the Significance Criteria matrix in Table 7.4.

7.6.3.6 Construction Traffic Effects Along the Castlecraig Quarry Route

The single-track road which links the B9175 and Castlecraig Quarry is part of THC's core paths plan and it will be important that access to this core path by pedestrians is maintained during the period of stone importation to the proposed development. It is also acknowledged that the hamlet of Balnapaling is situated adjacent to the Nigg Ferry pier and that from May / June – September there will be additional pedestrians in this general vicninty due to the operation of the ferry.

Current baseline HGV levels suggest that there are approximately 135 HGV movements occurring along the B9715 in the vicninty of the Nigg Energy Park. It is unknown what proportion of these trips are associated with the quarry activities or the Nigg facility, however, the expected level of trips generated by importing stone to the proposed development is not expected to exceed the current baseline levels.

As discussed, there could be up to 46 two-way HGV trips per day travelling between Castlecraig Quarry and the Nigg Energy Park access, assuming that stone is transported to the proposed development over the course of a month and there are five working days per week. Over the course of the working day (12 hours), this level traffic generation equates to approximately 4 movements per hour and 1 movement per 15 minutes only. It is considered that this level of HGV movements can be managed effectively to avoid a moderate or major magnitude of effect. It is noted that the route to and from Castlecraig Quarry will already be well-used by HGVs when the quarry is fulfilling contracts, therefore, construction of the proposed development will not create more disruption than is typical for this route.

In reference to the application to re-open the quarry in 2012 (ref: 12/01584/FUL), THC's Access Officer commented that the interaction between the haulage of stone and pedestrians along the core path can be effectively managed *"by means of safe driving procedures and cautionary signage for both drivers and public".* In addition, in reference to the application in 2014 to extend the quarry (ref: (14/02221/FUL), THC's Access Officer responded with no further comments. This suggests that since the re-opening of the quarry, no significant issues have been experienced between the quarry traffic, core path and the Nigg Ferry users.

Notwithstanding this, the proposed development intends to manage the impact of construction traffic on the residents of Balnapaling, users of the Nigg Ferry and pedestrians utilising the core path network through the implementation of the Construction Traffic Management Plan (CTMP). In line with THC Access Officer's comments on the re-opening of the quarry, measures such as; implementing additional warning signs for the

duration of the stone importation and ensuring enforcement of the 20mph speed limit can be implemented along the Castlecraig Quarry single-track route to manage the conflict between HGVs and pedestrians. It is also proposed that, during the months in which the Nigg Ferry operates, HGVs transporting stone from the quarry are to hold station when ferry passengers are disembarking and until they have vacated the immediate area. Further details of the CTMP are included in Section 7.8 and Technical Appendix 7.1.

7.6.4 Operational Stage Impact Assessment

It is understood from Arch Henderson that, during the operational stage, all large components will be delivered to and exported from the proposed development by sea. Operational traffic associated with the proposed development will therefore comprise staff travelling to and from the site, predominantly in private cars. The Applicant has informed that during the operational stage, the level of staff vehicle trips generated would be negligible, particularly when compared to the existing fluctuation in staff vehicle movements that occur at the Nigg Energy Park facility according to contract work underway at any one point in time.

Notwithstanding this, the construction stage impact assessment in Section 7.6.6, specifically Table 7.8, demonstrates that if an additional 40 two-way staff vehicle trips were also to be generated by the proposed development during the operational stage, there would be a negligible (<10%) increase in total traffic levels across each of the road links within the study area. As a result, any environmental effects as a result of operational traffic can be concluded as negligible and Not Significant.

7.7 Mitigation and Monitoring

Although not required through the EIA Regulations as no significant environmental effects are predicted as a result of the proposed development, a CTMP is proposed as a 'good practice' measure.

The CTMP will identify measures to reduce the number of construction vehicles required as well as considering the mitigation of vehicle impacts through construction programming, routing and identification of an individual with responsibilities for managing traffic and transport impacts and effects. The CTMP can include (but is not limited to) the following measures (with further details included within Technical Appendix 7.1):

- The main contractor should develop a logistics plan highlighting the access point for the site, loading bay, pedestrian / vehicular segregation, welfare, storage, security and material handling that will be enforced following full site establishment;
- All contractors will be provided with a site induction pack containing information on delivery routes and any restrictions on routes;
- Temporary construction site signage would be erected along the identified construction traffic routes to warn people of construction activities and associated construction vehicles. During the site visit it was noted that warning signs already exist in relation to quarry traffic, additional signage can be erected for the duration of the month(s) of stone importation;
- A construction traffic speed limit of 30mph through Arabella and 20mph along the access road to Castlecraig Quarry (it is noted that this is an existing speed limit) will be implemented through notifying all contractors via the site induction pack and temporary signage erected along the route;
- The construction material 'lay down' areas will allow for a staggered delivery schedule throughout the day, avoiding peak and unsociable hours;
- An integral part of the progress meetings held with all trade contractors is the delivery schedule pro-forma.
- Under no circumstances will HGVs be allowed to lay-up in surrounding roads. All personnel in the team will be in contact with each other and site management who in turn will have mobile and telephone contact with the subcontractors;

- To maintain roads in a clean and safe condition, wheel washing facilities (or similar device) will be provided at the site and contents of vehicle loads will be sheeted; and
- A works mini-bus will be put in place for staff to ensure that single-occupancy car trips to and from the proposed development are minimised.

7.8 Residual Effects

All residual effects following the implementation of the CTMP (as detailed in Technical Appendix 7.1) are considered to be negligible and Not Significant.

7.9 Statement of Significance

A worst-case assessment of the proposed development's traffic impact on related effects: severance; driver delay; pedestrian delay and amenity; accidents and safety; and dust and dirt; concludes that, during the construction stage, all effects associated with an increase in HGV traffic levels are deemed to be negligible which is classed as Not Significant.

Once the proposed development is operational it is anticipated that only staff vehicle movements will be generated. It is intended that all large components will be transported to and from the development by sea and will not generate additional HGV movements within the study area. Staff numbers associated with the operational stage will not exceed that assessed under the construction stage (40 two-way vehicle movements per day). Therefore, it can be concluded that any effects associated with a small number of additional car trips will be negligible and classed as Not Significant.

8 CHAPTER 8: OTHER ISSUES

8.1 Introduction

This chapter provides a summary and assessment where applicable of additional potential environmental effects or features which are relevant to the proposed development but have not been scoped into the full EIA given significant effects were not deemed to be likely. These include effects or information associated with terrestrial ecology, ornithology, landscape and visual, cultural heritage, air quality, navigation and vessel movement, population and human health, climate change and natural disasters. It is not the purpose of this chapter to draw conclusions on the level of significance based upon detailed methodology (as per the chapters outlined throughout this EIAR), but instead offer a synopsis of relevant information, an approach which has been agreed with THC and MSLOT as per Technical Appendix 3.1 within Volume 3 of this EIAR, alongside a relevant level of assessment specific to each feature of this chapter.

8.2 Terrestrial Ecology including bats

8.2.1 Introduction

A Phase 1 Habitat and Protected Species survey was carried out in December 2018 and reported in February 2019 (the full report is provided in Technical Appendix 8.1, within Volume 3 of the EIAR). The objective of these surveys was to:

- Identify and map the broad habitats present on the site;
- Search for field evidence of a range of protected or notable faunal species which may frequent the
- survey area;
- Identify suitable habitat for protected or notable faunal species in the survey area; and
- Make recommendations for any further survey and/or species licensing requirements.

From an initial desk based study and results from data searches, the following relevant species groups were focussed upon for the site:

- Plants;
- Bats;
- Otter;
- Badger;
- West European hedgehog;
- Brown hare; and
- Birds.

The key findings of the surveys can be summarised as follows for the survey area:

- No sensitive habitats were identified;
- No evidence of otter or badger was identified;
- Suitable nesting habitat for birds was identified on the site; and
- Some of the buildings on site offer potential for use by bats and further surveys were proposed.

Further surveys were carried out for bats (as described in Technical Appendix 8.2, in Volume 3 of the EIAR).

A Preliminary Roost Assessment (PRA) conducted in January 2019 assessed the buildings as having low suitability for hibernating bats due to there being a small number of features which could provide appropriate conditions for hibernating bats, such as gaps in door lintels. One building was assessed as having moderate suitability (Building 1) for summer bat roosts. Four buildings were assessed as having low suitability for summer bat roosts due to reduced number of potential features available for use. A small number of bat droppings were found within Building 1. DNA analysis revealed these as originating from a common pipistrelle bat. The location and spread of the droppings suggest these were from sheltered foraging rather than roosting bats. The habitat itself on site was, assessed as being of low suitability for commuting and foraging bats.

Winter hibernation surveys were also conducted for the five buildings in January and February 2019. No evidence of hibernating bats was identified. Activity surveys for bats were conducted in May 2019. One common pipistrelle roost was identified in a single building. Bat activity on site was concentrated around mature trees and scrub in the east of the site.

8.2.2 Potential Effects

The proposed development is not considered to result in any significant effects on habitats at the site. Pre-commencement checks would be required before work commences to ascertain the findings of the Protected Species Report. Pre-construction nesting bird surveys will be required if site clearance works are planned to start within the breeding bird season.

With regard to bats a derogation licence from Scottish Natural Heritage (SNH) will be required prior to the demolition of the building where the common pipistrelle bat was identified during the activity surveys.

To reduce risk of accidental injury or death to opportunistically roosting bats it is recommended that demolition occurs in the months of October, November or March to avoid the bat summer activity season and the sensitive hibernation period.

No replacement buildings are included within the proposed development design. It is therefore recommended that three woodcrete crevice style bat boxes are erected on a mature tree(s) or structure within 50m of the site to compensate.

Provided the above mitigation is implemented there are no predicted significant negative effects on terrestrial habitats or protected species.

8.3 Ornithology

8.3.1 Introduction

Bird interests at the site and its surrounds were considered as part of the terrestrial ecology surveys and assessments, potential effects on birds local to the site area from construction and operational activities, and also within the Habitats Regulations Assessment carried out for the development. The three relevant Technical Appendices (TA) are:

- TA 8.1 Phase 1 Habitat and Protected Species Surveys;
- TA 8.3 Ornithology Baseline Report; and
- TA 4.3 Habitats Regulations Assessment.

8.3.2 Potential Effects

For the new development area the site surveys noted common species of birds using the site and suitable nesting habitat. The Ornithology baseline report (Technical Appendix 8.3) documented the baseline understanding of bird interests around the site area and features of note such as the tern nesting sites to the west, and wader roosting areas to the east of the site.

To avoid significant effects on birds during construction the following practical mitigation was proposed:

- Timing of works; Vegetation clearance and demolition of buildings should be undertaken outwith the nesting bird season (March – August) to avoid impacts on breeding birds;
- If vegetation clearance or demolitions are undertaken within the breeding season, a suitably qualified ecologist will be required to undertake nesting bird checks no later than 24 hours prior to works; and
- Bird dissuasion methods should be employed (which include regular inspections by an Ecological Clerk of Works (ECoW) and artificial deterrents) to discourage nesting birds on site during construction works. Methods to be employed will be detailed within Environmental Management Plans for the site to be compiled post-consent.

In the longer term it was also recommended as good practice to provide artificial nest boxes for both Common and Arctic Terns where they currently nest, over 500m from the development site. These would include raft nests which are preferred by Common Tern and nest boxes which are preferred by Arctic Tern.

There are two European protected areas relevant to ornithology close to the development site namely:

- Cromarty Firth SPA; and
- Moray Firth pSPA.

A Habitats Regulations Assessment was carried out (Technical Appendix 4.3) which considered the bird species associated with these protected sites. Assessments focused on Bar-tailed Godwit, Common Terns and Waterfowl assemblages. The assessments concluded that there were no direct impacts on the SPA or pSPA, and that potential indirect effects from pollution for example could be mitigated (as described in other technical assessments such as Chapter 5 the Water Environment, Soils and Coastal Processes).

On the basis of the above assessments, surveys and mitigation described in the EIAR no significant impacts on birds generally, or on the SPA or pSPA are predicted.

8.4 Landscape and Visual

8.4.1 Introduction

Although Landscape and Visual interests was scoped out of the Environmental Impact Assessment (EIA) Report as a full chapter a Landscape and Visual Appraisal (LVA) has been undertaken and is contained within Technical Appendix 8.5 (within Volume 3 of the EIAR). This approach broadly follows that of typical EIA development, and follows the methodology described in the Landscape Institute and the Institute of Environmental Management and Assessment (2013), The Guidelines for Landscape and Visual Impact Assessment, version 3, and other current best practice where relevant.

Landscape effects consider the fabric, character and quality of the site and surrounding landscape/seascape and are concerned with:

- landscape elements (e.g. hedgerows, trees and woodlands);
- landscape/seascape character (local and regional distinctiveness); and
- special interests (e.g. designations, conservation areas and cultural associations).

Visual effects are primarily concerned with the changes in people's views through intrusion or obstruction and whether important opportunities to enjoy views may be improved or reduced.

Landscape and coastal character areas were defined and assessed for the site a surrounding areas. Eight viewpoints were defined in consultation with the Highland Council and visual assessment made for each.

8.4.2 Potential Effects

For the construction phase of the project significant effects are only predicted from two viewpoint locations in relatively close proximity to the site. These are:

- Viewpoint 1: Nigg Ferry Terminal - moderate-major (adverse) effects on visitors and recreational users; and
- Viewpoint 2: Cromarty Beach - moderate-major (adverse) effects on visitors, recreational users and some nearby residents.

For the operational phase, from the eight locations assessed in the Viewpoint Assessment, significant effects are only predicted from one viewpoint located in close proximity to the site. This is:

- Viewpoint 1: Nigg Ferry Terminal - moderate-major (adverse) effects on visitors and recreational users.

As detailed in within the Landscape and Visual Appraisal (Technical Appendix 8.5), the Highland-wide Local Development Plan (2012) aims to ensure that special quality of the natural, built and cultural environment is protected and enhanced. In doing so, the landscape related policy framework sets out a clear suite of criteria in which to assess the landscape acceptability of the proposed development in the context of wider social and economic material considerations. In summary, the proposed development should:

- demonstrate sensitive siting and high quality design in keeping with local character and historic and natural environment;
- safeguard natural and cultural heritage assets within the coastal zone;
- demonstrated it will not have an unacceptable impact on the natural environment, amenity and heritage resource of Special Landscape Areas;
- not compromise the natural environment, amenity and heritage resource of Gardens and Designed Landscapes; and
- be designed to reflect the landscape characteristics and special qualities identified in the Landscape Character Assessment of the area in which they are proposed.

Although some significant visual effects are predicted during the construction and operational phases, these are relatively localised in extent and considering the scale of the proposed development, such significant effects would generally be expected for a project of this nature within the context of other adjacent development.

The Viewpoint Assessment also reflects the worst case scenario as the viewpoint locations were carefully selected to ensure these provide the most open views towards the site. In many instances, due to the screening effect of nearby intervening built development/and or rising ground and vegetation, the experience of any significant visual effect would often be restricted to a very small part of the locality.

In context of material considerations relevant to landscape, the findings of this LVA have demonstrated that the proposed development would not significantly compromise any important landscape and visual interests within the study area.

In relation to landscape receptors, the absence of any significant effects is primarily due to the proposed development being experienced in context of a heavily industrialised setting and as such, any changes would be entirely characteristic to the locality. In general, there would be very limited change on the wider landscape due to the site's physical containment on a low coastal shelf, and the screening and backdrop provided by the headland of North Sutor.

In relation to coastal character (or seascape), the large majority of terrestrial key characteristics would remain largely unaffected, as would most of the more natural marine character and qualities of the Cromarty Firth. Considering the presence of several existing rigs in the firth, the addition of a further jack-up rig for 10-18 weeks a year would also be characteristic to the seascape.

The very limited extent of any significant effects is largely in response to the proposed development reflecting the visual composition of other nearby and more prominent existing infrastructure and activity. In general, there would be little change to the focus of the view and the important views over the Cromarty Firth and out to sea would be largely unaffected from most locations.

8.5 Archaeology and Cultural Heritage

8.5.1 Introduction

Following submission of the Scoping Report and post-Scoping consultation, it was agreed that an Archaeology and Cultural Heritage Desk-Based Assessment (DBA) was required in order to identify potential effects arising from the proposed development. The full DBA is included in Technical Appendix 8.4, within Volume 3 of the EIAR.

Two study areas were used in assembling and presenting the data available:

- The Inner Study Area (ISA) – which corresponds to the Site boundary; and
- The Outer Study Area (OSA) – this extends 2km from the Site boundary.

Within the ISA two features were identified Dunskeath House and Balnapaling, cottage, outbuilding and walls with both considered to be of low importance. The OSA included the Scheduled Ancient Monument Dunskeath Castle, and two listed buildings Pitcalzean House and associated Coach House of medium and low importance respectively. The Cromarty Conservation Area and local Inventory Gardens and Designated Landscapes (including Cromarty House) were also considered as were undesignated assets recorded in the area.

8.5.2 Potential Effects

Both features within the Inner Study Area will be removed during development and could constitute a significant effect.

For Dunskeath Castle, the proposed development will be visible from the castle, on lower ground approximately 1km to the west. However, the development will be absorbed into a modern landscape comprising drilling platforms and marine traffic in the Firth, and houses and the existing fabrication yard on land. The views out over the Firth will remain substantively unaltered by the proposed development, and therefore no significant effects are anticipated.

No significant effects were predicted for any designated or undesignated heritage assets in the Outer Study area.

For the two features within the site boundary (Dunskeath House and Balnapaling, cottage, outbuilding and walls), mitigation (in the form of historic building recording and monitoring of construction groundworks) would ensure

that adverse impacts upon these assets, and potential impacts upon unknown archaeological deposits, are minimised.

8.6 Air Quality

8.6.1 Introduction

The proposed development will not result in large increases in either vessel traffic or road traffic during its operational phase (see Chapter 7: Traffic and Transport). Air quality related to transport emissions was therefore not an assessment required within this EIAR. Given the nature of the development (laydown area and quay construction) there is the potential to generate dust which could affect local properties particularly those to the east of the proposed development.

8.6.2 Potential Effects

Nuisance dust generation is most likely during the construction phase of the development when earthworks and creation of laydown platform will be taking place. There are a number of practical mitigation measures that can be applied such as:

- Setting site speed limits;
- Damping down roadways in prolonged dry weather; and
- Shaping of stockpiles of fine soils to minimise windblown dust from being carried off site.

Specific measures for dust control should be defined by the Contractor undertaking the Works and documented within the Construction Environmental Management Plans for the development. The Draft Construction Traffic Management Plan contained within Technical Appendix 7.1 contains relevant provisions.

Within the operational phase dust generation will be more limited as the laydown area will not have a running surface with ready sources of dust (essentially a hardcore stone surface), however regular inspection and maintenance should be applied by the site management to ensure nuisance dust is not generated during operations.

8.7 Navigational and Vessel Movement

The Cromarty Firth is utilised by a diverse range of marine traffic. This section provides baseline information on historic, current and projected vessel movements from the Global Energy facility at Nigg, and discusses the potential effects and mitigation that should be applied for the construction and operational phase of the development. Information on other larger scale construction projects that we are aware of is also included.

The close proximity of the Moray Firth Special Area of Conservation (SAC) and its designated Important Ecological Features (IEF), namely Bottlenose dolphin, also necessitates the need for robust marine mammal mitigation whilst maintaining the safety needs of all commercial and recreational users in the Cromarty and Inner Moray Firths. This section has also been used to inform the marine mammal assessments.

8.7.1 Baseline Operational Vessel Movements

Annual, overall port calls to Nigg Energy Park since 2015 are summarised below:

- 2015 – 81 visits;

- 2016 – 122 visits (50% increase on 2015 numbers, +40);
- 2017 – 130 visits (6.55% increase on 2016 numbers, +8); and
- 2018 – 174 (33% increase on 2017, +44).

We understand from the Applicant that 2019 figures are likely to follow the same annual incremental increase on the previous year.

On a monthly basis, peak port calls normally occur over the summer months from June-October, with 2018 figures doubling on the previous years for these months. The months of January and February have lowest call numbers, and most of these are comprised of inspection, repair and maintenance (IRM) contracts and associated support vessels.

8.7.2 Construction Related Vessel Traffic

Construction related marine vessel movements can be significant over a relatively short period of time. For example for the constructed South Quay development, the construction vessel movement numbers were estimated as 482[76] over around a six month construction period. The vessel movements for the proposed development are anticipated to be similar or less than that required to construct the South Quay.

Once the appointed contractors' detailed methods and approaches are known the vessel movements can be confirmed more accurately. At that time also it would be possible to prepare a Vessel Management Plan in conjunction with the Contractors, although many of the general principles contained within the Grontmij plan of 2014 are likely to apply.

We are aware of other significant construction projects in the northeast of Scotland which had the potential to overlap in terms of construction related traffic: Invergordon Phase 4, Ardersier, and Aberdeen Harbour Expansion. We have consulted with various organisations involved in these projects, and the Port of Cromarty Firth, and would comment as follows:

- Invergordon Phase 4 – Minimal construction vessel movements anticipated (seven more bulk carriers and four more coaster deliveries expected). Construction dredging should be complete by August 2019.
- Ardersier – Following renewal of consents for Ardersier in early 2019, a construction programme has not been defined as yet.
- Aberdeen Harbour Expansion – The dredging programme is due to complete in February 2020 with quay construction work and breakwater marine works programmed until July 2020.

8.7.3 Discussion of Potential Effects

For the operational phase of the proposed development, additional vessel movements per annum are estimated as being between 26 and 35 in total (the upper figure being for a year in which an offshore renewable project is being delivered). This is a modest increase in relation to current movements with vessel numbers for 2019 anticipated as being around 220.

The incremental change in vessel numbers is not considered significant provided the marine mammal mitigation relevant to vessels is applied as described in Chapter 4: Marine Ecology of the ES.

The density and frequency of vessel movements during construction will be greater than for normal operations at Nigg Energy Park. Therefore the risk to marine mammals from vessels is potentially greater. Within Technical Appendix 4.1 of Volume 3, the marine mammal mitigation plan proposes measures for works including piling and dredging disposal such as the use of Marine Mammal Observers (MMOs). Additional mitigation with regard to

[76] South Quay Extension, Grontmij Vessel Management Programme, February 2014

vessel movements and risks to marine mammals has been successfully used in the past (as described in the South Quay Extension, Grontmij Vessel Management Programme, February 2014) and is well established for any major construction project. Examples include:

- Use of propulsion thrusters will be minimised wherever possible, ducted thrusters being preferred to nozzle thrusters;
- Dredge vessels will avoid interactions with marine mammals wherever safe/possible;
- Generally maintain a steady direction and a slow 'no wake' speed (<10 knots);
- Avoid sudden changes in speed or direction; and
- Never drive head on to, or move between, scatter or separate marine mammals or sharks.

It is envisaged that once the Contractors are known, and specific vessel details are known, that Vessel Management Protocols can be considered further, potentially within a Vessel Management Plan (to comprise part of a Construction Environmental Management Plan) as has been applied previously for the area.

8.7.4 Navigation and General Vessel Movements

The Port of Cromarty Firth (PoCF) and the Applicant already operate and implement and monitor management plans and procedures for vessels transiting the Cromarty Firth and berthing at Nigg. Maritime safety is already well regulated and controlled.

Prior to and during construction the Applicant will coordinate with PoCF to ensure appropriate planning and procedures are in place for the construction works.

8.8 Population and Human Health

8.8.1 Introduction

The development as proposed will continue to afford employment opportunities to the local population. Given its nature and location are not expected to be any direct effects on the local population in terms of density or distribution and potential indirect effects on the local population are consider elsewhere within this EIAR (matters such as noise impacts or visual intrusion). The only potential effect on human health arising from the development is that associated with the operations at the site which is a Health and Safety consideration rather than to be addressed through environmental assessment.

8.8.2 Potential Effects

The only anticipated risk to human health is that associated with works at the site and possible effects (accidents) involving site workers or visitors to the site. These risks are addressed through normal health and safety procedures and risk assessments which are in place at the site and would be applied to the new development area and activities there also. Therefore no significant environmental risks to human health are expected to result from the proposed development.

8.9 Climate Change and Natural Disasters

The area of the country where the development lies is not considered at risk from most potential forms of natural disasters, such as major landslides, earthquakes, tsunamis, or hurricanes. It is however potentially at risk from extreme rainfall and flooding events, including those exacerbated by climate change. Chapter 5 which includes appraisal of the water environment considers extreme flood events with an allowance for predicted climate

change. This matter is not therefore considered further here. No significant impacts are predicted by Chapter 5: Water Environment and Coastal Processes with regard to extreme flood events.

9 CHAPTER 9: SCHEDULE OF MITIGATION

9.1 Introduction

This chapter presents a summary of the mitigation and enhancement measures identified by the specialist environmental studies throughout the EIA process. It indicates how these mitigation measures have or would be implemented. In addition to summarising mitigation, enhancement measures identified in the topic specific chapters of this EIAR are also highlighted.

The mitigation and enhancement measures included in this EIAR would be implemented during one or more of the following three broad phases of the proposed development:

- Measures incorporated during the design process;
- Measures required through the construction phase;
- Measures likely to be required during post-construction

Table 9.1 below provides a summary of the mitigation measures proposed for each issue identified by the EIA process. The measures are divided into the categories outlined above. It should be noted that the tables present a summary only; further details on the mitigation and enhancement measures are included within each chapter and the associated reports are included within Volume 3: Technical Appendices of this EIAR.

The Schedule is designed to provide a comprehensive summary of all construction or physical mitigation measures that would require to be carried through into the construction and operation of the proposed development, to ensure that the environmental assessment outcomes discussed throughout this EIAR are reached, e.g. to ensure that significant adverse effects are avoided where applicable and possible.

It should be noted that enhancement measures which have been suggested where appropriate throughout this EIAR have been included within the Schedule. Whilst they are actions or features which are encouraged, they are not mitigation which is required to alleviate potentially significant effects.

9.2 Mitigation Measures

Mitigation detailed in each technical chapter has been summarised below.

Table 9.1: Schedule of Mitigation

Feature / Topic	Mitigation	Timing
Chapter 4: Marine Ecology		

Standard Mitigation	The following standard mitigation practices will be followed during the construction and operational phase of the proposed development:
	
	• Pollution of the marine environment should be prevented in order to safeguard water quality and marine life which marine mammals rely on within these habitats;
	• A Construction Environmental Management Plan (CEMP) detailing pollution prevention measures will be agreed with the regulatory authority prior to works commencing;
	• The CEMP will incorporate a marine INNS biosecurity protocol for both construction and operational phases;
	• The following good practice guidelines shall be adhered to and incorporated into the CEMP:
	  ○ GGP 5: Works and maintenance in or near water;
	  ○ PPG 6: Working at construction and demolition sites;
	  ○ PPG 7: Safe Storage – The safe operation of refuelling facilities;
	  ○ GPP 21: Pollution and incident response planning;
	  ○ PPG 22: Incident response – dealing with spills;
	  ○ The Water Environment (Controlled Activities) (Scotland) Regulations 2011[77];
	  ○ Code of Practice on Non-Native Species Made by the Scottish Ministers under section 14C of the Wildlife and Countryside Act 1981[78];
	  ○ SEPA Guidance to prevent the introduction or spread of INNS when undertaking controlled activities[79]; and
	  ○ The Firth of Clyde Biosecurity Plan (2012-2016)[80].
		Construction/Operation

[77] https://www.sepa.org.uk/media/34761/car_a_practical_guide.pdf
[78] https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2012/08/non-native-species-code-practice/documents/00398608-pdf/00398608-pdf/govscot%3Adocument
[79] https://www.sepa.org.uk/media/163480/biosecurity-and-management-of-invasive-non-native-species-construction-sites.pdf
[80] http://www.clydemarineplan.scot/wp-content/uploads/2016/05/FoCF-Biosecurity-plan.pdf

Feature / Topic	Mitigation	Timing
Impact Piling Protocol	The Marine Mammal Observation Protocol (MMOP), as per Technical Appendix 4.1 of this EIA, will be implemented so that the impact piling works do not cause injury or unnecessary disturbance to marine mammals. Although not an EPS, as good practice and as they are known to be present in the general area, this will extend to pinnipeds including harbour seal (also a feature of the Dornoch Firth and Morrich More SAC) and grey seal. This section has been designed with reference to current JNCC guidance 'Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise' (August 2010)[81]. The standard[82] JNCC protocol is outlined below:	*Construction*
	1. The MMO will not initiate this protocol during periods of darkness or poor visibility (such as fog) or during periods when the sea state is not conducive to visual mitigation (above sea state 4 is considered not conducive[83]) as there is a greater risk of failing to detect the presence of marine mammals[84]. Harbour porpoise have small dorsal fins, therefore the MMO shall take additional precautions if the sea state exceeds 2. An elevated platform for the MMO to monitor from would be beneficial when the sea state is 2 or above, the impact piling works could also be scheduled on a day where the sea is expected to be calm.	*Construction*
	2. The mitigation zone of 500m will be monitored visually by the MMO for an agreed period prior to the commencement of piling. This will be a minimum of 30 minutes.	*Construction*
	3. The MMO will scan the waters using binoculars or a spotting scope and by making visual observations. Sightings of marine mammals will be appropriately recorded in terms of date, time, position, weather conditions, sea state, species, number, adult/juvenile, behavior, range etc. on the JNCC standard forms. Communication between the MMO and the contractor and the start/end times of the activities will also be recorded on the forms.	*Construction*
	4. Piling will not commence if marine mammals are detected within the mitigation zone or until 20 minutes after the last visual detection. The MMO will track any marine mammals detected and ensure they are satisfied the animals have left the mitigation zone before they advise the crew to commence piling activities.	*Construction*

[81] It should be noted that this protocol does not document measures to mitigate disturbance effects, but has been developed to reduce to negligible levels of risk of injury or death to marine mammals in close proximity to piling operations.
[82] There is a 'variation of standard piling protocol' allowed in the guidance if required.
[83] Detection of marine mammals, particularly porpoises, decreases as sea state increases. According to the JNCC guidance ideally sea states of 2 or less are required for optimal visual detection.
[84] There is a 'variation of standard piling protocol' allowed in the guidance if required.

Feature / Topic	Mitigation	Timing
	5. A soft-start will be employed, with the gradual ramping up of piling power incrementally over a set time period until full operational power is achieved. The soft-start duration will be a period of between 10 and 20 minutes, depending on machinery used. This will allow for any marine mammals to move away from the noise source.	*Construction*
	6. If a marine mammal enters the mitigation zone during the soft-start then, whenever possible, the piling operation will cease, or at least the power will not be further increased until the marine mammal exits the mitigation zone and there is no further detection for 10 - 20 minutes.	*Construction*
	7. When piling at full power this will continue if a marine mammal is detected in the mitigation zone (as it is deemed to have entered voluntarily[85]).	*Construction*
	8. If there is a pause in the piling operations for a period of greater than 10 minutes, then the pre-piling search and soft-start procedure will be repeated before piling recommences. If a watch has been kept during the piling operation, the MMO should be able to confirm the presence or absence of marine mammals, and it may be possible to commence the soft-start immediately. If there has been no watch, the complete pre-piling search and soft-start procedure will be undertaken.	*Construction*
	As per the JNCC guidance, reports detailing the piling activity and marine mammal mitigation (the MMO reports) will be sent to Marine Scotland at the conclusion of piling activity. Reports will include: • Completed MMRFs; • Date and location of the piling activities; • A record of all occasions when piling occurred, including details of the duration of the pre-piling search and soft-start procedures, and any occasions when piling activity was delayed or stopped due to presence of marine mammals; • Details of watches made for marine mammals, including details of any sightings, and details of the piling activity during the watches; • Details of any problems encountered during the piling activities including instances of non-compliance with the agreed piling protocols; and • Any recommendations for amendment of the protocols.	*Construction*

[85] The guidance states that there is no scientific evidence for this voluntary hypothesis; instead it is based on a common sense approach. Factors such as food availability may result in marine mammals approaching piling operations; in particular, the availability of prey species stunned by loud underwater noise may attract seals into the vicinity.

Feature / Topic	Mitigation	Timing
PAM Protocol	This protocol will be followed when works are to commence during periods of low visibility (i.e. when sea states are not conducive to visual monitoring, fog or darkness). PAM systems can only be used to detect vocalising species of marine mammals, which includes bottlenose dolphin and harbour porpoise, and they are not as accurate as visual observations for determining range. As such, the most accurate system available will be used and the PAM Operative will factor in a realistic estimate of the range accuracy.	*Construction*
	PAM systems will be deployed at a location in the vicinity of the proposed quay which allows uninterrupted and realistic background underwater noise measurements prior to the commencement of the activity. The hydrophones will be calibrated to receive cetacean (dolphin, porpoise and whale) calls, both whistles and clicks over a frequency range of 1 to 20kHz and 15kHz to 150kHz. Whilst less vocal, the hydrophones will also be calibrated to intercept and recognise grey seal and harbour seal, typically vocal over a frequency range of 100kHz to 150kHz.	*Construction*
	The PAM system will be appropriately placed with sufficient spatial coverage to measure and monitor construction noise generation within the marine mammal mitigation zone. Underwater noise levels at this mitigation perimeter must be less than the values prescribed within the CEMP.	*Construction*
	PAM activities will be carried out in consultation with the University of Aberdeen and Marine Scotland to ensure that the information collected is suitable to be assessed against the longer term studies in the wider area. The results of the PAM will be appropriately recorded and reported, and in accordance with JNCC guidance.	*Construction*
Vibratory Piling Mitigation Protocol	The requirement of an MMO for Vibratory Piling is not considered necessary due to the underwater noise modelling displaying only negligible risks of PTS to bottlenose dolphin, harbour porpoise and seals. A soft-start method/gradual ramp-up of power will likely deter marine mammals from staying within, or moving into the area where vibratory piling is ongoing.	*Construction*
Dredging Mitigation Protocol	The requirement of an MMO for dredging is not considered necessary due to the small TTS zones associated with the noise generated. Instead, contractors should be made aware that marine mammals may be present within the working area, and suggested vessel movement mitigation (Technical Appendix 4.1) should be implemented.	*Construction*
Dredge Disposal Protocol	An MMO will be present on the dredge vessel during disposal at The Sutors site. A scan of the water within an approximate 250m radius shall be undertaken prior to dredge material being disposed of to ensure there are no marine mammals,	*Construction*

Feature / Topic	Mitigation	Timing
	particularly bottlenose dolphin which frequently utilise this habitat, are in proximity to the vessel. The search will be conducted for a minimum of ten minutes.	
Vessel Movement	Speed restrictions shall be implemented on vessels travelling to and from the proposed development, and will continue throughout construction and operation. Chapter 8: Other Issues includes further information regarding vessel movements and mitigation; and Technical Appendix 4.2 includes detailed mitigation. Good practice measures that will be followed include: • Keep a safe distance. Never get closer than 100m (200m if another boat is present) if within 100m, switch the engine to neutral; • Never drive head on to, or move between, scatter or separate marine mammals or sharks. If unsure of their movements, simply stop and put the engine into neutral; • Spend no longer than 15 minutes near the animals; • Special care must be taken with mothers and young; • Maintain a steady direction and a slow 'no wake' speed; and • Avoid sudden changes in speed.	*Construction/Operation*
Cumulative Working	In the event of overlap between underwater noise producing activities at other cumulative developments, a 'Works Dialogue Protocol' shall be implemented which would involve active communication between the four projects (Nigg East Quay, Ardersier, Invergordon Phase 4, Aberdeen South Harbour). Assuming that all parties agree to a collaborative working approach, an initial meeting would be arranged with respective Ecological Clerk of Works present, where the programmes for both projects would be reviewed to identify any overlaps of potential concern, along with the mitigation and monitoring measures in place. The performance of the mitigation measures and findings from the monitoring of activities to date would be considered along with the measures set out in the MMPP. This collaborative working would aim to review, and if necessary update the MMPP in order to minimise and mitigate potential impacts identified. Regular communication would continue through any period of programme overlap, with minutes of meetings being made available as required. Mitigation outlined within the CEMP regarding INNS shall be implemented during operation as well as construction.	*Construction/Operation*
Chapter 5: Water Environment and Coastal Processes		
Construction Environmental	A Construction Environmental Management Plan (CEMP) will be developed to ensure that the mitigation measures outlined in the EIAR are followed during the proposed construction works. The CEMP includes surface water management and	*Construction*

Feature / Topic	Mitigation	Timing
Management Plan (CEMP)	pollution prevention measures (e.g. Pollution Prevention Plan), and will be in place during construction and operation. The CEMP will remain a live document and will be continually updated as the work progresses. The CEMP is a practical tool to facilitate the management of environmental mitigation measures and to provide a clear roadmap of the key roles and responsibilities during construction.	
	A suitably qualified Environmental Clerk of Works (EnvCoW) will monitor the construction works to ensure that the CEMP and associated mitigation measures are being implemented effectively.	*Construction*
	Best practice will be adopted throughout all phases of development, following current guidance. The programme of works, including timing, direction and method of capital dredge, will be planned, monitored and managed to minimise the potential negative environmental impacts.	*Construction*
	A Pollution Incident Response Plan will be developed relating to the construction of the proposed development, statutory requirements and identification of areas of highest sensitivity. This will provide site spill response procedures, emergency contact details and equipment inventories and their location. All staff will be made aware of this document and its content during site induction. A copy will be available in the site office at all times.	*Construction*
	All activities above Mean High Water Springs (MHWS) with potential to affect the water environment require to be authorised under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). The level of authorisation required is dependent on the anticipated environmental risk posed by the activity to be carried out. These activities could include construction drainage. Construction activities below MHWS with potential to affect the water environment require to be authorised under a Marine Licence.	*Construction*
Dredged Material	Mitigation measures will be delivered by the principal contractor through detailed Construction Environment Management Plans (CEMPs) that will be produced following appointment. The contractor will be responsible for producing a site specific Pollution Prevention Plan (PPP) that will apply the principles of the agreed mitigation to show how the mitigation is implemented effectively down to the specific site.	*Construction*
Surface Water Management	The surface water drainage will be designed to ensure that there are no untreated surface water discharges directly to surrounding coastal waters. It is proposed to replicate natural drainage around construction areas and to use source control to deal with rainwater in proximity to where it hits the ground in line with current Sustainable Drainage Systems (SuDS) guidance. Suitable prevention measures will be in place at all times to prevent the release of pollutants to the water	*Construction*

Feature / Topic	Mitigation	Timing
	environment, including adjacent coastal waters. These will be regularly inspected and maintained to ensure optimal performance.	
Site Compounds	Run-off from compounds will be captured and passed through construction drainage features prior to discharge. Foul drainage will either be contained in a closed system and disposed of at a suitable off-site facility with private treatment and discharge or, where possible, directed via a connection to the Nigg Energy Park foul drainage treatment system.	*Construction*
Concrete	In the case that concrete batching was to be undertaken on-site the following mitigation measures would be implemented to minimise the potential impact of concrete batching on the water environment in line with PPG6: • Concrete batching will take place on an impermeable designated area and at least 10m from any waterbody. • Equipment and vehicles will be washed out in a designated area that has been specifically designed to contain wet concrete/ wash water. • A closed loop system will be used for wash waters. Wash waters will be stored in a contained lined pond for settlement before being reused (e.g. for mixing and washing). • No discharge of wash waters will occur on-site. All excess wash water that cannot be reused will be disposed of off-site. The following mitigation is proposed for concrete handling and placement: - Pouring of concrete will take place within well shuttered pours to prevent egress of concrete from the pour area. - Pouring of concrete during adverse weather conditions will be avoided. - The CEMP will include a Pollution Incident Response Plan, and drivers of vehicles carrying concrete will be informed so as to raise awareness of potential effects of concrete and of the procedures for clean-up of any accidental spills. - Concrete acidity (pH) will be as close to neutral (or site-specific pH) as practicable as a further precaution against spills or leakage.	*Construction*
Oil, Fuel, Site Vehicle Use and Storage	The risk of oil contamination will be minimised by good site working practice (further described below) but should a higher risk of oil contamination be identified then installation of an oil separator will be considered. The storage of oil is considered a Controlled Activity which will be deemed to be authorised if it complies with the Regulations. The mitigation measures to minimise any risk of contaminant release are in line with SEPA PPG and GPP documents and include the following: • Storage: o Storage for oil and fuels on site will be designed to be compliant with GPP2 and GPP8.	*Construction*

Feature / Topic	Mitigation	Timing
	○ The storage and use of loose drums of fuel on site will not be permitted. ○ Bunded tanks will provide storage of at least 110% of the tank's maximum capacity. • Refuelling and maintenance: ○ Fuelling and maintenance of vehicles and machinery, and cleaning of tools, will be carried out in a designated area where possible in line with PPG7. ○ Multiple spill kits will be kept on site. ○ Drip trays will be used while refuelling. ○ Regular inspection and maintenance of vehicles, tanks and bunds will be undertaken. Emergency procedure: The Pollution Incident Response Plan will include measures to deal with accidental spillages.	
Operational Environmental Management Document (OEMD)	An Operational Environmental Management Document (OEMD) will be in place throughout the operational phase. Best practice will be followed throughout the operational phase, with reference to the SEPA Guidance for Pollution Prevention (GPPs), and best practice guidance.	*Operational*
Surface Water Management	It is proposed that drainage of surface water will adopt SuDS principles and be by means of infiltration through a permeable surface, and the underlying permeable reclamation fill, providing treatment. Details of the operational surface water management proposals and methodology will be included within the OEMD and will be submitted to SEPA's operations team for agreement consent. Plans of the surface water management system will be located within the Site office, with foul water systems clearly marked. Where a site use or development proposal is such that it will require a Pollution Prevention and Control (PPC) authorisation from SEPA, then specific processes, techniques and technologies will be included within the surface water management system in that location in order to meet the requirements of the PPC authorisation. Such measures would be in line with best practice guidance.	*Operational*

Feature / Topic	Mitigation	Timing
Oil, Fuel, Site Vehicle Use and Storage	The proposed development's Pollution Incident Response Plan will be updated for the operational phase of the development, taking full consideration of best practice, statutory requirements and identification of areas of highest sensitivity. It will provide site spill response procedures, emergency contact details and equipment inventories and their location. All operation staff will be made aware of this document, and its contents, and it will be available in the port office. Appropriate spill kits and absorbent materials will be stored in a suitable location which is easy to access. Staff/contractors will be trained in the use of spill kits and other pollution control equipment and the operation of pollution control devices.	*Operational*
Monitoring and Enhancement	Global Energy Nigg Ltd shall undertake a planned programme of compliance monitoring to verify the effectiveness of the project's environmental management. Monitoring plans will be established and implemented with the agreement of SEPA, SNH and Marine Scotland. Specific auditing and monitoring plans will be developed by the contractor and will cover the following: • The contractor's own Environmental Management System; • The CEMD, schedule of mitigation register, relevant legislation and industry good practice; • All project activity; • Roles and responsibilities for those undertaking audits and monitoring; • Frequency of inspection activities (i.e. daily, weekly, monthly); • Process to deal with corrective actions/non-compliance; and • Reporting procedures (including non-compliance). Additionally, as construction activities at Ardersier, Invergordon, Aberdeen South Harbour and the proposed development may overlap, a 'Works Dialogue Protocol' would involve active communication between the various projects and consultation with the relevant Ecological Steering Groups (ESG) should be undertaken. An initial meeting should be arranged between stakeholders with respect to Ecological Clerk of Works' (ECoW) present and the programmes for both projects reviewed to identify any overlaps of potential concern, along with the mitigation and monitoring measures in place. This collaborative working would aim to review, and if necessary update the respective Marine Mammal Protection Plans in order to minimise and mitigate potential impacts identified. Regular communication would continue through any period of programme overlap, with minutes of meetings being made available to all stakeholders.	*Construction/Operation*
Chapter 6: Airborne Noise		
Site Design	As part of the site design process for the proposed development, EnviroCentre modelled scenarios of operational activities provided by the Applicant in order to inform noise mitigation measures. As part of this process, and in order to reduce noise	Design

Feature / Topic	Mitigation	Timing
	from the operational activities described in Section 6.4.7.1, an acoustic bund of up to 2m height is proposed, located between the Laydown Area and noise sensitive receptors to the north (Balnabruaich) and east (Balnapaling). The extent and height of the acoustic bund is shown in Figure 6.3, within Volume 2 of this EIAR. The most exposed properties to noise are identified as being those located to the east of the proposed development in Balnapaling. The topographic level of the ground on which the acoustic bund is proposed is between 1.2m and 1.8m higher than that of the East Quay itself, therefore the proposed bund effectively reduces noise from both the Laydown Area and operational activities on the southern half of the quay, on which the majority of loading / unloading activities are likely to take place. It also provides a reduction in noise levels from existing operations in Nigg Energy Park, including parts of the Graving Dock, southern sections of the main yard/berths and South Quay activities, at receptors in Balnapaling.	
Construction Noise	Piling – The majority of piling will be carried out using a vibratory hammer with the impact hammer being used to drive the sheet and king piles into their final position if needed. The use of the impact hammer, particularly when driving the sheet piles generates the greatest level of noise during this process (Large Adverse significance). In order to reduce the level of impact during the most sensitive weekend daytime period at receptors in Balnapaling the following measures are recommended; • The use of impact hammers on sheet piles should, where practicable, be scheduled for weekdays and avoided at weekends. • The use of quiet hammer systems and acoustic shrouding techniques should be considered during impact piling.	Construction
Construction Noise Management	It is recommended that best practice construction noise management techniques should be employed following guidance provided in BS5228-1:2009, and that the general principles of the Considerate Constructors Scheme be incorporated into the Construction Environmental Management Plan (CEMP).	Construction

Feature / Topic	Mitigation	Timing
General Noise Management	The following noise mitigation measures have been discussed with the Applicant and are recommended to be incorporated into the site-wide noise management plan for both existing and proposed East Quay operations (to be prepared post-consent). These recommendations are in addition to the proposed site design mitigation measures described in Section 6.4.9. • Minimise, and if feasible avoid plant movements or loading / unloading activities on the southern half of the East Quay (due to line of sight to receptors in Balnapaling) during the most sensitive night-time period; • Use of centralised and temporary quiet generator systems positioned on or near to the South and East Quaysides; • Where practicable, switch off vessel and rig generators when not required; • Where practicable, selection of low noise plant / equipment for works on the South Quay and proposed East Quayside; • Restrict the operation of loud speaker communication systems to daytime periods only; • Schedule high noise generating activities to occur during daytime hours, with restrictions on high noise activities at night; • Where maintenance activities are to be carried out at night, ensure maintenance areas are remote, or isolated from areas of noise sensitivity; • Keep internal haul routes well maintained and avoid steep gradients; • Keep doors to fabrication and workshop units closed when not in use; • When plant/equipment is due for replacement/renewal, or when hiring, give preference to selection of low noise options; • Carry out regular and effective maintenance on plant/equipment to reduce noise from wear and tear of components; • Provide training to existing and new start employees (through incorporation into the site induction process) in best practice noise management techniques / make familiar with the operational noise management plan; and • Carry out weekly scheduled monitoring of on-site noise levels. Log measured levels, along with description of activities occurring at time of monitoring. The log may be used to determine particularly high noise generating activities, or combinations of activities to inform further refinement of the operational noise management plan (if required), or provide information in the event of noise complaints in the surrounding community.	Operational
Mobile Plant	• Design traffic routing and vehicle selection to avoid / minimise the requirement for vehicle reversing;	Operational

Feature / Topic	Mitigation	Timing
	• Where vehicle reversing alarms are required, they should be designed to cause the lowest practical environmental impact; preferably they should be directional broadband noise emitters or automatically adjusted to ambient noise levels; • Avoid unnecessary revving of engines and shut down idling plant and equipment when not in use; • Acoustic covers to engines should be kept closed; and • Noise from plant which is known to be particularly directional, where practicable, should be orientated such that the noise is directed away from noise sensitive areas.	
Chapter 7: Traffic and Transport		
Construction Traffic Management Plan (CTMP)	Although not required through the EIA Regulations as no significant environmental effects are predicted as a result of the proposed development, a CTMP is proposed as a 'good practice' measure. The CTMP will identify measures to reduce the number of construction vehicles required as well as considering the mitigation of vehicle impacts through construction programming, routing and identification of an individual with responsibilities for managing traffic and transport impacts and effects. The CTMP can include (but is not limited to) the following measures (with further details included within Technical Appendix 7.1):	Construction
	The main contractor should develop a logistics plan highlighting the access point for the site, loading bay, pedestrian / vehicular segregation, welfare, storage, security and material handling that will be enforced following full site establishment;	Construction
	All contractors will be provided with a site induction pack containing information on delivery routes and any restrictions on routes;	Construction
	Temporary construction site signage would be erected along the identified construction traffic routes to warn people of construction activities and associated construction vehicles. During the site visit it was noted that warning signs already exist in relation to quarry traffic, additional signage can be erected for the duration of the month(s) of stone importation;	Construction
	A construction traffic speed limit will be enforced of 30mph through Arabella and 20mph along the access road to Castlecraig Quarry (it is noted that this is an existing speed limit);	Construction

Feature / Topic	Mitigation	Timing
	The construction material 'lay down' areas will allow for a staggered delivery schedule throughout the day, avoiding peak and unsociable hours;	Construction
	An integral part of the progress meetings held with all trade contractors is the delivery schedule pro-forma.	Construction
	Under no circumstances will HGVs be allowed to lay-up in surrounding roads. All personnel in the team will be in contact with each other and site management who in turn will have mobile and telephone contact with the subcontractors;	Construction
	To maintain roads in a clean and safe condition, wheel washing facilities (or similar device) will be provided at the site and contents of vehicle loads will be sheeted; and	Construction
	A works mini-bus will be put in place for staff to ensure that single-occupancy car trips to and from the proposed development are minimised.	Construction
Chapter 8: Other Issues		
Terrestrial Ecology (Bats)	The following mitigation is recommended to reduce potential negative impacts to bats as a result of the proposed development: • To reduce risk of accidental injury or death to opportunistically roosting bats it is recommended that demolition occurs in the months of October, November or March to avoid the bat summer activity season and the sensitive hibernation period. • The compensatory bat boxes should be installed prior to demolition works commencing site so that if any bats are unexpectedly found they can be relocated. • All site personnel should be made aware of the presence of bats on site via a toolbox talk. • If bats are discovered on site or seen flying during daylight hours, demolition works should be halted and the project ecologist contacted for advice. • The trees and scrub in the east of the site is a key commuting and foraging habitat for bats in the locale. It is understood that this will be removed as part of the proposed development. A landscape bund with associated planting has been proposed to screen the development. The landscape design should incorporate a similar species mix to that present within the existing scrub habitat.	Pre-Construction/Construction

Feature / Topic	Mitigation	Timing
	Artificial lighting, and security lighting in particular, should be designed to reduce impacts to nocturnal animals such as bats. Measures could include the use of shades to prevent light spill outside of the site, use of vegetation to act as a screen for artificial lighting and the use of soft white light. The Lighting Institute guidance on appropriate lighting can be found here: https://www.theilp.org.uk/documents/guidance-note-8-bats-and-artificial-lighting/	
Ornithology	The following mitigation measures are proposed for the proposed development: • Timing of works; Vegetation clearance and demolition of buildings should be undertaken outwith the nesting bird season (March –August) to avoid impacts on breeding birds; • If vegetation clearance or demolitions are undertaken within the breeding season, a suitably qualified ecologist will be required to undertake nesting bird checks no later than 24 hours prior to works; and • Bird dissuasion methods should be employed (which include regular inspections by an Ecological Clerk of Works (ECoW) and artificial deterrents) to discourage nesting birds on site during construction works. Methods to be employed will be detailed within Environmental Management Plans for the site post-consent. Although there is unlikely to be an impact on breeding terns from the proposed development, it would be good practice to provide artificial nest boxes for both Common and Arctic Terns where they currently nest, over 500m from the development site. These would include raft nests which are preferred by Common Tern and nest boxes which are preferred by Arctic Tern.	Pre-Construction/Construction
Landscape and Visual	The outline design of the proposed development is described in full within Chapter 2 of this EIAR. This has evolved as part of an iterative process that aims to provide an optimal design in environmental terms, but also takes into account technical and economic factors. As part of this, objectives to minimise any adverse landscape and visual effects have been considered and to help ensure that the proposed development integrates positively with its landscape and coastal setting, the following landscape design and mitigation measures have been embedded in the project proposals: • The construction of a 2 m landscape bund formed from reclaimed material on the eastern and northern extents of the laydown area;	Design

Feature / Topic	Mitigation	Timing
	• To help integrate the bund with local landscape character (in addition to ecological benefits), it is proposed to plant this up with a neutral grassland mix with shrub species such as dog rose (*Rosa canina*), broom (*Cytisus scoparius*), gorse (*Ulex europaeus*) and juniper (*Juniperis communis*); and • Considering the large-scale industrial land uses of the operational Nigg Energy Park, the overall design and selection of materials would generally reflect existing infrastructure. If consented, it is expected that other relevant landscape mitigation measures would also be considered as part of a Construction Environmental Management Plan (CEMP) to be provided post-consent. No construction mitigation has been proposed within this chapter.	
Cultural Heritage	Any direct impacts upon standing buildings can be mitigated through a programme of historic building recording (HBR). Potential impacts upon unknown archaeological deposits can be mitigated with a programme of archaeological investigation and recording. The finer details of the HBR should be agreed with THC, but it is anticipated that it would comprise, as a minimum, a measured photographic survey of the upstanding remains of Dunskeath House (MHG21540) and HA1, accompanied by a report outlining the methodology employed, relevant policy and guidance, and the historical context of the HBR work. Since there is only a small risk of impacts upon unknown archaeological deposits, it is considered that any programme of archaeological investigation should be limited to archaeological monitoring of construction groundworks. However, as with the HBR, the finer details should be agreed with THC.	Pre-Construction/Construction
Air Quality	No mitigation is proposed for Air Quality	N/A
Navigation	Use of propulsion thrusters will be minimised wherever possible, ducted thrusters being preferred to nozzle thrusters; Dredge vessels will avoid interactions with marine mammals wherever safe/possible; Generally maintain a steady direction and a slow 'no wake' speed (<10 knots); Avoid sudden changes in speed or direction; and Never drive head on to, or move between, scatter or separate marine mammals or sharks. It is envisaged that once the Contractors are known, and specific vessel details are known, that Vessel Management Protocols can be considered further, potentially within a Vessel Management Plan (to comprise part of a Construction Environmental Management Plan) as has been applied previously for the area.	Construction/Operation Construction

Feature / Topic	Mitigation	Timing
Population and Human Health	No mitigation is proposed for Population and Health	N/A
Climate Change	Discussion of water-related climate change impacts and associated mitigation is contained within Chapter 5: Water Environment and Coastal Processes.	
Natural Disasters	No mitigation is proposed for Natural Disasters	N/A

10 CHAPTER 10: CONCLUSIONS

10.1 Introduction

The predicted environmental effects related to the construction and operation of the proposed development have been considered throughout the design and subsequent assessment of the development layout. The views of statutory consultees have been taken into account as presented in Chapter 3: EIA Methodology and Scoping. The final design of the proposed development has been subject to a detailed EIA which has sought to minimise the effects resulting from the proposed development. Mitigation measures are detailed within their respective specific chapters of this EIAR and summaries within Chapter 9: Schedule of Mitigation of this EIAR.

The conclusions of each chapter are presented below.

10.2 Marine Ecology

As detailed within Chapter 4: Marine Ecology and with the exception of impacts caused via the unknown spread of Invasive Non-Native Species (INNS), no significant effects were predicted upon species or receptors identified. These are subject to the mitigation measures identified throughout the chapter being applied, primarily through the Marine Mammal Mitigation Protocol outlined within Technical Appendix 4.1, and noted in full within Chapter 9: Schedule of Mitigation. It should be noted that we have taken a precautionary approach to the assessment of effects related to INNS given a level of uncertainty regarding the dispersion of INNS across the Cromarty Firth.

The proposed mitigation measures in relation to marine mammals have been devised with reference to academic literature, best practice and further supporting evidence from similar developments, in addition to liaison and consultation with Dr Paul Thomson of the University of Aberdeen Lighthouse Field Station. Following all mitigation outlined, adverse effects will not be significant.

10.3 Water Environment and Coastal Processes

Assessment of the impacts of the proposed development on the water environment and coastal processes in the study area was undertaken and detailed within Chapter 5. Overall, the effects of the proposed development on the water environment and coastal processes are not significant. The post-mitigation magnitude of any residual effects are detailed within Chapter 5 and are considered either minor or negligible in this respect. Accordingly, no significant adverse effects have been identified.

10.4 Airborne Noise

As detailed within Chapter 6: Airborne Noise, an extensive noise impact assessment was completed as part of the EIA. Noise generated by construction activities is temporary in nature, and as such there are no predicted long-term residual effects. Construction noise results were split into weekday daytime, weekend daytime, evening and night-time, to cover all eventualities provided under the proposed development timetable (see Chapter 2: Proposed Development).

There are no significant construction noise effects anticipated within weekday daytime, evening or at night time. Assessment for weekend daytime demonstrated that if piling activities were to take place at the weekend, there would be a significant effect on properties at Balnapaling (however no other significant effects were noted) during the duration of time where piling and dredging timetables potentially overlap (approximately two weekends).

For operational noise, there were assessed to be no significant effects at any time of the day for any receptor.

10.5 Traffic and Transport

A worst-case assessment of the proposed development's traffic impact on related effects: severance; driver delay; pedestrian delay and amenity; accidents and safety; and dust and dirt; concludes that, during the construction stage, all effects associated with an increase in HGV traffic levels are deemed to be negligible which is classed as not significant.

Once the proposed development is operational it is anticipated that only staff vehicle movements will be generated. It is intended that all large components will be transported to and from the development by sea and will not generate additional HGV movements within the study area. Staff numbers associated with the operational stage will not exceed that assessed under the construction therefore, it can be concluded that any effects associated with a small number of additional car trips will be negligible and classed as not significant

10.6 Other Issues

The Other Issues chapter covers potential effects upon topics scoped out of full EIA assessment including terrestrial ecology, ornithology, landscape and visual, cultural heritage, air quality, navigation, population and human health, natural disasters and climate change.

Subject to the mitigation measures specified within Chapter 9: Schedule of Mitigation there are anticipated to be no significant effects across these topics, with a small exception in landscape and visual terms. Technical Appendix 8.5 assesses that there may be significant effects during construction from Nigg Ferry Terminal and from Cromarty Beach, and upon users of the Nigg Ferry Terminal only during operation. These are localised effects and it was found that the proposed development would not significantly compromise important landscape or visual interests within the study area.