Appendix E: Sound transmission forecast and calculation methods

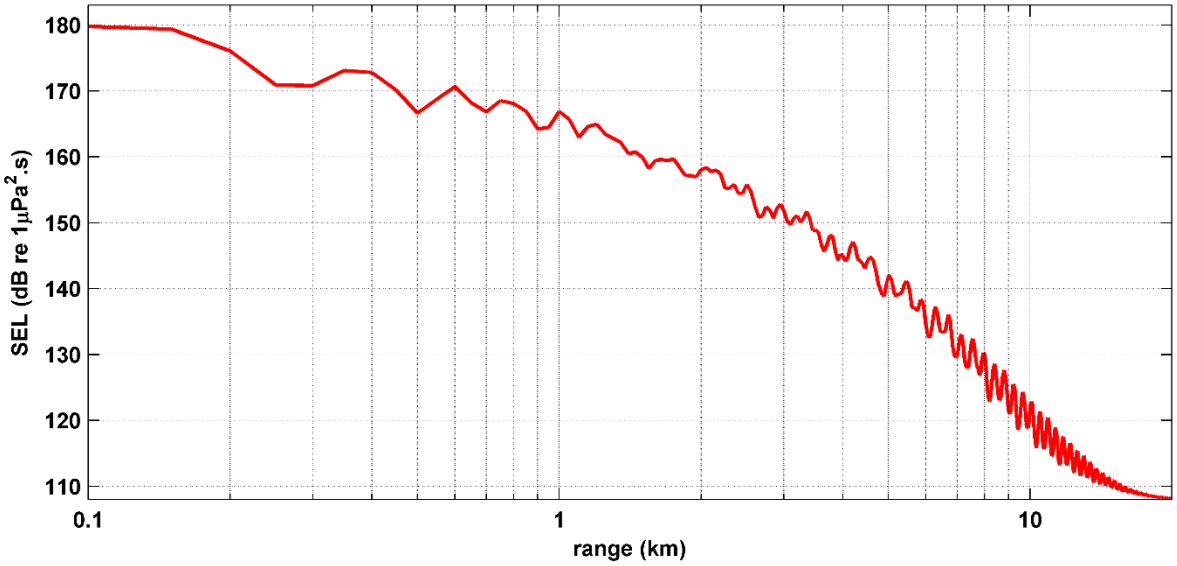

Figure 1. Estimated propagation in sound exposure level units of a 3130 cui seismic array towed at 6 m depth at the pearl study area.

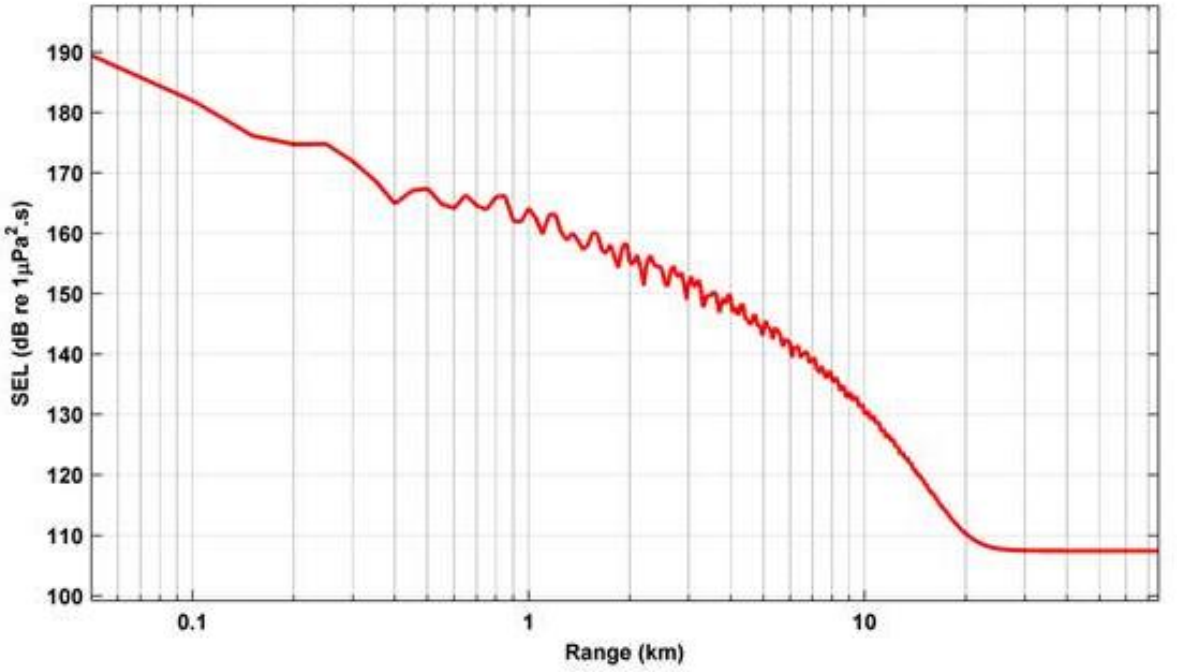

Figure 2. Estimated propagation in sound exposure level units of a 3130 cui seismic array towed at 6 m depth at the fish study area.

Modelling of the air gun signals was calculated using the sound propagation model Scooter run in the ActUp, Matlab interface (Curtin, www.cmst.curtin.edu.au/products). The model used an Austral summer, vertical sound speed profile downloaded from the World Ocean Atlas for the areas (Figure 3). The seabed type used a 1.5 m sand layer over limestone over a hard basement layer with appropriate geoacoustic parameters based on the author's previous experience in comparing modelled

output with measured data sets from the North West Shelf of Western Australia made in deeper water (McCauley *et al*., 2016).

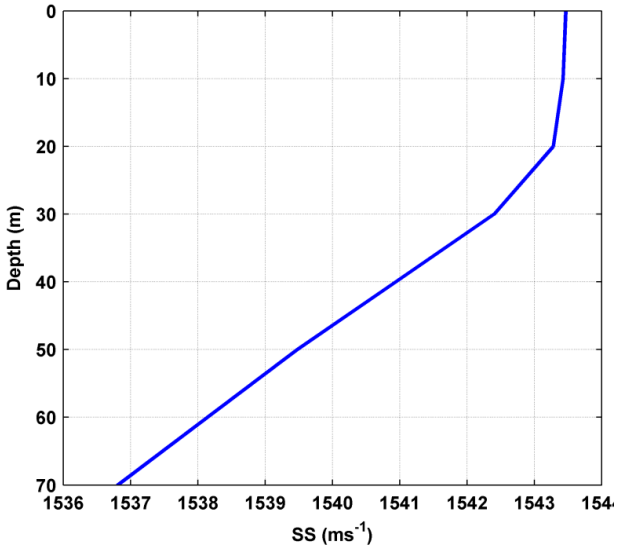

Figure 3. Vertical sound speed profile used in modelling sound propagation.

A CMST seismic source model was used to define the source spectra in the near horizontal plane 1° steps about the 3130 cui seismic source as used in the BRAHSS, humpback whale project. The source dimensions are listed in

Table 1. The source spectra were interpolated and integrated across the modelling frequency bands (modelled frequency ± 2.5 Hz) to give broadband energy source spectra matching the modelled frequencies. This source spectra was then corrected for the estimated transmission loss at each frequency to give a curve of received level with range at each frequency. A low ambient sea noise spectra from north Western Australia was then added in the linear domain to the estimated received level at the appropriate frequency. The energy across frequencies was then summed to give broadband received air gun array levels on each heading about the source

Table 1: Layout of the BRAHSS 3130 cui source giving the X (fore and aft, m), Y (across track, m) and gun volume (cui) for the four strings of the array.

X	Y	Vol	X	Y	Vol	X	Y	Vol	X	Y	Vol
-0.0	12.5	300	-0.0	4.5	100	-0.0	-3.5	100	-0.0	-11.5	150
-0.0	11.5	300	-3.5	4.5	250	-3.5	-3.5	250	-3.5	-11.5	250
-5.5	12.0	200	-3.5	3.5	250	-3.5	-4.5	250	-5.5	-12.0	40
-10.0	12.0	70	-8.0	4.0	80	-8.0	-4.0	80	-8.0	-12.0	200
			-10.0	4.0	70	-10.0	-4.0	70	-12.0	-12.0	40
			-12.0	4.0	40	-12.0	-4.0	40	-0.0	-11.5	150

All calculations were carried out in the Matlab (the MathWorks) environment. All spatial analysis used latitude and longitude co-ordinates (WGM-84 chart datum) assuming a spherical earth in the Matlab mapping toolbox.

References

McCauley RD, Duncan AJ, Gavrilov AN and Cato DH. (2016) Transmission of marine seismic survey, air gun array signals in Australian waters. Proceedings of ACOUSTICS 2016, 9-11 November 2016, Brisbane, Acoustics Australia