Appropriate Assessment and Environmental Impact Assessment for EA/00042/20 regarding avifauna

As per ERA requirements for the Planning Application of the proposed construction of a Material Recovery Facility (MRF) for the processing of grey bag and recovery of different streams of materials.

The proposal includes ancillary office space, staff quarters and parking spaces. The site is located at Ecohive Complex, Tul il-Kosta / Triq ir-Ramla, Triq ta' Saverja, Naxxar.

Technical Report

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1.0 Methodology for the avian study

The study at hand considers populations of wild birds, in particular populations of protected species and of species with conservation concern as relevant sensitive receptors.

The Area of Influence for the avifauna assessment of the terrestrial part of the proposed development, from here onwards referred to as **AoI-1**, consists of the actual site area of the proposed MRF development and a 0.1 km buffer zone around this area (Figure 1).

The additional potential impact on avifauna in the wider area, e.g. caused by light pollution from the planned development is assessed as a 5.0 km buffer around the site area of the proposed development, referred to as **AoI-2** from here onward (Figure 1).

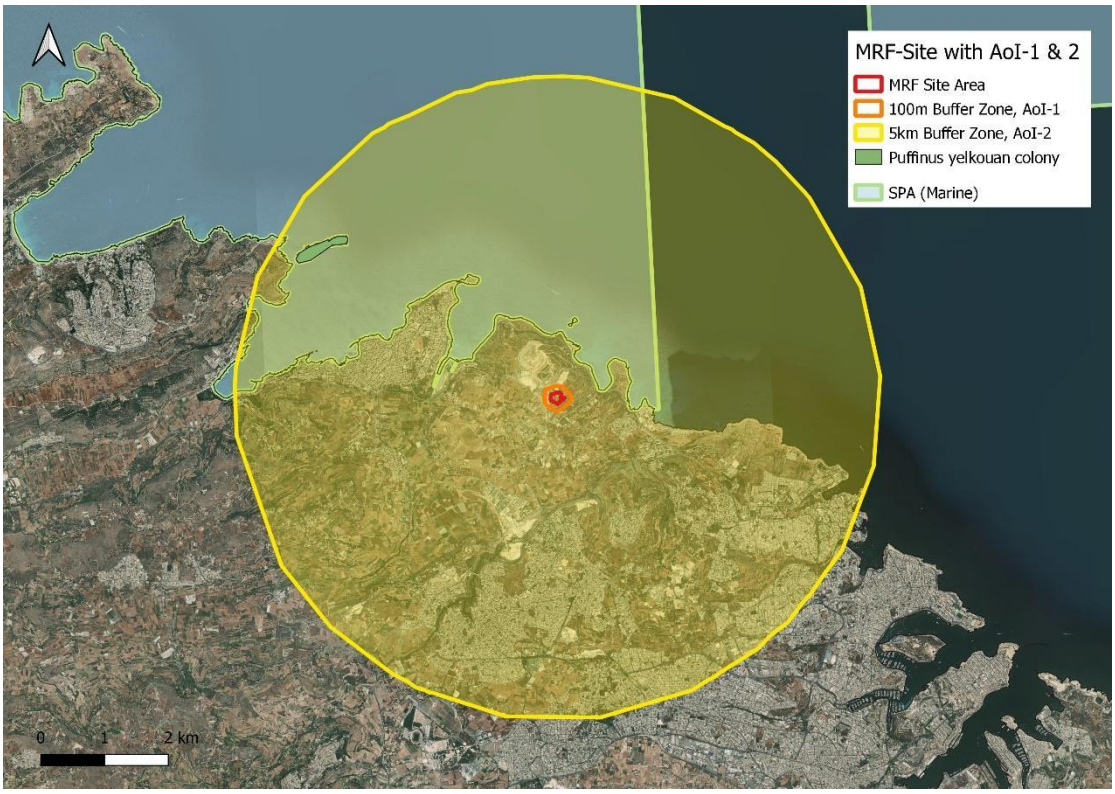

Figure 1: Proposed MRF Site with AoIs relevant to avifauna

The assessment of potential impacts on avifauna receptors in the identified AoIs was performed through a literature review.

The main references considered were:

- Malta Breeding Bird Atlas 2008 (BirdLife Malta 2009)
- Malta Breeding Bird Atlas 2018 (Epsilon 2019)
- The Breeding Birds of Malta (Sultana et al. 2011)
- Malta Marine Important Bird Areas (IBA) Inventory Report (BirdLife Malta 2015)
- Marine Strategy Framework Directive (MSFD) initial assessment report, seabirds (Borg et al. 2013)
- MSFD second assessment report (ERA 2020)

- BirdLife International (2024) IUCN Red List for birds. Downloaded from https://datazone.birdlife.org/species/searchBird species of Annex I of the Birds Directive (Last updated: 14/09/2020)
- Draft Guidelines for the Reduction of Light Pollution in the Maltese Islands (Environment and Resources Authority 2020).

The Natura 2000 sites that are either situated within or partially overlapping with the AoI-2 are the SAC L-Għadira s-Safra (MT0000008), the SAC Is-Salini (MT0000007), the SAC Il-Gżejjer ta' San Pawl (Selmunett, MT0000022), as well as the marine SPA Żona fil-Baħar madwar Għawdex (MT0000112).

The report details the conservation status of the relevant bird species within the AoIs and in the above-mentioned Natura 2000 sites.

2.0 Avifauna baseline study - desktop review

2.1 General overview

More than 400 bird species have been recorded in the Maltese Islands and their Fisheries Management Zone (FMZ; 25 NM) (Bonavia, pers. comm.). Slightly above two hundred of these species occur in the Maltese Islands regularly[1]. Up to 48 bird species have been recorded breeding on the Maltese Islands, of which 23 are regular breeders from wild populations[2]. Three species, all pelagic seabirds, hold significant breeding populations in the Maltese islands from an EU, European and global perspective, and are listed under Annex I of the EU Birds Directive[3]. Information regarding the species' conservation status, population numbers, trends and range presented below are derived from BirdLife International's Data Zone[4]. All information regarding species listed in Annex I of the EU Birds Directive (2009/147/EC) such as population numbers in the EU were obtained from the Environment, Nature and Biodiversity site of the European Commission[5].

The 5.0 km buffer zone around the proposed development, AoI-2, overlaps to various extents with the following five sites that are protected within the Natura 2000 network and of conservation interest in relation to bird species:

- SAC Pembroke (MT0000002)
- SAC Is-Salini (MT0000007)
- SAC L-Għadira s-Safra u l-Iskoll tal-Għallis (MT0000008)
- SAC Il-Gżejjer ta' San Pawl (Selmunett, MT0000022)
- SPA Żona fil-Baħar madwar Għawdex (MT0000112)

The avifauna baseline study intends to inform which receptors (bird species) are expected to occur in the AoIs, including in the above listed, potentially impacted protected areas in relevant numbers.

[1] *Bonavia et al. (2005): Systematic list 1996-1999, Il-Merill 31, 1-34.*

Bonavia et al. (2010): Systematic list 2000-2005, Il-Merill 32, 55-109.

[2] *Epsilon Malta Ltd, Nature Conservation Consultants (2019). Malta Breeding Bird Atlas 2018. Malta: Wild Birds Regulation Unit, Ministry for the Environment, Sustainable Development and climate Change*

[3] Maltese Environment and Resources Authority - ERA (2020): Update of Articles 8, 9 and 10 of the Marine Strategy Framework Directive (2008/56/EC) in Malta's Marine Waters. Second Assessment Report, pp.321-344.

[4] *BirdLife International (2020) IUCN Red List for birds. Downloaded from http://www.birdlife.org on 18/09/2020.*

[5] *https://ec.europa.eu/environment/nature/conservation/wildbirds/threatened/index_en.htm*

2.2 Breeding landbirds within the AoI-1

Four bird species have been reported as confirmed, probably, or possibly breeding within the AoI-1 according to the Malta Breeding Bird Atlas 2008[6] and 2018[7], considering the breeding seasons 2008, 2017 and 2018. Two of the four species regularly choose anthropogenic structures as nest sites.

Table 1: List of breeding bird species in the AoI-1 and their status

Species	Breeding status in AoI-1	Abundance status	Trend in Malta	Trend in Europe	Conser-vation status	Annex I (EU Birds Directive)
Blue Rock Thrush *Monticola solitarius*	Possible	Frequent	Stable	Unknown	Least Concern	No
Sardinian Warbler *Curruca melanocephala*	Probable	Common	Decreasing	Stable	Least Concern	No
Zitting Cisticola *Cisticola juncidis*	Probable	Abundant	Stable	Increasing	Least Concern	No
Spanish Sparrow *Passer hispaniolensis*	Confirmed	Abundant	Stable	Decreasing	Least Concern	No

2.3 Seabirds of Maltese breeding populations utilising the AoI-2

Three pelagic seabird species from the order Procellariiformes – the Yelkouan Shearwater *Puffinus yelkouan*, Scopoli's Shearwater *Calonectris diomedea*, and Mediterranean Storm-petrel *Hydrobates pelagicus melitensis* – nest on the Maltese Islands and inhabit Maltese waters in significant population numbers from a global and European population perspective. All three species are listed in Annex I of the EU Birds Directive. One of them, the Yelkouan Shearwater, is listed as Vulnerable on the IUCN Redlist and holds a breeding colony inside the AoI-2 (see below). The designation of the marine SPA Żona fil-baħar madwar Għawdex (MT0000112), which partially overlaps with the AoI-2 was triggered by two of the above-mentioned species: the Yelkouan Shearwater and the Scopoli's Shearwater.

In addition to the three procellariform seabird species, Malta hosts a breeding population of Yellow-legged Gull *Larus michahellis*, not listed in Annex I of the EU Birds Directive.

Scopoli's Shearwater *Calonectris diomedea – Least Concern, Annex I*

[6] *Raine, A., Sultana, J., and Gillings, S. (2009) Malta Breeding Bird Atlas 2008. Malta: BirdLife Malta*

[7] *Epsilon Malta Ltd, Nature Conservation Consultants (2019). Malta Breeding Bird Atlas 2018. Malta: Wild Birds Regulation Unit, Ministry for the Environment, Sustainable Development and climate Change*

The Scopoli's Shearwater is currently listed as Least Concern by the IUCN. It is listed under Annex I of the EU Birds Directive. The species is endemic (breeding) to the Mediterranean basin, with major colonies in the Central Mediterranean. The global population size was last estimated in 2013 at 285,000 – 446 000 mature individuals equating to 142,478 – 222,886 breeding pairs, showing a decreasing trend. For the Maltese islands, the total population estimate in 2018 was 2670 – 3605 breeding pairs according to Malta's second assessment report for the MSFD, roughly equating to around 1.6 – 1.9% of the global breeding population. Previous figures reported in 2013 had estimated the total Maltese population to be 3,046 – 3,962 breeding pairs. The available data suggests a decreasing population trend. Birds only approach land to breed, entering and leaving the colonies under the cover of darkness. Adults in and near the colonies and fledglings are sensitive to light pollution[8]. The closest breeding colony to the proposed development is Irdum tal-Madonna (SPA MT0000009) – which is not expected to be impacted directly by noise and light pollution from the development.

The Scopoli's Shearwater inhabits Maltese waters from February to November, with the highest activity at and in front of the colonies mainly from March to October. The species is strictly pelagic, foraging frequently together in large numbers on shoaling fish and squid by plunge-diving and pursue-diving, up to 15m deep. During the breeding period, Scopoli's Shearwaters congregate in large flocks, sitting on the water's surface exhibiting 'rafting' behaviour within a 4km radius in front of the colonies in the evenings[9], as described by Sultana et al. 2011. GPS-tracking of individuals from Maltese colonies during the chick-rearing period (July-October) shows that Scopoli's Shearwaters utilise at-sea areas in the Maltese FMZFMZ, including the marine part of the AoI-2. The distribution of foraging Scopoli's Shearwaters within the FMZ (25nm), including the marine part of AoI-2 has been confirmed by vessel-based counts. Up to 7,300 individuals of the species make regular use of the SPA MT0000112, Żona fil-Baħar madwar Għawdex during the reproductive season as foraging ground and rafting areas in front the colonies. Frequent passage occurs through the marine part of the AoI-2 by birds commuting between breeding grounds and foraging areas. Scopoli's Shearwaters have not been reported breeding inside the AoIs.

Scopoli's Shearwaters are highly susceptible to plastic ingestion and entanglement. Furthermore, as long-lived, top-level predators, they are known to bio-accumulate pollutants with potentially detrimental impacts on physiology and reproduction [10].

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[8] *Rodríguez et al. (2017). Seabird mortality induced by land-based artificial lights. Conservation Biology, 31(5), 986-1001.*

Crymble et al. (2020): Identifying light-induced grounding hotspots for Maltese seabirds. Il-Merill 34, 23-43.

[9] *BirdLife International (2010) Marine Important Bird Areas toolkit: standardised techniques for identifying priority sites for the conservation of seabirds at sea. BirdLife International, Cambridge UK. Version 1.2: February 2011.*

[10] *Walsh PM (1990) The use of seabirds as monitors of heavy metals in the marine environment. In: Furness RW, Rainbow PS (eds) Heavy metals in the marine environment. CRC Press, Boca Raton, pp 183–204.*

Costantini et al. (2014) Oxidative stress in relation to reproduction, contaminants, gender and age in a long-lived seabird, Oecologia, 175:1107–1116, DOI 10.1007/s00442-014-2975-x

Dias et al. (2019) Global threats to seabirds, Biological Conservation, 237: 525-537, DOI: 10.1016/j.biocon.2019.06.033

Yelkouan Shearwater *Puffinus yelkouan – Vulnerable, Annex I*

The IUCN lists the Yelkouan Shearwater as Vulnerable. It is furthermore listed under Annex I of the EU Birds Directive. The Yelkouan Shearwater is endemic to the Mediterranean basin. The global population size, estimated in 2011, is 15,337 – 30,519 pairs, roughly equating to 46,000 – 92,000 individuals. However, due to knowledge gaps, the quality of this estimate is moderate. According to the IUCN the global population trend is decreasing. The latest total population estimates of Yelkouan Shearwaters for the Maltese Islands (2016-2018) is 1,795 – 2,635 breeding pairs, roughly equating to 10% of the global breeding population. While previous figures reported in 2013 in the initial MSFD report suggest a short-term increase for Maltese population, this increase of the Maltese Yelkouan Shearwater population is rather a result of intense research in recent years with the result of increased monitoring intensity rather than an actual increase in population numbers[11]. The long-term trend indicates a stable population. By-catch is likely to be responsible for low adult survival rates[12] as shown for Maltese Yelkouan Shearwaters. Birds only approach land to breed, entering and leaving the colonies under cover of darkness. Adults and fledglings are sensitive to light pollution[13], and, like the Scopoli's Shearwater, the species is highly susceptible to plastic ingestion, and entanglement as well as to bio-accumulation of pollutants.

The largest Yelkouan Shearwater colony in Malta is situated at Irdum tal-Madonna (MT0000009). The colony closest to the proposed development is situated on Selmunett (MT0000022), within the 5km buffer area of the proposed MRF (AoI-2), holding approximately 45 to 70 breeding pairs[14]. Yelkouan Shearwater can be found in the colonies and adjacent waters, including the marine part of the AoI-2 from October to July. Outside the breeding season, the birds disperse more widely across the Central Mediterranean and a significant part of the population migrates East to the Aegean and into the Black Sea[15]. Yelkouan Shearwaters are strictly pelagic, foraging frequently together in flocks on shoaling fish and squid mainly by pursuit-diving, up to 50m deep. Like Scopoli's Shearwaters, Yelkouan Shearwaters congregate in flocks exhibiting rafting behaviour within a 7 km radius in front of the colonies in the evenings, according to GPS-tracking data. The individual rafts tend to be further out at sea than those of the Scopoli's Shearwaters and are made up of fewer individuals.

[11] *Maltese Environment and Resources Authority - ERA (2020): Update of Articles 8, 9 and 10 of the Marine Strategy Framework Directive (2008/56/EC) in Malta's Marine Waters. Second Assessment Report, pp.321-344.*

[12] *Oppel et al. (2011) Is the Yelkouan shearwater Puffinus yelkouan threatened by low adult survival probabilities?. Biological Conservation, 144(9), 2255-2263.*

[13] *Crymble et al. (2020) Identifying light-induced grounding hotspots for Maltese seabirds. Il-Merill 34, 23-43.*

[14] *Metzger, B., Austad, M. (2022). Towards effective management of Malta's marine waters – Seabird Fieldwork Report 2021 (https://era.org.mt/wp-content/uploads/2022/11/Seabird-Fieldwork-Report-2021-public.pdf)*

[15] *Raine, A. F., Borg, J. J., Raine, H., & Phillips, R. A. (2013): Migration strategies of the Yelkouan Shearwater Puffinus yelkouan. Journal of Ornithology, 154(2), 411-422.*

GPS-tracking of individuals during chick-rearing from the two main Maltese colonies (2012-14)[16] suggests that Yelkouan Shearwaters forage predominantly in waters further offshore and partially outside Maltese waters. Like other shearwater species, Yelkouan Shearwaters avoid crossing over land. The Yelkouan Shearwater is one of the trigger species for the designation of the relevant marine SPAs at hand, with. 3,270 – 4,650 individuals of the species making regular use of the SPA MT0000112 during the reproductive season as foraging ground and rafting areas in front of the colonies. Frequent passage occurs regularly through the marine part of the AoI-2 by birds commuting between breeding grounds and foraging areas.

Mediterranean Storm-petrel *Hydrobates pelagicus melitensis – Least Concern, Annex I*

The Mediterranean Storm-petrel *Hydrobates pelagicus melitensis* is a Mediterranean subspecies, clearly separated both genetically[17] and morphologically[18] from the Atlantic breeding population of the European Storm-petrel. Neither IUCN/BirdLife International nor the EU Birds Directive has assessed this taxonomic unit separately. The IUCN lists the species overall as Least Concern. It is listed under Annex I of the EU Birds Directive. The Mediterranean subspecies *H. pelagicus melitensis* is endemic to the Mediterranean basin and therefore has a relatively restricted distribution range. The global estimated population size of the entire species is 430,000 – 519,999 mature individuals. However, the data quality is poor (estimated in 2015). The most recent population size estimates for the Mediterranean sub-species are 8,500 – 15,200 pairs, roughly 2 – 3% of the global population. While the global population trend is unknown, the population trend of Mediterranean sub-species is decreasing according to EU Birds Directive. The closest breeding colony to the proposed development is Irdum tal-Madonna (MT0000009) – which is not expected to be directly impacted by the proposed development.

The most recent population assessment through capture mark recapture revealed an overall population size estimate of 8,575 breeding pairs for the Maltese Population, around 7% of the estimated global population of the species and at least 56% of the entire population of the Mediterranean subspecies. The short-term trend (2008-2018) and the long-term trend (1980-2018) for the Maltese population (2008-2018) are both reported to be stable[19].

The species is found in the Maltese FMZ year-round and in the colonies from February to October. It is by far more commonly seen in Maltese waters during the breeding season, and

[16] *Metzger, B., Oppel, S., Carroll, M., Meirinho, A., Dias, M. P., Barbara, N., & Lago, P. (2015). Malta Marine IBA Inventory Report. https://birdlifemalta.org/wp-content/uploads/2018/03/LIFE10NATMT090-MSP-A8_mIBA_Report_final.pdf*

[17] *Cagnon et al. (2004): Phylogeographic differentiation of storm petrels (Hydrobates pelagicus) based on cytochrome b mitochondrial DNA variation. Marine Biol. 145(6): 1257–1264.*

[18] *Lalanne et al. (2001): Morphological differentation between European Storm-petrel subspecies: new results regarding two Mediterranean populations. Alauda 69(4): 475–482.*

[19] *Maltese Environment and Resources Authority - ERA (2020): Update of Articles 8, 9 and 10 of the Marine Strategy Framework Directive (2008/56/EC) in Malta's Marine Waters. Second Assessment Report, pp.321-344.*

more frequently and in higher numbers southeast and south of Malta. Adults and fledglings are sensitive to light pollution[20].

The 70% KDE of seven Storm-petrels from the Filfla colony GLS-tracked during the breeding season indicate that the birds make use of the entire Maltese FMZ, but also of areas further offshore between Malta and Libya[21].

While not being a trigger species for the designation of the marine SPA MT0000112, Storm-petrels are commonly making use of this area (including the marine part of the AoI-2) year-round, and more so during the breeding season. While Storm-petrels have been captured, ringed and released at night on Selmunett (MT0000022) inside the AoI-2 during the breeding season, breeding has not been confirmed inside the AoI-2. Passage of Storm-petrels is expected to occur frequently through the marine part of the AoI-2 by birds commuting between breeding grounds and foraging areas.

Yellow-legged Gull *Larus michahellis – Least Concern*

The IUCN lists the Yellow-legged Gull as Least Concern with an increasing population trend. The Global population numbers are unknown. The European population is estimated at 409,000 – 534,000 pairs equating to 819,000 – 1,070,000 mature individuals, with an increasing trend. The latest assessment of the Maltese YLG population for Malta's Article 12 reporting to the EU[22] lists 250 breeding pairs for the Maltese islands with an increasing trend. The largest colony, 202 ± 24 apparently occupied nests (5-year mean), is located on Filfla. Similar numbers have been reported from Filfla before. Smaller colonies at Ta' Ċenċ, Dingli and Wardija might have expanded in the last years. The species has also established new breeding locations such as Comino, Għarb and within AoI-2 on Selmunett (MT0000022) recently[23]. Therefore, the actual number of breeding pairs might exceed 300 pairs.

Western to Central Mediterranean populations are mainly sedentary and dispersive but some populations are partially migratory. In the Maltese Islands a large number of non-breeders are present year-round. Ring recoveries show that birds ringed on Filfla as chicks utilise other locations in Malta and abroad, mainly Sicily and Southern Italy (pers. comm.). Yellow-legged Gulls are highly opportunistic feeders and benefit from human activities, such as fishing, discard from fisheries and other vessels, food-waste, open landfills, aquaculture and agriculture. In the Maltese islands, they occur in their highest densities and largest abundances in the harbour areas, around the largest colony (Filfla), around areas with large aquaculture facilities, especially tuna pens such as those in the vicinity of St Paul's Island and the wider area off Selmun. Large numbers of feeding flocks can be observed in the AoI-2 next to the

[20] *Crymble et al. (2020): Identifying light-induced grounding hotspots for Maltese seabirds. Il-Merill 34, 23-43.*

[21] *Lago, P., Austad, M. & Metzger, B. (2019): Partial migration in the Mediterranean Storm Petrel Hydrobates pelagicus melitensis. Marine Ornithology 47: 105–113.*

[22] *https://circabc.europa.eu/sd/a/4e807e1b-8aa1-4ede-ac48-a13cdd32889f/MT_A12NatSum_20141031.pdf*

[23] *Crymble et al. (2020): New breeding sites of Yellow-legged Gull around the Maltese Islands. Il-Merill 34, 72-80.*

proposed development at the Magħtab landfill year-round, as well as in adjacent areas in the AoI-2 on land (SACs MT0000007, MT0000008, MT0000022) and at sea (SPA MT0000112).

2.4 Other avian species expected to occur in the AoIs

The following is a list of species expected to make use of the AoIs.

Seabird species *sensu lato*

Several seabird species *sensu lato* have been recorded to make use of the AoIs, mainly crossing the area during migration, but also stopping over during the migration period or staging extended periods of time during summer or winter. Two of these species are listed as Vulnerable and one is listed as Near Threatened in the IUCN Red List. Overall, nine species are listed in Annex I of the EU Birds Directive.

Ferruginous Duck *Aythya nyroca* – *Near Threatened, Annex I of the EU Birds Directive*

Population trend decreasing. A significant proportion of the European Ferruginous Duck population and more than 1% of the global population funnels through Gozo Channel situated in the marine SPA (MT0000112) annually, mainly during spring migration. The birds often pass in larger flocks, also alighting on the water to rest. Occasionally observed in Is-Salini (MT0000007). However, no larger numbers of the species have ever been recorded in the AoIs.

Greater Flamingo *Phoenicopterus roseus* – *Least Concern, Annex I of the EU Birds Directive*

Overall population trend increasing**.** Flamingos migrate through the Maltese Islands, including the marine SPA MT0000112, annually often gathering in larger flocks. In recent years they have been recorded in increasing numbers, mainly in autumn. Expected to pass through the AoIs regularly on migration, but it is unlikely that this happens in significant numbers. Reported stopping over in Is-Salini (MT0000007).

Slender-billed Gull *Chroicocephalus genei* – *Least Concern, Annex I of the EU Birds Directive*

European population size is decreasing. In Malta Slender-billed Gulls are recorded annually on migration mainly from (July) August to March (April) in single to low double figures of daily observations. Slender-billed Gulls are considered a coastal species. The species can be expected to occur regularly in the AoI, including foraging at Magħtab landfill and foraging, roosting and passing over the marine part of the AoI that is part of the SPA MT0000112. Furthermore, the species has been reported making use of the reserves, Is-Salini (MT0000007) and L-Għadira s-Safra (MT0000008) for foraging and roosting. However, it is very unlikely that numbers in any of the AoI reach significant levels from a global or European population perspective at any point.

Mediterranean Gull *Larus melanocephalus* – *Least Concern, Annex I of the EU Birds Directive*

The European population trend is decreasing. In the Maltese islands the species is mainly recorded from October to April with numbers in the lower hundreds reported in the period from November to March. Regularly makes use of the SPA MT0000112, including the marine part of the AoI. Birds will also make use of the adjacent land areas for roosting as well as foraging at the landfill. SPA MT0000112. Furthermore, recorded regularly in Is-Salini

(MT0000007), L-Għadira s-Safra (MT0000008) and Selmunett (MT0000022). It is not expected that Mediterranean Gulls reach relevant numbers in the AoIs as compared with the European population which is equivalent to the global population.

Audouin's Gull *Ichthyaetus audouinii – Vulnerable, Annex I of the EU Birds Directive*

The European breeding population is believed to be currently rapidly decreasing. Audouin's Gulls are mainly found in marine habitats year-round, very frequently following trawlers to feed on discarded fish. The species is migratory and dispersive. Before 2000, the Audouin's Gull was considered a very rare bird species to the Maltese islands. The species' status has changed significantly since. From 2000 to 2009 there were 311 records of 535 individuals, with a maximum of 184 sightings during this period in 2007. During stopover on migration the species can be expected regularly in the AoIs, foraging at Magħtab landfill and roosting, foraging and passing through SPA MT0000112, including the AoI-2. It has also been recorded regularly from Is-Salini (MT0000007), L-Għadira s-Safra (MT0000008) and Selmunett (MT0000022). However, it is very unlikely that numbers in any of the aforementioned areas reach significant levels from a global or European population perspective at any point.

Little Tern *Sternula albifrons – Least Concern, Annex I of the EU Birds Directive*

The overall population trend is decreasing, the European population size trend is unknown. In Malta Little Terns are recorded annually in small numbers, mainly in spring (April-May). The species is at least partially migratory and dispersal in the region. Little Terns regularly frequent coastal areas, such as lagoons and saltpans when foraging, including the marine part of the AoI-2 inside SPA MT0000112. They also have been reported from Is-Salini (MT0000007). However, it is highly unlikely that significant numbers regarding the global, European or EU population are reached inside the AoIs.

Common Gull-billed Tern *Gelochelidon nilotica – Least Concern, Annex I of the EU Birds Directive*

The global population is suspected to be in decline, while the European population is estimated to be increasing. The species is recorded in Malta annually in single to double digit numbers on migration, both in spring and autumn. It is likely that Gull-billed terns occur in the AoI-2 annually during passage on migration and make use of the area for foraging. However, it is highly unlikely that significant numbers regarding the European population are reached at any time.

Caspian Tern *Hydroprogne caspia – Least Concern, Annex I of the EU Birds Directive*

The global population as well as the European population are both increasing. The species is recorded in Malta annually in double digit numbers on migration, both in spring and autumn. It is likely that Caspian Terns occur in the AoI-2 annually during passage on migration and that they make use of it as foraging areas, plunge-diving for fish while feeding on the wing and potentially also stopping over and resting in the relevant Natura 2000 sites. However, it is highly unlikely that significant numbers regarding the European population are reached at any time. Ringed Caspian Terns that have been recorded in Malta were ringed in Finland (e.g. 9

until 1996), confirming that birds of the European population are passing through Malta regularly.

Black Tern *Chlidonias niger – Least Concern, Annex I of the EU Birds Directive*

The overall population trend is declining, while the European population trend is unknown. The species occurs in Maltese waters annually and in good numbers mainly during autumn migration, peaking in the second half of August to the beginning of September with few scattered records during spring migration. The species passes through the Maltese islands mainly in offshore areas, frequently foraging on the wing for small prey items at or close to the sea surface. The birds are often attracted to the net cages of the Maltese Tuna aquaculture industry where they feed from next to the cages but also rest on the rails of the cages. Black Terns can also be frequently observed offshore resting on the floats of Fish Aggregation Devices (FADs) of the Dolphin-fish (Lampuka, *Coryphaena hippurus*) fisheries, but also on sun-bathing turtles (*Caretta caretta*), buoys and floating debris (all own observations). During vessel-based surveys and trips to tuna-cages in the Maltese FMZ during the end of August, numbers of up to 2000 individuals have been counted during a single trip. On migration, Black Terns are very likely to pass through the AoI-2 and use it to forage and rest during migration and stop-over. Nevertheless, it is not likely that significant threshold values are reached in the AoI as compared to the global, European and EU populations at any point.

Sandwich Tern *Thalasseus sandvicensis - Least Concern, Annex I of the EU Birds Directive*

The overall and European population trends are fluctuating. In Malta Sandwich Terns occur on passage and to a lower extent wintering from (August) September to March (April). They are reported annually in double figures. As other tern species, Sandwich Terns forage in coastal waters. Within AoI-2 Sandwich Terns occur in the SPA MT0000112 annually during passage on migration and make use of it as foraging area. Furthermore, they are recorded or can be expected regularly in Is-Salini (MT0000007), L-Għadira s-Safra (MT0000008) and Selmunett (MT0000022). However, it is very unlikely that significant numbers regarding the global European or EU population are reached at any time.

Red-breasted Merganser *Mergus serrator – Least Concern,* expected to pass through the marine part of the AoI-2 in small numbers on migration, observed on passage and stopover in the marine part of the AoI-2.

Common Shelduck *Tadorna tadorna – Least Concern,* recorded regularly from Is-Salini (MT0000007), observed on passage and stopover in the marine part of the AoI-2.

Little Grebe *Tachybabtus ruficollis – Least Concern,* regular winter visitor Is-Salini (MT0000007).

Great-crested Grebe *Podiceps cristatus – Least Concern,* scarce winter visitor and passage migrants, recorded from Is-Salini (MT0000007).

Black-necked Grebe *Podiceps nigricollis – Least Concern,* regular winter visitor and passage migrant in small numbers in Is-Salini (MT0000007).

Common Moorhen ***Gallinula chloropus – Least Concern***, recent breeding attempt from Is-Salini (MT0000007).

Northern Gannet ***Morus bassanus – Least Concern,*** expected to pass through and potentially forage in the marine part of the AoI-2, mainly during the winter months.

Great Cormorant ***Phalacrocorax carbo – Least Concern,*** recorded regularly in increasing numbers wintering in the Maltese islands, including the marine part of the AoI and the relevant Natura 2000 sites (MT0000007, MT0000008 and MT0000022).

Little Gull ***Hydrocoloeus minutus – Least Concern,*** regularly passing through MT0000112 during migration, has been occasionally recorded roosting and/or foraging in singles at Is-Salini (MT0000007).

Black-headed Gull ***Chroicocephalus ridibundus - Least Concern,*** large numbers migrate through the Maltese islands and winter there. Larger flocks forage and roost in the AoI-2 and the relevant Natura 2000 sites (MT0000007, MT0000008, MT0000022, MT0000112).

Lesser Black-backed Gull ***Larus fuscus – Least Concern,*** regular on migration and to some extend wintering in smaller numbers, making use of the AoI-2 for foraging and roosting, recorded in all relevant Natura 2000 sites (MT0000007, MT0000008, MT0000022, MT0000112).

Long-tailed Skua ***Stercorarius longicaudus - Least Concern,*** expected to pass through the marine part of the AoI-2 (including MT0000112) on migration in singles.

Arctic Skua ***Stercorarius parasiticus – Least Concern*** expected to pass through the marine part of the AoI-2 (including MT0000112) in small numbers on migration.

Pomarine Skua ***Stercorarius pomarinus – Least Concern*** expected to pass through the marine part of the AoI-2 (including MT0000112) in small numbers on migration and when wintering.

Great Skua ***Catharacta skua - Least Concern*** expected to pass through the marine part of the AoI-2 (including MT0000112) in small numbers on migration and when wintering.

Land-birds

Non-passeriformes

Here we provide a list of non-passeriform species that are recorded in the Maltese islands regularly to frequently on migration and as winter visitors. We also include those species that have been recorded breeding on the islands. Information regarding their conservation status, whether they are listed in Annex I of the EU Birds Directive, and their local occurrence (wintering, breeding, migrant) and frequency of occurrence (scarce, regular, common) is noted. Furthermore, information on their expected or reported status in the AoIs including the relevant Natura 2000 sites is given. Of approximately 80 species, less than half of them are listed in Annex I of the EU Birds Directive. The majority is listed as Least Concern, while 8 are listed as Near Threatened, one is listed as Vulnerable and one is listed as Endangered.

The majority of species listed here mainly pass through the AoIs during migration. It is not expected that any of the species listed below will be significantly impacted by the proposed development nor are they expected to ever reach threshold values in the AoIs.

Common quail *Coturnix coturnix – Least Concern,* declining, irregular breeder, common passage migrant (nocturnal), winters in small numbers, expected to occur regularly in the AoIs, mainly on stopover during migration.

European Turtledove *Streptopelia turtur – Vulnerable,* strong decline, would breed regularly if spring hunting was abolished, regular passage migrant in declining numbers, more common in spring, can be expected stopping over in the AoIs.

Collared Dove *Streptopelia decaocto – Least Concern*, trend increasing, likely to occur in the terrestrial part of the AoIs.

European Nightjar *Caprimulgus europaeus – Least Concern,* common on passage in spring and autumn, can be expected to pass regularly through the AoIs on migration and make use of them for foraging and roosting.

Alpine Swift *Tachymarptis melba – Least Concern,* recorded in small numbers during spring and autumn migration, aerial feeder, likely to pass occasionally through the AoIs.

Pallid Swift *Apus palidus – Least Concern,* in Malta regularly to commonly seen from March to October, small breeding populations in Malta, can be expected to make regular use of the airspace of the AoIs including the relevant Natura 2000 sites (MT0000002, MT0000007, MT0000008, MT0000022, MT0000112).

Common Swift *Apus apus – Least Concern,* common on migration in spring and autumn, small but increasing breeding population. Can be expected/ has been recorded to make regular use of the airspace of the AoIs, including the relevant Natura 2000 sites (MT0000002, MT0000007, MT0000008, MT0000022, MT0000112).

Common Cuckoo ***Cuculus canorus – Least Concern,*** fairly common on spring migration, less common during autumn, single breeding records in Malta. Expected to occur in the AoIs during migration and stopping over, reported from Is-Salini (MT0000007).

Western Water Rail ***Rallus aquaticus – Least Concern,*** population numbers decreasing. Frequent autumn migrant and common winter visitor in the wetlands of the Maltese islands. Some breeding attempts. Recorded from Is-Salini (MT0000007).

Spotted Crake ***Porzana porzana – Least Concern, Annex I of the EU Birds Directive,*** small numbers in spring and autumn on migration.

Common Crane ***Grus grus – Least Concern, Annex I of the EU Birds Directive,*** population trend increasing, recorded annually on migration in small flocks, potentially through the AoIs.

Black Stork ***Ciconia nigra – Least Concern, Annex I of the EU Birds Directive,*** European population increasing, in Malta annually in small numbers during migration, mainly in autumn.

White Stork ***Ciconia ciconia – Least Concern, Annex I of the EU Birds Directive,*** population increasing, in Malta annually in small numbers on migration mainly autumn, to less extend in spring. White Storks are frequently foraging on landfills. Therefore, can be expected to occur in the AoIs.

Eurasian Spoonbill ***Platalea leucorodia – Least Concern, Annex I of the EU Birds Directive,*** trend increasing, in Malta mainly on passage in spring and autumn. Regularly migrating through the AoI, including MT0000112 and has been recorded in Is-Salini (MT0000007).

Glossy Ibis ***Plegadis falcinellus – Least Concern, Annex I of the EU Birds Directive,*** European population increasing, in Malta recorded annually on migration. Has been recorded passing through the AoI-2 (MT0000112).

Common Little Bittern ***Ixobrychus minutus - Least Concern, Annex I of the EU Birds Directive,*** European population stable, irregularly breeding in Malta, recorded annually in small numbers on migration. Expected to migrate through the AoIs (at night). Recorded on stopover during migration for the Natura 2000 site Is-Salini (MT0000007).

Black-crowned Night Heron ***Nycticorax Nycticorax - Least Concern, Annex I of the EU Birds Directive,*** decreasing in Europe, frequently migrating over Malta, regularly observed during stop-over at Salini (MT0000007), expected to migrate regularly through the AoIs.

Squacco Heron ***Ardeola ralloides - Least Concern, Annex I of the EU Birds Directive,*** European population considered stable, passing through Malta in small numbers on migration annually. Has been recorded at Is-Salini (MT0000007); expected to migrate through the AoIs regularly.

Grey Heron ***Ardea cinerea - Least Concern,*** regular visitor to the Maltese islands year-round but higher numbers during migration. Can be expected to migrate regularly through the AoIs.

Has been recorded regularly to frequently in all relevant Natura 2000 sites (MT0000002, MT0000006, MT0000007, MT0000008, MT0000022, MT0000112).

Purple Heron ***Ardea purpurea - Least Concern, Annex I of the EU Birds Directive,*** European population decreasing, passing through Maltese islands annually during migration in good numbers. Has been recorded regularly at Is-Salini (MT0000007). Can be expected to pass through the AoIs on migration.

Great White Egret ***Casmerodius alba – Least Concern, Annex I of the EU Birds Directive,*** recorded annually on passage in small numbers, Is-Salini (MT0000007). Can be expected to pass through the AoIs on migration.

Little Egret ***Egretta garzetta – Least Concern, Annex I of the EU Birds Directive,*** fairly common passage migrant in spring and autumn, few individuals year-round, recently established small breeding population close to Is-Salini, at least partially founded by escapes. Recorded regularly at Is-Salini (MT0000007), recorded in the AoIs and including the relevant Natura 2000 sites (MT0000002, MT0000008 and MT0000022, MT0000112) regularly.

Stone Curlew / Eurasian Thick-knee ***Burhinus oedicnemus – Least Concern, Annex I of the EU Birds Directive,*** recorded in Malta regularly in small numbers on migration in spring and autumn. Potentially passing through the AoIs in low numbers.

Oystercatcher ***Haematopus ostralegus – Near threatened,*** population declines across Europe, recorded in Malta annually in small numbers. Potentially passing through and resting/ foraging in the AoI-2 in small numbers, including MT0000022.

Pied Avocet ***Recurvirostra avosetta – Least Concern, Annex I of the EU Birds Directive,*** recorded in Malta annually in small numbers mainly during autumn migration, potentially wintering. Recorded from Is-Salini (MT0000007).

Black-winged Stilt ***Himantopus himantopus – Least Concern, Annex I of the EU Birds Directive,*** frequent spring migrant in the Maltese islands, expected to occur regularly in the AoIs mainly on migration.

Grey Plover ***Pluvialis squatarola – Least Concern,*** in Malta recorded annually in small numbers during spring and autumn migration. Potentially migrating through the AoIs.

Eurasian Golden Plover ***Pluvialis apricaria - Least Concern, Annex I of the EU Birds Directive,*** population trend increasing. Common in Malta during winter months, both on migration and wintering. Expected migrating through and/or stopping over in the AoIs.

Eurasian Dotterel ***Charadrius morinellus - Least Concern, Annex I of the EU Birds Directive,*** in Malta annually in small numbers, stopping over mainly during autumn migration. Potentially migrating through and stopping over in the AoIs.

Common Ringed Plover ***Charadrius hiaticula – Least Concern,*** decreasing on EU and global level, fairly common passage migrant in spring and autumn. Recorded from Is-Salini

(MT0000007). Expected to be also foraging and stopping over at MT0000022 on migration and to pass through the AoIs.

Little Ringed Plover ***Charadrius dubius – Least Concern,*** population decreasing, common passage migrant in spring and autumn; recorded regularly from Is-Salini (MT0000007). Expected to also occur in the AoIs including MT0000022.

Kentish Plover ***Charadrius alexandrinus – Least Concern, Annex I of the EU Birds Directive,*** regular passage migrant in small numbers in spring and autumn. Potentially occurring in the AoIs.

Northern Lapwing ***Vanellus vanellus – Near Threatened,*** overall declining population trend, recorded regularly in Malta during the winter months in small flocks and is a regular passage migrant in small numbers in spring and autumn. Potentially occurring in the AoIs.

Whimbrel ***Numenius phaeopus – Least Concern,*** recorded annually in small numbers in spring and autumn during migration. Expected to occur in the AoIs in small numbers and irregularly, foraging/ roosting on the rocky shore and migrating through the area.

Eurasian Curlew ***Numenius arquata – Near Threatened,*** global population trend decreasing, passing regularly through Malta during spring and autumn. Expected to occur in the AoIs in small numbers and irregularly, foraging/ roosting on the rocky shore and migrating through the area.

Black-tailed Godwit ***Limosa limosa – Near Threatened,*** population trend decreasing, in Malta recorded annually, mainly on spring migration. Potentially migrating through the AoIs in small numbers.

Ruddy Turnstone ***Arenaria interpres – Least Concern,*** recorded in Malta annually in small numbers in spring and autumn. Expected to occur in the AoI-2 in small numbers and irregularly, foraging/ roosting on the rocky shore and migrating through the area at night.

Red Knot ***Calidris canutus – Near Threatened,*** global population trend decreasing, recorded in Malta almost annually in small numbers on passage. Potentially passing through the AoIs on migration.

Ruff ***Calidris pugnax – Least Concern, Annex I of the EU Birds Directive,*** population trend decreasing, recorded in the Maltese islands regularly and in good numbers, mainly during spring migration, including in Is-Salini (MT0000007). Expected to be passing through the AoIs on migration.

Curlew Sandpiper ***Calidris ferruginea – Near Threatened,*** suspected to be declining, in Malta regularly in small flocks on passage migration in spring and autumn. Recorded in Is-Salini (MT0000007) and expected to be passing through the AoIs on migration.

Temminck's Stint ***Calidris temminckii – Least Concern,*** population trend stable, recorded in Malta in small numbers during spring and autumn migration, including in Is-Salini (MT0000007). Expected to be passing through the AoIs on migration occasionally.

Sanderling ***Calidris alba – Least Concern,*** passing through Malta annually in small numbers during spring and autumn. Potentially passing through the AoIs.

Dunlin ***Calidris alpina – Least Concern,*** recorded in Malta annually in small numbers mainly on passage in spring and autumn including in Is-Salini (MT0000007). Expected to be passing through the AoIs on migration.

Little Stint ***Calidris minuta – Least Concern,*** singles recorded in Malta year-round, common during spring and autumn migration. Observations at Is-Salini (MT0000007) and expected to be passing through the AoIs on migration.

Eurasian Woodcock ***Scolopax rusticola – Least Concern,*** trend estimated stable, observed in Malta during the winter months, expected to occur in the AoIs during migration and wintering.

Great Snipe ***Gallinago media – Near Threatened, Annex I of the EU Birds Directive,*** overall trend decreasing, in Malta encountered annually in singles on spring migration. It is expected that the species occasionally passes through the AoI-2 on migration.

Common Snipe ***Gallinago gallinago – Least Concern,*** common passage migrant, mainly in spring, regularly observed at Is-Salini (MT0000007). Can be expected to occur at L-Għadira s-Safra u l-Iskoll tal-Għallis (MT0000008) and to pass through the AoIs on migration.

Jack Snipe ***Lymnocryptes minimus – Least Concern,*** population trend stable, passing through the Maltese islands annually in small numbers during the winter months, potentially passing through and stopping over in the AoIs.

Common Sandpiper ***Actitis hypoleucos – Least Concern,*** overall population trend decreasing, common passage migrant in Malta in spring and autumn, recorded in small numbers year-round. Recorded or expected regularly in the AoIs, including all relevant Natura2000 sites (MT0000002, MT0000007, MT0000008, MT0000022, MT0000112).

Green Sandpiper ***Tringa ochropus – Least Concern,*** population trend increasing, regular passage migrant through the Maltese islands in spring and autumn and expected to pass through the AoIs on migration.

Spotted Redshank ***Tringa erythropus – Least Concern,*** population trend stable, recorded annually in Malta in small numbers on migration and in winter. Expected to occasionally pass through the AoIs.

Common Greenshank ***Tringa nebularia – Least Concern,*** population stable, common visitor to the Maltese islands in relatively low numbers on spring and autumn migration. Expected to pass through the AoIs.

Common Redshank ***Tringa totanus – Least Concern,*** European population has undergone a moderate decline, a regular passage migrant in Malta in small numbers, both in spring and autumn. Expected to pass through the AoIs.

Wood Sandpiper ***Tringa glareola – Least Concern, Annex I of the EU Birds Directive,*** population trend stable, common passage migrant in the Maltese islands in spring and autumn. Expected to pass through the AoIs.

Marsh Sandpiper ***Tringa stagnatilis – Least Concern,*** overall population trend decreasing, recorded in Malta regularly in small numbers on migration. Recorded from Is-Salini (MT0000007). Potentially passing through the AoIs.

Collared Pratincole ***Glareola pratincola – Least Concern, Annex I of the EU Birds Directive,*** overall population trend decreasing, recorded almost annually in singles, mainly during spring migration. Recorded from Is-Salini (MT0000007). Potentially passing through the AoI.

Eurasian Scops-owl ***Otus scops – Least Concern,*** global population trend declining, regularly recorded in the Maltese islands, mainly during migration. Can be expected to pass through the AoIs occasionally and in low numbers and also use the terrestrial area during stopover on migration.

Short-eared Owl ***Asio flammeus – Least Concern, Annex I of the EU Birds Directive,*** population trend in Europe fluctuating, recorded annually in small numbers, mainly on migration, has been reported nesting in the Maltese islands, at least two times in recent years. Can be expected to pass through the AoIs on migration.

Osprey ***Pandion haliaetus – Least Concern, Annex I of the EU Birds Directive,*** European population trend increasing, regularly recorded in the Maltese islands on spring and autumn migration. Has been observed foraging and roosting at Is-Salini (MT0000007). Can be expected to pass through the AoIs regularly in small numbers.

European Honey-buzzard ***Pernis apivorus – Least Concern, Annex I of the EU Birds Directive,*** overall population trend decreasing, common passage migrant over the Maltese islands, mainly in autumn. Can be expected to migrate through the AoIs regularly.

Egyptian Vulture ***Neophron percnopterus – Endangered, Annex I of the EU Birds Directive,*** population trend declining in entire range, recorded in Malta almost annually in singles on migration, mainly in autumn. Birds might be attracted to the landfill and therefore the species might occur in the AoIs occasionally on migration.

Short-toed Snake-eagle ***Circaetus gallicus – Least Concern, Annex I of the EU Birds Directive,*** population trend stable, appears on passage in the Maltese islands annually in small numbers, mainly in autumn. Potentially passes through the AoIs on migration.

Lesser spotted Eagle ***Aquila pomarina – Least Concern, Annex I of the EU Birds Directive,*** European population estimated stable, in Malta almost recorded annually in singles to small flocks mainly on autumn migration. Potentially passes through the AoIs on migration.

Booted Eagle ***Aquila pennata – Least Concern, Annex I of the EU Birds Directive,*** population size increasing in Europe, recorded in Malta almost annually in singles mainly during autumn migration. Potentially passes through the AoIs on migration.

Western Marsh Harriers ***Circus aeruginosus – Least Concern, Annex I of the EU Birds Directive,*** population trend in Europe increasing, common passage migrant to the Maltese islands both in spring and autumn. Has been reported at Is-Salini (MT0000007). Can be expected to appear in the AoIs on passage migration regularly.

Montagu's Harrier ***Circus pygargus – Least Concern, Annex I of the EU Birds Directive,*** population decreasing in the EU, recorded in the Maltese islands annually in double figure numbers during spring and autumn migration. Can be expected to migrate through the AoIs occasionally.

Eurasian Sparrowhawk ***Accipiter nisus – Least Concern,*** overall population trend stable, recorded annually in Malta in small numbers on migration, mainly in autumn. Can be expected to pass through the AoIs occasionally.

Black Kite ***Milvus migrans – Least Concern, Annex I of the EU Birds Directive,*** population trend unknown, recorded in Malta annually in double figure numbers on migration. Species is attracted to landfills. Can be expected to occur in the AoIs occasionally.

Common Hoopoe ***Upupa epops – Least Concern,*** overall population trend decreasing, common passage migrant in Malta, both in spring and autumn, at least one breeding recorded in recent years. Has been observed at Is-Salini (MT0000007). Can be expected to pass through the AoIs and foraging and roosting there during stop-over on migration.

European Bee-eater ***Merops apiaster, Least Concern,*** overall population trend declining, common spring migrant in Malta, less common in autumn, has made single breeding attempts on the islands in recent years. Regularly observed in all relevant Natura 2000 sites and can be expected regularly in the AoIs on migration.

European Roller ***Coracias garrulus – Least Concern, Annex I of the EU Birds Directive,*** European population trend decreasing, recorded in Malta annually in small numbers, mainly during spring migration. Can be expected to pass through the AoIs occasionally.

Common Kingfisher ***Alcedo atthis – Least Concern, Annex I of the EU Birds Directive,*** European population trend decreasing, common winter visitor and passage migrant in Malta. Observed regularly making use of all relevant Natura 2000 sites. Expected to pass through the AoIs regularly on migration and when wintering.

Eurasian Wryneck ***Jynx torquilla – Least Concern,*** population trends: long-term decline, short-term increase, fairly common passage migrant and winter visitor to the Maltese islands. Can be expected to be present in the AoIs during migration, stopping over and potentially also wintering in the terrestrial part.

Lesser Kestrel ***Falco naumanni – Least Concern, Annex I of the EU Birds Directive,*** population trend previous severe declines, recently stable, fairly common passage migrant to the Maltese islands in spring and autumn. Expected to pass through the AoIs on migration and also foraging in the terrestrial area when stopping over.

Common Kestrel ***Falco tinnunculus – Least Concern,*** population trend decreasing, present in Malta year-round, common during passage in spring and autumn, breeding almost annually in very low numbers (1-3 pairs). Can be expected to forage in the terrestrial part of the AoIs year-round (local birds). Passage migrants can be expected to pass through all AoIs.

Red-footed Falcon ***Falco vespertinus – Near Threatened, Annex I of the EU Birds Directive,*** European population trend declining, in Malta fairly regularly encountered on migration, numbers higher in spring. Can be expected to pass through the AoIs and forage in the terrestrial part during passage.

Eleonora's Falcon ***Falco eleonorae – Least Concern, Annex I of the EU Birds Directive,*** European population size increasing, recorded in Malta annually in fairly good numbers on migration in spring and autumn. Can be expected to pass through the AoIs, including the relevant Natura 2000 sites on migration.

Merlin ***Falco columbarius – Least Concern, Annex I of the EU Birds Directive,*** population trend fluctuating, recorded in Malta annually in low numbers mainly on autumn migration. Might occasionally migrate through the AoIs.

Eurasian Hobby ***Falco subbuteo – Least Concern,*** overall population trend declining, fairly common in Malta on migration in spring and autumn. Can be expected to migrate through the AoIs regularly.

Peregrine Falcon ***Falco peregrinus – Least Concern, Annex I of the EU Birds Directive,*** population trend increasing, potentially regular breeder in the Maltese islands in very low numbers, would be more common if left undisturbed/ not persecuted, also appears on passage and as winter visitor. Can be expected to make use of the AoIs including the relevant Natura 2000 sites regularly and year-round, especially hunting for Black-headed Gulls etc. in the landfill area.

Passeriformes

Here we provide a list of all passerine species that are recorded in the Maltese islands regularly to frequently on migration and as winter visitors. We also include those species that are residents i.e. breeding on the islands. Information regarding their conservation status, whether they are listed in Annex I of the EU Birds Directive, and their local occurrence (wintering, breeding, migrant) and frequency of occurrence (scarce, regular, common) is noted. Furthermore, information on their expected or reported status in the AoIs including the relevant Natura 2000 site is given.

The vast majority of species is listed as Least Concern (only two are listed as Near Threatened, both not in Annex I of the EU Birds Directive) and only seven species are listed in Annex I of the EU Birds Directive (all Least Concern). Of all passerine species that have been recorded breeding in the Maltese islands, two are listed in Annex I of the EU Birds Directive. One of them is a common breeder – the Greater Short-toed Lark *Calandrella brachydactyla* (see above) while the other one has been reported breeding irregularly - the Tawny Pipit *Anthus campestris.*

In general, small passerines have relatively higher reproductive rates and shorter lifespans (generation cycles) compared to often larger non-passerine species. This, together with a large distribution range and often a greater distribution density in most species listed below, reduces their overall population vulnerability. The majority of migratory species listed here mainly migrate during the night and cross the area in broad front. It is not expected that any of the species listed below will reach threshold values in the AoIs.

Species list of Passeriformes regularly encountered on the Maltese islands

Eurasian Golden Oriole *Oriolus oriolus* - Least Concern, common passage migrant, expected frequently in the AoIs on migration.

Red-backed Shrike *Lanius collurio* - Least Concern, Annex I, passage in low numbers, not expected to occur in the AoIs in relevant numbers.

Woodchat Shrike *Lanius senator* - Least Concern, regular passage migrant, expected to occur in the AoIs occasionally.

Penduline Tit *Remiz pendulinus* - Least Concern, passage in small numbers, might migrate through the AoIs occasionally and in small numbers.

Greater Short-toed Lark *Calandrella brachydactyla* - Least Concern, Annex I, common breeder and passage migrant, reported breeding in the AoI-2, not expected to occur in the AoIs in relevant numbers, but expected to pass through on migration and potentially stopping over.

Woodlark *Lullula arborea* - Least Concern, Annex I, regular passage migrant in low numbers, expected to also pass through the AoIs.

Eurasian Skylark *Alauda arvensis* - Least Concern, common on passage and wintering, expected to occur in the AoIs regularly.

Zitting Cisticola *Cisticola juncidis* - Least Concern, probable breeder in the AoI-1.

Olivaceus Warbler *Iduna pallida* - Least Concern, passage in low numbers, potentially occurring in the AoIs.

Isabelline Warbler *Iduna opaca* - Least Concern, passage in low numbers, potentially occurring in the AoIs.

Icterine Warbler *Hippolais icterina* - Least Concern, regular passage migrant, expected to pass through the AoIs regularly on migration.

Moustached Warbler *Acrocephalus melanopogon* - Least Concern, passage and wintering in low numbers, expected to pass through the AoIs occasionally in very low numbers.

Sedge Warbler *Acrocephalus schoenobaenus* – Least Concern, regular passage migrant, to pass through the AoIs regularly on migration.

Common Reed Warbler *Acrocephalus scirpaceus* - Least Concern, breeds in Malta in small numbers, regular passage migrant, single winter records. Expected to pass through the AoIs regularly on migration.

Great Reed Warbler *Acrocephalus arundinaceus* - Least Concern, regular passage migrant, expected to pass through the AoIs regularly on migration.

Savi's Warbler *Locustella luscinioides* - Least Concern, passage migrant in low numbers, expected to pass through the AoIs occasionally on migration.

Northern House Martin *Delichon urbicum* - Least Concern, rare breeder, common passage migrant, expected to make use of the airspace of the AoIs regularly, foraging in the area during migration, potentially roosting in the area, too.

Red-rumped Swallow *Cecropis daurica* - Least Concern, regular passage migrant, expected to make use of the airspace of the AoIs regularly, foraging in the area during migration, potentially roosting in the area, too.

Barn Swallow *Hirundo rustica* - Least Concern, breeder in low numbers, common passage migrant, expected to make use of the airspace of the AoIs regularly, foraging in the area during migration and potentially during breeding. Potentially roosting in the terrestrial part of the area, too.

Common Sand Martin *Riparia riparia* - Least Concern, regular passage migrant, expected to make use of the airspace of the AoIs regularly, foraging in the area during migration and potentially roosting.

Eastern Bonelli's Warbler *Phylloscopus orientalis* - Least Concern, regular passage migrant, expected to pass through the AoIs occasionally during migration.

Western Bonelli's Warbler *Phylloscopus bonelli* - Least Concern, regular passage migrant expected to pass through the AoIs occasionally during migration.

Wood Warbler *Phylloscopus sibilatrix* - Least Concern, common passage migrant, in good numbers, expected to regularly occur in the AoIs on passage.

Yellow-browed Warbler *Phylloscopuls inornatus* - Least Concern, regular passage migrant, expected to occur occasionally in the AoIs on migration.

Willow Warbler *Phylloscopus trochilus* - Least Concern, common passage migrant, expected to regularly pass through the AoIs on migration.

Common Chiffchaff *Phylloscopus collybita* - Least Concern, common passage migrant and winter visitor, expected to pass through the AoIs regularly on migration and winter in the terrestrial part regularly.

Cetti's Warbler *Cettia cetti* - Least Concern, common breeder, including at Is-Salini (MT0000007). Expected to occur in the AoI regularly also during dispersal.

Eurasian Blackcap *Sylvia atricapilla* - Least Concern, common passage migrant and winter visitor. Expected to pass through the AoIs regularly during migration and make use of its terrestrial part during stop-over and wintering.

Garden Warbler *Sylvia borin* - Least Concern, common passage migrant. Expected to pass through the AoIs regularly during migration and make use of its terrestrial part during stop-over.

Lesser Whitethroat *Curruca curruca* - Least Concern, passage migrant in small numbers. Expected to occur in the AoIs occasionally on migration.

Sardinian Warbler *Curruca melanocephala* - Least Concern, common breeder in Malta and probable breeder in the AoI-1, present year-round.

Subalpine Warbler *Curruca cantillans* - Least Concern, common passage migrant, expected to regularly pass through the AoIs during migration.

Common Whitethroat *Curruca communis* - Least Concern, common passage migrant, expected to regularly pass through the AoI during migration.

Spectacled Warbler *Curruca conspicillata* - Least Concern, regular breeder.

Common Starling *Sturnus vulgaris* - Least Concern, breeding in small numbers, common passage migrant and winter visitor, expected to occur in the AoIs regularly in good number on passage and while wintering, including making use of the terrestrial area for foraging and potentially roosting.

Mistle Thrush *Turdus viscivorus* - Least Concern, regular passage migrant, can be expected to pass through the AoIs occasionally on migration.

Song Thrush *Turdus philomelos* - Least Concern, common passage migrant and winter visitor, can be expected to occur regularly in the AoIs.

Redwing *Turdus iliacus* - Near Threatened, regular passage migrant in small numbers, potentially wintering, can be expected to occasionally occur in the AoIs on migration.

Eurasian Blackbird *Turdus merula* - Least Concern, regular passage migrant and winter visitor, can be expected in the AoIs on passage and during wintering.

Fieldfare *Turdus pilaris* - Least Concern, regular passage migrant, potentially wintering, can be expected to occasionally occur in the AoIs on migration.

Rufous-tailed Scrub-robin *Cercotrichas galactotes* - Least Concern, rare but regular visitor, potentially occurring irregularly in singles in the AoIs.

Spotted Flycatcher *Muscicapa striata* - Least Concern, breeder in increasing numbers, common passage migrant, expected to be present regularly in the AoIs on passage and stopping over.

European Robin *Erithacus rubecula* - Least Concern, very common passage migrant and winter visitor. Expected to be present in the AoIs outside the breeding season in good numbers.

Bluethroat *Luscinia svecica* - Least Concern, Annex I, regular passage migrant, potentially wintering in small numbers, can be expected to pass through the AoIs occasionally on migration.

Common Nightingale *Luscinia megarhynchos* - Least Concern, common passage migrant, one breeding record from 1995, expected to pass through the AoIs on migration.

Semicollared Flycatcher *Ficedula semitorquata* - Least Concern, Annex I, regular passage migrant in small numbers, expected to pass through the AoIs occasionally on migration.

European Pied Flycatcher *Ficedula hypoleuca* - Least Concern, common passage migrant, expected to be present regularly in the AoIs during the migration periods.

Collared Flycatcher *Ficedula albicollis* – Least Concern, Annex I, regular passage migrant in low numbers, expected to pass through the AoIs during the migration periods.

Black Redstart *Phoenicurus ochruros* - Least Concern, common passage migrant, common winter visitor, expected to be regularly present in the AoIs during the non-breeding period.

Common Redstart *Phoenicurus phoenicurus* - Least Concern, common passage migrant, expected to regularly occur in the AoIs during the migration periods.

Rufous-tailed Rock-thrush *Monticola saxatilis* - Least Concern, regular passage migrant, can be expected to occur in the AoIs on passage and stop-over in the migration periods.

Blue Roch-thrush *Monticola solitarius* - Least Concern, common breeder, possibly breeding in the AoI-1, expected to make use of the terrestrial part of the AoIs year-round.

Whinchat *Saxicola rubetra* - Least Concern, common passage migrant, expected to pass through the AoIs on migration and also stopping over in the terrestrial area.

Common Stonechat *Saxicola rubicola* - Least Concern, common passage migrant and winter visitor, expected to be common in the AoIs during the non-breeding period.

Northern Wheatear *Oenanthe oenanthe* - Least Concern, common passage migrant, can be expected to pass through the AoIs on migration regularly.

Isabelline Wheatear *Oenanthe isabellina* - Least Concern, regular passage migrant in low numbers, might occasionally pass through the AoIs on migration.

Black-eared Wheatear *Oenanthe hispanica* - Least Concern, regular passage migrant, expected to occur in the AoIs regularly in low numbers during migration.

Goldcrest *Regulus regulus* - Least Concern, regular passage migrant and winter visitor, can be expected to regularly occur in the AoIs on passage.

Common Firecrest *Regulus ignicapilla* - Least Concern, regular passage migrant and winter visitor, can be expected to regularly occur in the AoIs on passage.

Dunnock *Prunella modularis* - Least Concern, regular passage migrant and winter visitor, expected to be present in the AoIs outside the breeding season in small numbers.

Spanish Sparrow *Passer hispaniolensis* - Least Concern, common breeder and regular passage migrant, common breeding resident confirmed in the AoI-1.

Eurasian Tree Sparrow *Passer montanus* - Least Concern, expected to occur in the AoIs during dispersal and in the non-breeding period in low numbers.

Tree Pipit *Anthus trivialis* - Least Concern, common passage migrant, during migration, expected to occur regularly in the AoIs on passage.

Red-throated Pipit *Anthus cervinus* - Least Concern, regular passage migrant, wintering in low numbers, expected to occasionally pass through the AoIs during migration and stopping over.

Meadow Pipit *Anthus pratensis* - Near Threatened, common passage migrant and winter visitor, expected to make regular use of the terrestrial part of the AoIs on stop-over during migration and as foraging grounds in winter.

Water Pipit *Anthus spinoletta* - Least Concern, rare passage migrant or winter visitor, expected to make use of the AoIs during migration occasionally.

Tawny Pipit *Anthus campestris* - Least Concern, Annex I, rare breeder, regular passage migrant, expected to pass through the AoIs occasionally on migration.

Western Yellow Wagtail *Motacilla flava* - Least Concern, common passage migrant, expected to pass through the AoIs regularly during migration, including foraging and potentially roosting during stop-over in the terrestrial part.

Grey Wagtail *Motacilla cinerea* - Least Concern, rare breeder, regular passage migrant and winter visitor, expected to occur in the AoIs occasionally to regularly in singles.

White Wagtail *Motacilla alba* - Least Concern, common passage migrant and winter visitor, expected to be regularly present in the AoIs during the non-breeding period.

Common Chaffinch *Fringilla coelebs* - Least Concern, regular passage migrant and winter visitor, potential breeder, but no breeding confirmed in recent years, expected to occur in the AoIs regularly during migration and as winter visitor.

Hawfinch *Coccothraustes coccothraustes* - Least Concern, regular passage migrant and winter visitor, expected to occur in the AoIs occasionally on migration and as winter visitor.

European Greenfinch *Chloris chloris* - Least Concern, common passage migrant and winter visitor, has bred occasionally on the Maltese islands but no confirmed breeding record in recent years. Can be expected to occur in the AoIs regularly during migration and as a winter visitor.

Common Linnet *Linaria cannabina* - Least Concern, common passage migrant and winter visitor, irregular breeder in very low numbers, expected to occur in the AoIs regularly during migration and as winter visitor, potentially year-round.

European Goldfinch *Carduelis carduelis* - Least Concern, common passage migrant and winter visitor, irregular breeder in very low numbers, expected to occur in the AoIs regularly during migration and as winter visitor, potentially year-round.

European Serin *Serinus serinus* - Least Concern, common passage migrant and winter visitor, irregular breeder in very low numbers, expected to occur in the AoIs regularly during migration and as winter visitor.

Eurasian Siskin *Spinus spinus* - Least Concern, regular passage migrant and winter visitor, expected to occur in the AoIs on migration and as winter visitor occasionally.

Corn Bunting *Emberiza calandra* - Least Concern, formerly regular breeder in Malta in very small numbers with decreasing trend, might occasionally occur in the AoIs during dispersal.

Ortolan Bunting *Emberiza hortulana* - Least Concern, Annex I, regular passage migrant, expected to occasionally pass through the AoIs during migration.

Reed Bunting *Emberiza schoeniclus* - Least Concern, regular passage migrant and winter visitor, expected to pass through the AoIs occasionally during migration and in the winter months.

3.0 Impact Assessment

3.1 Construction phase

3.1.1 Temporary reduction of terrestrial habitat (AoI-1)

The proposed development will result in a temporary (localised, short-term) loss of potential breeding habitat for up to 4 terrestrial songbird species within the AoI-1. While the terrestrial part of the development, including the AoI-1, are not situated inside Natura 2000 sites, the habitats disturbed during the construction phase including the buffer area set at 0.1 km around the proposed development provide nesting territories for some land birds[24],[25]. Furthermore, the roads leading to the construction site will experience higher traffic volume of heavy machinery, creating additional disturbance, noise pollution, dust etc. Material from excavation and construction will need to be stored at least temporarily. Overall, the proposed development will lead to temporary and localised, short-term disturbance for these terrestrial bird species in the AoI-1.

Several breeding territories of the Sardinian Warbler and the Zitting Cisticola will be disturbed or lost during the construction phase if works are carried out during the breeding season (March – August). Up to 2 breeding pairs of Blue Rock Thrush will be disturbed during the construction phase if works are carried out during the breeding season (March – July). The disturbance can potentially lead to the complete temporary displacement, and consecutive reduction in breeding success up to loss of nest sites leading to reproductive failure of the breeding pairs of all three species in the AoI-1 during the construction phase if it coincides with the breeding season.

Foraging areas and potential colonial nest sites of the Spanish Sparrow can be expected to be reduced temporarily during the construction phase and some broods may fail if works are carried out during the breeding season (March – August).

Temporary habitat loss and disturbance is expected to result in the destruction of foraging areas for other breeding, wintering, and/or staging species in the AoI-1 depending on the period of the year in which the construction works will take place.

The impacts during the construction phase of the MRF and ancillary facilities will act temporarily on a localised scale in the AoI-1 and, to some extent, the access roads. The works are not expected to impact a significant proportion of the relevant bird populations on a national or wider scale. However, they are expected to impact few local breeders of common species at least in the short-term.

[24] *Sultana et al. (2011): The Breeding Birds of Malta. BirdLife Malta, Malta.*

[25] *Epsilon Malta Ltd, Nature Conservation Consultants (2019). Malta Breeding Bird Atlas 2018. Malta: Wild Birds Regulation Unit, Ministry for the Environment, Sustainable Development and climate Change*

3.1.2 *Impacts from light pollution (AoI-2)*

Artificial light at night (ALAN) is well documented to negatively affect birds, including seabirds. Adults from all three procellariform species nesting on the Maltese Islands actively avoid approaching breeding areas under high levels of illumination and may desert colonies as a result of exposure to ALAN. That seabirds are negatively affected even by temporary light pollution in front of their colonies has been recently proven for *P. yelkouan* in Malta[26]. Furthermore, ALAN causes the stranding of seabird fledglings on their first flight out of the colony. These may be injured or killed by collisions with manmade structures such as street light poles, or they might get grounded. Unless grounded individuals are found and released, they are likely to die[27]. In general, light pollution from ALAN is additive and light trespass that creates skyglow adds to light pollution in areas that are otherwise dark.

The proposed development including the AoI-1 is not situated within the immediate line of sight of any seabird nest sites. However, a *P. yelkouan* colony holding a significant number of breeding pairs is located on St Paul's Island (MT0000022) within the 5.0 km buffer zone AoI-2, in which additional sky glow from ALAN from the construction site can have significant impacts. This is relevant if night-time construction activities are carried out during the reproductive season (February to July). The negative impact will potentially act on 45-70 breeding pairs. Including their offspring and prospecting birds, this equates to 225-350 individuals.

Additionally, ALAN is known to have negative consequences on nocturnally migrating birds in general. Bright lights are known to attract, disorient, and ground birds in active migration during the night[28] if construction work or operations are carried out at night during spring or autumn migration with no mitigation measures in place. The lit-up construction site during night-time operation is highly likely to have above-mentioned impacts on nocturnally migrating birds passing within the AoI-2 (5.0 km buffer). However, it is unlikely that the additional ALAN from the construction site will impact threshold numbers of significance of birds of any species during their nocturnal migration.

3.2 *Operational phase*

3.2.1 *General standard operations, footprint and AoI-1*

Situated in an Outside Development Zone (ODZ), the proposed MRF with ancillary facilities will result in the permanent reduction of breeding habitat on its footprint (and via disturbance, noise, and habitat alteration in the AoI-1 and along access roads) for up to four receptor

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[26] *Austad, M., Oppel, S., Crymble, J., Greetham, H., Sahin, D., Lago, P. & Metzger, B. (2023). The effects of temporally distinct light pollution from ships on nocturnal colony attendance in a threatened seabird. J Ornithol 164, 527–536. https://doi.org/10.1007/s10336-023-02045-z*

[27] *Rodríguez, A., Holmes, N. D., Ryan, P. G., Wilson, K. J., Faulquier, L., Murillo, Y., Raine, A. F., Penniman, J. F., Neves, V., Rodríguez, B., Negro, J. J., Chiaradia, A., Dann, P., Anderson, T., Metzger, B., Shirai, M., Deppe, L., Wheeler, J., Hodum, P., … Corre, M. Le. (2017). Seabird mortality induced by land-based artificial lights. Conservation Biology, 31(5), 986–1001. https://doi.org/10.1111/cobi.12900*

[28] *Evans Ogden, L. J. (2002). Summary report on the bird friendly building program: Effect of light reduction on collision of migratory birds. In Fatal Light Awareness Program (Vol. 1).*

species (see Table 1). Depending on how the non-built landscape and flat roofs of the planned development will be landscaped, this will result in the permanent loss of several breeding pairs *C. melanocephala*, *C. juncidis* and *M. solitarius*. Furthermore, it will lead to a reduction in foraging and roosting habitat as well as potential nesting sites for a population of breeding pairs (up to a few tens) of *P. hispaniolensis*.

Localised, permanent habitat loss and disturbance are additionally expected to result in the destruction of foraging areas for other breeding, wintering, and/or staging species making use of the footprint of the planned development and buffer zone (AoI-1).

Overall numbers of birds impacted are expected to remain well below levels of significance when considering the local (national), EU or international populations of any bird species making use of the area, thus no significant impacts on avifauna are expected in the footprint including the buffer zone (AoI-1) during standard operations.

3.2.2 Impacts from light pollution (AoI-2)

The impacts of ALAN on seabirds are explained in 3.1.2.

The proposed development including the AoI-1 is not situated within the immediate line of sight of any seabird nest sites. However, a *P. yelkouan* colony holding a significant number of breeding pairs is located on Saint Paul's Island (MT0000022) within the 5.0 km buffer zone AoI-2, in which additional sky glow from ALAN emitted by the MRF during operation can have significant impacts. This is relevant when operations are carried out during night-time or if the MRF including the ancillary facilities remain illuminated during the night outside working hours. The negative impact will be permanent and potentially act on 45-70 breeding pairs. Including their offspring and prospecting birds, this equates to 225-350 individuals.

Additionally, ALAN is known to have negative consequences on nocturnally migrating birds in general. Bright lights are known to attract, disorient, and ground birds in active migration during the night[29] if the MRF carries out night-time operations (or remains lit-up in general) during the spring or autumn migration period with no mitigation measures in place. The lit-up MRF is highly likely to have above-mentioned impacts on nocturnally migrating birds passing within the AoI-2 (5.0 km buffer). However, it is unlikely that the additional ALAN from the MRF will impact threshold numbers of significance of birds of any species passing through the wider area (AoI-2) during their nocturnal migration.

3.2.3 Potential for the reduction in waste ending up in the environment

The waste separation and treatment inside the proposed MRF as well as the recovery of the waste and (preparation for) recycling – if carried out appropriately – can have several indirect beneficial impacts on avifauna as compared to the current situation (open landfill at Magħtab).

It can lead to a reduction in the amount of plastic waste that is openly accessible to birds at the landfill and that can be blown or washed into the sea, as it is currently the case at the open

[29] *Evans Ogden, L. J. (2002). Summary report on the bird friendly building program: Effect of light reduction on collision of migratory birds. In Fatal Light Awareness Program (Vol. 1).*

landfill and can be observed regularly. Once in the marine environment, plastics are known to have a strong detrimental impact on avifauna and other marine life[30]. The reduction in the amount of plastics ending in the sea will reduce the number of birds suffering from entanglement and/or ingestion of macro-plastics and will lead to a reduction in the amount of micro-plastics ingested by avifauna, directly or indirectly.

3.2.4 Potential for the reduction in greenhouse gas emissions

Methane: Municipal solid waste landfills are among the largest sources of human-related methane emissions (Refs). As a greenhouse gas, methane is more than 25 times as potent as carbon dioxide at trapping heat in the atmosphere (Refs).

Carbon dioxide: Recycling plastic waste (e.g. from pellets) can significantly reduce carbon emissions by more than 40% as compared to conventional plastic production[31]. Anthropogenic greenhouse gas emissions are the main cause of climate change with negative impacts on biodiversity worldwide, including avifaunal communities. In connection with the Waste to Energy plant and the Composting plant, the MRF with plastic recycling facilities can contribute to the future reduction in the emission of greenhouse gas methane, leaking from the open landfill at Magħtab with potentially beneficial impact on biodiversity, including avifauna.

3.2.5 Risks associated with the MRF during operation

Manipulating, preparing and transporting material destined for recycling can lead to spills of such material into the environment with potentially detrimental effects on living organisms including avifauna. Small and lightweight plastic pellets (nurdles) can easily be blown or washed into the environment in large quantities during production, handling, shipping etc. if infrastructure is inadequate and/or protocols preventing such spills are not strictly adhered to. This is specifically of concern as operations (e.g. export of material for recycling abroad) are expected by vessels. Once released into the environment, the small plastic pellets are also known to absorb toxins and harmful chemicals like persistent organic pollutants (POP), increasing their potential impact for birds and other wildlife when accumulating in the food chain[32].

Transporting, manipulating, and storing flammable material in large quantities imposes significant risks. Processing and storing such material increases the fire hazard risks. Some types of plastics are known to produce toxic fumes when burning (e.g. hydrogen chloride is released when burning PVC). In fact, the previous MRF in Malta, based at Sant' Antnin, Marsascala, was destroyed in a large blaze in 2017[33], producing a plume of toxic fumes and

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[30] *Kühn, S. & van Franeker, J. A. (2020) Quantitative overview of marine debris ingested by marine megafauna. Marine Pollution Bulletin, 151, 110858. https://doi.org/10.1016/j.marpolbul.2019.110858*

[31] *Saleem, J., F. Tahir, M. Z. Khalid Baig, T. Al-Ansari, G. McKay (2023): Assessing the environmental footprint of recycled plastic pellets: A life-cycle assessment perspective, Environmental Technology & Innovation, Volume 32, https://doi.org/10.1016/j.eti.2023.103289.*

[32] *Teuten et al. (2009) Transport and release of chemicals from plastics to the environment and to wildlife. Philosophical Transactions of the Royal Society B, 364, 2027–2045. doi:10.1098/rstb.2008.0284*

[33] *Times of Malta (22nd May 2017) 'Watch: Health warning issued as fierce fire rages at Sant' Antnin waste recycling plant', https://timesofmalta.com/articles/view/sant-antnin-plant-on-fire.648706*

residues in the firefighting water runoff with negative short- and long-term impacts on the environment. There is a large risk that in the event of a fire in the MRF, the plume of the blaze as well as the run-off from firefighting water will release toxins into the environment, with detrimental short- to long-term effects on living organisms including avifauna.

3.3 Decommissioning phase

The potential demolition, removal, and restoration of the MRF at the end of the operational phase would likely have similar impacts on avifauna in the AoIs as compared to the construction phase. The loss of habitat is deemed permanent.

4.0 Mitigation measures

4.1 Mitigation by abstaining from the proposed development

Overall, net negative residual impacts on avifauna are expected under the scenario that the project is not realised at all. However, the quantification of the impacts would depend on a multitude of scenarios. The net negative impacts are:

- Continuation of plastic waste blown and washed into the sea from sites of continuous open land-filling;
- Continuation of an unnaturally high population size of *L. michahellis* due to food availability from the open landfill, competing with/ predating on species that are of conservation concern, and the landfill potentially acting as an ecological trap to foraging gulls;
- Unnaturally high population densities of *Rattus* spp. due to food availability from the open landfill, predating on avifauna, including potentially on species with conservation concern (However, some species such as various raptors may benefit from high densities of rodents);
- Future uptake of more land necessary for the expansion of open landfills;
- Methane leakage into the atmosphere from landfills due to anaerobic decomposition processes (methane is a more than 25 times more powerful greenhouse gas as compared to carbon dioxide, exacerbating global warming and climate change);
- Overall negative impact of wasteful resource management and linear material pathways as opposed to waste separation, recovery, and circular models of material management;
- Exporting mixed materials is less beneficial from an energetic point of view as compared to separating and recovering as much material as possible locally and export separated and pre-purified material for recovery abroad.

4.2 Mitigation by selection of an alternative location for the proposed development

Overall, the negative impacts on avifauna are expected to be lower if the project is realised at an alternative site with the following features:

- Not situated in an ODZ;
- Not taking up land of ecological and cultural value;
- Not consisting of permeable ground (agricultural or alike) which will be sealed by the planned development with significant consequence for water cycling and climate impacts, but situated in an built up area/ industrial estate that is already sealed by tarmac or concrete;
- Situated closer to areas where the material for recovery is produced (most densely urbanised areas including industrial estates);
- Situated closer to areas where staff that will work at the MRF is based to minimise commute impacts;

- Situated closer to areas where the material that is recovered is either processed for reuse or shipped for export (relevant industrial estates, terminals for large commercial vessels such as Freeport…);
- Situated farther away from ecologically sensitive, protected sites hosting important avifauna communities of significance (SACs, SPAs).

One of the advantages of the selected site is that the synergies in co-locating the proposed MRF within the direct vicinity to other waste management infrastructure within the ECOHIVE complex can have an environmental net benefit as compared to alternative location scenarios. This net benefit is expected to stem from the vicinity of resources and services shared between facilities within the ECOHIVE complex (e.g. staff, maintenance services, fire and emergency response, etc).

4.3 Mitigation measures during the construction phase

4.3.1 Mitigation of impact on terrestrial breeding birds (AoI-1)

To reduce the residual impact on local terrestrial breeding bird populations the following recommendations are made:

- The construction phase for the planned development is kept as short as possible;
- The construction phase is timed to a period outside the main reproductive season (March to August) of the bird species breeding in the area, thus focusing on the autumn and winter months. However, if this appears to be unfeasible, it is recommended that:
    - The footprint of the construction sites including the AoI-1 is kept as small as possible, specifically in the areas of natural and semi-natural habitat (agricultural land, garrigue on disused agricultural land);
    - Adherence to best practice procedures to keep noise pollution and dust production and dispersal at the construction site at a minimum;
    - No works will be carried out during the night. If this is not feasible, and artificial light is required, such lighting should strictly follow ERA's draft "Guidelines for the Reduction of Light Pollution in the Maltese Islands" throughout the duration of any nighttime works[35];
    - Adequate landscaping will be applied to restore the disturbed habitat in all affected areas in the AoI-1 at the end of the construction phase to mitigate any longer-term impact. It is recommended that solely native plants are used for habitat restoration, that species with known benefit to avifauna are chosen, and that fruiting plants which may provide resources to rats are avoided.

4.3.2 Mitigation of impact on receptors in the wider area (AoI-2)

To further reduce the residual impact on the receptor species utilising the wider AoI-2, including protected areas, during the construction phase, the following mitigation measures are recommended: No construction is carried out during darkness. If this is not feasible and

[35] Environment and Resources Authority (2020): Guidelines for the Reduction of Light Pollution in the Maltese Islands. Draft Public Consultation Document downloaded from https://era.org.mt/topic/public-consultation-guidelines-for-the-reduction-of-light-pollution-in-the-maltese-islands/ on 12-07-20223.

nighttime work requiring artificial light cannot be avoided, such lighting should strictly follow ERA's draft "Guidelines for the Reduction of Light Pollution in the Maltese Islands" throughout the duration of any nighttime works[36].

4.4 Mitigation measures during the operational phase

Overall, the localised negative impact on avifauna (area of the footprint of the MRF including the AoI-1 and access roads) during standard operations is expected to be not significant. However, as the proposed site for the MRF development is situated in an ODZ, it is highly recommended to implement the following mitigation measures: the permanent reduction of breeding habitat for *C. melanocephala*, and *C. juncidis* and the foraging and roosting habitat for all avifauna utilising the site is kept as small as possible by landscaping the open spaces (e.g. borders of parking areas, roofs) and planting native flora. The local reduction of the breeding populations of *M. solitarius* and *P. hispaniolensis* can be partially reversed by the installation of breeding facilities such as nest boxes at the buildings of the proposed development.

Additionally, it is suggested that physical sound barriers are installed along the footprint of the proposed development. Such barriers will additionally reduce the disturbance of avifauna in the AoI-1 and light trespass into the environment. Furthermore, depending on the design, such barriers could significantly reduce the amount of material (plastic pellets, pieces of sheets foil, paper or cardboard to be released into the environment during standard operations such as loading, unloading, packing.

Any artificial light structure – fixed or mobile – that is required during standard operational procedures at night should strictly follow ERA's draft "Guidelines for the Reduction of Light Pollution in the Maltese Islands" throughout the duration of any nighttime works[37]. This is crucial to avoid potentially significant impact from light pollution (glare, trespass, sky glow) on seabirds and other avian receptors making use of the AoI-2, specifically the protected areas.

To reduce the amount of plastics and other, potentially toxic material ending in the (marine) environment where it has strong and wide reaching negative long-term impacts on avifauna it is necessary that the MRF has adequate infrastructure in place such as catchment facilities and filters/ treatment facilities for run-off (from rain, but also flash-floods, firefighting measures, etc.).

Infrastructure and procedures would need to be in place to keep any fire hazard risks at the proposed development at a minimum and to make sure that in the event of fire or comparable accidents no material with negative impact to wildlife is leaked into the environment.

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37*36/37* Environment and Resources Authority (2020): Guidelines for the Reduction of Light Pollution in the Maltese Islands. Draft Public Consultation Document downloaded from https://era.org.mt/topic/public-consultation-guidelines-for-the-reduction-of-light-pollution-in-the-maltese-islands/ on 12-07-20223.

4.5 Mitigation measures during the decommissioning phase

For the decommissioning phase, the same mitigation measures are recommended as during the construction phase. Additionally, to reduce the impact of any remaining contamination on avifauna at the site (e.g. soil containing plastic residues, oil, heavy metals, etc.), any such contaminated material would need to be removed and disposed of adequately.

Furthermore, it has been highlighted that the proposed MRF is situated in an ODZ. Therefore, it can be expected that as part of the decommissioning phase the area covered with concrete and tarmac is unsealed and the habitat is restored to a status that is comparable to the current habitats. Landscaping could restore the area towards the current features present, but any planting activities should make use of native wild flora. It is expected that the demolition waste is either recycled or disposed of adequately to minimise any potential impact on avifauna.

5.0 Residual impacts on avifauna

No significant negative residual impacts on avifauna are expected from the proposed development alone if the mitigation measures highlighted above are implemented. The reduction of any risks of material ending up in the marine environment, both during standard operations and in the event of accidents is considered especially important, together with keeping light pollution from the MRF at a minimum.

Indirect residual impact on avifauna in the wider area and in the longer run might be positive as compared to the current situation in which large proportions of material still end up in the open landfill. However, the permanent destruction of habitat available for breeding and foraging as a result of the proposed development has negative cumulative effects.

It needs to be emphasized that further cumulative effects on avifauna can be expected, given that the MRF is not a standalone development in the area. The proposed development forms part of WasteServ's larger EcoHive complex, including a Waste to Energy plant, an Organic Processing Plant (OPP), as well as a Thermal Treatment Facility (TTF). These will be situated in direct vicinity of the MRF within the AoI-2. Additionally, construction works for the Second Sicily-Malta Interconnector are foreseen to take place in the wider area too (AoI-2), with the onshore cable route partially situated within the AoI-1. Cumulative effects can be expected both during the construction and operational phase of the EcoHive Project. The effects on avifauna would originate from increased habitat loss and modification (taking into account the cumulative footprint), disturbance (e.g. from noise, increased traffic in the area) and (additive) light pollution, among others.

6.0 Summary of Impacts

A detailed summary of impacts is provided in Table 3.

Table 3: Summary of impacts table

Impact type and source			Impact receptor		Effect & Scale							Probability of impact occurring	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	**Specific intervention leading to impact**	**Project phase**	**Receptor type**	**Sensitivity & resilience toward impact**	**Direct/ Indirect/ Cumulative**	**Beneficial/ Adverse**	**Severity**	**Physical/ geographic extent of impact**	**Short-/ Medium-/ Long-term**	**Temporary/ Permanent**	**Reversible/ Irreversible**					
Loss of habitat for terrestrial avian species	Destruction of (disused) agricultural land in ODZ	Construction	Terrestrial avian species	High & Low	Direct	Adverse	Low	Local in footprint and AoI-1	Short-term	Temporary	Reversible	Inevitable	Moderate	Keep time short, keep footprint low, avoid (if possible) reproductive season, habitat restoration	Minor	N/A
Noise, vibration, and light pollution negatively affecting terrestrial avian assemblages in AoI-1	Construction activities, operation	Construction	Terrestrial avian species	Moderate & Moderate	Direct	Adverse	Low	Local, in footprint and AoI-1	Short term	Temporary	Reversible	High	Moderate	Limit night-time activities, reduce light pollution, avoid (if possible) sensitive periods	Minor	N/A
Light pollution negatively impacting nocturnally migrating birds	Lighting during construction	Construction	Nocturnally migrating birds	Moderate & Moderate	Direct	Adverse	Low	Broad (AoI-1 and AoI-2)	Short-term	Temporary	Reversable	High	Moderate	Limit night-time activities, reduce light pollution, avoid (if possible) sensitive periods	Minor	N/A

Impact type and source			Impact receptor		Effect & Scale							Probability of impact occurring	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	**Specific intervention leading to impact**	**Project phase**	**Receptor type**	**Sensitivity & resilience toward impact**	**Direct/ Indirect/ Cumulative**	**Beneficial/ Adverse**	**Severity**	**Physical/ geographic extent of impact**	**Short-/ Medium-/ Long-term**	**Temporary/ Permanent**	**Reversible/ Irreversible**					
Colony disturbance grounding of seabird fledgling, associated induced mortality caused by ALAN	Lighting during construction and operation	Construction, operation	Procellariform seabirds, specifically *P. yelkouan*	High & Low	Direct	Adverse	High	Broad (AoI-2)	Short-term, potentially long term	Temporary, potentially permanent	Reversible	High	Major	Limit night-time activities, reduce light pollution, avoid (if possible) sensitive periods.	Minor	Strictly follow ERA guidelines for the reduction of light pollution
Loss of habitat for terrestrial avian species	Destruction of (disused) agricultural land in ODZ	Operation	Terrestrial avian species	High & Low	Direct	Adverse	High	Local in footprint and AoI-1	Long-term	Permanent	Irreversible	Inevitable	Moderate	Breeding and foraging habitat loss is minimised through landscaping and compensated with nesting installations.	Minor	N/A
Exposure of (marine) avifauna to macro-/ microplastics, other harmful substances	Spills, leakage of material from MRF into the environment during standard operations including transport or during accidents	Operation	Marine avian species and others	High & Low	Direct	Adverse (beneficial as compared to current open landfill situation)	high	Broad (AoI-2 and beyond)	Long term	Permanent	Reversible	Inevitable	Moderate	Infrastructure & protocols in place to minimize spills of any harmful material into the environment	Minor	N/A

Contribution or otherwise to climate change, impacting biodiversity	Reduction in methane from open landfill, reduction in CO2	Operation	Biotic and abiotic environment	Moderate & Moderate	Indirect/ Cumulative	Beneficial	Moderate	Very broad	Long-term	Permanent	Reversible, with difficulty	High	Moderate	N/A	Moderate	N/A