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**Addressing
constraints to coastal
works: noise
disturbance to birds**

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Addressing constraints to coastal works noise disturbance to birds

Overview

- Why are coastal birds so important?
- What information is required to assess noise disturbance (airborne noise) to birds from proposed coastal developments?
- How does noise affect birds?
- Do noise limits for people also apply to birds?
- What types of mitigation can be used and how effective are they?



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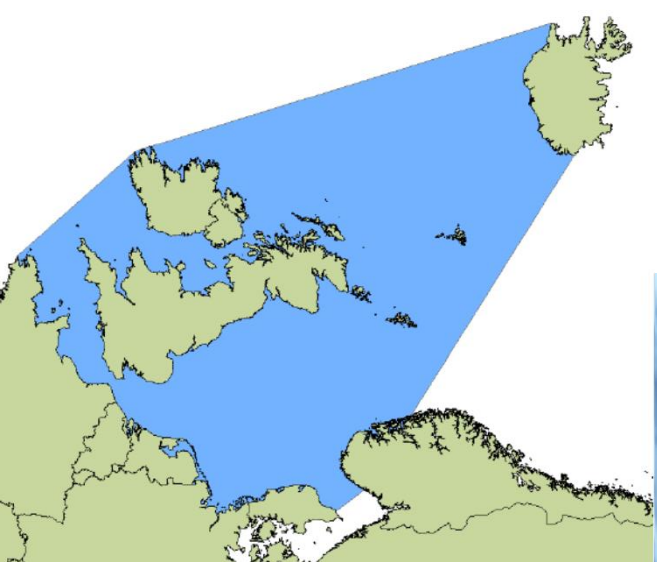
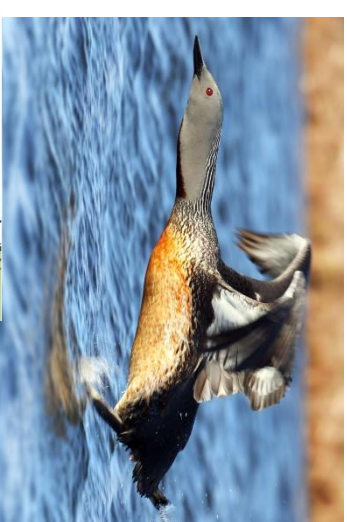
- Scotland is home to internationally important populations of coastal birds
- Waders, wildfowl, seabirds
- Location
- Large estuarine systems
- Firth of Tay
- Firth of Forth
- Extent of shoreline
- Offshore islands
- Surrounded by sea



Source: International Wader Study Group, in Boere & Stroud 2006

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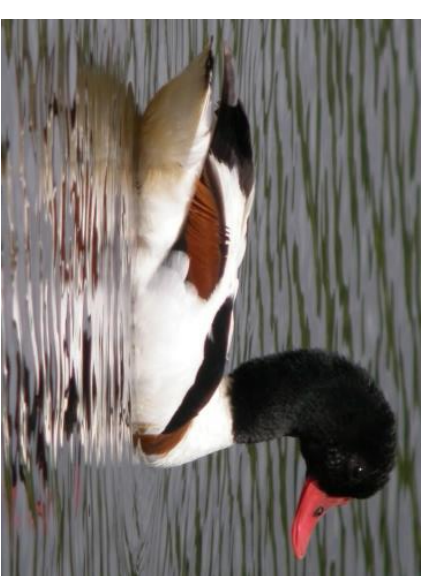
Red-throated diver



Predicted migration zones used by red-throated divers that breed in Britain and Ireland and those that migrate to Britain and Ireland during the non-breeding season. Source: Wright et al. (2012). SOSS-05. BTO, Crown Estates

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Shelduck

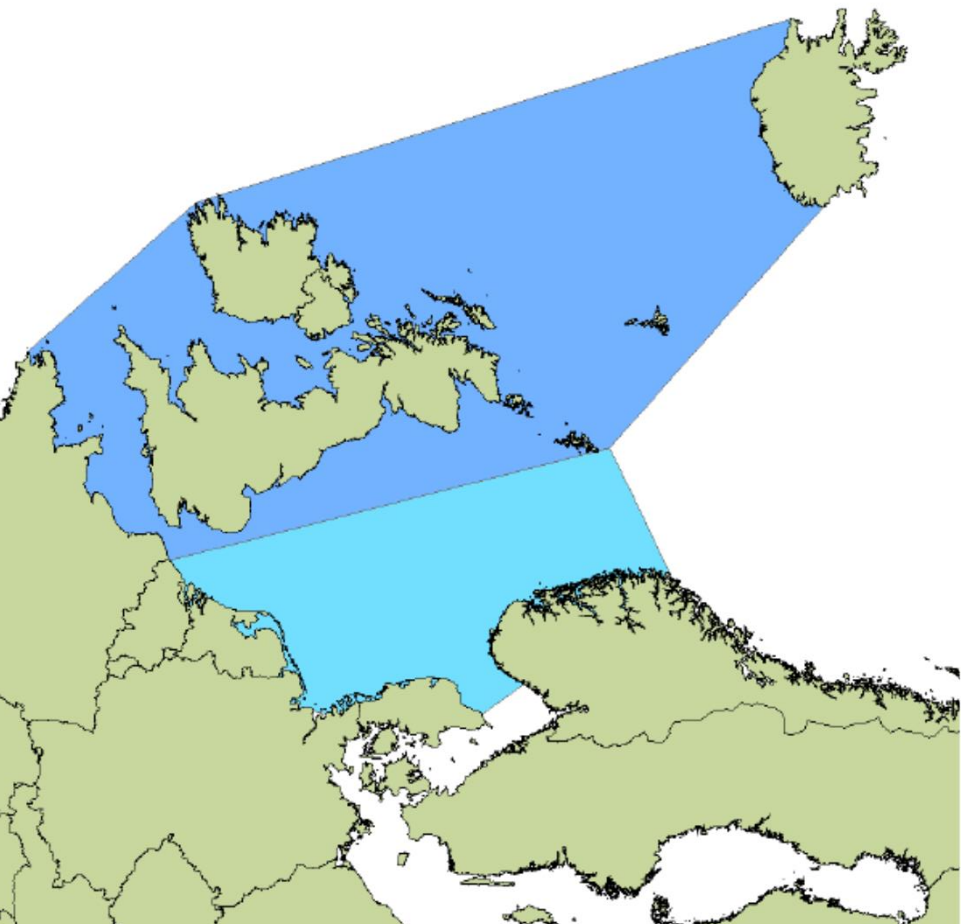


Predicted migration zone for shelducks that either breed or winter in Britain and Ireland. Important moulting areas shown.

Source: Wright et al. 2012 SOSS-05

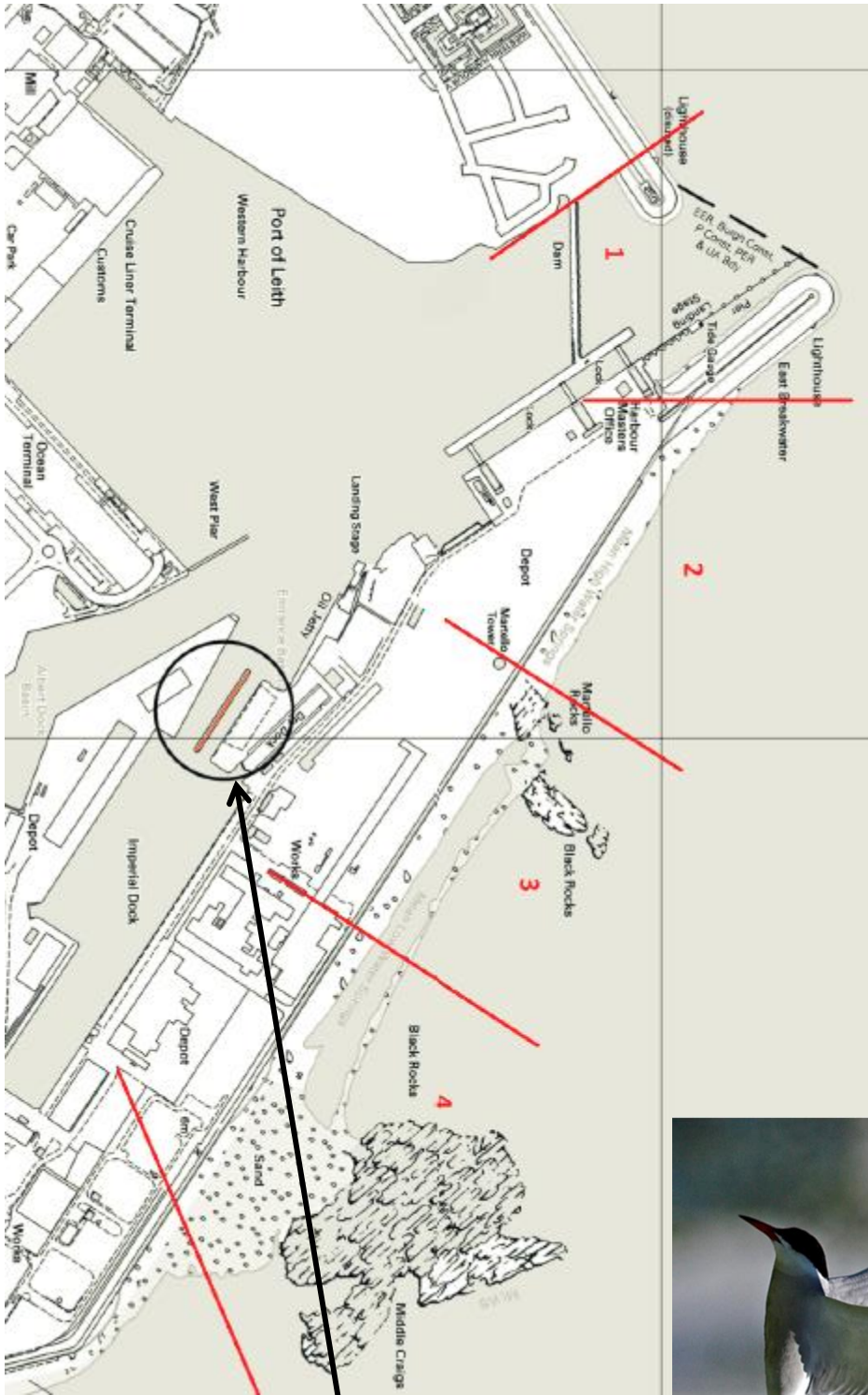
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Dunlin



Predicted migration zone for Dunlins that either breed in Britain or pass through Britain and Ireland on migration from Iceland or Greenland (two races)

Source: Wright et al. 2012. SOSS-05. BTO, Crown Estates

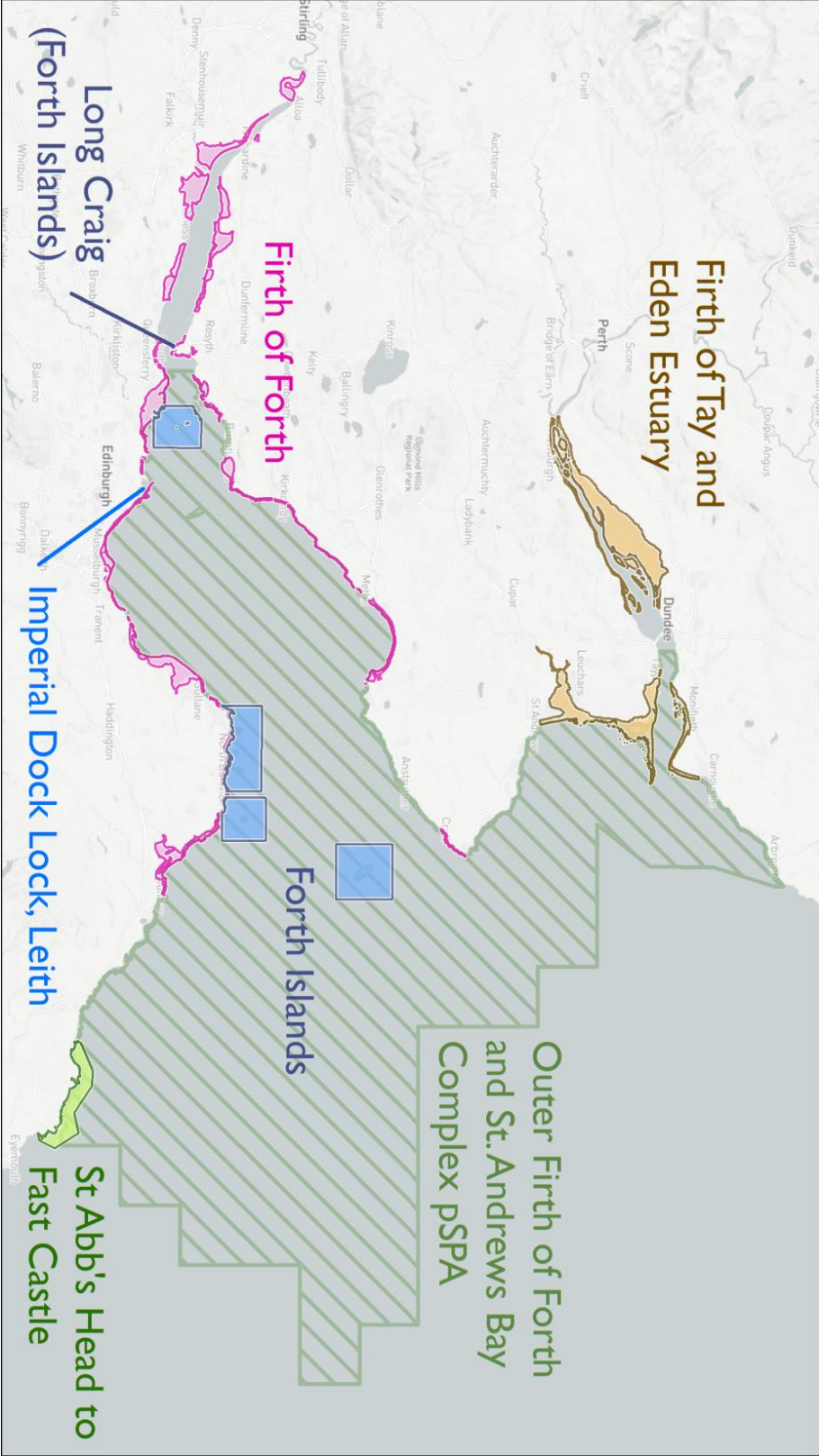


Leith Docks
breeding
colony,
Imperial Dock
Lock SPA

Source : Gemma
Jennings,
University of
Glasgow



Special Protection Areas for coastal birds in the Forth and Tay



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Statutory Sites and hierarchy of protection

**SPA / SAC /
Ramsar**

- International sites: **Special Protection Areas** (SPAs), EU Birds Directive, Special Areas of Conservation (SACs), EU Habitats Directive. Many are also **Ramsar Sites** (Wetlands of International Importance)
- Requirement for Habitats Regulations Appraisal for plans and projects



MPA

- Marine Protected Areas for birds most are also all SPAs
- Protection regime similar to SPA and SAC



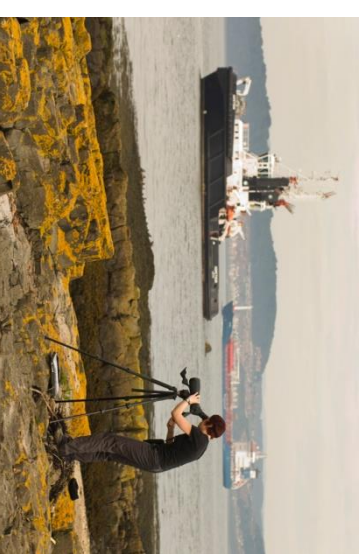
SSSI

- Sites of Special Scientific Interest (to MLWS)
- Consider notified interest features

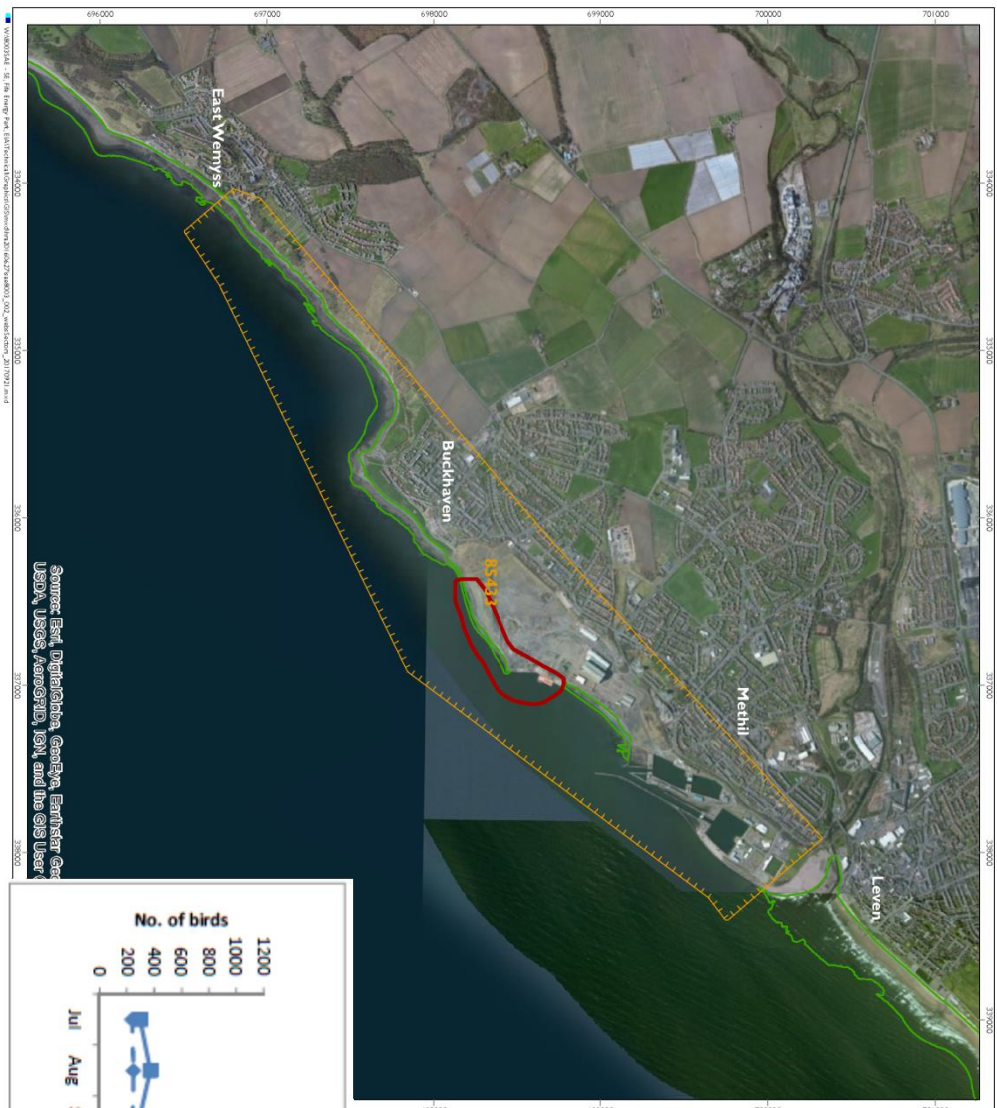


What information about birds is needed to assess noise disturbance to birds?

- Numbers and distribution of birds using areas in the vicinity of a proposed development are there important feeding / roosting / nesting areas?
- Study area and detail of information required depends on size of development and location
- Desk study data e.g. Wetland Bird Survey (WeBS), seabird colony counts
- Site-specific surveys (for larger developments)
- Through the tide counts (based on WeBS methods)
- Counts of birds using inshore waters



Example of Development Study Area for Birds

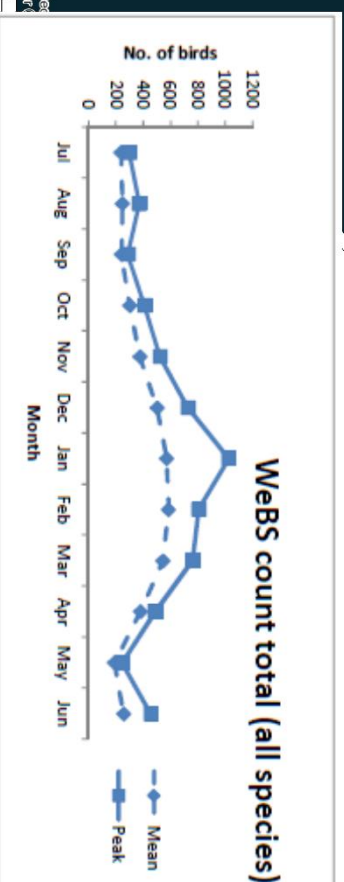


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNR AeroGlobe, IGN, and the GIS User Community

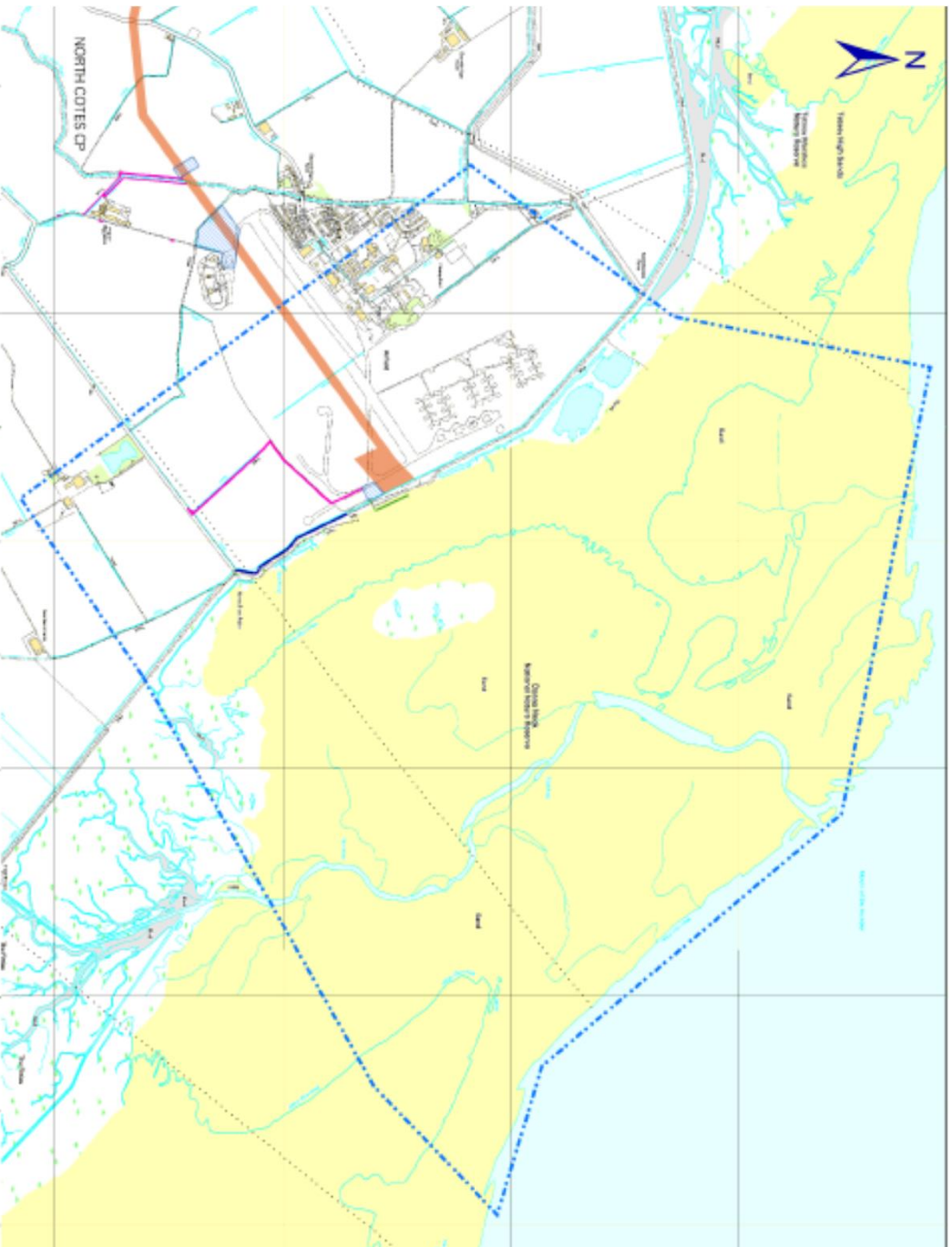
Coastal Site
Investigations and
Mooring Works

- Legend
- WeBS core count sector
- Firth of Forth and Forth Islands SPA
- Area of proposed works

Wetland Bird Survey (WeBS) data, high tide (core) counts, 2009/10 2013/14

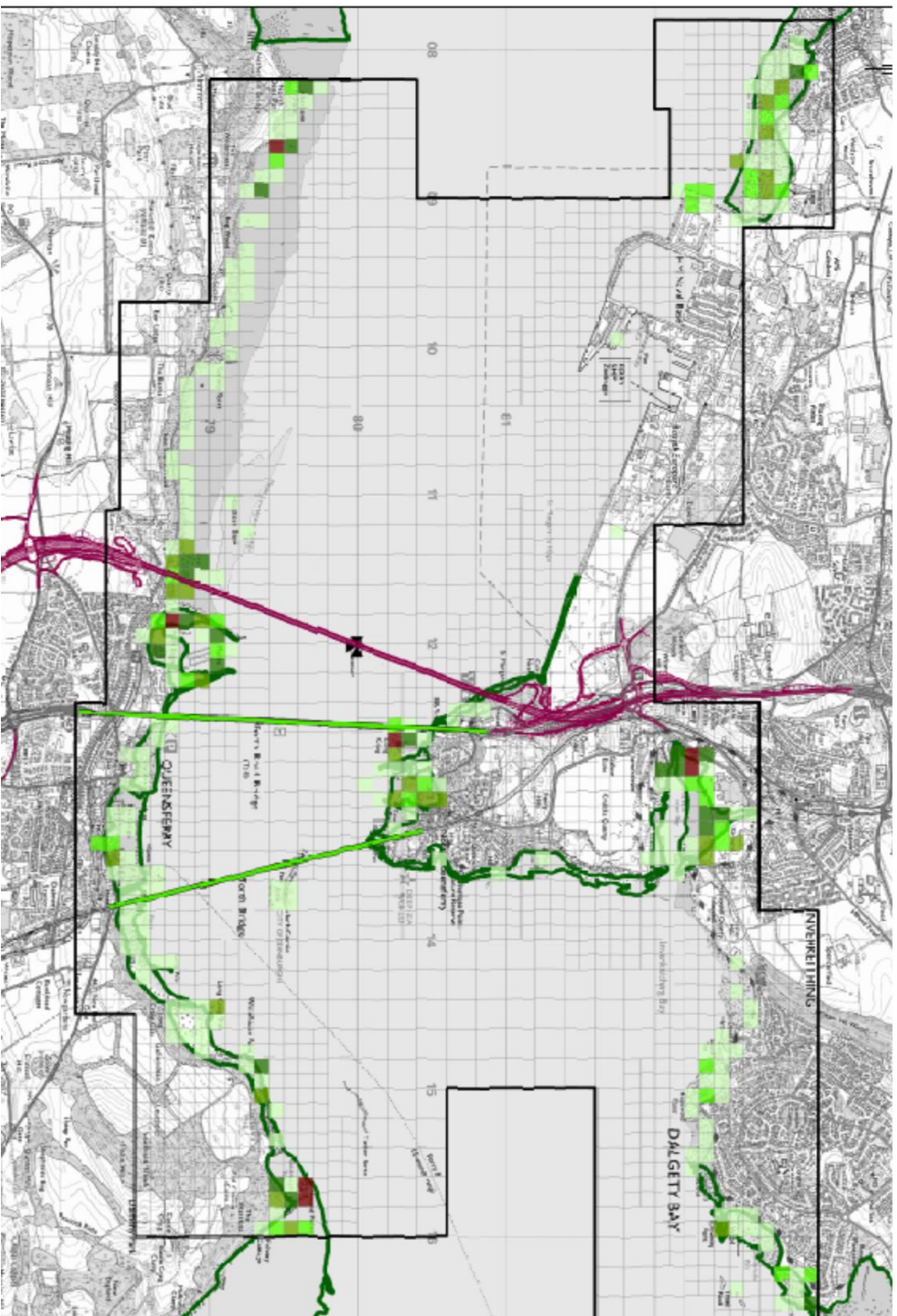


Example of Development Study Area for Birds



Example coastal
bird survey area for
transmission cable
landfall for an
offshore wind farm
(1km either side of
the cable landfall
and 1km inland)

Example of Development Study Area for Birds



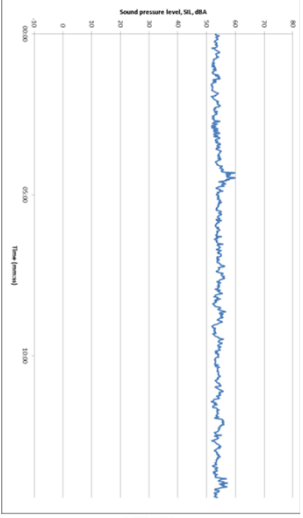
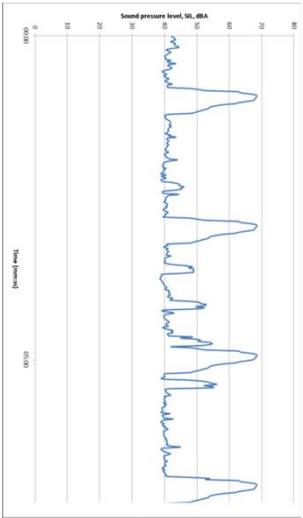
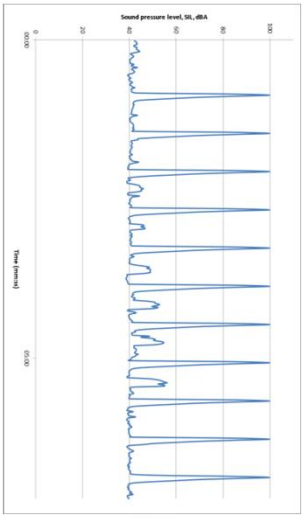
Example of data mapping roost counts of waders, Queensferry Crossing

Source: Jacobs Arup (2009)

Peak Wader Counts.
All Roosting Records.

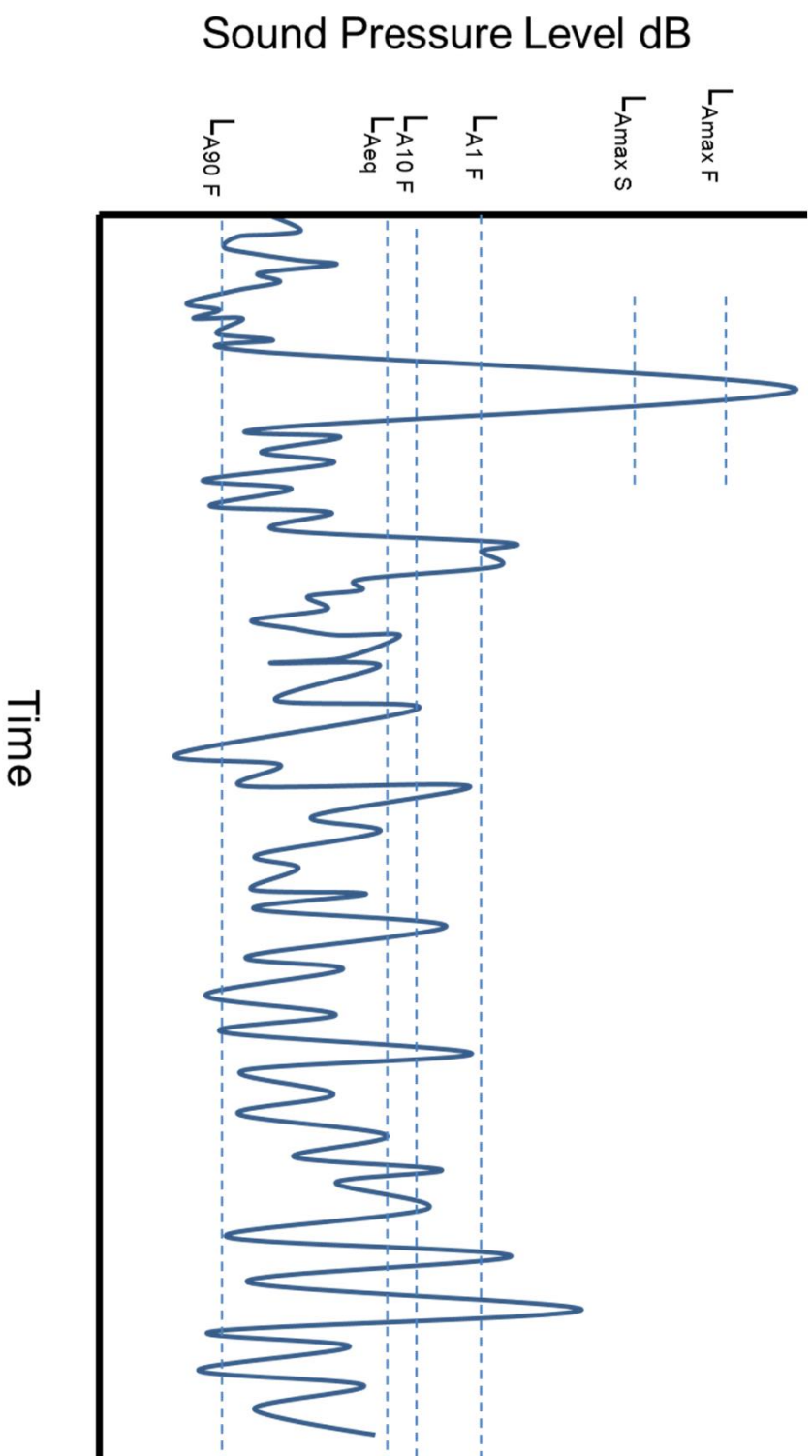
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Different types of sound

Type of noise	Examples	Possible effects	Graph
Continuous	Traffic, industry	Could be a concern w.r.t. masking	
Intermittent / variable	Aircraft, trains, construction	Intermittent effect for disturbance	
Impulsive	Piling, explosions, gun shots	Startle response, injury	

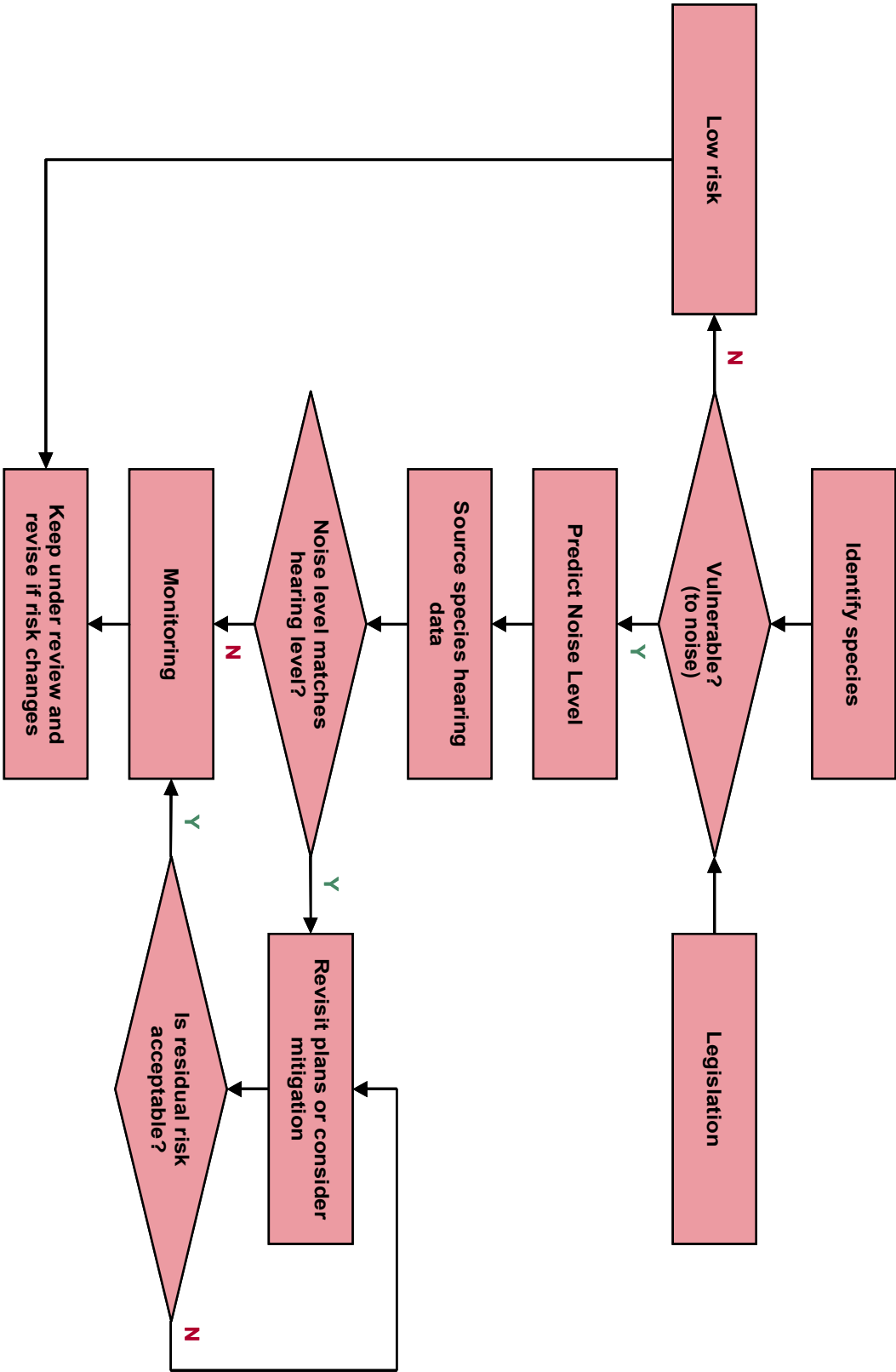


Acoustic parameters





Generic Impact Assessment Methodology





Potential effects of noise and vibration on wildlife

- Startle response / fleeing area
- Avoidance of area
- Abandonment of preferred breeding/feeding habitats
- Abandonment of offspring
- Loss of communication ability
- Altered prey / predator interaction
- Physical damage
 - hearing damage
 - injury
 - mortality
- Interference with echolocation (e.g. bats, porpoise)



Generic Scale of Significance of Impact on Animals

Impact	Semantic Descriptor	Significance
No reaction.	No impact	Not significant
Noise causes a reaction, either physiological or behavioural, but fauna returns to pre-exposure conditions relatively quickly and without continuing effects.	Slight	Not significant
Noise causes a reaction, either physiological or behavioural, but causes more permanent changes that do not readily allow individuals or communities to return to pre-existing conditions. Can include temporary nest abandonment.	Moderate	Significant
Noise causes demonstrable harm, either injury or death or causes situations such as permanent nest abandonment.	Severe	Significant

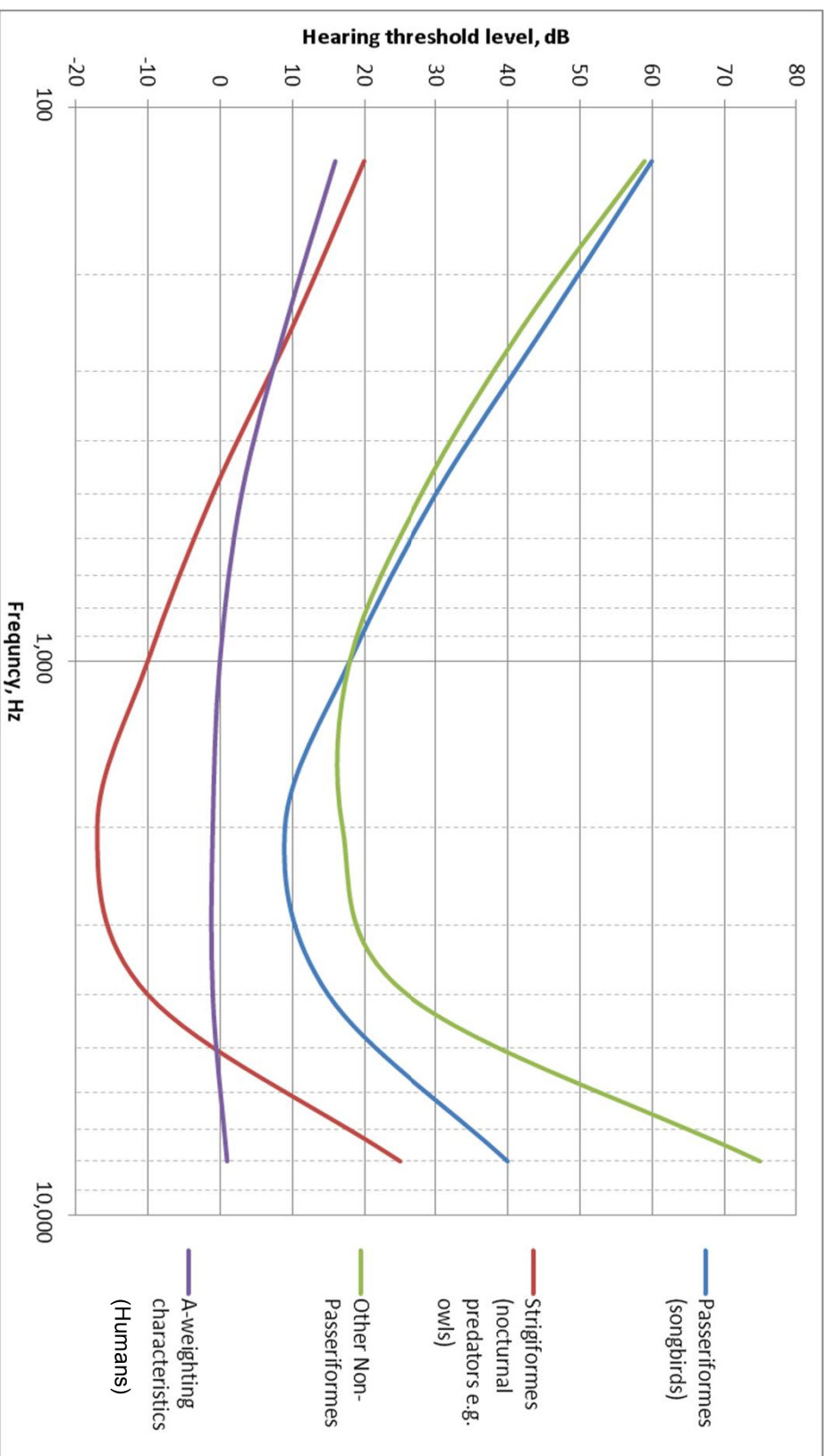
Based on IEMA guidance on noise impact assessment

- Relatively poor hearing sensitivity (except some species e.g. Strigiformes)
- Relatively well studied
- Mainly behavioural
- Evidence that some birds are driven away from sensitive areas (e.g. breeding near roads)
- Evidence of changes in behaviour (e.g. vocal effort)
- Startle response often (but not always) seen
- Relatively vulnerable





Birds and Noise





Birds and Noise

Institute of Estuarine and Coastal Studies (IECS) noise impact criteria – Construction noise and birds

Level	Impact	Effect Level	dB(A)	Type of Noise
1	No impact	Low	Below 50	Regular construction noise
2	Behavioural changes (alarm calls, heads up, change in feeding/roosting activity)	Moderate	Equal to or below 70	Piling noise
3	Movement within zone	Moderate to high	Above 70	Piling noise
4	Movement out of zone but remaining on site	High	Above 85	Piling noise
5	Movement off site	High	Not defined	

Probably L_{Aeq}

Probably L_{AFmax}

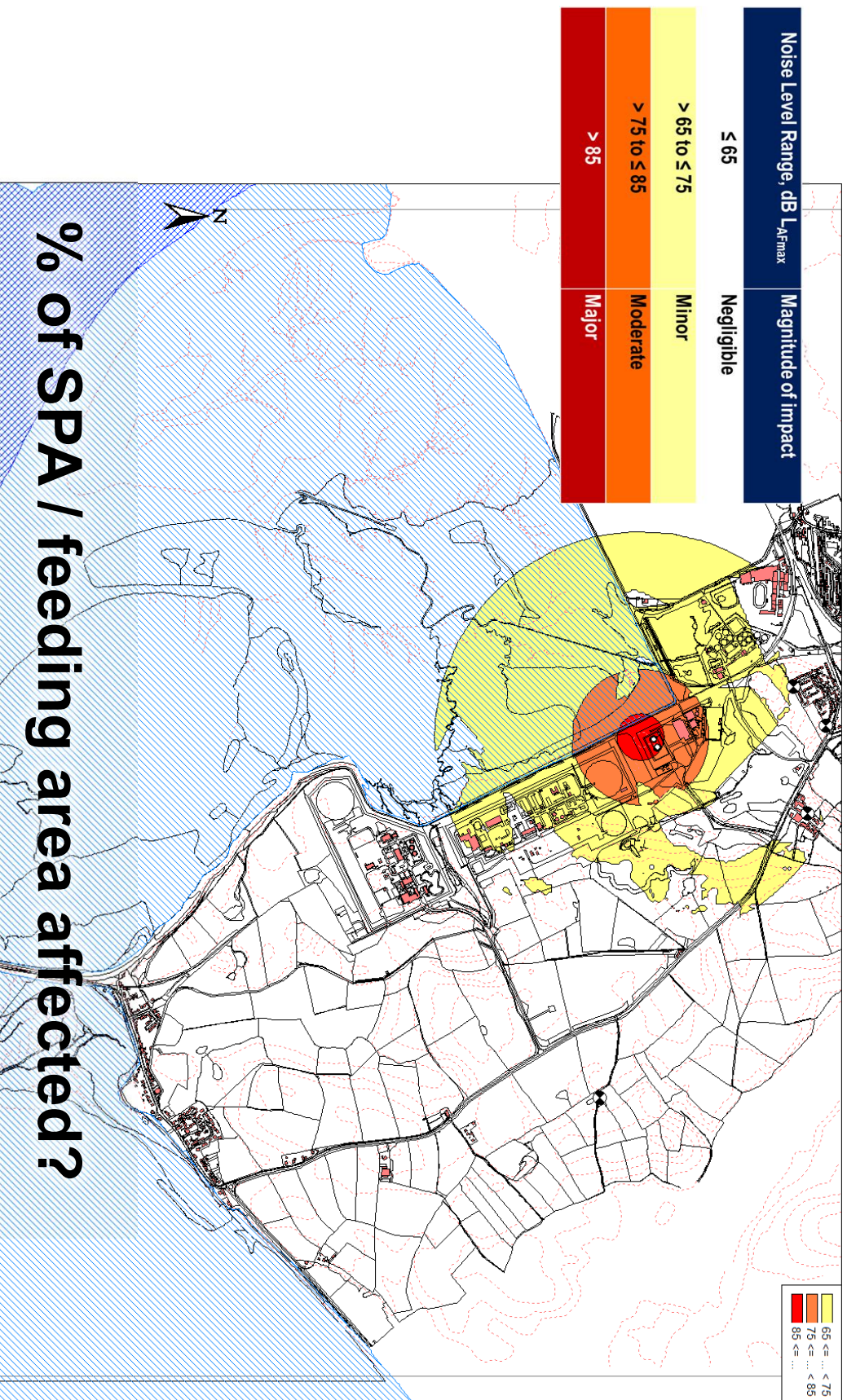
Example EIA criteria

Takes into account more recent studies as well as IECS

Noise Level Range, dB $L_{A_{Fmax}}$	Magnitude of impact
≤ 65	Negligible
> 65 to ≤ 75	Minor
> 75 to ≤ 85	Moderate
> 85	Major

Also need to take into account sensitivity etc.

Habituation and baseline noise also important (e.g. already noisy areas)

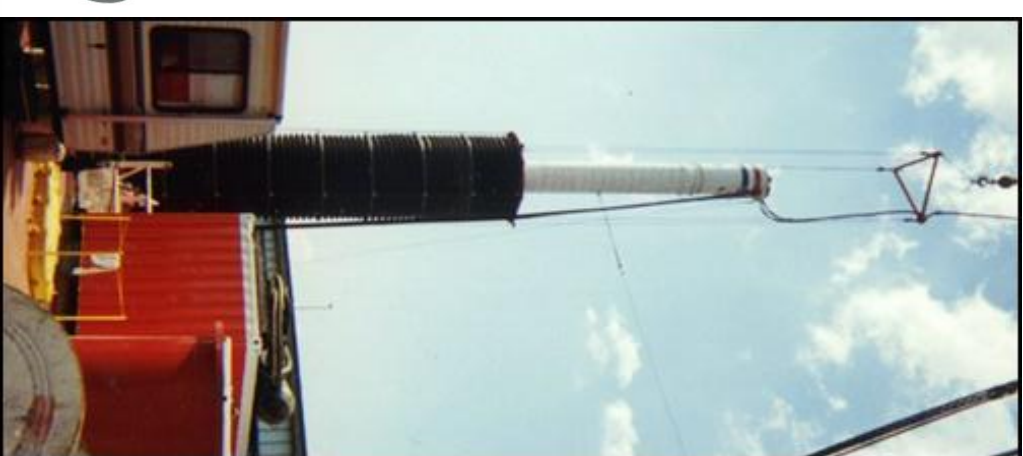
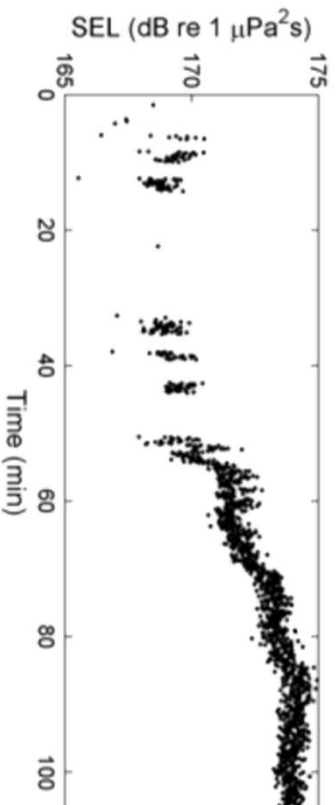


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- Soft-start of operations
- Deterrence (ADDs)
- Timing
- Screening / barriers
- Source selection
- Noise Control
- Monitoring



Mitigation





**Thank you for your time
Any questions?**

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