

## **Appendix 11.1**

### **Marine Ornithology**

Table 11-17 Input values for collision risk modelling for gannet using mean values and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|--|-----------------------|-------|----------------|-----------------------------------|-----|------|------|-----------|------|-----|------|------|-----|------|-----|
| Species name                               |                       |       | <b>Gannet</b>  |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird length                                | m                     |       | 0.94           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Wingspan                                   | m                     |       | 1.72           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Flight speed                               | m/sec                 |       | 14.9           | Pennicuick 1997                   |     |      |      |           |      |     |      |      |     |      |     |
| Nocturnal activity factor (1-5)            |                       |       | 2              | Garthe and Huppopp 2004           |     |      |      |           |      |     |      |      |     |      |     |
| Flight type, flapping or gliding           |                       |       | gliding        |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird survey data                           |                       |       |                | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|  |                       |       |                | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| All daytime density                        |                       |       |                | 0                                 | 0   | 0.09 | 0.19 | 0         | 0.15 | 0   | 0.45 | 1.07 | 0   | 0.09 | 0   |
| % flying                                   |                       |       |                | 0%                                | 0%  | 100% | 100% | 100%      | 17%  | 0%  | 20%  | 83%  | 86% | 100% | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0   | 0.09 | 0.19 | 0         | 0.02 | 0   | 0.09 | 0.89 | 0   | 0.09 | 0   |
| Proportion at rotor height                 | %                     |       | 7.0%           | Johnston <i>et al.</i> 2014       |     |      |      |           |      |     |      |      |     |      |     |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |     |      |      |           |      |     |      |      |     |      |     |
| Windfarm data                              |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |     |      |      |           |      |     |      |      |     |      |     |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Tidal offset                               | m                     |       | 0              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Turbine data                               |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Turbine model                              |                       |       |                |                                   |     |      |      |           |      |     |      |      |     |      |     |
| No of blades                               |                       |       | 3              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotor radius                               | m                     |       | 77             |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93% | 93%  | 93%  | 93%       | 93%  | 93% | 93%  | 93%  | 93% | 93%  | 93% |
| Max blade width                            | m                     |       | 5.500          |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Pitch                                      | degrees               |       | 7              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |     |      |      | SNCB 2014 |      |     |      |      |     |      |     |



Table 11-19 Input values for collision risk modelling for gannet using upper 95% CIs and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|--|-----------------------|-------|----------------|-----------------------------------|-----|------|------|-----------|------|-----|------|------|-----|------|-----|
| Species name                               |                       |       | <b>Gannet</b>  |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird length                                | m                     |       | 0.94           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Wingspan                                   | m                     |       | 1.72           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Flight speed                               | m/sec                 |       | 14.9           | Pennicuick 1997                   |     |      |      |           |      |     |      |      |     |      |     |
| Nocturnal activity factor (1-5)            |                       |       | 2              | Garthe and Huppopp 2004           |     |      |      |           |      |     |      |      |     |      |     |
| Flight type, flapping or gliding           |                       |       | gliding        |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird survey data                           |                       |       |                | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|  |                       |       |                | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| All daytime density                        |                       |       |                | 0                                 | 0   | 0.27 | 0.46 | 0         | 0.33 | 0   | 1.10 | 1.70 | 0   | 0.27 | 0   |
| % flying                                   |                       |       |                | 0%                                | 0%  | 100% | 100% | 100%      | 17%  | 0%  | 20%  | 83%  | 86% | 100% | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0   | 0.27 | 0.46 | 0         | 0.06 | 0   | 0.22 | 1.41 | 0   | 0.27 | 0   |
| Proportion at rotor height                 | %                     |       | 13.0%          | Johnston <i>et al.</i> 2014       |     |      |      |           |      |     |      |      |     |      |     |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |     |      |      |           |      |     |      |      |     |      |     |
| Windfarm data                              |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |     |      |      |           |      |     |      |      |     |      |     |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Tidal offset                               | m                     |       | 0              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Turbine data                               |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Turbine model                              |                       |       |                |                                   |     |      |      |           |      |     |      |      |     |      |     |
| No of blades                               |                       |       | 3              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotor radius                               | m                     |       | 77             |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93% | 93%  | 93%  | 93%       | 93%  | 93% | 93%  | 93%  | 93% | 93%  | 93% |
| Max blade width                            | m                     |       | 5.500          |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Pitch                                      | degrees               |       | 7              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |     |      |      | SNCB 2014 |      |     |      |      |     |      |     |

Table 11-20 Output results for collision risk modelling for gannet using upper 95% CIs and generic flight height data in Option 1 (Band 2012).

| Stage A – Flight activity          |                         |        |     |     |      |      |     |      |     |      |      |     |      |     | Per annum |
|------------------------------------|-------------------------|--------|-----|-----|------|------|-----|------|-----|------|------|-----|------|-----|-----------|
|                                    |                         |        | Jan | Feb | Mar  | Apr  | May | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |           |
| Daytime aerial bird density        | birds/km <sup>2</sup>   |        | 0   | 0   | 0.27 | 0.46 | 0   | 0.06 | 0   | 0.22 | 1.41 | 0   | 0.27 | 0   |           |
| Proportion at rotor height         | %                       | 13.0   |     |     |      |      |     |      |     |      |      |     |      |     |           |
| Total daylight hours per month     | hrs                     |        | 221 | 259 | 365  | 432  | 521 | 547  | 546 | 479  | 387  | 320 | 236  | 199 |           |
| Total night hours per month        | hrs                     |        | 523 | 413 | 379  | 288  | 223 | 173  | 198 | 265  | 333  | 424 | 484  | 545 |           |
| Flux factor                        |                         |        | 0   | 0   | 1610 | 2980 | 0   | 427  | 0   | 1563 | 8633 | 0   | 1252 | 0   |           |
| Option 1 – Basic model             |                         |        | 0   | 0   | 15   | 28   | 0   | 4    | 0   | 14   | 80   | 0   | 12   | 0   | 152       |
| Collisions assuming avoidance rate | Birds per month or year | 98.90% | 0   | 0   | 0    | 0    | 0   | 0    | 0   | 0    | 1    | 0   | 0    | 0   | 2         |

Table 11-21 Input values for collision risk modelling for gannet using mean values and site specific flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|--|-----------------------|-------|----------------|-----------------------------------|-----|------|------|-----------|------|-----|------|------|-----|------|-----|
| Species name                               |                       |       | <b>Gannet</b>  |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird length                                | m                     |       | 0.94           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Wingspan                                   | m                     |       | 1.72           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Flight speed                               | m/sec                 |       | 14.9           | Pennicuick 1997                   |     |      |      |           |      |     |      |      |     |      |     |
| Nocturnal activity factor (1-5)            |                       |       | 2              | Garthe and Huppop 2004            |     |      |      |           |      |     |      |      |     |      |     |
| Flight type, flapping or gliding           |                       |       | gliding        |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird survey data                           |                       |       |                | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|  |                       |       |                | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| All daytime density                        |                       |       |                | 0                                 | 0   | 0.09 | 0.19 | 0         | 0.15 | 0   | 0.45 | 1.07 | 0   | 0.09 | 0   |
| % flying                                   |                       |       |                | 0%                                | 0%  | 100% | 100% | 100%      | 17%  | 0%  | 20%  | 83%  | 86% | 100% | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0   | 0.09 | 0.19 | 0         | 0.02 | 0   | 0.09 | 0.89 | 0   | 0.09 | 0   |
| Proportion at rotor height                 | %                     |       | 37.8%          | Irwin <i>et al.</i> 2015b         |     |      |      |           |      |     |      |      |     |      |     |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |     |      |      |           |      |     |      |      |     |      |     |
| Windfarm data                              |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |     |      |      |           |      |     |      |      |     |      |     |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Tidal offset                               | m                     |       | 0              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Turbine data                               |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Turbine model                              |                       |       |                |                                   |     |      |      |           |      |     |      |      |     |      |     |
| No of blades                               |                       |       | 3              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotor radius                               | m                     |       | 77             |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93% | 93%  | 93%  | 93%       | 93%  | 93% | 93%  | 93%  | 93% | 93%  | 93% |
| Max blade width                            | m                     |       | 5.500          |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Pitch                                      | degrees               |       | 7              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |     |      |      | SNCB 2014 |      |     |      |      |     |      |     |

Table 11-22 Output results for collision risk modelling for gannet using mean values and site specific flight height data in Option 1 (Band 2012).

| Stage A – Flight activity          |                         |        |     |     |      |      |     |      |     |      |      |     |      |     | Per annum |
|------------------------------------|-------------------------|--------|-----|-----|------|------|-----|------|-----|------|------|-----|------|-----|-----------|
|                                    |                         |        | Jan | Feb | Mar  | Apr  | May | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |           |
| Daytime aerial bird density        | birds/km <sup>2</sup>   |        | 0   | 0   | 0.09 | 0.19 | 0   | 0.02 | 0   | 0.09 | 0.89 | 0   | 0.09 | 0   |           |
| Proportion at rotor height         | %                       | 37.8   |     |     |      |      |     |      |     |      |      |     |      |     |           |
| Total daylight hours per month     | hrs                     |        | 221 | 259 | 365  | 432  | 521 | 547  | 546 | 479  | 387  | 320 | 236  | 199 |           |
| Total night hours per month        | hrs                     |        | 523 | 413 | 379  | 288  | 223 | 173  | 198 | 265  | 333  | 424 | 484  | 545 |           |
| Flux factor                        |                         |        | 0   | 0   | 537  | 1242 | 0   | 190  | 0   | 637  | 5421 | 0   | 417  | 0   |           |
| Option 1 – Basic model             |                         |        | 0   | 0   | 14   | 33   | 0   | 5    | 0   | 17   | 146  | 0   | 11   | 0   | 227       |
| Collisions assuming avoidance rate | Birds per month or year | 98.90% | 0   | 0   | 0    | 0    | 0   | 0    | 0   | 0    | 2    | 0   | 0    | 0   | 3         |

Table 11-23 Input values for collision risk modelling for gannet using upper 95% CIs and site specific flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|--|-----------------------|-------|----------------|-----------------------------------|-----|------|------|-----------|------|-----|------|------|-----|------|-----|
| Species name                               |                       |       | <b>Gannet</b>  |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird length                                | m                     |       | 0.94           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Wingspan                                   | m                     |       | 1.72           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Flight speed                               | m/sec                 |       | 14.9           | Pennicuick 1997                   |     |      |      |           |      |     |      |      |     |      |     |
| Nocturnal activity factor (1-5)            |                       |       | 2              | Garthe and Huppopp 2004           |     |      |      |           |      |     |      |      |     |      |     |
| Flight type, flapping or gliding           |                       |       | gliding        |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird survey data                           |                       |       |                | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|  |                       |       |                | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| All daytime density                        |                       |       |                | 0                                 | 0   | 0.27 | 0.46 | 0         | 0.33 | 0   | 1.10 | 1.70 | 0   | 0.27 | 0   |
| % flying                                   |                       |       |                | 0%                                | 0%  | 100% | 100% | 100%      | 17%  | 0%  | 20%  | 83%  | 86% | 100% | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0   | 0.27 | 0.46 | 0         | 0.06 | 0   | 0.22 | 1.41 | 0   | 0.27 | 0   |
| Proportion at rotor height                 | %                     |       | 37.8%          | Irwin <i>et al.</i> 2015b         |     |      |      |           |      |     |      |      |     |      |     |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |     |      |      |           |      |     |      |      |     |      |     |
| Windfarm data                              |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |     |      |      |           |      |     |      |      |     |      |     |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Tidal offset                               | m                     |       | 0              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Turbine data                               |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Turbine model                              |                       |       |                |                                   |     |      |      |           |      |     |      |      |     |      |     |
| No of blades                               |                       |       | 3              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotor radius                               | m                     |       | 77             |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93% | 93%  | 93%  | 93%       | 93%  | 93% | 93%  | 93%  | 93% | 93%  | 93% |
| Max blade width                            | m                     |       | 5.500          |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Pitch                                      | degrees               |       | 7              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |     |      |      | SNCB 2014 |      |     |      |      |     |      |     |

Table 11-24 Output results for collision risk modelling for gannet using upper 95% CIs and site specific flight height data in Option 1 (Band 2012).

| Stage A – Flight activity          |                         |        |     |     |      |      |     |      |     |      |      |     |      |     | Per annum |
|------------------------------------|-------------------------|--------|-----|-----|------|------|-----|------|-----|------|------|-----|------|-----|-----------|
|                                    |                         |        | Jan | Feb | Mar  | Apr  | May | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |           |
| Daytime aerial bird density        | birds/km <sup>2</sup>   |        | 0   | 0   | 0.27 | 0.46 | 0   | 0.06 | 0   | 0.22 | 1.41 | 0   | 0.27 | 0   |           |
| Proportion at rotor height         | %                       | 37.8   |     |     |      |      |     |      |     |      |      |     |      |     |           |
| Total daylight hours per month     | hrs                     |        | 221 | 259 | 365  | 432  | 521 | 547  | 546 | 479  | 387  | 320 | 236  | 199 |           |
| Total night hours per month        | hrs                     |        | 523 | 413 | 379  | 288  | 223 | 173  | 198 | 265  | 333  | 424 | 484  | 545 |           |
| Flux factor                        |                         |        | 0   | 0   | 1610 | 2980 | 0   | 427  | 0   | 1563 | 8633 | 0   | 1252 | 0   |           |
| Option 1 – Basic model             |                         |        | 0   | 0   | 43   | 80   | 0   | 12   | 0   | 42   | 232  | 0   | 34   | 0   | 443       |
| Collisions assuming avoidance rate | Birds per month or year | 98.90% | 0   | 0   | 0    | 1    | 0   | 0    | 0   | 0    | 3    | 0   | 0    | 0   | 5         |

Table 11-25 Input values for collision risk modelling for gannet using mean values and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|--|-----------------------|-------|----------------|-----------------------------------|-----|------|------|-----------|------|-----|------|------|-----|------|-----|
| Species name                               |                       |       | <b>Gannet</b>  |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird length                                | m                     |       | 0.94           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Wingspan                                   | m                     |       | 1.72           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Flight speed                               | m/sec                 |       | 14.9           | Pennicuick 1997                   |     |      |      |           |      |     |      |      |     |      |     |
| Nocturnal activity factor (1-5)            |                       |       | 2              | Garthe and Huppopp 2004           |     |      |      |           |      |     |      |      |     |      |     |
| Flight type, flapping or gliding           |                       |       | gliding        |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird survey data                           |                       |       |                | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|  |                       |       |                | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| All daytime density                        |                       |       |                | 0                                 | 0   | 0.09 | 0.19 | 0         | 0.15 | 0   | 0.45 | 1.07 | 0   | 0.09 | 0   |
| % flying                                   |                       |       |                | 0%                                | 0%  | 100% | 100% | 100%      | 17%  | 0%  | 20%  | 83%  | 86% | 100% | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0   | 0.09 | 0.19 | 0         | 0.02 | 0   | 0.09 | 0.89 | 0   | 0.09 | 0   |
| Proportion at rotor height                 | %                     |       | 7.0%           | Johnston <i>et al.</i> 2014       |     |      |      |           |      |     |      |      |     |      |     |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |     |      |      |           |      |     |      |      |     |      |     |
| Windfarm data                              |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |     |      |      |           |      |     |      |      |     |      |     |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Tidal offset                               | m                     |       | 0              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Turbine data                               |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Turbine model                              |                       |       |                |                                   |     |      |      |           |      |     |      |      |     |      |     |
| No of blades                               |                       |       | 3              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotor radius                               | m                     |       | 77             |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93% | 93%  | 93%  | 93%       | 93%  | 93% | 93%  | 93%  | 93% | 93%  | 93% |
| Max blade width                            | m                     |       | 5.500          |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Pitch                                      | degrees               |       | 7              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |     |      |      | SNCB 2014 |      |     |      |      |     |      |     |



Table 11-27 Input values for collision risk modelling for gannet using upper 95% CIs and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|--|-----------------------|-------|----------------|-----------------------------------|-----|------|------|-----------|------|-----|------|------|-----|------|-----|
| Species name                               |                       |       | <b>Gannet</b>  |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird length                                | m                     |       | 0.94           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Wingspan                                   | m                     |       | 1.72           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Flight speed                               | m/sec                 |       | 14.9           | Pennicuick 1997                   |     |      |      |           |      |     |      |      |     |      |     |
| Nocturnal activity factor (1-5)            |                       |       | 2              | Garthe and Huppopp 2004           |     |      |      |           |      |     |      |      |     |      |     |
| Flight type, flapping or gliding           |                       |       | gliding        |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird survey data                           |                       |       |                | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|  |                       |       |                | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| All daytime density                        |                       |       |                | 0                                 | 0   | 0.27 | 0.46 | 0         | 0.33 | 0   | 1.10 | 1.70 | 0   | 0.27 | 0   |
| % flying                                   |                       |       |                | 0%                                | 0%  | 100% | 100% | 100%      | 17%  | 0%  | 20%  | 83%  | 86% | 100% | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0   | 0.27 | 0.46 | 0         | 0.06 | 0   | 0.22 | 1.41 | 0   | 0.27 | 0   |
| Proportion at rotor height                 | %                     |       | 13.0%          | Johnston <i>et al.</i> 2014       |     |      |      |           |      |     |      |      |     |      |     |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |     |      |      |           |      |     |      |      |     |      |     |
| Windfarm data                              |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |     |      |      |           |      |     |      |      |     |      |     |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Tidal offset                               | m                     |       | 0              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Turbine data                               |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Turbine model                              |                       |       |                |                                   |     |      |      |           |      |     |      |      |     |      |     |
| No of blades                               |                       |       | 3              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotor radius                               | m                     |       | 77             |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93% | 93%  | 93%  | 93%       | 93%  | 93% | 93%  | 93%  | 93% | 93%  | 93% |
| Max blade width                            | m                     |       | 5.500          |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Pitch                                      | degrees               |       | 7              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |     |      |      | SNCB 2014 |      |     |      |      |     |      |     |



Table 11-29 Input values for collision risk modelling for gannet using mean values and site-specific flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|--|-----------------------|-------|----------------|-----------------------------------|-----|------|------|-----------|------|-----|------|------|-----|------|-----|
| Species name                               |                       |       | <b>Gannet</b>  |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird length                                | m                     |       | 0.94           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Wingspan                                   | m                     |       | 1.72           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Flight speed                               | m/sec                 |       | 14.9           | Pennicuick 1997                   |     |      |      |           |      |     |      |      |     |      |     |
| Nocturnal activity factor (1-5)            |                       |       | 2              | Garthe and Huppopp 2004           |     |      |      |           |      |     |      |      |     |      |     |
| Flight type, flapping or gliding           |                       |       | gliding        |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird survey data                           |                       |       |                | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|  |                       |       |                | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| All daytime density                        |                       |       |                | 0                                 | 0   | 0.09 | 0.19 | 0         | 0.15 | 0   | 0.45 | 1.07 | 0   | 0.09 | 0   |
| % flying                                   |                       |       |                | 0%                                | 0%  | 100% | 100% | 100%      | 17%  | 0%  | 20%  | 83%  | 86% | 100% | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0   | 0.09 | 0.19 | 0         | 0.02 | 0   | 0.09 | 0.89 | 0   | 0.09 | 0   |
| Proportion at rotor height                 | %                     |       | 7.0%           | Johnston <i>et al.</i> 2014       |     |      |      |           |      |     |      |      |     |      |     |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |     |      |      |           |      |     |      |      |     |      |     |
| Windfarm data                              |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |     |      |      |           |      |     |      |      |     |      |     |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Tidal offset                               | m                     |       | 0              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Turbine data                               |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Turbine model                              |                       |       |                |                                   |     |      |      |           |      |     |      |      |     |      |     |
| No of blades                               |                       |       | 3              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotor radius                               | m                     |       | 77             |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93% | 93%  | 93%  | 93%       | 93%  | 93% | 93%  | 93%  | 93% | 93%  | 93% |
| Max blade width                            | m                     |       | 5.500          |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Pitch                                      | degrees               |       | 7              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |     |      |      | SNCB 2014 |      |     |      |      |     |      |     |



Table 11-31 Input values for collision risk modelling for gannet using upper 95% CIs and site-specific flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|--|-----------------------|-------|----------------|-----------------------------------|-----|------|------|-----------|------|-----|------|------|-----|------|-----|
| Species name                               |                       |       | <b>Gannet</b>  |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird length                                | m                     |       | 0.94           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Wingspan                                   | m                     |       | 1.72           | BWP                               |     |      |      |           |      |     |      |      |     |      |     |
| Flight speed                               | m/sec                 |       | 14.9           | Pennicuick 1997                   |     |      |      |           |      |     |      |      |     |      |     |
| Nocturnal activity factor (1-5)            |                       |       | 2              | Garthe and Huppopp 2004           |     |      |      |           |      |     |      |      |     |      |     |
| Flight type, flapping or gliding           |                       |       | gliding        |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Bird survey data                           |                       |       |                | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
|  |                       |       |                | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| All daytime density                        |                       |       |                | 0                                 | 0   | 0.27 | 0.46 | 0         | 0.33 | 0   | 1.10 | 1.70 | 0   | 0.27 | 0   |
| % flying                                   |                       |       |                | 0%                                | 0%  | 100% | 100% | 100%      | 17%  | 0%  | 20%  | 83%  | 86% | 100% | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0   | 0.27 | 0.46 | 0         | 0.06 | 0   | 0.22 | 1.41 | 0   | 0.27 | 0   |
| Proportion at rotor height                 | %                     |       | 37.8%          | Irwin <i>et al.</i> 2015b         |     |      |      |           |      |     |      |      |     |      |     |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |     |      |      |           |      |     |      |      |     |      |     |
| Windfarm data                              |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |     |      |      |           |      |     |      |      |     |      |     |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |     |      |      |           |      |     |      |      |     |      |     |
| Tidal offset                               | m                     |       | 0              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Turbine data                               |                       | Units | Value          | Data sources                      |     |      |      |           |      |     |      |      |     |      |     |
| Turbine model                              |                       |       |                |                                   |     |      |      |           |      |     |      |      |     |      |     |
| No of blades                               |                       |       | 3              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Rotor radius                               | m                     |       | 77             |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb | Mar  | Apr  | May       | Jun  | Jul | Aug  | Sep  | Oct | Nov  | Dec |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93% | 93%  | 93%  | 93%       | 93%  | 93% | 93%  | 93%  | 93% | 93%  | 93% |
| Max blade width                            | m                     |       | 5.500          |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Pitch                                      | degrees               |       | 7              |                                   |     |      |      |           |      |     |      |      |     |      |     |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |     |      |      | SNCB 2014 |      |     |      |      |     |      |     |



Table 11-33 Input values for collision risk modelling for great skua using mean values and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units    | Value                             | Data sources                 |     |     |     |                 |      |     |     |     |     |     |     |
|--|-----------------------|----------|-----------------------------------|------------------------------|-----|-----|-----|-----------------|------|-----|-----|-----|-----|-----|-----|
| Species name                               |                       |          | <b>Great skua</b>                 |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Bird length                                | m                     | 0.56     | BWP                               |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Wingspan                                   | m                     | 1.36     | BWP                               |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Flight speed                               | m/sec                 | 14.9     | Pennicuick 1997                   |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Nocturnal activity factor (1-5)            |                       | 1        | Garthe & Huppopp 2004             |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Flight type, flapping or gliding           |                       | flapping |                                   |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Bird survey data                           |                       |          |                                   | Data sources                 |     |     |     |                 |      |     |     |     |     |     |     |
|  |                       |          |                                   | Jan                          | Feb | Mar | Apr | May             | Jun  | Jul | Aug | Sep | Oct | Nov | Dec |
| All daytime density                        |                       |          |                                   | 0                            | 0   | 0   | 0   | 0.1             | 0.14 | 0   | 0   | 0   | 0   | 0   | 0   |
| % flying                                   |                       |          |                                   | 0%                           | 0%  | 0%  | 0%  | 100%            | 50%  | 0%  | 50% | 0%  | 0%  | 0%  | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |          |                                   | 0                            | 0   | 0   | 0   | 0.1             | 0.07 | 0   | 0   | 0   | 0   | 0   | 0   |
| Proportion at rotor height                 | %                     | 0.0%     | Johnston <i>et al.</i> 2014       |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Proportion of flights upwind               | %                     | 50.0%    | Assumed                           |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Windfarm data                              |                       | Units    | Value                             | Data sources                 |     |     |     |                 |      |     |     |     |     |     |     |
| Name of windfarm site                      |                       |          | <b>Hexicon</b>                    |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Latitude                                   | degrees               | 58.66    | ArcGIS                            |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Number of turbines                         |                       | 2        | Design envelope for JF review v3A |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Width of windfarm                          | km                    | 0.25     | Design envelope for JF review v3A |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Tidal offset                               | m                     | 0        |                                   |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Turbine data                               |                       | Units    | Value                             | Data sources                 |     |     |     |                 |      |     |     |     |     |     |     |
| Turbine model                              |                       |          |                                   |                              |     |     |     |                 |      |     |     |     |     |     |     |
| No of blades                               |                       | 3        |                                   |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Rotation speed                             | rpm                   | 10.2     |                                   |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Rotor radius                               | m                     | 77       |                                   |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Hub height                                 | m                     | 124      |                                   | Jan                          | Feb | Mar | Apr | May             | Jun  | Jul | Aug | Sep | Oct | Nov | Dec |
| Monthly proportion of time operational     | %                     |          |                                   | 93%                          | 93% | 93% | 93% | 93%             | 93%  | 93% | 93% | 93% | 93% | 93% | 93% |
| Max blade width                            | m                     | 5.500    |                                   |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Pitch                                      | degrees               | 7        |                                   |                              |     |     |     |                 |      |     |     |     |     |     |     |
| Avoidance rates used in presenting results |                       |          | 98.30%                            | Data sources (if applicable) |     |     |     | Cook et al 2012 |      |     |     |     |     |     |     |



Table 11-35 Input values for collision risk modelling for great skua using upper 95% CIs and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units    | Value                             | Data sources  |     |     |     |      |      |     |     |     |     |     |     |
|--|-----------------------|----------|-----------------------------------|---|-----|-----|-----|------|------|-----|-----|-----|-----|-----|-----|
| Species name                               |                       |          | <b>Great skua</b>                 |   |     |     |     |      |      |     |     |     |     |     |     |
| Bird length                                | m                     | 0.56     | BWP                               |   |     |     |     |      |      |     |     |     |     |     |     |
| Wingspan                                   | m                     | 1.36     | BWP                               |   |     |     |     |      |      |     |     |     |     |     |     |
| Flight speed                               | m/sec                 | 14.9     | Pennicuick 1997                   |   |     |     |     |      |      |     |     |     |     |     |     |
| Nocturnal activity factor (1-5)            |                       | 1        | Garthe & Huppopp 2004             |   |     |     |     |      |      |     |     |     |     |     |     |
| Flight type, flapping or gliding           |                       | flapping |                                   |   |     |     |     |      |      |     |     |     |     |     |     |
| Bird survey data                           |                       |          |                                   | Data sources  |     |     |     |      |      |     |     |     |     |     |     |
|  |                       |          |                                   | Jan   | Feb | Mar | Apr | May  | Jun  | Jul | Aug | Sep | Oct | Nov | Dec |
| All daytime density                        |                       |          |                                   | 0   | 0   | 0   | 0   | 0.1  | 0.14 | 0   | 0   | 0   | 0   | 0   | 0   |
| % flying                                   |                       |          |                                   | 0%  | 0%  | 0%  | 0%  | 100% | 50%  | 0%  | 50% | 0%  | 0%  | 0%  | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |          |                                   | 0   | 0   | 0   | 0   | 0.1  | 0.07 | 0   | 0   | 0   | 0   | 0   | 0   |
| Proportion at rotor height                 | %                     | 1.3      | Johnston <i>et al.</i> 2014       |   |     |     |     |      |      |     |     |     |     |     |     |
| Proportion of flights upwind               | %                     | 50.0%    | Assumed                           |   |     |     |     |      |      |     |     |     |     |     |     |
| Windfarm data                              |                       | Units    | Value                             | Data sources  |     |     |     |      |      |     |     |     |     |     |     |
| Name of windfarm site                      |                       |          | <b>Hexicon</b>                    |   |     |     |     |      |      |     |     |     |     |     |     |
| Latitude                                   | degrees               | 58.66    | ArcGIS                            |   |     |     |     |      |      |     |     |     |     |     |     |
| Number of turbines                         |                       | 2        | Design envelope for JF review v3A |   |     |     |     |      |      |     |     |     |     |     |     |
| Width of windfarm                          | km                    | 0.25     | Design envelope for JF review v3A |   |     |     |     |      |      |     |     |     |     |     |     |
| Tidal offset                               | m                     | 0        |                                   |   |     |     |     |      |      |     |     |     |     |     |     |
| Turbine data                               |                       | Units    | Value                             | Data sources  |     |     |     |      |      |     |     |     |     |     |     |
| Turbine model                              |                       |          |                                   |   |     |     |     |      |      |     |     |     |     |     |     |
| No of blades                               |                       | 3        |                                   |   |     |     |     |      |      |     |     |     |     |     |     |
| Rotation speed                             | rpm                   | 10.2     |                                   |   |     |     |     |      |      |     |     |     |     |     |     |
| Rotor radius                               | m                     | 77       |                                   |   |     |     |     |      |      |     |     |     |     |     |     |
| Hub height                                 | m                     | 124      |                                   | Jan   | Feb | Mar | Apr | May  | Jun  | Jul | Aug | Sep | Oct | Nov | Dec |
| Monthly proportion of time operational     | %                     |          |                                   | 93%   | 93% | 93% | 93% | 93%  | 93%  | 93% | 93% | 93% | 93% | 93% | 93% |
| Max blade width                            | m                     | 5.500    |                                   |   |     |     |     |      |      |     |     |     |     |     |     |
| Pitch                                      | degrees               | 7        |                                   |   |     |     |     |      |      |     |     |     |     |     |     |
| Avoidance rates used in presenting results |                       | 98.30%   | Data sources (if applicable)      | Cook et al 2012 – NB SNCBs offer no advice on avoidance rates |     |     |     |      |      |     |     |     |     |     |     |



Table 11-37 Input values for collision risk modelling for great skua using mean values and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units          | Value                             | Data sources |     |     |   |      |      |     |     |     |     |     |     |  |
|--|-----------------------|----------------|-----------------------------------|--------------|-----|-----|---|------|------|-----|-----|-----|-----|-----|-----|--|
| Species name                               |                       |                |                                   |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Bird length                                | m                     | 0.56           | BWP                               |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Wingspan                                   | m                     | 1.36           | BWP                               |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Flight speed                               | m/sec                 | 14.9           | Pennicuick 1997                   |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Nocturnal activity factor (1-5)            |                       | 1              | Garthe & Huppopp 2004             |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Flight type, flapping or gliding           |                       | flapping       |                                   |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Bird survey data                           |                       |                |                                   | Data sources |     |     |   |      |      |     |     |     |     |     |     |  |
|  |                       |                |                                   | Jan          | Feb | Mar | Apr   | May  | Jun  | Jul | Aug | Sep | Oct | Nov | Dec |  |
| All daytime density                        |                       |                |                                   | 0            | 0   | 0   | 0   | 0.1  | 0.14 | 0   | 0   | 0   | 0.2 | 0   | 0   |  |
| % flying                                   |                       |                |                                   | 0%           | 0%  | 0%  | 0%  | 100% | 50%  | 0%  | 50% | 0%  | 0%  | 0%  | 0%  |  |
| Daytime bird density                       | birds/km <sup>2</sup> |                |                                   | 0            | 0   | 0   | 0   | 0.1  | 0.07 | 0   | 0   | 0   | 0   | 0   | 0   |  |
| Proportion at rotor height                 | %                     | 0.0%           | Johnston <i>et al.</i> 2014       |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Proportion of flights upwind               | %                     | 50.0%          | Assumed                           |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Windfarm data                              |                       | Units          | Value                             | Data sources |     |     |   |      |      |     |     |     |     |     |     |  |
| Name of windfarm site                      |                       | <b>Hexicon</b> |                                   |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Latitude                                   | degrees               | 58.66          | ArcGIS                            |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Number of turbines                         |                       | 2              | Design envelope for JF review v3A |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Width of windfarm                          | km                    | 0.25           | Design envelope for JF review v3A |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Tidal offset                               | m                     | 0              |                                   |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Turbine data                               |                       | Units          | Value                             | Data sources |     |     |   |      |      |     |     |     |     |     |     |  |
| Turbine model                              |                       |                |                                   |              |     |     |   |      |      |     |     |     |     |     |     |  |
| No of blades                               |                       | 3              |                                   |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Rotation speed                             | rpm                   | 10.2           |                                   |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Rotor radius                               | m                     | 77             |                                   |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Hub height                                 | m                     | 124            | Jan                               | Feb          | Mar | Apr | May   | Jun  | Jul  | Aug | Sep | Oct | Nov | Dec |     |  |
| Monthly proportion of time operational     | %                     |                | 93%                               | 93%          | 93% | 93% | 93%   | 93%  | 93%  | 93% | 93% | 93% | 93% | 93% |     |  |
| Max blade width                            | m                     | 5.500          |                                   |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Pitch                                      | degrees               | 7              |                                   |              |     |     |   |      |      |     |     |     |     |     |     |  |
| Avoidance rates used in presenting results |                       | 98.30%         | Data sources (if applicable)      |              |     |     | Cook et al 2012 – NB SNCBs offer no advice on avoidance rates |      |      |     |     |     |     |     |     |  |



Table 11-39 Input values for collision risk modelling for great skua using upper 95% CIs and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units          | Value                             | Data sources |     |   |     |      |      |     |     |     |     |     |     |
|--|-----------------------|----------------|-----------------------------------|--------------|-----|---|-----|------|------|-----|-----|-----|-----|-----|-----|
| Species name                               |                       |                |                                   |              |     |   |     |      |      |     |     |     |     |     |     |
| Bird length                                | m                     | 0.56           | BWP                               |              |     |   |     |      |      |     |     |     |     |     |     |
| Wingspan                                   | m                     | 1.36           | BWP                               |              |     |   |     |      |      |     |     |     |     |     |     |
| Flight speed                               | m/sec                 | 14.9           | Pennicuick 1997                   |              |     |   |     |      |      |     |     |     |     |     |     |
| Nocturnal activity factor (1-5)            |                       | 1              | Garthe & Huppop 2004              |              |     |   |     |      |      |     |     |     |     |     |     |
| Flight type, flapping or gliding           |                       | flapping       |                                   |              |     |   |     |      |      |     |     |     |     |     |     |
| Bird survey data                           |                       |                |                                   | Data sources |     |   |     |      |      |     |     |     |     |     |     |
|  |                       |                |                                   | Jan          | Feb | Mar   | Apr | May  | Jun  | Jul | Aug | Sep | Oct | Nov | Dec |
| All daytime density                        |                       |                |                                   | 0            | 0   | 0   | 0   | 0.1  | 0.14 | 0   | 0   | 0   | 0   | 0   | 0   |
| % flying                                   |                       |                |                                   | 0%           | 0%  | 0%  | 0%  | 100% | 50%  | 0%  | 50% | 0%  | 0%  | 0%  | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |                |                                   | 0            | 0   | 0   | 0   | 0.1  | 0.07 | 0   | 0   | 0   | 0   | 0   | 0   |
| Proportion at rotor height                 | %                     | 1.3%           | Johnston <i>et al.</i> 2014       |              |     |   |     |      |      |     |     |     |     |     |     |
| Proportion of flights upwind               | %                     | 50.0%          | Assumed                           |              |     |   |     |      |      |     |     |     |     |     |     |
| Windfarm data                              |                       | Units          | Value                             | Data sources |     |   |     |      |      |     |     |     |     |     |     |
| Name of windfarm site                      |                       | <b>Hexicon</b> |                                   |              |     |   |     |      |      |     |     |     |     |     |     |
| Latitude                                   | degrees               | 58.66          | ArcGIS                            |              |     |   |     |      |      |     |     |     |     |     |     |
| Number of turbines                         |                       | 2              | Design envelope for JF review v3A |              |     |   |     |      |      |     |     |     |     |     |     |
| Width of windfarm                          | km                    | 0.25           | Design envelope for JF review v3A |              |     |   |     |      |      |     |     |     |     |     |     |
| Tidal offset                               | m                     | 0              |                                   |              |     |   |     |      |      |     |     |     |     |     |     |
| Turbine data                               |                       | Units          | Value                             | Data sources |     |   |     |      |      |     |     |     |     |     |     |
| Turbine model                              |                       |                |                                   |              |     |   |     |      |      |     |     |     |     |     |     |
| No of blades                               |                       | 3              |                                   |              |     |   |     |      |      |     |     |     |     |     |     |
| Rotation speed                             | rpm                   | 10.2           |                                   |              |     |   |     |      |      |     |     |     |     |     |     |
| Rotor radius                               | m                     | 77             |                                   |              |     |   |     |      |      |     |     |     |     |     |     |
| Hub height                                 | m                     | 124            | Jan                               | Feb          | Mar | Apr   | May | Jun  | Jul  | Aug | Sep | Oct | Nov | Dec |     |
| Monthly proportion of time operational     | %                     |                | 93%                               | 93%          | 93% | 93%   | 93% | 93%  | 93%  | 93% | 93% | 93% | 93% | 93% |     |
| Max blade width                            | m                     | 5.500          |                                   |              |     |   |     |      |      |     |     |     |     |     |     |
| Pitch                                      | degrees               | 7              |                                   |              |     |   |     |      |      |     |     |     |     |     |     |
| Avoidance rates used in presenting results |                       | 98.30%         | Data sources (if applicable)      |              |     | Cook et al 2012 – NB SNCBs offer no advice on avoidance rates |     |      |      |     |     |     |     |     |     |



Table 11-41 Input values for collision risk modelling for kittiwake using mean values and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
|--|-----------------------|-------|----------------|-----------------------------------|------|------|------|-----------|------|------|------|------|------|------|------|
| Species name                               |                       |       | Kittiwake      |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Bird length                                | m                     |       | 0.39           | BWP                               |      |      |      |           |      |      |      |      |      |      |      |
| Wingspan                                   | m                     |       | 1.08           | BWP                               |      |      |      |           |      |      |      |      |      |      |      |
| Flight speed                               | m/sec                 |       | 13.1           | Alerstam <i>et al.</i> 2007       |      |      |      |           |      |      |      |      |      |      |      |
| Nocturnal activity factor (1-5)            |                       |       | 3              | Garthe & Huppopp 2004             |      |      |      |           |      |      |      |      |      |      |      |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Bird survey data                           |                       |       |                | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
|  |                       |       |                | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| All daytime density                        |                       |       |                | 0.1                               | 0.28 | 0.37 | 0.85 | 0.31      | 0.58 | 1.62 | 0.09 | 0.19 | 0.50 | 3.80 | 2.81 |
| % flying                                   |                       |       |                | 100%                              | 90%  | 92%  | 67%  | 100%      | 62%  | 76%  | 100% | 0%   | 80%  | 82%  | 89%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0.1                               | 0.25 | 0.34 | 0.57 | 0.31      | 0.36 | 1.23 | 0.09 | 0.00 | 0.40 | 3.12 | 2.50 |
| Proportion at rotor height                 | %                     |       | 6.6%           | Johnston <i>et al.</i> 2014       |      |      |      |           |      |      |      |      |      |      |      |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |      |      |      |           |      |      |      |      |      |      |      |
| Windfarm data                              |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |      |      |      |           |      |      |      |      |      |      |      |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |      |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |      |
| Tidal offset                               | m                     |       | 0              |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Turbine data                               |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
| Turbine model                              |                       |       |                |                                   |      |      |      |           |      |      |      |      |      |      |      |
| No of blades                               |                       |       | 3              |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Rotor radius                               | m                     |       | 77             |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93%  | 93%  | 93%  | 93%       | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |
| Max blade width                            | m                     |       | 5.500          |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Pitch                                      | degrees               |       | 7              |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |      |      |      | SNCB 2014 |      |      |      |      |      |      |      |

Table 11-42 Output results for collision risk modelling for kittiwake using mean values and generic flight height data in Option 1 (Band 2012).

| Stage A – Flight activity  |                         |        |     |      |      |      |      |      |      |      |      |      |       |       | Per annum |
|--|-------------------------|--------|-----|------|------|------|------|------|------|------|------|------|-------|-------|-----------|
|  |                         |        | Jan | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov   | Dec   |           |
| Daytime aerial bird density                                      | birds/km <sup>2</sup>   |        | 0.1 | 0.25 | 0.34 | 0.57 | 0.31 | 0.36 | 1.23 | 0.09 | 0.00 | 0.40 | 3.12  | 2.50  |           |
| Proportion at rotor height                                       | %                       | 6.8    |     |      |      |      |      |      |      |      |      |      |       |       |           |
| Total daylight hours per month                                   | hrs                     |        | 221 | 259  | 365  | 432  | 521  | 547  | 546  | 479  | 387  | 320  | 236   | 199   |           |
| Total night hours per month                                      | hrs                     |        | 523 | 413  | 379  | 288  | 223  | 173  | 198  | 265  | 333  | 424  | 484   | 545   |           |
| Flux factor  |                         |        | 550 | 1338 | 2153 | 3741 | 2237 | 2579 | 9061 | 628  | 0    | 2427 | 17001 | 13457 |           |
| Option 2 – Basic model using proportion from flight distribution |                         |        | 2   | 5    | 8    | 15   | 9    | 216  | 35   | 2    | 0    | 9    | 66    | 52    | 420       |
| Collisions assuming avoidance rate                               | Birds per month or year | 98.90% | 0   | 0    | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 0    | 1     | 1     | 5         |

Table 11-43 Input values for collision risk modelling for kittiwake using upper 95% CIs and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value     | Data sources                      |      |      |      |           |       |      |      |      |      |      |      |
|--|-----------------------|-------|-----------|-----------------------------------|------|------|------|-----------|-------|------|------|------|------|------|------|
| Species name                               |                       |       | Kittiwake |                                   |      |      |      |           |       |      |      |      |      |      |      |
| Bird length                                | m                     |       | 0.39      | BWP                               |      |      |      |           |       |      |      |      |      |      |      |
| Wingspan                                   | m                     |       | 1.08      | BWP                               |      |      |      |           |       |      |      |      |      |      |      |
| Flight speed                               | m/sec                 |       | 13.1      | Alerstam <i>et al.</i> 2007       |      |      |      |           |       |      |      |      |      |      |      |
| Nocturnal activity factor (1-5)            |                       |       | 3         | Garthe & Huppopp 2004             |      |      |      |           |       |      |      |      |      |      |      |
| Flight type, flapping or gliding           |                       |       | flapping  |                                   |      |      |      |           |       |      |      |      |      |      |      |
| Bird survey data                           |                       |       |           | Data sources                      |      |      |      |           |       |      |      |      |      |      |      |
|  |                       |       |           | Jan                               | Feb  | Mar  | Apr  | May       | Jun   | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| All daytime density                        |                       |       |           | 0.3                               | 0.64 | 0.90 | 1.62 | 0.62      | 10.64 | 2.09 | 0.27 | 0.46 | 1.21 | 6.16 | 4.22 |
| % flying                                   |                       |       |           | 100%                              | 90%  | 92%  | 67%  | 100%      | 62%   | 76%  | 100% | 0%   | 80%  | 82%  | 89%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |           | 0.3                               | 0.58 | 0.83 | 1.08 | 0.62      | 6.55  | 1.59 | 0.27 | 0    | 0.97 | 5.05 | 3.75 |
| Proportion at rotor height                 | %                     |       | 11.6%     | Johnston <i>et al.</i> 2014       |      |      |      |           |       |      |      |      |      |      |      |
| Proportion of flights upwind               | %                     |       | 50.0%     | Assumed                           |      |      |      |           |       |      |      |      |      |      |      |
| Windfarm data                              |                       | Units | Value     | Data sources                      |      |      |      |           |       |      |      |      |      |      |      |
| Name of windfarm site                      |                       |       | Hexicon   |                                   |      |      |      |           |       |      |      |      |      |      |      |
| Latitude                                   | degrees               |       | 58.66     | ArcGIS                            |      |      |      |           |       |      |      |      |      |      |      |
| Number of turbines                         |                       |       | 2         | Design envelope for JF review v3A |      |      |      |           |       |      |      |      |      |      |      |
| Width of windfarm                          | km                    |       | 0.25      | Design envelope for JF review v3A |      |      |      |           |       |      |      |      |      |      |      |
| Tidal offset                               | m                     |       | 0         |                                   |      |      |      |           |       |      |      |      |      |      |      |
| Turbine data                               |                       | Units | Value     | Data sources                      |      |      |      |           |       |      |      |      |      |      |      |
| Turbine model                              |                       |       |           |                                   |      |      |      |           |       |      |      |      |      |      |      |
| No of blades                               |                       |       | 3         |                                   |      |      |      |           |       |      |      |      |      |      |      |
| Rotation speed                             | rpm                   |       | 10.2      |                                   |      |      |      |           |       |      |      |      |      |      |      |
| Rotor radius                               | m                     |       | 77        |                                   |      |      |      |           |       |      |      |      |      |      |      |
| Hub height                                 | m                     |       | 124       | Jan                               | Feb  | Mar  | Apr  | May       | Jun   | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| Monthly proportion of time operational     | %                     |       |           | 93%                               | 93%  | 93%  | 93%  | 93%       | 93%   | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |
| Max blade width                            | m                     |       | 5.500     |                                   |      |      |      |           |       |      |      |      |      |      |      |
| Pitch                                      | degrees               |       | 7         |                                   |      |      |      |           |       |      |      |      |      |      |      |
| Avoidance rates used in presenting results |                       |       | 98.90%    | Data sources (if applicable)      |      |      |      | SNCB 2014 |       |      |      |      |      |      |      |

Table 11-44 Output results for collision risk modelling for kittiwake using upper 95% CIs and generic flight height data in Option 1 (Band 2012).

| Stage A – Flight activity          |                         |        | Jan  | Feb  | Mar  | Apr  | May  | Jun   | Jul   | Aug  | Sep | Oct  | Nov   | Dec   | Per annum |
|------------------------------------|-------------------------|--------|------|------|------|------|------|-------|-------|------|-----|------|-------|-------|-----------|
| Daytime aerial bird density        | birds/km <sup>2</sup>   |        | 0.3  | 0.58 | 0.83 | 1.08 | 0.62 | 6.55  | 1.59  | 0.27 | 0   | 0.97 | 5.05  | 3.75  |           |
| Proportion at rotor height         | %                       | 11.6   |      |      |      |      |      |       |       |      |     |      |       |       |           |
| Total daylight hours per month     | hrs                     |        | 221  | 259  | 365  | 432  | 521  | 547   | 546   | 479  | 387 | 320  | 236   | 199   |           |
| Total night hours per month        | hrs                     |        | 523  | 413  | 379  | 288  | 223  | 173   | 198   | 265  | 333 | 424  | 484   | 545   |           |
| Flux factor                        |                         |        | 1651 | 3058 | 5262 | 7125 | 4474 | 47317 | 11713 | 1884 | 0   | 5865 | 27559 | 20185 |           |
| Option 1 – Basic model             |                         |        | 11   | 20   | 35   | 47   | 30   | 313   | 77    | 12   | 0   | 39   | 183   | 134   | 902       |
| Collisions assuming avoidance rate | Birds per month or year | 98.90% | 0    | 0    | 0    | 1    | 0    | 3     | 1     | 0    | 0   | 0    | 2     | 1     | 10        |

Table 11-45 Input values for collision risk modelling for kittiwake using mean values and site-specific flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value     | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
|--|-----------------------|-------|-----------|-----------------------------------|------|------|------|-----------|------|------|------|------|------|------|------|
| Species name                               |                       |       | Kittiwake |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Bird length                                | m                     |       | 0.39      | BWP                               |      |      |      |           |      |      |      |      |      |      |      |
| Wingspan                                   | m                     |       | 1.08      | BWP                               |      |      |      |           |      |      |      |      |      |      |      |
| Flight speed                               | m/sec                 |       | 13.1      | Alerstam <i>et al.</i> 2007       |      |      |      |           |      |      |      |      |      |      |      |
| Nocturnal activity factor (1-5)            |                       |       | 3         | Garthe & Huppopp 2004             |      |      |      |           |      |      |      |      |      |      |      |
| Flight type, flapping or gliding           |                       |       | flapping  |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Bird survey data                           |                       |       |           | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
|  |                       |       |           | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| All daytime density                        |                       |       |           | 0.1                               | 0.28 | 0.37 | 0.85 | 0.31      | 0.58 | 1.62 | 0.09 | 0.19 | 0.50 | 3.80 | 2.81 |
| % flying                                   |                       |       |           | 100%                              | 90%  | 92%  | 67%  | 100%      | 62%  | 76%  | 100% | 0%   | 80%  | 82%  | 89%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |           | 0.1                               | 0.25 | 0.34 | 0.57 | 0.31      | 0.36 | 1.23 | 0.09 | 0.00 | 0.40 | 3.12 | 2.50 |
| Proportion at rotor height                 | %                     |       | 30.6%     | Irwin <i>et al.</i> 2015b         |      |      |      |           |      |      |      |      |      |      |      |
| Proportion of flights upwind               | %                     |       | 50.0%     | Assumed                           |      |      |      |           |      |      |      |      |      |      |      |
| Windfarm data                              |                       | Units | Value     | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
| Name of windfarm site                      |                       |       | Hexicon   |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Latitude                                   | degrees               |       | 58.66     | ArcGIS                            |      |      |      |           |      |      |      |      |      |      |      |
| Number of turbines                         |                       |       | 2         | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |      |
| Width of windfarm                          | km                    |       | 0.25      | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |      |
| Tidal offset                               | m                     |       | 0         |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Turbine data                               |                       | Units | Value     | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
| Turbine model                              |                       |       |           |                                   |      |      |      |           |      |      |      |      |      |      |      |
| No of blades                               |                       |       | 3         |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Rotation speed                             | rpm                   |       | 10.2      |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Rotor radius                               | m                     |       | 77        |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Hub height                                 | m                     |       | 124       | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| Monthly proportion of time operational     | %                     |       |           | 93%                               | 93%  | 93%  | 93%  | 93%       | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |
| Max blade width                            | m                     |       | 5.500     |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Pitch                                      | degrees               |       | 7         |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Avoidance rates used in presenting results |                       |       | 98.90%    | Data sources (if applicable)      |      |      |      | SNCB 2014 |      |      |      |      |      |      |      |

Table 11-46 Output results for collision risk modelling for kittiwake using mean values and site-specific flight height data in Option 1 (Band 2012).

| Stage A – Flight activity          |                         |        |     |      |      |      |      |      |      |      |      |      |       |       | Per annum |
|------------------------------------|-------------------------|--------|-----|------|------|------|------|------|------|------|------|------|-------|-------|-----------|
|                                    |                         |        | Jan | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov   | Dec   |           |
| Daytime aerial bird density        | birds/km <sup>2</sup>   |        | 0.1 | 0.25 | 0.34 | 0.57 | 0.31 | 0.36 | 1.23 | 0.09 | 0.00 | 0.40 | 3.12  | 2.50  |           |
| Proportion at rotor height         | %                       | 0.2    |     |      |      |      |      |      |      |      |      |      |       |       |           |
| Total daylight hours per month     | hrs                     |        | 221 | 259  | 365  | 432  | 521  | 547  | 546  | 479  | 387  | 320  | 236   | 199   |           |
| Total night hours per month        | hrs                     |        | 523 | 413  | 379  | 288  | 223  | 173  | 198  | 265  | 333  | 424  | 484   | 545   |           |
| Flux factor                        |                         |        | 550 | 1338 | 2153 | 3741 | 2237 | 2579 | 9061 | 628  | 0    | 2427 | 17001 | 13457 |           |
| Option 1 – Basic model             |                         |        | 10  | 23   | 38   | 65   | 39   | 486  | 159  | 11   | 0    | 42   | 298   | 236   | 1407      |
| Collisions assuming avoidance rate | Birds per month or year | 98.90% | 0   | 0    | 0    | 1    | 0    | 5    | 2    | 0    | 0    | 0    | 3     | 3     | 15        |

Table 11-47 Input values for collision risk modelling for kittiwake using upper 95% CIs and site-specific flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
|--|-----------------------|-------|----------------|-----------------------------------|------|------|------|-----------|------|------|------|------|------|------|-----|
| Species name                               |                       |       | Kittiwake      |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Bird length                                | m                     |       | 0.39           | BWP                               |      |      |      |           |      |      |      |      |      |      |     |
| Wingspan                                   | m                     |       | 1.08           | BWP                               |      |      |      |           |      |      |      |      |      |      |     |
| Flight speed                               | m/sec                 |       | 13.1           | Alerstam <i>et al.</i> 2007       |      |      |      |           |      |      |      |      |      |      |     |
| Nocturnal activity factor (1-5)            |                       |       | 3              | Garthe & Huppopp 2004             |      |      |      |           |      |      |      |      |      |      |     |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Bird survey data                           |                       |       |                | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
|  |                       |       |                | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec |
| All daytime density                        |                       |       | 0.3            | 0.64                              | 0.90 | 1.62 | 0.62 | 10.64     | 2.09 | 0.27 | 0.46 | 1.21 | 6.16 | 4.22 |     |
| % flying                                   |                       |       | 100%           | 90%                               | 92%  | 67%  | 100% | 62%       | 76%  | 100% | 0%   | 80%  | 82%  | 89%  |     |
| Daytime bird density                       | birds/km <sup>2</sup> |       | 0.3            | 0.58                              | 0.83 | 1.08 | 0.62 | 6.55      | 1.59 | 0.27 | 0    | 0.97 | 5.05 | 3.75 |     |
| Proportion at rotor height                 | %                     |       | 30.6%          | Irwin <i>et al.</i> 2015b         |      |      |      |           |      |      |      |      |      |      |     |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |      |      |      |           |      |      |      |      |      |      |     |
| Windfarm data                              |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |      |      |      |           |      |      |      |      |      |      |     |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |     |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |     |
| Tidal offset                               | m                     |       | 0              |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Turbine data                               |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
| Turbine model                              |                       |       |                |                                   |      |      |      |           |      |      |      |      |      |      |     |
| No of blades                               |                       |       | 3              |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Rotor radius                               | m                     |       | 77             |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93%  | 93%  | 93%  | 93%       | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93% |
| Max blade width                            | m                     |       | 5.500          |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Pitch                                      | degrees               |       | 7              |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |      |      |      | SNCB 2014 |      |      |      |      |      |      |     |

Table 11-48 Output results for collision risk modelling for kittiwake using upper 95% CIs and site-specific flight height data in Option 1 (Band 2012).

| Stage A – Flight activity          |                         |        | Jan  | Feb  | Mar  | Apr  | May  | Jun   | Jul   | Aug  | Sep | Oct  | Nov   | Dec   | Per annum |
|------------------------------------|-------------------------|--------|------|------|------|------|------|-------|-------|------|-----|------|-------|-------|-----------|
| Daytime aerial bird density        | birds/km <sup>2</sup>   |        | 0.3  | 0.58 | 0.83 | 1.08 | 0.62 | 6.55  | 1.59  | 0.27 | 0   | 0.97 | 5.05  | 3.75  |           |
| Proportion at rotor height         | %                       | 30.6   |      |      |      |      |      |       |       |      |     |      |       |       |           |
| Total daylight hours per month     | hrs                     |        | 221  | 259  | 365  | 432  | 521  | 547   | 546   | 479  | 387 | 320  | 236   | 199   |           |
| Total night hours per month        | hrs                     |        | 523  | 413  | 379  | 288  | 223  | 173   | 198   | 265  | 333 | 424  | 484   | 545   |           |
| Flux factor                        |                         |        | 1651 | 3058 | 5262 | 7125 | 4474 | 47317 | 11713 | 1884 | 0   | 5865 | 27559 | 20185 |           |
| Option 1 – Basic model             |                         |        | 29   | 54   | 92   | 125  | 78   | 828   | 205   | 33   | 0   | 103  | 482   | 354   | 2382      |
| Collisions assuming avoidance rate | Birds per month or year | 98.90% | 0    | 1    | 1    | 1    | 1    | 9     | 2     | 0    | 0   | 1    | 5     | 4     | 26        |

Table 11-49 Input values for collision risk modelling for kittiwake using mean values and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
|--|-----------------------|-------|----------------|-----------------------------------|------|------|------|-----------|------|------|------|------|------|------|------|
| Species name                               |                       |       | Kittiwake      |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Bird length                                | m                     |       | 0.39           | BWP                               |      |      |      |           |      |      |      |      |      |      |      |
| Wingspan                                   | m                     |       | 1.08           | BWP                               |      |      |      |           |      |      |      |      |      |      |      |
| Flight speed                               | m/sec                 |       | 13.1           | Alerstam et al. 2007              |      |      |      |           |      |      |      |      |      |      |      |
| Nocturnal activity factor (1-5)            |                       |       | 3              | Garthe & Huppopp 2004             |      |      |      |           |      |      |      |      |      |      |      |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Bird survey data                           |                       |       |                | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
|  |                       |       |                | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| All daytime density                        |                       |       |                | 0.1                               | 0.28 | 0.37 | 0.85 | 0.31      | 0.58 | 1.62 | 0.09 | 0.19 | 0.50 | 3.80 | 2.81 |
| % flying                                   |                       |       |                | 100%                              | 90%  | 92%  | 67%  | 100%      | 62%  | 76%  | 100% | 0%   | 80%  | 82%  | 89%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0.1                               | 0.25 | 0.34 | 0.57 | 0.31      | 0.36 | 1.23 | 0.09 | 0.00 | 0.40 | 3.12 | 2.50 |
| Proportion at rotor height                 | %                     |       | 6.8%           | Johnston <i>et al.</i> 2014       |      |      |      |           |      |      |      |      |      |      |      |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |      |      |      |           |      |      |      |      |      |      |      |
| Windfarm data                              |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |      |      |      |           |      |      |      |      |      |      |      |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |      |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |      |
| Tidal offset                               | m                     |       | 0              |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Turbine data                               |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
| Turbine model                              |                       |       |                |                                   |      |      |      |           |      |      |      |      |      |      |      |
| No of blades                               |                       |       | 3              |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Rotor radius                               | m                     |       | 77             |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93%  | 93%  | 93%  | 93%       | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |
| Max blade width                            | m                     |       | 5.500          |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Pitch                                      | degrees               |       | 7              |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |      |      |      | SNCB 2014 |      |      |      |      |      |      |      |



Table 11-51 Input values for collision risk modelling for kittiwake using upper 95% CIs and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value     | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
|--|-----------------------|-------|-----------|-----------------------------------|------|------|------|-----------|------|------|------|------|------|------|-----|
| Species name                               |                       |       | Kittiwake |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Bird length                                | m                     |       | 0.39      | BWP                               |      |      |      |           |      |      |      |      |      |      |     |
| Wingspan                                   | m                     |       | 1.08      | BWP                               |      |      |      |           |      |      |      |      |      |      |     |
| Flight speed                               | m/sec                 |       | 13.1      | Alerstam <i>et al.</i> 2007       |      |      |      |           |      |      |      |      |      |      |     |
| Nocturnal activity factor (1-5)            |                       |       | 3         | Garthe & Huppopp 2004             |      |      |      |           |      |      |      |      |      |      |     |
| Flight type, flapping or gliding           |                       |       | flapping  |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Bird survey data                           |                       |       |           | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
|  |                       |       |           | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec |
| All daytime density                        |                       |       | 0.3       | 0.64                              | 0.90 | 1.62 | 0.62 | 10.64     | 2.09 | 0.27 | 0.46 | 1.21 | 6.16 | 4.22 |     |
| % flying                                   |                       |       | 100%      | 90%                               | 92%  | 67%  | 100% | 62%       | 76%  | 100% | 0%   | 80%  | 82%  | 89%  |     |
| Daytime bird density                       | birds/km <sup>2</sup> |       | 0.3       | 0.58                              | 0.83 | 1.08 | 0.62 | 6.55      | 1.59 | 0.27 | 0    | 0.97 | 5.05 | 3.75 |     |
| Proportion at rotor height                 | %                     |       | 11.6%     | Johnston <i>et al.</i> 2014       |      |      |      |           |      |      |      |      |      |      |     |
| Proportion of flights upwind               | %                     |       | 50.0%     | Assumed                           |      |      |      |           |      |      |      |      |      |      |     |
| Windfarm data                              |                       | Units | Value     | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
| Name of windfarm site                      |                       |       | Hexicon   |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Latitude                                   | degrees               |       | 58.66     | ArcGIS                            |      |      |      |           |      |      |      |      |      |      |     |
| Number of turbines                         |                       |       | 2         | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |     |
| Width of windfarm                          | km                    |       | 0.25      | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |     |
| Tidal offset                               | m                     |       | 0         |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Turbine data                               |                       | Units | Value     | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
| Turbine model                              |                       |       |           |                                   |      |      |      |           |      |      |      |      |      |      |     |
| No of blades                               |                       |       | 3         |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Rotation speed                             | rpm                   |       | 10.2      |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Rotor radius                               | m                     |       | 77        |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Hub height                                 | m                     |       | 124       | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec |
| Monthly proportion of time operational     | %                     |       |           | 93%                               | 93%  | 93%  | 93%  | 93%       | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93% |
| Max blade width                            | m                     |       | 5.500     |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Pitch                                      | degrees               |       | 7         |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Avoidance rates used in presenting results |                       |       | 98.90%    | Data sources (if applicable)      |      |      |      | SNCB 2014 |      |      |      |      |      |      |     |



Table 11-53 Input values for collision risk modelling for kittiwake using mean values and site-specific flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
|--|-----------------------|-------|----------------|-----------------------------------|------|------|------|-----------|------|------|------|------|------|------|------|
| Species name                               |                       |       | Kittiwake      |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Bird length                                | m                     |       | 0.39           | BWP                               |      |      |      |           |      |      |      |      |      |      |      |
| Wingspan                                   | m                     |       | 1.08           | BWP                               |      |      |      |           |      |      |      |      |      |      |      |
| Flight speed                               | m/sec                 |       | 13.1           | Alerstam et al. 2007              |      |      |      |           |      |      |      |      |      |      |      |
| Nocturnal activity factor (1-5)            |                       |       | 3              | Garthe & Huppopp 2004             |      |      |      |           |      |      |      |      |      |      |      |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Bird survey data                           |                       |       |                | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
|  |                       |       |                | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| All daytime density                        |                       |       |                | 0.1                               | 0.28 | 0.37 | 0.85 | 0.31      | 0.58 | 1.62 | 0.09 | 0.19 | 0.50 | 3.80 | 2.81 |
| % flying                                   |                       |       |                | 100%                              | 90%  | 92%  | 67%  | 100%      | 62%  | 76%  | 100% | 0%   | 80%  | 82%  | 89%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0.1                               | 0.25 | 0.34 | 0.57 | 0.31      | 0.36 | 1.23 | 0.09 | 0.00 | 0.40 | 3.12 | 2.50 |
| Proportion at rotor height                 | %                     |       | 30.6%          | Irwin <i>et al.</i> 2015b         |      |      |      |           |      |      |      |      |      |      |      |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |      |      |      |           |      |      |      |      |      |      |      |
| Windfarm data                              |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |      |      |      |           |      |      |      |      |      |      |      |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |      |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |      |
| Tidal offset                               | m                     |       | 0              |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Turbine data                               |                       | Units | Value          | Data sources                      |      |      |      |           |      |      |      |      |      |      |      |
| Turbine model                              |                       |       |                |                                   |      |      |      |           |      |      |      |      |      |      |      |
| No of blades                               |                       |       | 3              |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Rotor radius                               | m                     |       | 77             |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93%  | 93%  | 93%  | 93%       | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |
| Max blade width                            | m                     |       | 5.500          |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Pitch                                      | degrees               |       | 7              |                                   |      |      |      |           |      |      |      |      |      |      |      |
| Avoidance rates used in presenting results |                       |       | 98.90%         | Data sources (if applicable)      |      |      |      | SNCB 2014 |      |      |      |      |      |      |      |



Table 11-55 Input values for collision risk modelling for kittiwake using upper 95% CIs and site-specific flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value     | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
|--|-----------------------|-------|-----------|-----------------------------------|------|------|------|-----------|------|------|------|------|------|------|-----|
| Species name                               |                       |       | Kittiwake |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Bird length                                | m                     |       | 0.39      | BWP                               |      |      |      |           |      |      |      |      |      |      |     |
| Wingspan                                   | m                     |       | 1.08      | BWP                               |      |      |      |           |      |      |      |      |      |      |     |
| Flight speed                               | m/sec                 |       | 13.1      | Alerstam <i>et al.</i> 2007       |      |      |      |           |      |      |      |      |      |      |     |
| Nocturnal activity factor (1-5)            |                       |       | 3         | Garthe & Huppopp 2004             |      |      |      |           |      |      |      |      |      |      |     |
| Flight type, flapping or gliding           |                       |       | flapping  |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Bird survey data                           |                       |       |           | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
|  |                       |       |           | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec |
| All daytime density                        |                       |       | 0.3       | 0.64                              | 0.90 | 1.62 | 0.62 | 10.64     | 2.09 | 0.27 | 0.46 | 1.21 | 6.16 | 4.22 |     |
| % flying                                   |                       |       | 100%      | 90%                               | 92%  | 67%  | 100% | 62%       | 76%  | 100% | 0%   | 80%  | 82%  | 89%  |     |
| Daytime bird density                       | birds/km <sup>2</sup> |       | 0.3       | 0.58                              | 0.83 | 1.08 | 0.62 | 6.55      | 1.59 | 0.27 | 0    | 0.97 | 5.05 | 3.75 |     |
| Proportion at rotor height                 | %                     |       | 30.6%     | Irwin <i>et al.</i> 2015b         |      |      |      |           |      |      |      |      |      |      |     |
| Proportion of flights upwind               | %                     |       | 50.0%     | Assumed                           |      |      |      |           |      |      |      |      |      |      |     |
| Windfarm data                              |                       | Units | Value     | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
| Name of windfarm site                      |                       |       | Hexicon   |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Latitude                                   | degrees               |       | 58.66     | ArcGIS                            |      |      |      |           |      |      |      |      |      |      |     |
| Number of turbines                         |                       |       | 2         | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |     |
| Width of windfarm                          | km                    |       | 0.25      | Design envelope for JF review v3A |      |      |      |           |      |      |      |      |      |      |     |
| Tidal offset                               | m                     |       | 0         |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Turbine data                               |                       | Units | Value     | Data sources                      |      |      |      |           |      |      |      |      |      |      |     |
| Turbine model                              |                       |       |           |                                   |      |      |      |           |      |      |      |      |      |      |     |
| No of blades                               |                       |       | 3         |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Rotation speed                             | rpm                   |       | 10.2      |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Rotor radius                               | m                     |       | 77        |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Hub height                                 | m                     |       | 124       | Jan                               | Feb  | Mar  | Apr  | May       | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec |
| Monthly proportion of time operational     | %                     |       |           | 93%                               | 93%  | 93%  | 93%  | 93%       | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93% |
| Max blade width                            | m                     |       | 5.500     |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Pitch                                      | degrees               |       | 7         |                                   |      |      |      |           |      |      |      |      |      |      |     |
| Avoidance rates used in presenting results |                       |       | 98.90%    | Data sources (if applicable)      |      |      |      | SNCB 2014 |      |      |      |      |      |      |     |



Table 11-57 Input values for collision risk modelling for herring gull using mean values and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
|--|-----------------------|-------|----------------|-----------------------------------|-----|-----|-----|-----------|-----|-----|-----|-----|------|-----|-----|
| Species name                               |                       |       | Herring gull   |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Bird length                                | m                     |       | 0.61           | BWP                               |     |     |     |           |     |     |     |     |      |     |     |
| Wingspan                                   | m                     |       | 1.47           | BWP                               |     |     |     |           |     |     |     |     |      |     |     |
| Flight speed                               | m/sec                 |       | 12.8           | Alerstam <i>et al.</i> 2007       |     |     |     |           |     |     |     |     |      |     |     |
| Nocturnal activity factor (1-5)            |                       |       | 3              | Garthe & Huppopp 2004             |     |     |     |           |     |     |     |     |      |     |     |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Bird survey data                           |                       |       |                | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
|  |                       |       |                | Jan                               | Feb | Mar | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov | Dec |
| All daytime density                        |                       |       |                | 0                                 | 0   | 0   | 0   | 0         | 0   | 0   | 0   | 0   | 0.20 | 0   | 0   |
| % flying                                   |                       |       |                | 0%                                | 0%  | 0%  | 0%  | 0%        | 0%  | 0%  | 0%  | 0%  | 33%  | 0%  | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0   | 0   | 0   | 0         | 0   | 0   | 0   | 0   | 0.07 | 0   | 0   |
| Proportion at rotor height                 | %                     |       | 19.3%          | Johnston et al 2014               |     |     |     |           |     |     |     |     |      |     |     |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |     |     |     |           |     |     |     |     |      |     |     |
| Windfarm data                              |                       | Units | Value          | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |     |     |     |           |     |     |     |     |      |     |     |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |     |     |     |           |     |     |     |     |      |     |     |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |     |     |     |           |     |     |     |     |      |     |     |
| Tidal offset                               | m                     |       | 0              |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Turbine data                               |                       | Units | Value          | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
| Turbine model                              |                       |       |                |                                   |     |     |     |           |     |     |     |     |      |     |     |
| No of blades                               |                       |       | 3              |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Rotor radius                               | m                     |       | 77             |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb | Mar | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov | Dec |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93% | 93% | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93% | 93% |
| Max blade width                            | m                     |       | 5.500          |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Pitch                                      | degrees               |       | 7              |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Avoidance rates used in presenting results |                       |       | 99.50%         | Data sources (if applicable)      |     |     |     | SNCB 2014 |     |     |     |     |      |     |     |



Table 11-59 Input values for collision risk modelling for herring gull using upper 95% CIs and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value        | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
|--|-----------------------|-------|--------------|-----------------------------------|-----|-----|-----|-----------|-----|-----|-----|-----|------|-----|-----|
| Species name                               |                       |       | Herring gull |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Bird length                                | m                     |       | 0.61         | BWP                               |     |     |     |           |     |     |     |     |      |     |     |
| Wingspan                                   | m                     |       | 1.47         | BWP                               |     |     |     |           |     |     |     |     |      |     |     |
| Flight speed                               | m/sec                 |       | 12.8         | Alerstam <i>et al.</i> 2007       |     |     |     |           |     |     |     |     |      |     |     |
| Nocturnal activity factor (1-5)            |                       |       | 3            | Garthe & Huppopp 2004             |     |     |     |           |     |     |     |     |      |     |     |
| Flight type, flapping or gliding           |                       |       | flapping     |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Bird survey data                           |                       |       |              | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
|  |                       |       |              | Jan                               | Feb | Mar | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov | Dec |
| All daytime density                        |                       |       |              | 0                                 | 0   | 0   | 0   | 0         | 0   | 0   | 0   | 0   | 0.40 | 0   | 0   |
| % flying                                   |                       |       |              | 0%                                | 0%  | 0%  | 0%  | 0%        | 0%  | 0%  | 0%  | 0%  | 33%  | 0%  | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |              | 0                                 | 0   | 0   | 0   | 0         | 0   | 0   | 0   | 0   | 0.13 | 0   | 0   |
| Proportion at rotor height                 | %                     |       | 34.8%        | Johnston et al 2014               |     |     |     |           |     |     |     |     |      |     |     |
| Proportion of flights upwind               | %                     |       | 50.0%        | Assumed                           |     |     |     |           |     |     |     |     |      |     |     |
| Windfarm data                              |                       | Units | Value        | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
| Name of windfarm site                      |                       |       | Hexicon      |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Latitude                                   | degrees               |       | 58.66        | ArcGIS                            |     |     |     |           |     |     |     |     |      |     |     |
| Number of turbines                         |                       |       | 2            | Design envelope for JF review v3A |     |     |     |           |     |     |     |     |      |     |     |
| Width of windfarm                          | km                    |       | 0.25         | Design envelope for JF review v3A |     |     |     |           |     |     |     |     |      |     |     |
| Tidal offset                               | m                     |       | 0            |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Turbine data                               |                       | Units | Value        | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
| Turbine model                              |                       |       |              |                                   |     |     |     |           |     |     |     |     |      |     |     |
| No of blades                               |                       |       | 3            |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Rotation speed                             | rpm                   |       | 10.2         |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Rotor radius                               | m                     |       | 77           |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Hub height                                 | m                     |       | 124          | Jan                               | Feb | Mar | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov | Dec |
| Monthly proportion of time operational     | %                     |       |              | 93%                               | 93% | 93% | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93% | 93% |
| Max blade width                            | m                     |       | 5.500        |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Pitch                                      | degrees               |       | 7            |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Avoidance rates used in presenting results |                       |       | 99.50%       | Data sources (if applicable)      |     |     |     | SNCB 2014 |     |     |     |     |      |     |     |



Table 11-61 Input values for collision risk modelling for herring gull using mean values and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value        | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
|--|-----------------------|-------|--------------|-----------------------------------|-----|-----|-----|-----------|-----|-----|-----|-----|------|-----|-----|
| Species name                               |                       |       | Herring gull |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Bird length                                | m                     |       | 0.61         | BWP                               |     |     |     |           |     |     |     |     |      |     |     |
| Wingspan                                   | m                     |       | 1.47         | BWP                               |     |     |     |           |     |     |     |     |      |     |     |
| Flight speed                               | m/sec                 |       | 12.8         | Alerstam <i>et al.</i> 2007       |     |     |     |           |     |     |     |     |      |     |     |
| Nocturnal activity factor (1-5)            |                       |       | 3            | Garthe & Huppopp 2004             |     |     |     |           |     |     |     |     |      |     |     |
| Flight type, flapping or gliding           |                       |       | flapping     |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Bird survey data                           |                       | Units | Value        | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
|  |                       |       |              | Jan                               | Feb | Mar | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov | Dec |
| All daytime density                        |                       |       |              | 0                                 | 0   | 0   | 0   | 0         | 0   | 0   | 0   | 0   | 0.20 | 0   | 0   |
| % flying                                   |                       |       |              | 0%                                | 0%  | 0%  | 0%  | 0%        | 0%  | 0%  | 0%  | 0%  | 33%  | 0%  | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |              | 0                                 | 0   | 0   | 0   | 0         | 0   | 0   | 0   | 0   | 0.07 | 0   | 0   |
| Proportion at rotor height                 | %                     |       | 19.3%        | Johnston et al 2014               |     |     |     |           |     |     |     |     |      |     |     |
| Proportion of flights upwind               | %                     |       | 50.0%        | Assumed                           |     |     |     |           |     |     |     |     |      |     |     |
| Windfarm data                              |                       | Units | Value        | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
| Name of windfarm site                      |                       |       | Hexicon      |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Latitude                                   | degrees               |       | 58.66        | ArcGIS                            |     |     |     |           |     |     |     |     |      |     |     |
| Number of turbines                         |                       |       | 2            | Design envelope for JF review v3A |     |     |     |           |     |     |     |     |      |     |     |
| Width of windfarm                          | km                    |       | 0.25         | Design envelope for JF review v3A |     |     |     |           |     |     |     |     |      |     |     |
| Tidal offset                               | m                     |       | 0            |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Turbine data                               |                       | Units | Value        | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
| Turbine model                              |                       |       |              |                                   |     |     |     |           |     |     |     |     |      |     |     |
| No of blades                               |                       |       | 3            |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Rotation speed                             | rpm                   |       | 10.2         |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Rotor radius                               | m                     |       | 77           |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Hub height                                 | m                     |       | 124          | Jan                               | Feb | Mar | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov | Dec |
| Monthly proportion of time operational     | %                     |       |              | 93%                               | 93% | 93% | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93% | 93% |
| Max blade width                            | m                     |       | 5.500        |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Pitch                                      | degrees               |       | 7            |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Avoidance rates used in presenting results |                       |       | 99.50%       | Data sources (if applicable)      |     |     |     | SNCB 2014 |     |     |     |     |      |     |     |



Table 11-63 Input values for collision risk modelling for herring gull using upper 95% CIs and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
|--|-----------------------|-------|----------------|-----------------------------------|-----|-----|-----|-----------|-----|-----|-----|-----|------|-----|-----|
| Species name                               |                       |       | Herring gull   |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Bird length                                | m                     |       | 0.61           | BWP                               |     |     |     |           |     |     |     |     |      |     |     |
| Wingspan                                   | m                     |       | 1.47           | BWP                               |     |     |     |           |     |     |     |     |      |     |     |
| Flight speed                               | m/sec                 |       | 12.8           | Alerstam <i>et al.</i> 2007       |     |     |     |           |     |     |     |     |      |     |     |
| Nocturnal activity factor (1-5)            |                       |       | 3              | Garthe & Huppopp 2004             |     |     |     |           |     |     |     |     |      |     |     |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Bird survey data                           |                       |       |                | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
|  |                       |       |                | Jan                               | Feb | Mar | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov | Dec |
| All daytime density                        |                       |       |                | 0                                 | 0   | 0   | 0   | 0         | 0   | 0   | 0   | 0   | 0.40 | 0   | 0   |
| % flying                                   |                       |       |                | 0%                                | 0%  | 0%  | 0%  | 0%        | 0%  | 0%  | 0%  | 0%  | 33%  | 0%  | 0%  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0   | 0   | 0   | 0         | 0   | 0   | 0   | 0   | 0.13 | 0   | 0   |
| Proportion at rotor height                 | %                     |       | 34.8%          | Johnston et al 2014               |     |     |     |           |     |     |     |     |      |     |     |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |     |     |     |           |     |     |     |     |      |     |     |
| Windfarm data                              |                       | Units | Value          | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |     |     |     |           |     |     |     |     |      |     |     |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |     |     |     |           |     |     |     |     |      |     |     |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |     |     |     |           |     |     |     |     |      |     |     |
| Tidal offset                               | m                     |       | 0              |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Turbine data                               |                       | Units | Value          | Data sources                      |     |     |     |           |     |     |     |     |      |     |     |
| Turbine model                              |                       |       |                |                                   |     |     |     |           |     |     |     |     |      |     |     |
| No of blades                               |                       |       | 3              |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Rotor radius                               | m                     |       | 77             |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb | Mar | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov | Dec |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93% | 93% | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93% | 93% |
| Max blade width                            | m                     |       | 5.500          |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Pitch                                      | degrees               |       | 7              |                                   |     |     |     |           |     |     |     |     |      |     |     |
| Avoidance rates used in presenting results |                       |       | 99.50%         | Data sources (if applicable)      |     |     |     | SNCB 2014 |     |     |     |     |      |     |     |



Table 11-65 Input values for collision risk modelling for great black-backed gull using mean values and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|--|-----------------------|----------------|-----------------------------------|--------------|------|-----|-----------|-----|-----|-----|-----|------|------|------|--|
| Species name                               |                       |                | Great black-backed gull           |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird length                                | m                     | 0.71           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Wingspan                                   | m                     | 1.58           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight speed                               | m/sec                 | 13.7           | Alerstam <i>et al.</i> 2007       |              |      |     |           |     |     |     |     |      |      |      |  |
| Nocturnal activity factor (1-5)            |                       | 3              | Garthe & Huppopp 2004             |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight type, flapping or gliding           |                       | flapping       |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird survey data                           |                       |                |                                   | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|  |                       |                | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| All daytime density                        |                       |                | 0.10                              | 0.19         | 0.49 | 0   | 0         | 0   | 0   | 0   | 0   | 0.70 | 0.10 | 0.30 |  |
| % flying                                   |                       |                | 67%                               | 75%          | 31%  | 0%  | 0%        | 0%  | 0%  | 3%  | 0%  | 0%   | 0%   | 67%  |  |
| Daytime bird density                       | birds/km <sup>2</sup> |                | 0.07                              | 0.14         | 0.15 | 0   | 0         | 0   | 0   | 0   | 0   | 0    | 0    | 0.20 |  |
| Proportion at rotor height                 | %                     | 36.5%          | Johnston et al 2014               |              |      |     |           |     |     |     |     |      |      |      |  |
| Proportion of flights upwind               | %                     | 50.0%          | Assumed                           |              |      |     |           |     |     |     |     |      |      |      |  |
| Windfarm data                              |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Name of windfarm site                      |                       | <b>Hexicon</b> |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Latitude                                   | degrees               | 58.66          | ArcGIS                            |              |      |     |           |     |     |     |     |      |      |      |  |
| Number of turbines                         |                       | 2              | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Width of windfarm                          | km                    | 0.25           | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Tidal offset                               | m                     | 0              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Turbine data                               |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Turbine model                              |                       |                |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| No of blades                               |                       | 3              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotation speed                             | rpm                   | 10.2           |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotor radius                               | m                     | 77             |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Hub height                                 | m                     | 124            | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| Monthly proportion of time operational     | %                     |                | 93%                               | 93%          | 93%  | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93%  | 93%  |  |
| Max blade width                            | m                     | 5.500          |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Pitch                                      | degrees               | 7              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Avoidance rates used in presenting results |                       | 99.50%         | Data sources (if applicable)      |              |      |     | SNCB 2014 |     |     |     |     |      |      |      |  |



Table 11-67 Input values for collision risk modelling for great black-backed gull using upper 95% CIs and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|--|-----------------------|----------------|-----------------------------------|--------------|------|-----|-----------|-----|-----|-----|-----|------|------|------|--|
| Species name                               |                       |                | Great black-backed gull           |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird length                                | m                     | 0.71           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Wingspan                                   | m                     | 1.58           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight speed                               | m/sec                 | 13.7           | Alerstam <i>et al.</i> 2007       |              |      |     |           |     |     |     |     |      |      |      |  |
| Nocturnal activity factor (1-5)            |                       | 3              | Garthe & Huppopp 2004             |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight type, flapping or gliding           |                       | flapping       |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird survey data                           |                       |                |                                   | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|  |                       |                | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| All daytime density                        |                       |                | 0.3                               | 0.38         | 0.98 | 0   | 0         | 0   | 0   | 0   | 0   | 0.97 | 0.30 | 0.69 |  |
| % flying                                   |                       |                | 67%                               | 75%          | 31%  | 0%  | 0%        | 0%  | 0%  | 3%  | 0%  | 0%   | 0%   | 67%  |  |
| Daytime bird density                       | birds/km <sup>2</sup> |                | 0.20                              | 0.29         | 0.30 | 0   | 0         | 0   | 0   | 0   | 0   | 0    | 0    | 0.46 |  |
| Proportion at rotor height                 | %                     | 52.0%          | Johnston et al 2014               |              |      |     |           |     |     |     |     |      |      |      |  |
| Proportion of flights upwind               | %                     | 50.0%          | Assumed                           |              |      |     |           |     |     |     |     |      |      |      |  |
| Windfarm data                              |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Name of windfarm site                      |                       | <b>Hexicon</b> |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Latitude                                   | degrees               | 58.66          | ArcGIS                            |              |      |     |           |     |     |     |     |      |      |      |  |
| Number of turbines                         |                       | 2              | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Width of windfarm                          | km                    | 0.25           | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Tidal offset                               | m                     | 0              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Turbine data                               |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Turbine model                              |                       |                |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| No of blades                               |                       | 3              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotation speed                             | rpm                   | 10.2           |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotor radius                               | m                     | 77             |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Hub height                                 | m                     | 124            | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| Monthly proportion of time operational     | %                     |                | 93%                               | 93%          | 93%  | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93%  | 93%  |  |
| Max blade width                            | m                     | 5.500          |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Pitch                                      | degrees               | 7              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Avoidance rates used in presenting results |                       | 99.50%         | Data sources (if applicable)      |              |      |     | SNCB 2014 |     |     |     |     |      |      |      |  |



Table 11-69 Input values for collision risk modelling for great black-backed gull using mean values and site-specific flight heights in Option 1 (Band 2012).

| Bird data                                  |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|--|-----------------------|----------------|-----------------------------------|--------------|------|-----|-----------|-----|-----|-----|-----|------|------|------|--|
| Species name                               |                       |                | Great black-backed gull           |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird length                                | m                     | 0.71           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Wingspan                                   | m                     | 1.58           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight speed                               | m/sec                 | 13.7           | Alerstam <i>et al.</i> 2007       |              |      |     |           |     |     |     |     |      |      |      |  |
| Nocturnal activity factor (1-5)            |                       | 3              | Garthe & Huppopp 2004             |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight type, flapping or gliding           |                       | flapping       |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird survey data                           |                       |                |                                   | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|  |                       |                | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| All daytime density                        |                       |                | 0.10                              | 0.19         | 0.49 | 0   | 0         | 0   | 0   | 0   | 0   | 0.70 | 0.10 | 0.30 |  |
| % flying                                   |                       |                | 67%                               | 75%          | 31%  | 0%  | 0%        | 0%  | 0%  | 3%  | 0%  | 0%   | 0%   | 67%  |  |
| Daytime bird density                       | birds/km <sup>2</sup> |                | 0.07                              | 0.14         | 0.15 | 0   | 0         | 0   | 0   | 0   | 0   | 0    | 0    | 0.20 |  |
| Proportion at rotor height                 | %                     | 58.3%          | Irwin et al 2015b                 |              |      |     |           |     |     |     |     |      |      |      |  |
| Proportion of flights upwind               | %                     | 50.0%          | Assumed                           |              |      |     |           |     |     |     |     |      |      |      |  |
| Windfarm data                              |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Name of windfarm site                      |                       | <b>Hexicon</b> |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Latitude                                   | degrees               | 58.66          | ArcGIS                            |              |      |     |           |     |     |     |     |      |      |      |  |
| Number of turbines                         |                       | 2              | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Width of windfarm                          | km                    | 0.25           | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Tidal offset                               | m                     | 0              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Turbine data                               |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Turbine model                              |                       |                |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| No of blades                               |                       | 3              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotation speed                             | rpm                   | 10.2           |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotor radius                               | m                     | 77             |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Hub height                                 | m                     | 124            | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| Monthly proportion of time operational     | %                     |                | 93%                               | 93%          | 93%  | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93%  | 93%  |  |
| Max blade width                            | m                     | 5.500          |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Pitch                                      | degrees               | 7              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Avoidance rates used in presenting results |                       | 99.50%         | Data sources (if applicable)      |              |      |     | SNCB 2014 |     |     |     |     |      |      |      |  |



Table 11-71 Input values for collision risk modelling for great black-backed gull using upper 95% CIs and site-specific flight heights in Option 1 (Band 2012).

| Bird data                                  |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|--|-----------------------|----------------|-----------------------------------|--------------|------|-----|-----------|-----|-----|-----|-----|------|------|------|--|
| Species name                               |                       |                | Great black-backed gull           |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird length                                | m                     | 0.71           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Wingspan                                   | m                     | 1.58           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight speed                               | m/sec                 | 13.7           | Alerstam <i>et al.</i> 2007       |              |      |     |           |     |     |     |     |      |      |      |  |
| Nocturnal activity factor (1-5)            |                       | 3              | Garthe & Huppopp 2004             |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight type, flapping or gliding           |                       | flapping       |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird survey data                           |                       |                |                                   | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|  |                       |                | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| All daytime density                        |                       |                | 0.3                               | 0.38         | 0.98 | 0   | 0         | 0   | 0   | 0   | 0   | 0.97 | 0.30 | 0.69 |  |
| % flying                                   |                       |                | 67%                               | 75%          | 31%  | 0%  | 0%        | 0%  | 0%  | 3%  | 0%  | 0%   | 0%   | 67%  |  |
| Daytime bird density                       | birds/km <sup>2</sup> |                | 0.20                              | 0.29         | 0.30 | 0   | 0         | 0   | 0   | 0   | 0   | 0    | 0    | 0.46 |  |
| Proportion at rotor height                 | %                     | 58.3%          | Irwin et al 2015b                 |              |      |     |           |     |     |     |     |      |      |      |  |
| Proportion of flights upwind               | %                     | 50.0%          | Assumed                           |              |      |     |           |     |     |     |     |      |      |      |  |
| Windfarm data                              |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Name of windfarm site                      |                       | <b>Hexicon</b> |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Latitude                                   | degrees               | 58.66          | ArcGIS                            |              |      |     |           |     |     |     |     |      |      |      |  |
| Number of turbines                         |                       | 2              | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Width of windfarm                          | km                    | 0.25           | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Tidal offset                               | m                     | 0              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Turbine data                               |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Turbine model                              |                       |                |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| No of blades                               |                       | 3              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotation speed                             | rpm                   | 10.2           |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotor radius                               | m                     | 77             |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Hub height                                 | m                     | 124            | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| Monthly proportion of time operational     | %                     |                | 93%                               | 93%          | 93%  | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93%  | 93%  |  |
| Max blade width                            | m                     | 5.500          |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Pitch                                      | degrees               | 7              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Avoidance rates used in presenting results |                       | 99.50%         | Data sources (if applicable)      |              |      |     | SNCB 2014 |     |     |     |     |      |      |      |  |



Table 11-73 Input values for collision risk modelling for great black-backed gull using mean values and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|--|-----------------------|----------------|-----------------------------------|--------------|------|-----|-----------|-----|-----|-----|-----|------|------|------|--|
| Species name                               |                       |                | Great black-backed gull           |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird length                                | m                     | 0.71           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Wingspan                                   | m                     | 1.58           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight speed                               | m/sec                 | 13.7           | Alerstam <i>et al.</i> 2007       |              |      |     |           |     |     |     |     |      |      |      |  |
| Nocturnal activity factor (1-5)            |                       | 3              | Garthe & Huppopp 2004             |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight type, flapping or gliding           |                       | flapping       |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird survey data                           |                       |                |                                   | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|  |                       |                | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| All daytime density                        |                       |                | 0.10                              | 0.19         | 0.49 | 0   | 0         | 0   | 0   | 0   | 0   | 0.70 | 0.10 | 0.30 |  |
| % flying                                   |                       |                | 67%                               | 75%          | 31%  | 0%  | 0%        | 0%  | 0%  | 3%  | 0%  | 0%   | 0%   | 67%  |  |
| Daytime bird density                       | birds/km <sup>2</sup> |                | 0.07                              | 0.14         | 0.15 | 0   | 0         | 0   | 0   | 0   | 0   | 0    | 0    | 0.20 |  |
| Proportion at rotor height                 | %                     | 36.5%          | Johnston et al 2014               |              |      |     |           |     |     |     |     |      |      |      |  |
| Proportion of flights upwind               | %                     | 50.0%          | Assumed                           |              |      |     |           |     |     |     |     |      |      |      |  |
| Windfarm data                              |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Name of windfarm site                      |                       | <b>Hexicon</b> |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Latitude                                   | degrees               | 58.66          | ArcGIS                            |              |      |     |           |     |     |     |     |      |      |      |  |
| Number of turbines                         |                       | 2              | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Width of windfarm                          | km                    | 0.25           | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Tidal offset                               | m                     | 0              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Turbine data                               |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Turbine model                              |                       |                |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| No of blades                               |                       | 3              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotation speed                             | rpm                   | 10.2           |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotor radius                               | m                     | 77             |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Hub height                                 | m                     | 124            | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| Monthly proportion of time operational     | %                     |                | 93%                               | 93%          | 93%  | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93%  | 93%  |  |
| Max blade width                            | m                     | 5.500          |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Pitch                                      | degrees               | 7              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Avoidance rates used in presenting results |                       | 99.50%         | Data sources (if applicable)      |              |      |     | SNCB 2014 |     |     |     |     |      |      |      |  |



Table 11-75 Input values for collision risk modelling for great black-backed gull using upper 95% CIs and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|--|-----------------------|----------------|-----------------------------------|--------------|------|-----|-----------|-----|-----|-----|-----|------|------|------|--|
| Species name                               |                       |                | Great black-backed gull           |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird length                                | m                     | 0.71           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Wingspan                                   | m                     | 1.58           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight speed                               | m/sec                 | 13.7           | Alerstam <i>et al.</i> 2007       |              |      |     |           |     |     |     |     |      |      |      |  |
| Nocturnal activity factor (1-5)            |                       | 3              | Garthe & Huppopp 2004             |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight type, flapping or gliding           |                       | flapping       |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird survey data                           |                       |                |                                   | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|  |                       |                | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| All daytime density                        |                       |                | 0.3                               | 0.38         | 0.98 | 0   | 0         | 0   | 0   | 0   | 0   | 0.97 | 0.30 | 0.69 |  |
| % flying                                   |                       |                | 67%                               | 75%          | 31%  | 0%  | 0%        | 0%  | 0%  | 3%  | 0%  | 0%   | 0%   | 67%  |  |
| Daytime bird density                       | birds/km <sup>2</sup> |                | 0.20                              | 0.29         | 0.30 | 0   | 0         | 0   | 0   | 0   | 0   | 0    | 0    | 0.46 |  |
| Proportion at rotor height                 | %                     | 52.0%          | Johnston et al 2014               |              |      |     |           |     |     |     |     |      |      |      |  |
| Proportion of flights upwind               | %                     | 50.0%          | Assumed                           |              |      |     |           |     |     |     |     |      |      |      |  |
| Windfarm data                              |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Name of windfarm site                      |                       | <b>Hexicon</b> |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Latitude                                   | degrees               | 58.66          | ArcGIS                            |              |      |     |           |     |     |     |     |      |      |      |  |
| Number of turbines                         |                       | 2              | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Width of windfarm                          | km                    | 0.25           | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Tidal offset                               | m                     | 0              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Turbine data                               |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Turbine model                              |                       |                |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| No of blades                               |                       | 3              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotation speed                             | rpm                   | 10.2           |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotor radius                               | m                     | 77             |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Hub height                                 | m                     | 124            | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| Monthly proportion of time operational     | %                     |                | 93%                               | 93%          | 93%  | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93%  | 93%  |  |
| Max blade width                            | m                     | 5.500          |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Pitch                                      | degrees               | 7              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Avoidance rates used in presenting results |                       | 99.50%         | Data sources (if applicable)      |              |      |     | SNCB 2014 |     |     |     |     |      |      |      |  |



Table 11-77 Input values for collision risk modelling for great black-backed gull using means and site-specific flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|--|-----------------------|----------------|-----------------------------------|--------------|------|-----|-----------|-----|-----|-----|-----|------|------|------|--|
| Species name                               |                       |                | Great black-backed gull           |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird length                                | m                     | 0.71           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Wingspan                                   | m                     | 1.58           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight speed                               | m/sec                 | 13.7           | Alerstam <i>et al.</i> 2007       |              |      |     |           |     |     |     |     |      |      |      |  |
| Nocturnal activity factor (1-5)            |                       | 3              | Garthe & Huppopp 2004             |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight type, flapping or gliding           |                       | flapping       |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird survey data                           |                       |                |                                   | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|  |                       |                | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| All daytime density                        |                       |                | 0.10                              | 0.19         | 0.49 | 0   | 0         | 0   | 0   | 0   | 0   | 0.70 | 0.10 | 0.30 |  |
| % flying                                   |                       |                | 67%                               | 75%          | 31%  | 0%  | 0%        | 0%  | 0%  | 3%  | 0%  | 0%   | 0%   | 67%  |  |
| Daytime bird density                       | birds/km <sup>2</sup> |                | 0.07                              | 0.14         | 0.15 | 0   | 0         | 0   | 0   | 0   | 0   | 0    | 0    | 0.20 |  |
| Proportion at rotor height                 | %                     | 58.3%          | Irwin et al 2015b                 |              |      |     |           |     |     |     |     |      |      |      |  |
| Proportion of flights upwind               | %                     | 50.0%          | Assumed                           |              |      |     |           |     |     |     |     |      |      |      |  |
| Windfarm data                              |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Name of windfarm site                      |                       | <b>Hexicon</b> |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Latitude                                   | degrees               | 58.66          | ArcGIS                            |              |      |     |           |     |     |     |     |      |      |      |  |
| Number of turbines                         |                       | 2              | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Width of windfarm                          | km                    | 0.25           | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Tidal offset                               | m                     | 0              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Turbine data                               |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Turbine model                              |                       |                |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| No of blades                               |                       | 3              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotation speed                             | rpm                   | 10.2           |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotor radius                               | m                     | 77             |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Hub height                                 | m                     | 124            | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| Monthly proportion of time operational     | %                     |                | 93%                               | 93%          | 93%  | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93%  | 93%  |  |
| Max blade width                            | m                     | 5.500          |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Pitch                                      | degrees               | 7              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Avoidance rates used in presenting results |                       | 99.50%         | Data sources (if applicable)      |              |      |     | SNCB 2014 |     |     |     |     |      |      |      |  |



Table 11-79 Input values for collision risk modelling for great black-backed gull using upper 95% CIs and site-specific flight heights in Option 2 (Band 2012).

| Bird data                                  |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|--|-----------------------|----------------|-----------------------------------|--------------|------|-----|-----------|-----|-----|-----|-----|------|------|------|--|
| Species name                               |                       |                | Great black-backed gull           |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird length                                | m                     | 0.71           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Wingspan                                   | m                     | 1.58           | BWP                               |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight speed                               | m/sec                 | 13.7           | Alerstam <i>et al.</i> 2007       |              |      |     |           |     |     |     |     |      |      |      |  |
| Nocturnal activity factor (1-5)            |                       | 3              | Garthe & Huppop 2004              |              |      |     |           |     |     |     |     |      |      |      |  |
| Flight type, flapping or gliding           |                       | flapping       |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Bird survey data                           |                       |                |                                   | Data sources |      |     |           |     |     |     |     |      |      |      |  |
|  |                       |                | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| All daytime density                        |                       |                | 0.3                               | 0.38         | 0.98 | 0   | 0         | 0   | 0   | 0   | 0   | 0.97 | 0.30 | 0.69 |  |
| % flying                                   |                       |                | 67%                               | 75%          | 31%  | 0%  | 0%        | 0%  | 0%  | 3%  | 0%  | 0%   | 0%   | 67%  |  |
| Daytime bird density                       | birds/km <sup>2</sup> |                | 0.20                              | 0.29         | 0.30 | 0   | 0         | 0   | 0   | 0   | 0   | 0    | 0    | 0.46 |  |
| Proportion at rotor height                 | %                     | 58.3%          | Irwin et al 2015b                 |              |      |     |           |     |     |     |     |      |      |      |  |
| Proportion of flights upwind               | %                     | 50.0%          | Assumed                           |              |      |     |           |     |     |     |     |      |      |      |  |
| Windfarm data                              |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Name of windfarm site                      |                       | <b>Hexicon</b> |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Latitude                                   | degrees               | 58.66          | ArcGIS                            |              |      |     |           |     |     |     |     |      |      |      |  |
| Number of turbines                         |                       | 2              | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Width of windfarm                          | km                    | 0.25           | Design envelope for JF review v3A |              |      |     |           |     |     |     |     |      |      |      |  |
| Tidal offset                               | m                     | 0              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Turbine data                               |                       | Units          | Value                             | Data sources |      |     |           |     |     |     |     |      |      |      |  |
| Turbine model                              |                       |                |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| No of blades                               |                       | 3              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotation speed                             | rpm                   | 10.2           |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Rotor radius                               | m                     | 77             |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Hub height                                 | m                     | 124            | Jan                               | Feb          | Mar  | Apr | May       | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec  |  |
| Monthly proportion of time operational     | %                     |                | 93%                               | 93%          | 93%  | 93% | 93%       | 93% | 93% | 93% | 93% | 93%  | 93%  | 93%  |  |
| Max blade width                            | m                     | 5.500          |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Pitch                                      | degrees               | 7              |                                   |              |      |     |           |     |     |     |     |      |      |      |  |
| Avoidance rates used in presenting results |                       | 99.50%         | Data sources (if applicable)      |              |      |     | SNCB 2014 |     |     |     |     |      |      |      |  |



Table 11-81 Input values for collision risk modelling for Arctic tern using mean values and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |      |      |      |   |      |       |      |      |      |      |      |
|--|-----------------------|-------|----------------|-----------------------------------|------|------|------|---|------|-------|------|------|------|------|------|
| Species name                               |                       |       | Arctic tern    |                                   |      |      |      |   |      |       |      |      |      |      |      |
| Bird length                                | m                     |       | 0.34           | BWP                               |      |      |      |   |      |       |      |      |      |      |      |
| Wingspan                                   | m                     |       | 0.7            | BWP                               |      |      |      |   |      |       |      |      |      |      |      |
| Flight speed                               | m/sec                 |       | 10.9           | Alerstam 2007                     |      |      |      |   |      |       |      |      |      |      |      |
| Nocturnal activity factor (1-5)            |                       |       | 1              | Garthe & Huppopp 2004             |      |      |      |   |      |       |      |      |      |      |      |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |      |      |      |   |      |       |      |      |      |      |      |
| Bird survey data                           |                       |       |                | Data sources                      |      |      |      |   |      |       |      |      |      |      |      |
|  |                       |       |                | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul   | Aug  | Sep  | Oct  | Nov  | Dec  |
| All daytime density                        |                       |       |                | 0                                 | 0    | 0    | 0    | 0   | 0    | 01.62 | 0    | 0    | 0    | 0    | 0    |
| % flying                                   |                       |       |                | 100%                              | 100% | 100% | 100% | 100%  | 100% | 100%  | 100% | 100% | 100% | 100% | 100% |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.02 | 1.62  | 0    | 0    | 0    | 0    | 0    |
| Proportion at rotor height                 | %                     |       | 0.0%           | Johnston et al 2014               |      |      |      |   |      |       |      |      |      |      |      |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |      |      |      |   |      |       |      |      |      |      |      |
| Windfarm data                              |                       | Units | Value          | Data sources                      |      |      |      |   |      |       |      |      |      |      |      |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |      |      |      |   |      |       |      |      |      |      |      |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |      |      |      |   |      |       |      |      |      |      |      |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |      |      |      |   |      |       |      |      |      |      |      |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |      |      |      |   |      |       |      |      |      |      |      |
| Tidal offset                               | m                     |       | 0              |                                   |      |      |      |   |      |       |      |      |      |      |      |
| Turbine data                               |                       | Units | Value          | Data sources                      |      |      |      |   |      |       |      |      |      |      |      |
| Turbine model                              |                       |       |                |                                   |      |      |      |   |      |       |      |      |      |      |      |
| No of blades                               |                       |       | 3              |                                   |      |      |      |   |      |       |      |      |      |      |      |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |      |      |      |   |      |       |      |      |      |      |      |
| Rotor radius                               | m                     |       | 77             |                                   |      |      |      |   |      |       |      |      |      |      |      |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul   | Aug  | Sep  | Oct  | Nov  | Dec  |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93%  | 93%  | 93%  | 93%   | 93%  | 93%   | 93%  | 93%  | 93%  | 93%  | 93%  |
| Max blade width                            | m                     |       | 5.500          |                                   |      |      |      |   |      |       |      |      |      |      |      |
| Pitch                                      | degrees               |       | 7              |                                   |      |      |      |   |      |       |      |      |      |      |      |
| Avoidance rates used in presenting results |                       |       | 98.30%         | Data sources (if applicable)      |      |      |      | Cook et al 2012 – NB SNCBs offer no advice on avoidance rates |      |       |      |      |      |      |      |



Table 11-83 Input values for collision risk modelling for Arctic tern using upper 95% CIs and generic flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units    | Value                             | Data sources  |      |      |      |      |      |      |      |      |      |      |      |
|--|-----------------------|----------|-----------------------------------|---|------|------|------|------|------|------|------|------|------|------|------|
| Species name                               |                       |          | Arctic tern                       |   |      |      |      |      |      |      |      |      |      |      |      |
| Bird length                                | m                     | 0.34     | BWP                               |   |      |      |      |      |      |      |      |      |      |      |      |
| Wingspan                                   | m                     | 0.7      | BWP                               |   |      |      |      |      |      |      |      |      |      |      |      |
| Flight speed                               | m/sec                 | 10.9     | Alerstam 2007                     |   |      |      |      |      |      |      |      |      |      |      |      |
| Nocturnal activity factor (1-5)            |                       | 1        | Garthe & Huppopp 2004             |   |      |      |      |      |      |      |      |      |      |      |      |
| Flight type, flapping or gliding           |                       | flapping |                                   |   |      |      |      |      |      |      |      |      |      |      |      |
| Bird survey data                           |                       |          |                                   | Data sources  |      |      |      |      |      |      |      |      |      |      |      |
|  |                       |          |                                   | Jan   | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| All daytime density                        |                       |          |                                   | 0   | 0    | 0    | 0    | 0    | 1.94 | 2.54 | 0    | 0    | 0    | 0    | 0    |
| % flying                                   |                       |          |                                   | 100%  | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Daytime bird density                       | birds/km <sup>2</sup> |          |                                   | 0   | 0    | 0    | 0    | 0    | 1.94 | 2.54 | 0    | 0    | 0    | 0    | 0    |
| Proportion at rotor height                 | %                     | 0.0%     | Johnston et al 2014               |   |      |      |      |      |      |      |      |      |      |      |      |
| Proportion of flights upwind               | %                     | 50.0%    | Assumed                           |   |      |      |      |      |      |      |      |      |      |      |      |
| Windfarm data                              |                       | Units    | Value                             | Data sources  |      |      |      |      |      |      |      |      |      |      |      |
| Name of windfarm site                      |                       |          | <b>Hexicon</b>                    |   |      |      |      |      |      |      |      |      |      |      |      |
| Latitude                                   | degrees               | 58.66    | ArcGIS                            |   |      |      |      |      |      |      |      |      |      |      |      |
| Number of turbines                         |                       | 2        | Design envelope for JF review v3A |   |      |      |      |      |      |      |      |      |      |      |      |
| Width of windfarm                          | km                    | 0.25     | Design envelope for JF review v3A |   |      |      |      |      |      |      |      |      |      |      |      |
| Tidal offset                               | m                     | 0        |                                   |   |      |      |      |      |      |      |      |      |      |      |      |
| Turbine data                               |                       | Units    | Value                             | Data sources  |      |      |      |      |      |      |      |      |      |      |      |
| Turbine model                              |                       |          |                                   |   |      |      |      |      |      |      |      |      |      |      |      |
| No of blades                               |                       | 3        |                                   |   |      |      |      |      |      |      |      |      |      |      |      |
| Rotation speed                             | rpm                   | 10.2     |                                   |   |      |      |      |      |      |      |      |      |      |      |      |
| Rotor radius                               | m                     | 77       |                                   |   |      |      |      |      |      |      |      |      |      |      |      |
| Hub height                                 | m                     | 124      |                                   | Jan   | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| Monthly proportion of time operational     | %                     |          |                                   | 93%   | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |
| Max blade width                            | m                     | 5.500    |                                   |   |      |      |      |      |      |      |      |      |      |      |      |
| Pitch                                      | degrees               | 7        |                                   |   |      |      |      |      |      |      |      |      |      |      |      |
| Avoidance rates used in presenting results |                       | 98.30%   | Data sources (if applicable)      | Cook et al 2012 – NB SNCBs offer no advice on avoidance rates |      |      |      |      |      |      |      |      |      |      |      |



Table 11-85 Input values for collision risk modelling for Arctic tern using mean values and site-specific flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |  |
|--|-----------------------|-------|----------------|-----------------------------------|------|------|------|---|------|------|------|------|------|------|------|--|
| Species name                               |                       |       | Arctic tern    |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Bird length                                | m                     |       | 0.34           | BWP                               |      |      |      |   |      |      |      |      |      |      |      |  |
| Wingspan                                   | m                     |       | 0.7            | BWP                               |      |      |      |   |      |      |      |      |      |      |      |  |
| Flight speed                               | m/sec                 |       | 10.9           | Alerstam 2007                     |      |      |      |   |      |      |      |      |      |      |      |  |
| Nocturnal activity factor (1-5)            |                       |       | 1              | Garthe & Huppopp 2004             |      |      |      |   |      |      |      |      |      |      |      |  |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Bird survey data                           |                       |       |                | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |  |
|  |                       |       |                | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |  |
| All daytime density                        |                       |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.02 | 1.62 | 0    | 0    | 0    | 0    | 0    |  |
| % flying                                   |                       |       |                | 100%                              | 100% | 100% | 100% | 100%  | 100% | 100% | 100% | 100% | 100% | 100% | 100% |  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.02 | 1.62 | 0    | 0    | 0    | 0    | 0    |  |
| Proportion at rotor height                 | %                     |       | 7.1%           | Irwin et al 2015b                 |      |      |      |   |      |      |      |      |      |      |      |  |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |      |      |      |   |      |      |      |      |      |      |      |  |
| Windfarm data                              |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |  |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |      |      |      |   |      |      |      |      |      |      |      |  |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |  |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |  |
| Tidal offset                               | m                     |       | 0              |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Turbine data                               |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |  |
| Turbine model                              |                       |       |                |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| No of blades                               |                       |       | 3              |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Rotor radius                               | m                     |       | 77             |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |  |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93%  | 93%  | 93%  | 93%   | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |  |
| Max blade width                            | m                     |       | 5.500          |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Pitch                                      | degrees               |       | 7              |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Avoidance rates used in presenting results |                       |       | 98.30%         | Data sources (if applicable)      |      |      |      | Cook et al 2012 – NB SNCBs offer no advice on avoidance rates |      |      |      |      |      |      |      |  |

Table 11-86 Output results for collision risk modelling for Arctic tern using mean values and site-specific flight height data in Option 1 (Band 2012).

| Stage A – Flight activity          |                         |        |     |     |     |     |     |      |      |     |     |     |     |     | Per annum |
|------------------------------------|-------------------------|--------|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|-----|-----------|
|                                    |                         |        | Jan | Feb | Mar | Apr | May | Jun  | Jul  | Aug | Sep | Oct | Nov | Dec |           |
| Daytime aerial bird density        | birds/km <sup>2</sup>   |        | 0   | 0   | 0   | 0   | 0   | 1.02 | 1.62 | 0   | 0   | 0   | 0   | 0   |           |
| Proportion at rotor height         | %                       | 7.1    |     |     |     |     |     |      |      |     |     |     |     |     |           |
| Total daylight hours per month     | hrs                     |        | 221 | 259 | 365 | 432 | 521 | 547  | 546  | 479 | 387 | 320 | 236 | 199 |           |
| Total night hours per month        | hrs                     |        | 523 | 413 | 379 | 288 | 223 | 173  | 198  | 265 | 333 | 424 | 484 | 545 |           |
| Flux factor                        |                         |        | 0   | 0   | 0   | 0   | 0   | 5299 | 8399 | 0   | 0   | 0   | 0   | 0   |           |
| Option 1 – Basic model             |                         |        | 0   | 0   | 0   | 0   | 0   | 21   | 34   | 0   | 0   | 0   | 0   | 0   | 55        |
| Collisions assuming avoidance rate | Birds per month or year | 98.30% | 00  | 0   | 0   | 0   | 0   | 0    | 1    | 0   | 0   | 0   | 0   | 0   | 1         |

Table 11-87 Input values for collision risk modelling for Arctic tern using upper 95% CIs and site-specific flight height data in Option 1 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
|--|-----------------------|-------|----------------|-----------------------------------|------|------|------|---|------|------|------|------|------|------|------|
| Species name                               |                       |       | Arctic tern    |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Bird length                                | m                     |       | 0.34           | BWP                               |      |      |      |   |      |      |      |      |      |      |      |
| Wingspan                                   | m                     |       | 0.7            | BWP                               |      |      |      |   |      |      |      |      |      |      |      |
| Flight speed                               | m/sec                 |       | 10.9           | Alerstam 2007                     |      |      |      |   |      |      |      |      |      |      |      |
| Nocturnal activity factor (1-5)            |                       |       | 1              | Garthe & Huppopp 2004             |      |      |      |   |      |      |      |      |      |      |      |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Bird survey data                           |                       |       |                | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
|  |                       |       |                | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| All daytime density                        |                       |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.94 | 2.54 | 0    | 0    | 0    | 0    | 0    |
| % flying                                   |                       |       |                | 100%                              | 100% | 100% | 100% | 100%  | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.94 | 2.54 | 0    | 0    | 0    | 0    | 0    |
| Proportion at rotor height                 | %                     |       | 7.1%           | Irwin et al 2015b                 |      |      |      |   |      |      |      |      |      |      |      |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |      |      |      |   |      |      |      |      |      |      |      |
| Windfarm data                              |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |      |      |      |   |      |      |      |      |      |      |      |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |
| Tidal offset                               | m                     |       | 0              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Turbine data                               |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
| Turbine model                              |                       |       |                |                                   |      |      |      |   |      |      |      |      |      |      |      |
| No of blades                               |                       |       | 3              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Rotor radius                               | m                     |       | 77             |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93%  | 93%  | 93%  | 93%   | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |
| Max blade width                            | m                     |       | 5.500          |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Pitch                                      | degrees               |       | 7              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Avoidance rates used in presenting results |                       |       | 98.30%         | Data sources (if applicable)      |      |      |      | Cook et al 2012 – NB SNCBs offer no advice on avoidance rates |      |      |      |      |      |      |      |

Table 11-88 Output results for collision risk modelling for Arctic tern using upper 95% CIs and site-specific flight height data in Option 1 (Band 2012).

| Stage A – Flight activity          |                         |        |     |     |     |     |     |       |       |     |     |     |     |     | Per annum |
|------------------------------------|-------------------------|--------|-----|-----|-----|-----|-----|-------|-------|-----|-----|-----|-----|-----|-----------|
|                                    |                         |        | Jan | Feb | Mar | Apr | May | Jun   | Jul   | Aug | Sep | Oct | Nov | Dec |           |
| Daytime aerial bird density        | birds/km <sup>2</sup>   |        | 0   | 0   | 0   | 0   | 0   | 1.94  | 2.54  | 0   | 0   | 0   | 0   | 0   |           |
| Proportion at rotor height         | %                       | 0%     |     |     |     |     |     |       |       |     |     |     |     |     |           |
| Total daylight hours per month     | hrs                     |        | 221 | 259 | 365 | 432 | 521 | 547   | 546   | 479 | 387 | 320 | 236 | 199 |           |
| Total night hours per month        | hrs                     |        | 523 | 413 | 379 | 288 | 223 | 173   | 198   | 265 | 333 | 424 | 484 | 545 |           |
| Flux factor                        |                         |        | 0   | 0   | 0   | 0   | 0   | 10079 | 13164 | 0   | 0   | 0   | 0   | 0   |           |
| Option 1 – Basic model             |                         |        | 0   | 0   | 0   | 0   | 0   | 40    | 53    | 0   | 0   | 0   | 0   | 0   | 93        |
| Collisions assuming avoidance rate | Birds per month or year | 98.30% | 0   | 0   | 0   | 0   | 0   | 1     | 1     | 0   | 0   | 0   | 0   | 0   | 2         |

Table 11-89 Input values for collision risk modelling for Arctic tern using mean values and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
|--|-----------------------|-------|----------------|-----------------------------------|------|------|------|---|------|------|------|------|------|------|------|
| Species name                               |                       |       | Arctic tern    |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Bird length                                | m                     |       | 0.34           | BWP                               |      |      |      |   |      |      |      |      |      |      |      |
| Wingspan                                   | m                     |       | 0.7            | BWP                               |      |      |      |   |      |      |      |      |      |      |      |
| Flight speed                               | m/sec                 |       | 10.9           | Alerstam 2007                     |      |      |      |   |      |      |      |      |      |      |      |
| Nocturnal activity factor (1-5)            |                       |       | 1              | Garthe & Huppopp 2004             |      |      |      |   |      |      |      |      |      |      |      |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Bird survey data                           |                       |       |                | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
|  |                       |       |                | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| All daytime density                        |                       |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.02 | 1.62 | 0    | 0    | 0    | 0    | 0    |
| % flying                                   |                       |       |                | 100%                              | 100% | 100% | 100% | 100%  | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.02 | 1.62 | 0    | 0    | 0    | 0    | 0    |
| Proportion at rotor height                 | %                     |       | 0.0%           | Johnston et al 2014               |      |      |      |   |      |      |      |      |      |      |      |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |      |      |      |   |      |      |      |      |      |      |      |
| Windfarm data                              |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |      |      |      |   |      |      |      |      |      |      |      |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |
| Tidal offset                               | m                     |       | 0              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Turbine data                               |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
| Turbine model                              |                       |       |                |                                   |      |      |      |   |      |      |      |      |      |      |      |
| No of blades                               |                       |       | 3              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Rotor radius                               | m                     |       | 77             |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93%  | 93%  | 93%  | 93%   | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |
| Max blade width                            | m                     |       | 5.500          |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Pitch                                      | degrees               |       | 7              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Avoidance rates used in presenting results |                       |       | 98.30%         | Data sources (if applicable)      |      |      |      | Cook et al 2012 – NB SNCBs offer no advice on avoidance rates |      |      |      |      |      |      |      |



Table 11-91 Input values for collision risk modelling for Arctic tern using upper 95% CIs and generic flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
|--|-----------------------|-------|----------------|-----------------------------------|------|------|------|---|------|------|------|------|------|------|------|
| Species name                               |                       |       | Arctic tern    |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Bird length                                | m                     |       | 0.34           | BWP                               |      |      |      |   |      |      |      |      |      |      |      |
| Wingspan                                   | m                     |       | 0.7            | BWP                               |      |      |      |   |      |      |      |      |      |      |      |
| Flight speed                               | m/sec                 |       | 10.9           | Alerstam 2007                     |      |      |      |   |      |      |      |      |      |      |      |
| Nocturnal activity factor (1-5)            |                       |       | 1              | Garthe & Huppopp 2004             |      |      |      |   |      |      |      |      |      |      |      |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Bird survey data                           |                       |       |                | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
|  |                       |       |                | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| All daytime density                        |                       |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.94 | 2.54 | 0    | 0    | 0    | 0    | 0    |
| % flying                                   |                       |       |                | 100%                              | 100% | 100% | 100% | 100%  | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.94 | 2.54 | 0    | 0    | 0    | 0    | 0    |
| Proportion at rotor height                 | %                     |       | 0.0%           | Johnston et al                    |      |      |      |   |      |      |      |      |      |      |      |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |      |      |      |   |      |      |      |      |      |      |      |
| Windfarm data                              |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |      |      |      |   |      |      |      |      |      |      |      |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |
| Tidal offset                               | m                     |       | 0              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Turbine data                               |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
| Turbine model                              |                       |       |                |                                   |      |      |      |   |      |      |      |      |      |      |      |
| No of blades                               |                       |       | 3              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Rotor radius                               | m                     |       | 77             |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93%  | 93%  | 93%  | 93%   | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |
| Max blade width                            | m                     |       | 5.500          |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Pitch                                      | degrees               |       | 7              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Avoidance rates used in presenting results |                       |       | 98.30%         | Data sources (if applicable)      |      |      |      | Cook et al 2012 – NB SNCBs offer no advice on avoidance rates |      |      |      |      |      |      |      |



Table 11-93 Input values for collision risk modelling for Arctic tern using mean values and site-specific flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |  |
|--|-----------------------|-------|----------------|-----------------------------------|------|------|------|---|------|------|------|------|------|------|------|--|
| Species name                               |                       |       | Arctic tern    |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Bird length                                | m                     |       | 0.34           | BWP                               |      |      |      |   |      |      |      |      |      |      |      |  |
| Wingspan                                   | m                     |       | 0.7            | BWP                               |      |      |      |   |      |      |      |      |      |      |      |  |
| Flight speed                               | m/sec                 |       | 10.9           | Alerstam 2007                     |      |      |      |   |      |      |      |      |      |      |      |  |
| Nocturnal activity factor (1-5)            |                       |       | 1              | Garthe & Huppopp 2004             |      |      |      |   |      |      |      |      |      |      |      |  |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Bird survey data                           |                       |       |                | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |  |
|  |                       |       |                | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |  |
| All daytime density                        |                       |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.02 | 1.62 | 0    | 0    | 0    | 0    | 0    |  |
| % flying                                   |                       |       |                | 100%                              | 100% | 100% | 100% | 100%  | 100% | 100% | 100% | 100% | 100% | 100% | 100% |  |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.02 | 1.62 | 0    | 0    | 0    | 0    | 0    |  |
| Proportion at rotor height                 | %                     |       | 7.1%           | Irwin et al 2015b                 |      |      |      |   |      |      |      |      |      |      |      |  |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |      |      |      |   |      |      |      |      |      |      |      |  |
| Windfarm data                              |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |  |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |      |      |      |   |      |      |      |      |      |      |      |  |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |  |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |  |
| Tidal offset                               | m                     |       | 0              |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Turbine data                               |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |  |
| Turbine model                              |                       |       |                |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| No of blades                               |                       |       | 3              |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Rotor radius                               | m                     |       | 77             |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |  |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93%  | 93%  | 93%  | 93%   | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |  |
| Max blade width                            | m                     |       | 5.500          |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Pitch                                      | degrees               |       | 7              |                                   |      |      |      |   |      |      |      |      |      |      |      |  |
| Avoidance rates used in presenting results |                       |       | 98.30%         | Data sources (if applicable)      |      |      |      | Cook et al 2012 – NB SNCBs offer no advice on avoidance rates |      |      |      |      |      |      |      |  |



Table 11-95 Input values for collision risk modelling for Arctic tern using upper 95% CIs and site-specific flight height data in Option 2 (Band 2012).

| Bird data                                  |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
|--|-----------------------|-------|----------------|-----------------------------------|------|------|------|---|------|------|------|------|------|------|------|
| Species name                               |                       |       | Arctic tern    |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Bird length                                | m                     |       | 0.34           | BWP                               |      |      |      |   |      |      |      |      |      |      |      |
| Wingspan                                   | m                     |       | 0.7            | BWP                               |      |      |      |   |      |      |      |      |      |      |      |
| Flight speed                               | m/sec                 |       | 10.9           | Alerstam 2007                     |      |      |      |   |      |      |      |      |      |      |      |
| Nocturnal activity factor (1-5)            |                       |       | 1              | Garthe & Huppopp 2004             |      |      |      |   |      |      |      |      |      |      |      |
| Flight type, flapping or gliding           |                       |       | flapping       |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Bird survey data                           |                       |       |                | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
|  |                       |       |                | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| All daytime density                        |                       |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.94 | 2.54 | 0    | 0    | 0    | 0    | 0    |
| % flying                                   |                       |       |                | 100%                              | 100% | 100% | 100% | 100%  | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Daytime bird density                       | birds/km <sup>2</sup> |       |                | 0                                 | 0    | 0    | 0    | 0   | 1.94 | 2.54 | 0    | 0    | 0    | 0    | 0    |
| Proportion at rotor height                 | %                     |       | 7.1%           | Irwin et al 2015b                 |      |      |      |   |      |      |      |      |      |      |      |
| Proportion of flights upwind               | %                     |       | 50.0%          | Assumed                           |      |      |      |   |      |      |      |      |      |      |      |
| Windfarm data                              |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
| Name of windfarm site                      |                       |       | <b>Hexicon</b> |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Latitude                                   | degrees               |       | 58.66          | ArcGIS                            |      |      |      |   |      |      |      |      |      |      |      |
| Number of turbines                         |                       |       | 2              | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |
| Width of windfarm                          | km                    |       | 0.25           | Design envelope for JF review v3A |      |      |      |   |      |      |      |      |      |      |      |
| Tidal offset                               | m                     |       | 0              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Turbine data                               |                       | Units | Value          | Data sources                      |      |      |      |   |      |      |      |      |      |      |      |
| Turbine model                              |                       |       |                |                                   |      |      |      |   |      |      |      |      |      |      |      |
| No of blades                               |                       |       | 3              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Rotation speed                             | rpm                   |       | 10.2           |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Rotor radius                               | m                     |       | 77             |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Hub height                                 | m                     |       | 124            | Jan                               | Feb  | Mar  | Apr  | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| Monthly proportion of time operational     | %                     |       |                | 93%                               | 93%  | 93%  | 93%  | 93%   | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  | 93%  |
| Max blade width                            | m                     |       | 5.500          |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Pitch                                      | degrees               |       | 7              |                                   |      |      |      |   |      |      |      |      |      |      |      |
| Avoidance rates used in presenting results |                       |       | 98.30%         | Data sources (if applicable)      |      |      |      | Cook et al 2012 – NB SNCBs offer no advice on avoidance rates |      |      |      |      |      |      |      |

