Advice from Professor Richard Fuller, University of Queensland, regarding the assessment of the proposed Turtle Cove Haven Retirement Village at River Heads, Queensland (EPBC 2013/3078) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The Department is hoping you are able to provide some advice regarding the likely impacts and suitable mitigation measures for migratory shorebirds.

Further information on the proposed development can be found at: http://epbcnotices.environment.gov.au/referralslist/

Request for advice

• How important/significant is the clay pan at Turtle Cove as habitat for migratory shorebirds in Australia, in particular the Eastern Curlew? Are there other similar sites in Australia?

Monitoring data from the Queensland Wader Study Group (QWSG) show that the claypan at Turtle Cove is the most numerically important high tide roost site for Eastern Curlew within the Great Sandy Strait, which itself is one of the most important areas in the world for Eastern Curlew. In 2005, 1182 Eastern Curlew were observed roosting on the claypan at Turtle Cove, a number that represents more than 3% of the global population (most recently estimated at 35,000 individuals; Hansen et al. 2016). Since 1995 when QWSG began monitoring the claypan at Turtle Cove for shorebird numbers, the average count of Eastern Curlew occupying the Turtle Cove claypan is 553, corresponding to 1.6% of the global population. As such, the claypan at Turtle Cove alone consistently meets the numerical criterion for international importance (1% of the flyway population) and far exceeds the criterion for a site of national importance (0.1% of the flyway population). The claypan at Turtle Cove is safely among the top 5 most important sites for Eastern Curlew in Australia.

• Are the following measures likely to adequately mitigate the impacts to migratory shorebirds, in particular the Eastern Curlew, at Turtle Cove?

I provide comments under each measure below.

• Maintain at least a 250m buffer zone from the highest astronomical tide to the development footprint. No activities may occur within the buffer zone.

In my view, this width of buffer zone is a minimum for managing disturbance impacts to listed migratory species, including the Eastern Curlew. One way to measure the disruption caused by a disturbance agent (e.g. person walking) is to measure the distance at which a bird takes flight, the so-called flight initiation distance. There are no relevant studies from the Great Sandy Strait, and the only way to robustly set a buffer zone width for this particular case would be to conduct a study *in situ* at the planned development site. However, a study in Victoria has revealed some useful numbers (Glover et al. 2011). Eastern Curlew is the largest migratory shorebird in Australia, and has the longest flight initiation distance. Thus, it is the most appropriate species for estimating buffer width. Mean flight initiation distance in the Victorian study for Eastern Curlew was 126 m (minimum: 81 m, maximum: 196 m; Glover et al. 2011). Importantly, flight initiation distance was highly variable, and increased in a statistically significant manner with intruder starting distance, suggesting that the mean flight initiation distance does not represent a single threshold beyond which Eastern Curlews trade off risk (Blumstein et al. 2003). This indicates that "conservative set-back distances should be much larger than the mean FID" (Blumstein et al. 2003, p. 856).

Because the physiological impacts of disturbance are apparent well before a bird actually takes flight (e.g. Weimerskirch et al. 2002), a buffer distance exceeding the maximum observed flight initiation distance for Eastern Curlews is warranted. The only available data are 22 trials conducted by Glover et al. (2011), which returned a maximum flight initiation distance of 196 m. Given the likelihood of a greater sample size of trials detecting longer flight initiation distances, a buffer of 250 m seems to me a bare minimum at which to set a buffer zone.

Finally, it is critical that as well as no development (e.g. buildings, fences, screens) occurring within that buffer zone, no disturbance occurs, i.e. no dogs, vehicles or pedestrians are permitted.

• Prior to commencement, establish and maintain for the life of the project, screening within the buffer zone to minimise visual disturbance and impacts associated with light and noise.

Yes, it is a sensible proposal to establish screening for these reasons, but this screening must be set at the inland edge of the buffer zone, and not within it. A screen is, by definition, a development – and the condition above states that development cannot occur within the buffer zone. The buffer zone is solely for buffering the effects of the development, and needs to be free of infrastructure or disturbance agents.

The screening needs to be "appropriately designed to screen disturbance without itself creating a intrusive visual obstruction for the roosting listed migratory birds"

• No construction activities during roosting periods for EPBC Act listed threatened species and EPBC Act listed migratory species or during the period of 1 September through 30 March each year.

I suggest some modifications to ensure the meaning of this is crystal clear:

"No construction activities are permitted during roosting periods for EPBC Act listed threatened species and EPBC Act listed migratory species. Baseline surveys must be conducted to determine when roosting birds are present in relation to the tide height and time before or after high tide. Additionally, no construction activities are permitted during the period of 1 September through 30 March".

• Must not have an impact on the water quality entering the Great Sandy Strait Ramsar wetland.

OK.

• Develop a long term before-after, control-impact design monitoring program that enables the identification of impacts from the action on the receiving environment, particularly water quality.

OK.

• Ensure there is no decline in Eastern Curlew numbers, foraging and roosting habitat quality, or foraging and roosting habitat extent, compared to baseline information obtained prior to commencement of the action.

This is impossible for the proponent to meet – and it doesn't state what happens if a decline does occur, what constitutes a decline, and over which timeframe that decline should be measured. Typically it takes many years for declines in shorebird numbers to be statistically detectable (Wilson et al. 2011), by which time it may be too late to change course. Additionally, measuring quality of roosting / feeding habitat will be time consuming and error prone, and I think it distracts from the main issue, which is the number of birds using the site to roost. I suggest:

"Develop a long term before-after, control-impact design monitoring program that enables the rapid identification of impacts from the action on (i) the number of individuals of each roosting listed migratory species and (ii) the prevalence of disturbance to listed migratory species (e.g. changes in the amount and types of recreational use of the foreshore), compared to baseline information obtained prior to commencement of the action. With respect to shorebird numbers, baseline surveys must occur in summer when large numbers of migratory shorebirds are present, must measure the variability in numbers of individuals of each roosting listed migratory species present, and use this to establish trigger points at which the action will be modified or suspended if the number of individuals of any roosting listed migratory species falls below its trigger point".

• During construction and operation install and retain appropriate lighting on the project site to reduce impacts on EPBC Act listed migratory species and EPBC Act listed threatened species.

"Impacts" is a little vague in this context. Perhaps this should be "During construction and operation install and retain appropriate lighting on the project site to reduce impacts of light spill on EPBC Act listed migratory species and EPBC Act listed threatened species". As previously outlined, screening must be installed prior to commencing the development to minimize impacts of light spill, noise, and subsequent construction activities.

• Are there other appropriate mitigation measures that could be applied at Turtle Cove to minimise the impact of the development on migratory shore birds, in particular the Eastern Curlew?

The main additional issue is appropriately managing the activities of residents / occupants of the site after the development is completed. Careful planning around access to the shoreline is needed, e.g. where will community members spend recreational time? The proponent needs to have a disturbance management plan in place that will appropriately limit the proximity of people to the roost site once the development is complete and operational.

• Are you able to provide scientific papers to support the need for buffer zones or other mitigation measures to minimise impact to migratory shorebirds?

References cited above, full texts attached by email:

Blumstein DT (2003) Flight-initiation distance in birds is dependent on intruder starting distance. *Journal of Wildlife Management*, 67, 852-57.

Glover HK, Weston MA, Maguire GS, Miller KK & Christie BA (2011) Towards ecologically meaningful and socially acceptable buffers: Response distances of shorebirds in Victoria, Australia, to human disturbance. *Landscape and Urban Planning*, 103, 326-34.

Hansen BD, Fuller RA, Watkins D, Rogers DI, Clemens RS, Newman M, Woehler EJ & Weller DR (2016) *Revision of the East Asian-Australasian Flyway Population Estimates for 37 listed Migratory Shorebird Species*. Report for the Department of the Environment. BirdLife Australia, Melbourne.

Wilson HB, Kendall BE, Fuller RA, Milton DA & Possingham HP (2011) Analyzing variability and the rate of decline of migratory shorebirds in Moreton Bay, Australia. Conservation Biology, 25, 758-766.

Weimerskirch H, Shaffer SA, Mabille G, Martin J, Boutard O & Rouanet JL (2002) Heart rate and energy expenditure of incubating wandering albatrosses: Basal levels, natural variation, and the effects of human disturbance. *Journal of Experimental Biology*, 205, 475-83.