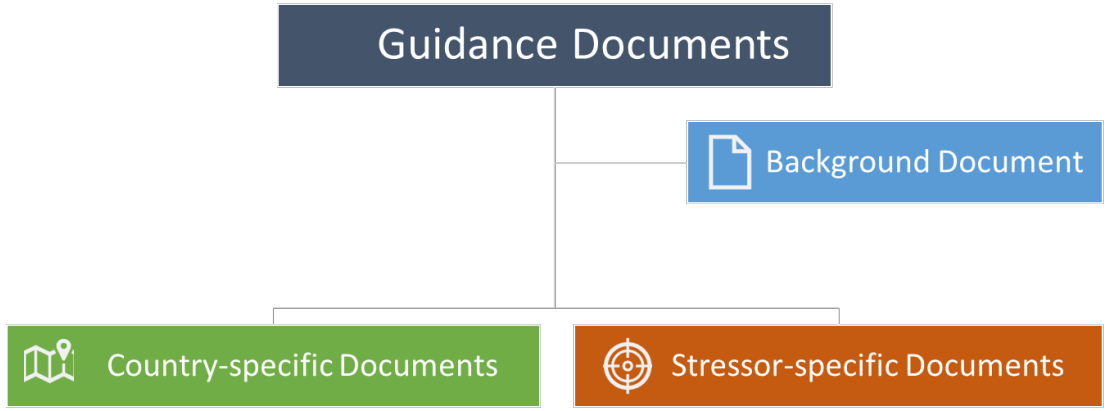
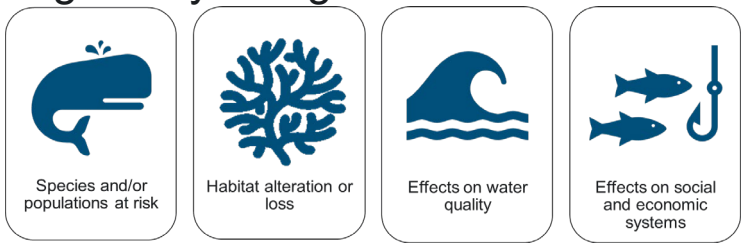
Breakout #2

11:30am – 12:05pm

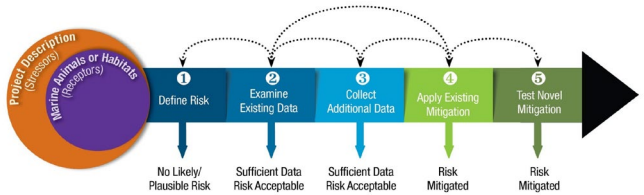


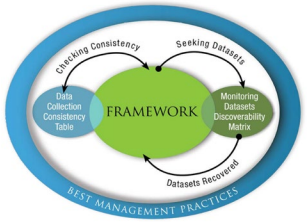
https://tethys.pnnl.gov/guidance-documents

- Discussion on guidance documents
  - Regulatory categories

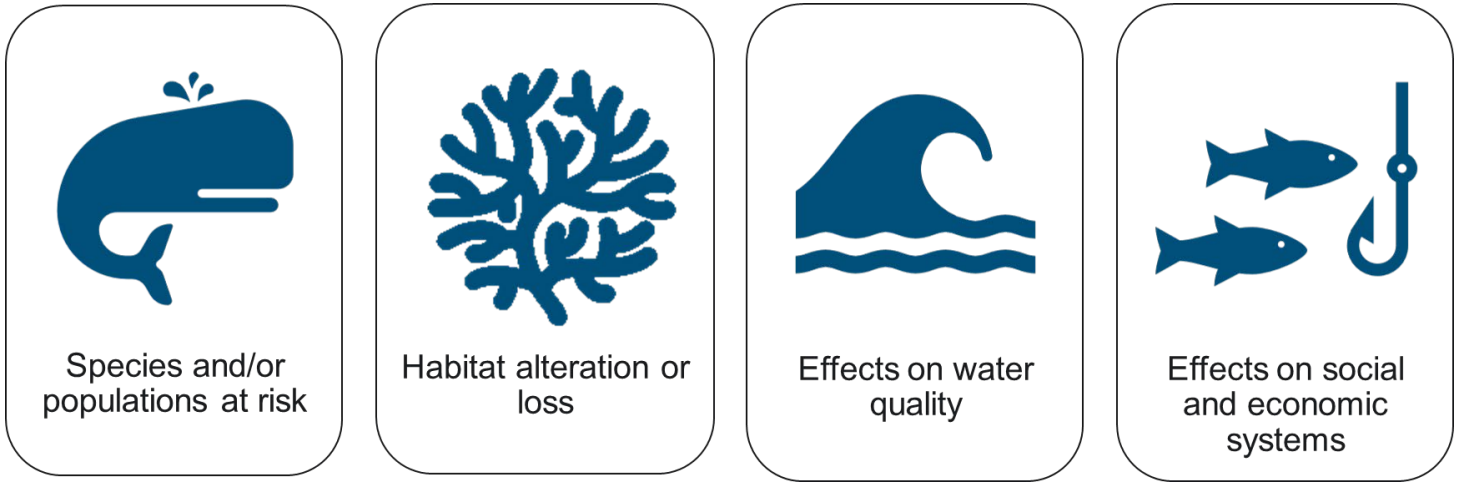


  - Exercise on application of guidance documents: framework, risk retirement and data transferability, useability for permitting processes





Regulatory Categories

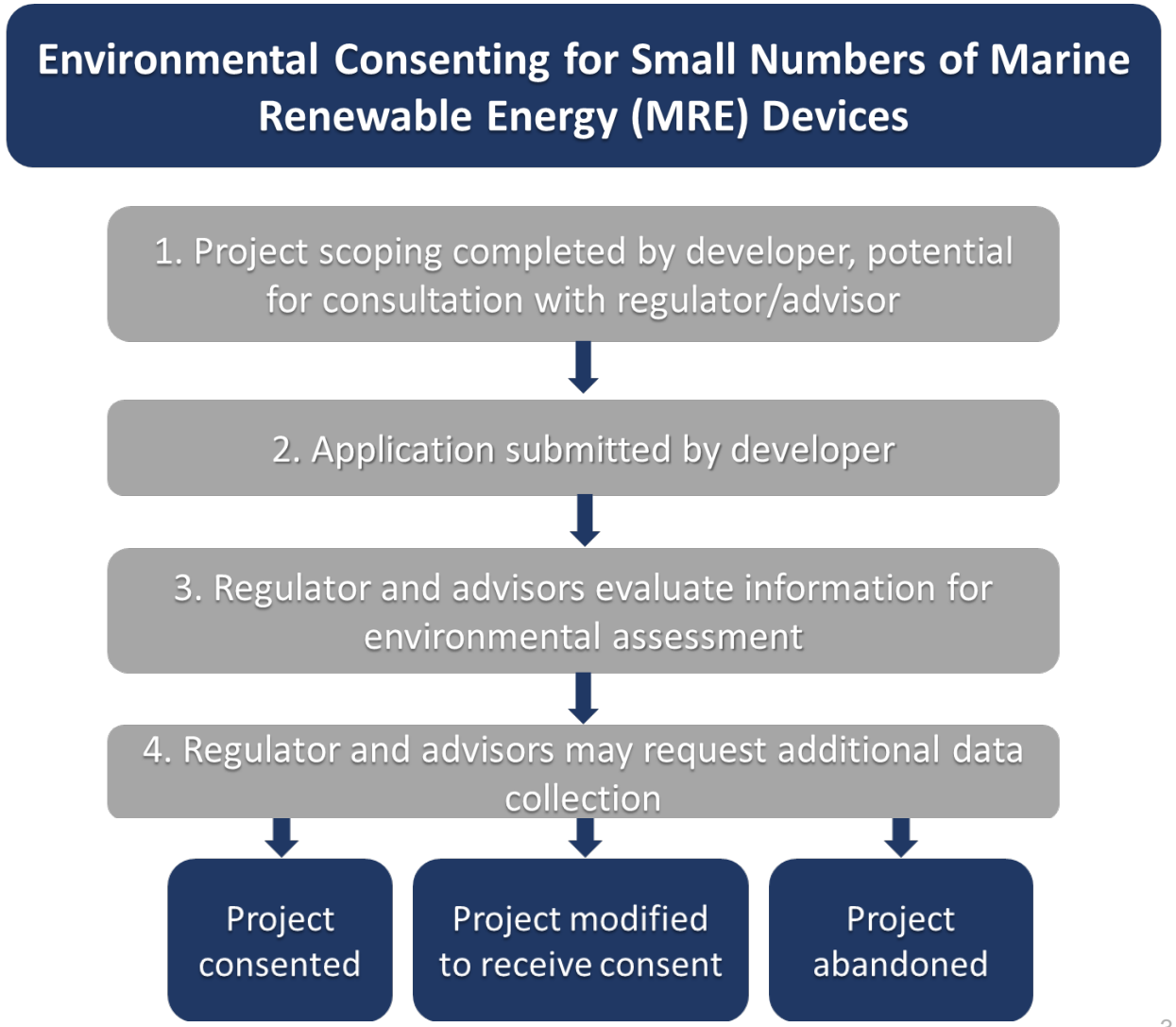


- Do the four regulatory categories make sense for capturing environmental effects of marine renewable energy and translating between science and regulatory processes?

- Is there anything missing that is not included in the four categories?

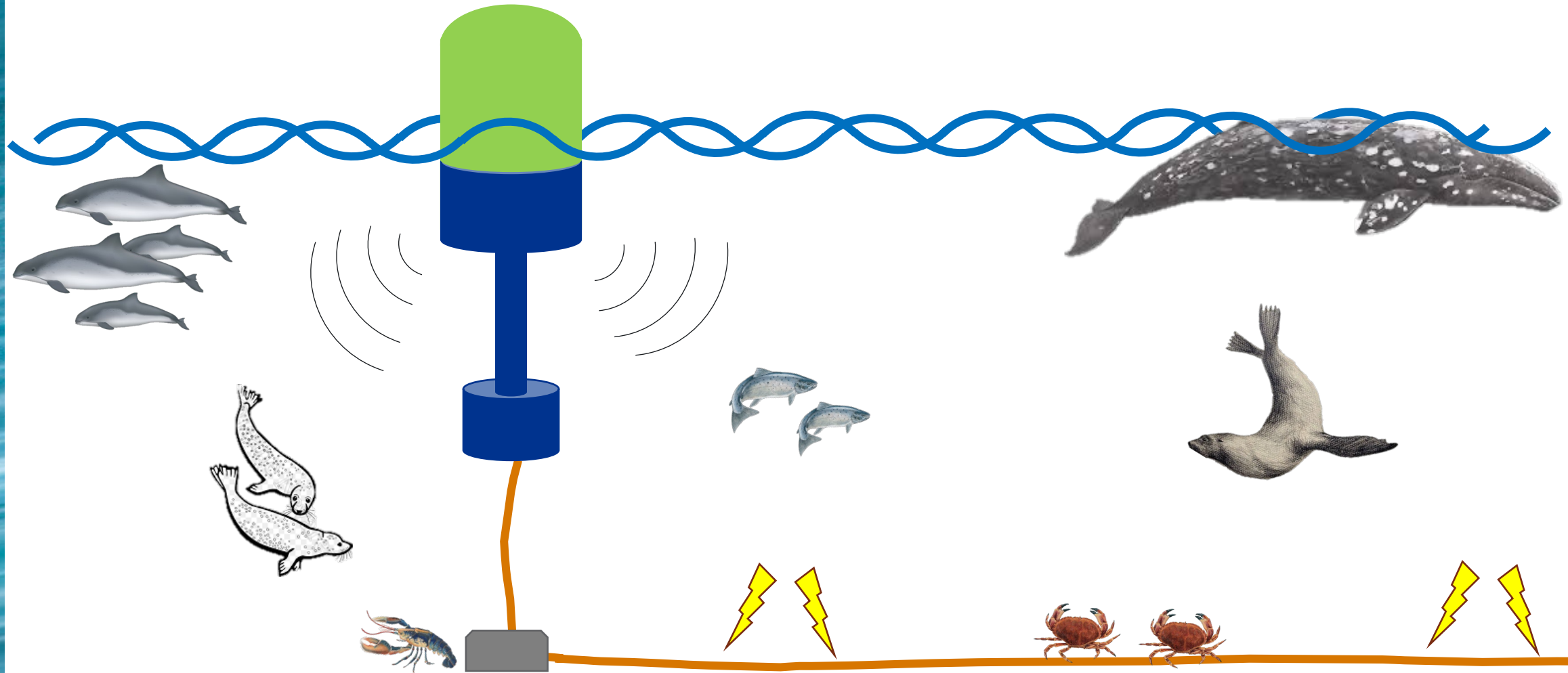
Exercise: Applying the guidance documents

- Hypothetical example to walk through framework
  - As a developer, how can the guidance documents and risk retirement be used in permitting processes
- Goals:
  - Assess the ability to use guidance documents for real-world permitting
  - Discuss application of risk retirement and data transferability

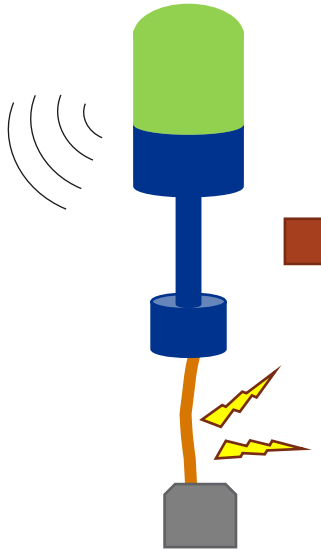


Hypothetical example

Wave energy deployment

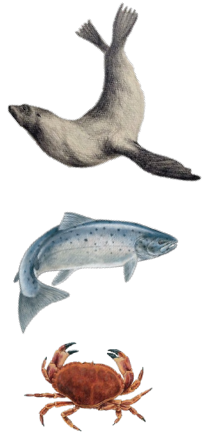


1. Project scoping completed by developer, potential for consultation with regulator/advisor



1a. Identify potential environmental concerns at the proposed site

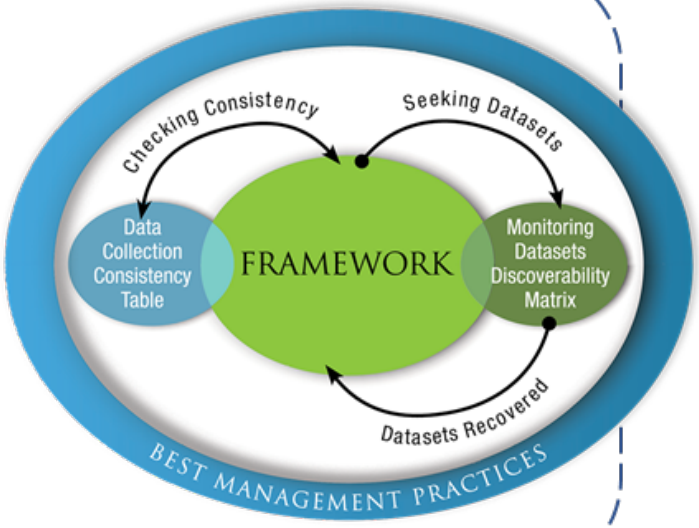
	Stressors	Receptors
Species and populations at risk	Collision	Sea turtles
	Entanglement	Marine mammals
	Underwater noise	Seabirds
	Electromagnetic fields	Fish
	Displacement	Invertebrates
Habitat alteration or loss	Habitat change	Benthic environments
	Oceanographic systems	Pelagic environments
		Marine plants and animals
Effects on water quality	Oceanographic systems	Water circulation
	Contaminants	Sediment transport
		Nutrient concentrations
		Primary production and food webs
		Marine plants and animals
Effects on social and economic systems	Device presence	Navigation and safety
	Project effects	Cultural resources
		Fisheries
		Recreation and tourism
		Visual impacts
		Jobs and economic opportunity



1. Project scoping completed by developer, potential for consultation with regulator/advisor

1b. Are data already available that could be transferred?

- Monitoring Datasets Discoverability Matrix
- Evidence Base for key stressors
- *Tethys* Knowledge Base
- Other relevant datasets for the site / region



Guidance Documents
Underwater Noise Example

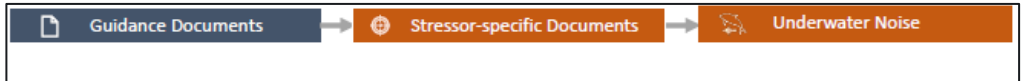


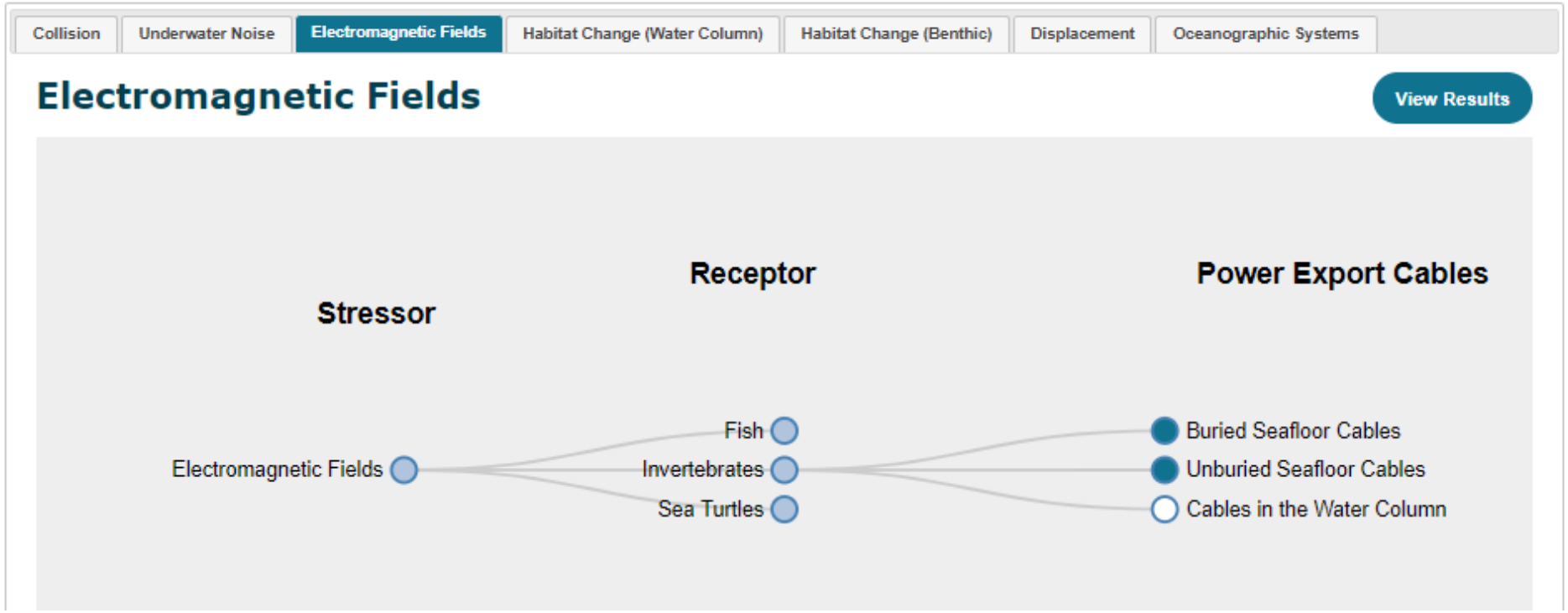
Table 1. A selection of studies from the evidence base for underwater noise effects on marine animals adapted from Copping et al. 2020a.

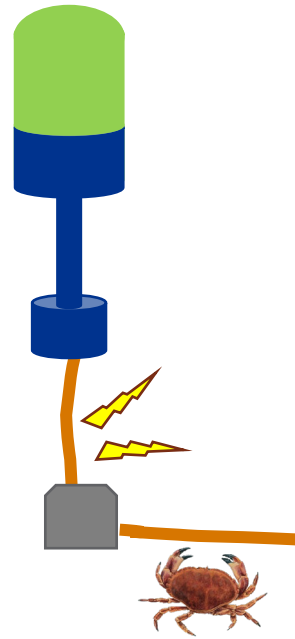
Project/Research Study	Location	Device type	Noise Measurements	Conclusion
Fred. Olsen Bolt Lifesaver (2016-2018) (Polagye et al. 2017)	U.S. Navy Wave Energy Test Site (WETS) – O'ahu, United States	Wave energy converter	Operational noise of floating point absorber wave device was 114 dB re 1 µPa for median broadband SPL, and mean levels as high as 159 dB re 1 µPa were infrequently observed. At one point during the study, the WEC had a damaged bearing, which coupled with the operational noise reached 124 dB re 1 µPa.	Operational noise levels remained below acceptable thresholds. Received levels exceeded the U.S. regulatory threshold for auditory harassment of marine mammals (broadband level of 120 dB re 1 µPa) for only 1% of the deployment. These exceedance events were dominated by non-propagating flow noise and sources unrelated to the Lifesaver.
WaveRoller (2012-2014) (Cruz et al. 2015)	WavEc – Peniche, Portugal	Wave energy converter	Operational noise of bottom-mounted oscillating wave surge converter prototype peaked at 121 dB re 1 µPa. Average broadband SPL measured with Hydrophone 2 varied between 115 and 126 dB re 1 µPa rms and with Hydrophone 1 between 115 and 121 dB re 1 µPa rms. SPL values decreased over time. The noise decreased within 300 m of the device.	Calculating the sound exposure level (SEL) of the WaveRoller sound, which was 150 dB re 1 $\mu Pa^2/s$, showed that no injury to cetaceans is expected. The results indicated that the frequency ranges at which the device operates overlap those used by some low and midfrequency cetaceans, but only behavioral responses would be expected if the organisms swim near the WaveRoller. Additionally, no cetaceans were around the WaveRoller device, likely due to the low depth where the device was installed.

https://tethys.pnnl.gov/publications/stressor-specific-guidance-document-underwater-noise

Monitoring Datasets Discoverability Matrix

EMF Example





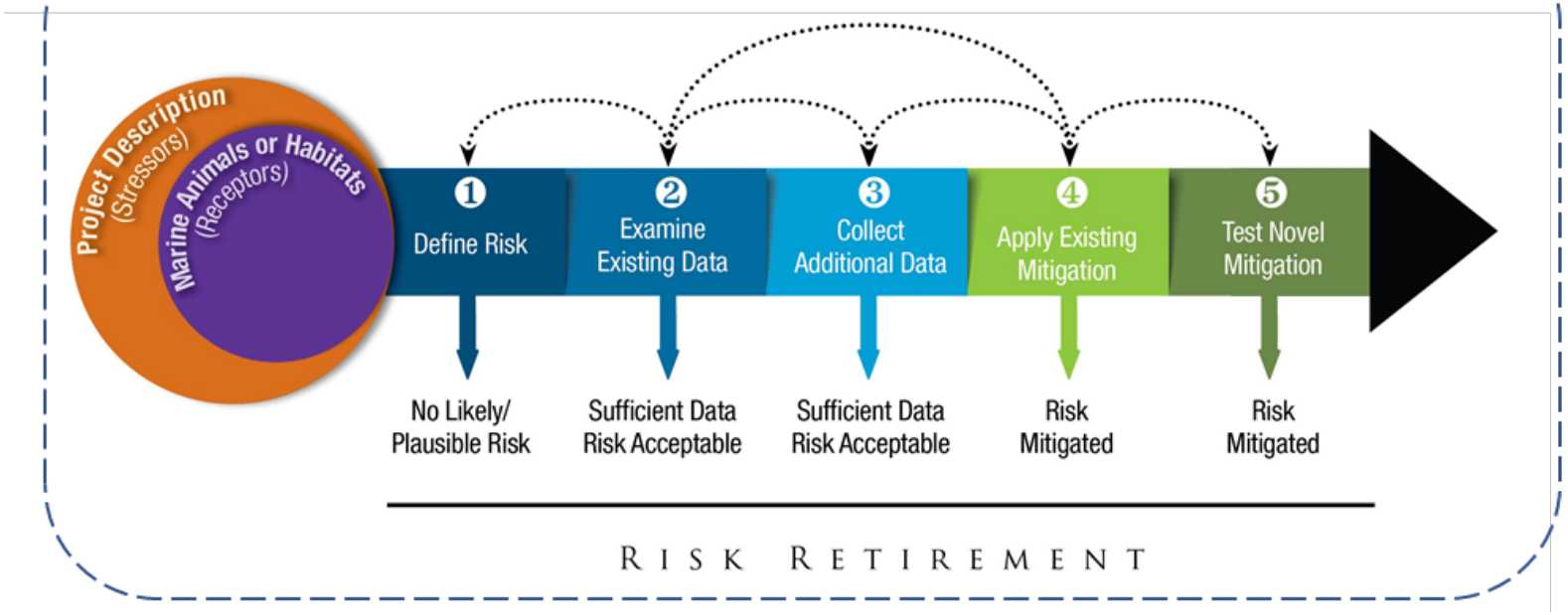
Post-Installation Monitoring: U.S. Navy Wave Energy Test Site (WETS)

EMF	Invertebrates	WET Year 1 Biological Assessment (October 2003 – October 2004)	Visual observations made by diver along replicate transects and surrounding area	No changes in the behavior, distribution or concentration of mollusks, echinoderms or arthropods was observed along the transmission cable. All species seen within the transect corridor, and on or under the transmission cable itself, were also sighted in comparable concentrations outside the transect corridor.	Completed

https://tethys.pnnl.gov/project-sites/us-navy-wave-energy-test-site-wets
https://tethys.pnnl.gov/monitoring-datasets-discoverability-matrix

1. Project scoping completed by developer, potential for consultation with regulator/advisor

1c. Can any risks be retired or managed?



https://tethys.pnnl.gov/risk-retirement

Guidance Documents Summaries

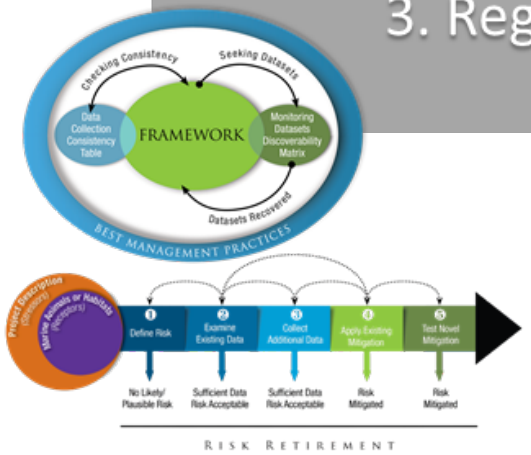
- Does EMF or underwater noise seem like significant risks or can they be retired based on the data/information gathered?

Stressor	Issues	Receptors	Sample Evidence	Consensus	Recommendations
Electromagnetic Fields 	Species and populations at risk: attraction, avoidance, or interference with orientation, navigation, or hunting.	Some species of: • Elasmobranchs, • Crustaceans, • Cetaceans, • Fish, and • Sea turtles	In an enclosure experiment with a 300kV buried DC cable, American lobster had a statistically significant, but subtle change in behavior in response to EMF and little skate had a statistically significant behavioral response to EMF from cable, but the EMF from the cable did not act as a barrier to movement for either species.	• The level of power carried by marine renewable energy (MRE) cables is much lower than offshore wind. • Risk can be retired for single devices and small arrays.	• Larger deployments may still require measurements to be taken.
Underwater Noise 	Species and populations at risk: Stress, behavioral changes, physical injuries, temporary or permanent impacts to hearing, or making of cues	• Marine mammals, • Fish, • Sea turtles, and • Invertebrates	Operational noise measurements of the WaveRoller oscillating wave surge converter peaked at 121 dB re 1 µPa and decreased within 300 m of the device. Sound exposure levels (150 dB re 1 $\mu Pa^2/s$) showed that no injury to cetaceans is expected and that only behavioral responses may be expected if organisms swim near the device; no cetaceans were around the device likely due to the low depth of the location	• Noise from MRE devices is generally lower than other anthropogenic sources • Risks can be retired for single devices and arrays as long as operational noise levels fall below those known to cause injury/harm.	• As the industry develops, impacts from large arrays and cumulative effects will need to be considered. • Regulatory action levels and guidance would benefit the industry

https://tethys.pnnl.gov/publications/stressor-specific-guidance-document-electromagnetic-fields
https://tethys.pnnl.gov/publications/stressor-specific-guidance-document-underwater-noise

2. Application submitted by developer

3. Regulator and advisors evaluate information for environmental assessment

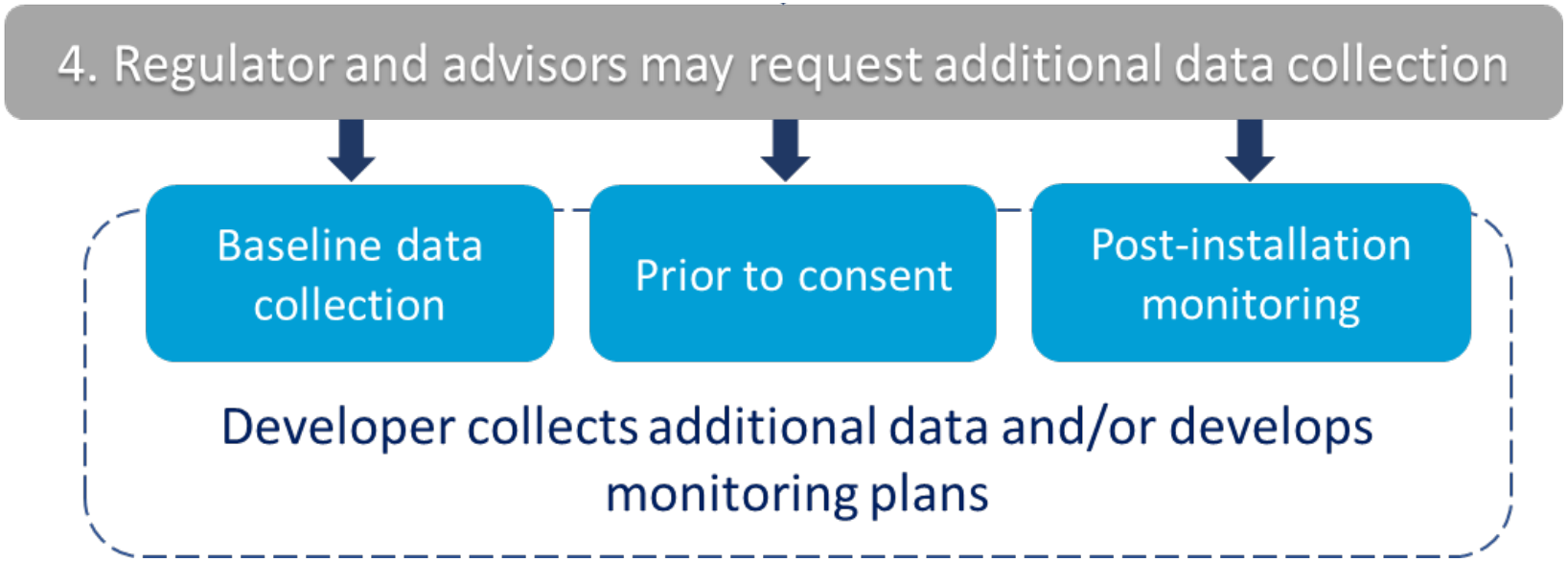


- Are there sufficient data to understand the risks?
- Are the risks acceptable?
- Can the remaining risks be managed?

Applying risk retirement and data transferability using data from evidence bases, matrix, and guidance documents

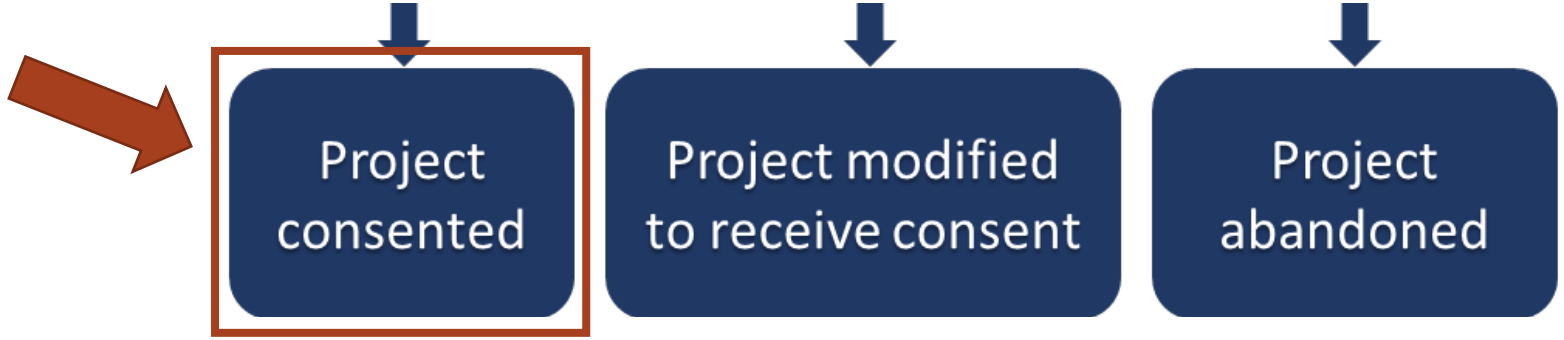
Sufficient data to retire risks

- ✓EMF
  - May need to manage potential effects through burying seafloor cable
- ✓Underwater noise
  - Will need to know if operational noise levels of the deployed device will exceed thresholds/guidance for injury/harm



Data needs:

- Background noise from deployment site (baseline data)
- Operational noise from deployed device to confirm falls below levels of harm/injury (prior to consent)
- Opportunistic observations of animal behavior near the device and around the cable (post-installation monitoring)



Pacific Northwest NATIONAL LABORATORY

Discussion