

# Bird Communities and the Rehabilitation of Al Karaana Lagoons in Qatar

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**Table S1:** Characteristics of TSE ponds as displayed at the Al Karaana wetland (Ashghal, Qatar Public Works Authority). The depth measured is of the deepest part of each TSE pond.

| Pond Name | Capacity (m <sup>3</sup> ) | Surface Area (Ha) | Depth (m) |
|-----------|----------------------------|-------------------|-----------|
| TSE-1     | 335,900                    | 19.20             | 3.0       |
| TSE-2     | 591,820                    | 17.02             | 5.2       |
| TSE-3     | 1,421,215                  | 34.20             | 5.5       |

## Detailed Survey Route

The morning route began at VP3 and continued along the TSE-1 shore in a counterclockwise direction until VP13 was reached, located at the overflow between TSE-1 and TSE-2 (Figure 3). The route continued along the north shore of TSE-2 until VP4, then turned eastward on the bund between TSE-2 and TSE-3 before returning close to VP4 again. Following that, it proceeded southward along the shore of TSE-3 then eastward to reach VP1, before going north to the endpoint VP12. On the other hand, the evening surveys began at VP1 and moved along to VP12 then VP3. The route then went around TSE-1 to reach VP13, then around the TSE-2 shore to reach VP4. Similar to the morning route, it then passed through the bund between TSE-2 and TSE-3 to reach the overflow, before returning and moving southward along TSE-3. The evening survey concluded by going eastward before circling back to the start point, VP1.

**Table S6:** Compilation of various water quality tests conducted from 2020 - 2021. Data within each category follows the order of the sampling dates. (Metito, personal comm.)

|                               | Date of sample testing | TSE 1 | TSE 2 | TSE 3 |
|-------------------------------|------------------------|-------|-------|-------|
| pH                            | 7-Jul-2020             | 8.36  | 8.30  | -     |
|                               | 30-Sep-2020            | 9.19  | 8.87  | -     |
|                               | 6-Oct-2020             | 9.42  | 9.44  | -     |
|                               | 13-Apr-2021            | 9.95  | 9.28  | -     |
|                               | 13-Jul-2021            | 9.24  | 9.64  | -     |
|                               | 3-Aug-2021             | 9.46  | 9.58  | 8.97  |
| Total Dissolved Solids (mg/L) | 7-Jul-2020             | 1239  | 1748  | -     |
|                               | 30-Sep-2020            | 1186  | 1774  | -     |
|                               | 6-Oct-2020             | 1073  | 1164  | -     |
|                               | 13-Apr-2021            | 891   | 1209  | -     |
|                               | 13-Jul-2021            | 944   | 1352  | -     |
|                               | 3-Aug-2021             | 919   | 1343  | 3398  |

|                                  |             |       |      |      |
|----------------------------------|-------------|-------|------|------|
| Total Suspended Solids (mg/L)    | 7-Jul-2020  | 50    | 33   | -    |
|                                  | 30-Sep-2020 | 43    | 23   | -    |
|                                  | 6-Oct-2020  | 60    | 20   | -    |
|                                  | 13-Apr-2021 | 29    | 23   | -    |
|                                  | 13-Jul-2021 | 35    | 21   | -    |
|                                  | 3-Aug-2021  | 10    | 26   | 17   |
| Chemical Oxygen Demand (mg/L)    | 7-Jul-2020  | 46    | 38   | -    |
|                                  | 30-Sep-2020 | 92    | 79   | -    |
|                                  | 6-Oct-2020  | 74    | 70   | -    |
|                                  | 13-Apr-2021 | 47    | 39   | -    |
|                                  | 13-Jul-2021 | 90    | 70   | -    |
|                                  | 3-Aug-2021  | 34    | 37   | 66   |
| Biochemical Oxygen Demand (mg/L) | 7-Jul-2020  | -     | -    | -    |
|                                  | 30-Sep-2020 | -     | -    | -    |
|                                  | 6-Oct-2020  | -     | -    | -    |
|                                  | 13-Apr-2021 | 7.4   | 6.9  | -    |
|                                  | 13-Jul-2021 | -     | -    | -    |
|                                  | 3-Aug-2021  | -     | -    | -    |
| Dissolved Oxygen                 | 7-Jul-2020  | 9.0   | 8.30 | -    |
|                                  | 30-Sep-2020 | 9.25  | 7.78 | -    |
|                                  | 6-Oct-2020  | 9.84  | 8.12 | -    |
|                                  | 13-Apr-2021 | 10.17 | 8.66 | -    |
|                                  | 13-Jul-2021 | 10.84 | 8.37 | -    |
|                                  | 3-Aug-2021  | 8.1   | 8.64 | 8.01 |
| Ammonia as N (mg/L)              | 7-Jul-2020  | 0.02  | 0.01 | -    |
|                                  | 30-Sep-2020 | 0.20  | 0.48 | -    |
|                                  | 6-Oct-2020  | 0.37  | 0.2  | -    |
|                                  | 13-Apr-2021 | 0.11  | 0.1  | -    |
|                                  | 13-Jul-2021 | 0.84  | 0.88 | -    |
|                                  | 3-Aug-2021  | 0.94  | 0.67 | 0.04 |



**Figure S1.** Pre-remediation observation of oil slick at “Vantage Point 2” in the 2015 report. This site is located between L3 and L6 (see Figure 2 in main text) and has been restored to the original condition of compact soil not used for receiving treated wastewater. (From WKC 2015 report, courtesy of Ashghal, Qatar Public Works Authority.)



**Figure S2:** Pre-remediation observation of surface contamination in the southern region of the former Lagoon 3 (L3), which is currently TSE-3 (see Figure 2 of main text). (Photo taken 2017-11-30, from KEO 2017 report, courtesy of Ashghal.)



**Figure S3:** Post-remediation observation of the southwestern corner of TSE-3, same location as the former southern region of the L3 in Figure S2. (Photo taken 2021-09-24.)



**Figure S4:** Post-remediation aerial view of TSE-1 pond, foreground, TSE-2 and TSE-3 ponds, upper-right looking southeastward. (Photo taken 2021-12-24.)



**Figure S5:** Post-remediation aerial view of TSE-2 pond, foreground and TSE-3 pond, background looking southeastward. (Photo taken 2021-12-24.)