Methodology and Sources for Roofs and Covers - Swine

Ecosystem Service	$/Animal Unit/Year	Citation
GHG Mitigation (at $51/tonne CO2e)	$138	The average uncovered emissions from a swine waste lagoon are 31kg per m3 per year. At 45 m3 required per AU, the baseline emissions are 1,395kg methane per AU per year (Kupper et. al., 2020). Kupper et al. (2020) determined that lagoon covers* reduce CH4 emissions by 8%. At an 8% reduction, implementing a cover reduces emissions by 111 kg per AU per year. When converted to CO2e per AU and converted to tonnes, the reduction is 2.7 tonnes per AU. At a value of $51 per tonne CO2e, the benefit is $138. *Cover types for which there was available methane data: lid (wood or concrete), plastic film, plastic fabrics, expanded clay, expanded polystyrene, plastic tiles, peat, straw cover, and vegetable oil.

Air Quality/ Human Health Benefits	$870	A covered lagoon saves 9lbs of ammonia from storage-related loss per head of swine ("Managing Manure to Improve Air and Water Quality," USDA ERS, 2005). Divided by 0.4 for animal unit conversion yields a value of 22.5lbs per AU. The public cost of ammonia emissions in the United States is $54,900 per ton NH3 (Heo et al., 2016), resulting in a per-animal unit benefit of $607. In "Ammonia and greenhouse gas emissions from slurry storage - A review," Kupper et al. (2020) determine that swine lagoon covers* tend to reduce ammonia emissions by an average of 71% compared to uncovered lagoons. The data suggests that covering lagoons reduces ammonia by 42 pounds per animal unit. Multiplied by $27 per lb ammonia is $1,134 per AU (Kupper et. al. 2020). The average of $607 per AU per yr and $1,134 per AU per yr equals $870 per AU per yr. *Cover types for which there was available ammonia data: lid (wood or concrete), tent covering, plastic film, plastic fabrics, expanded clay, expanded polystyrene, plastic tiles, peat, straw cover, and vegetable oil.
Total	**$1,008**	