September 2023

Dublin Airport

North Runway, Regulation 598/2014 (Aircraft Noise Regulation) Cost-Effectiveness Analysis Updates

Prepared for:

daa

Prepared by:

RICONDO

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daa requested an update of the cost-effectiveness assessment results documented in the *Dublin Airport North Runway, Regulation 598/2014 (Aircraft Noise Regulation) Cost Effectiveness Analysis Report* provided to daa on July 2021 (2021 CEA Report), based on the updated aircraft noise model data provided by Bickerdike Allen Partners LLP (BAP) on September 2, 2023. This memorandum updates the data tables provided in the 2021 CEA Report and notes any applicable updates to the CEA findings.

BAP provided updated noise metric results to Ricondo on September 2, 2023. The aircraft noise model was updated to incorporate a new aircraft movements forecast reflecting current post-pandemic conditions and adjustments to the modelled flight tracks associated with the North Runway.

Section 1 provides a summary of the effects the adjustments had on the updated noise results. The noise results data were entered into Ricondo's CEA workbook to provide updated results. **Sections 2-5** and **Section 7** provide, where applicable, updated data tables for the corresponding sections in the 2021 CEA Report, along with summary of relevant considerations and comparisons to the original report. **Section 8** confirms there are no changes to the recommendations from the 2021 CEA Report.

1. EFFECTS OF THE AIRCRAFT NOISE MODEL INPUT REFINEMENTS

BAP adjusted the aircraft noise models based on updates to the air traffic forecast, to account for more current post-Pandemic recovery trends, radar data reflecting actual aircraft flight tracks after North Runway was opened, and future scenario runway use assumptions based on refined input from air traffic control. The effects on the noise results were as follows:

- For aircraft using the North Runway for westerly departures and turning to the south, actual radar data compared to the 2021 noise model assumption indicates the initial turn is earlier and the altitude at which aircraft subsequently turn south is higher (4,000 feet versus 3,000 feet) compared to the 2021 projection. Adjusting input to reflect actual observed patterns results in aircraft overflights further north than previously assumed before turning to the south. This reduces the noise levels in the Blanchardstown area compared to equivalent South Runway overflight movements.
- Changes in runway use assumptions which move many of the westerly night-time departures from the South Runway to the North Runway in Scenario 02 (proposed preferential runway use measure). The lower noise level contours reach Northwest Dublin (Blanchardstown and surrounding communities) as a result of departures to the west, particularly those which turn south. The impacts in this area are lower when the aircraft depart from the North Runway, as the aircraft have further to travel and therefore are at a higher altitude once they reach the Blanchardstown area.
- A smaller proportion of aircraft are assumed to turn south compared to the previous assessment in 2021. Actual routes flown for each destination in 2022 were assessed, and findings were applied to the updated future forecasts noise models. This adjustment reduces overall impacts in terms of Highly Annoyed (HA) / Highly Sleep Disturbed (HSD) due to higher population levels south of the airport, but it does not materially affect the higher noise level contours.
- The updated movements forecast has over 10 percent more annual night flights in 2025 without the Permitted Conditions 3(d) and 5 relating to restrictions on the night time use of the runways, compared to the previous forecast that supported the analysis documented in the 2021 CEA Report. The increase is effectively all Boeing 737 MAX aircraft, so it does mean the average aircraft is quieter than previously assumed, but all else being equal larger night noise contours and higher quota count are expected as a result of this change. Conversely, daytime impacts will be slightly lower than previously as the total flights

are similar but there has been more fleet renewal (e.g. replacing Airbus 320 and Boeing 737 older models with Boeing 737 MAX).

- Future aircraft departure profiles are based on recent radar data. In general, the updates reduced the width of the contours close to the airport and have more limited changes further out.

2. 2018 NOISE EXPOSURE LEVELS

Table 2-1 of the 2021 CEA Report provides the Highly Sleep Disturbed (HSD) and Highly Annoyed (HA) population counts based on the 2018 situation and existing noise mitigation measures, including the current sound insulation schemes. It also includes the following metrics calculated to assess potential adverse to significant impacts related to night-time noise for the 2018 situation:

- 50 dB Lnight – a level of night-time noise exposure described as representing a medium level of impact.
- 55 dB Lnight – a level of night-time noise exposure described as representing a high level of impact.

The 2018 noise model input was based on actual aircraft movements and flight track data for 2018; therefore, the noise model results did not change and the values in Table 2-1 remain the same.

3. FORECAST WITHOUT NEW MEASURES NOISE EXPOSURE

The definition of the Forecast Without New Measure scenario and the existing and planned measures assumed (reference Table 3-1 of the 2021 CEA Report) did not change as a result of the updated assessment. The only change were the forecast aircraft movements and adjustments to noise model tracks for the new North Runway. As a result of these changes to the input, the results in Table 3-2 also changed as indicated in **Revised Table 3-2.**

REVISED TABLE 3-2: FORECAST WITHOUT NEW MEASURES NOISE EXPOSURE – NUMBER OFPEOPLE EXPOSED IN 2025

NOISE EFFECT	METRIC	THRESHOLD	NUMBER OF PEOPLE EXPOSED
Number of People Highly Sleep Disturbed	L_{night}	40 dB	25,303
Number of People Highly Annoyed	L_{den}	45 dB	58,929
Medium Impact	L_{night}	50 dB	11,494
High Impact	L_{night}	55 dB	214

NOTES:
Population analysis includes a 5 dB reduction factor for eligible dwelling units under the existing and planned residential sound insulation schemes. The 5 dB reduction does not represent a reduction in exterior levels and does not change the location of the dwelling unit within exterior noise exposure levels.
dB – decibels
L_{night} – average sound pressure level for an 8-hour period (recommended period of sleep for adults) between 23:00 and 07:00
L_{den} – average sound pressure for 24 hours with noise events weighted at 10 dB for night-time (23:00 to 07:00) and 5 dB for evening (19:00 to 23:00)
SOURCE Bickerdike Allen Partners LLP, *A11267_23_CA029_3.0 Summary of Results Including Mitigation*, September 10, 2023 (noise effect threshold, number of people exposed)

Revised Table 3-3 also changes as a result of the updated Forecast Without New Measures noise exposure results. It compares the 2018 population exposure levels to those modelled for the Forecast without New Measures scenario to determine if the forecast actions without Condition 3(d) and Condition 5 conflict with the cNAO for Dublin Airport (refer to Section 2.1 of the 2021 CEA Report) and, if so, to what degree.

REVISED TABLE 3-3: FORECAST WITHOUT NEW MEASURES NOISE EXPOSURE – NUMBER OF PEOPLE EXPOSED IN 2025 COMPARED TO 2018 SITUATION

NOISE EFFECT	METRIC	THRESHOLD	NUMBER OF PEOPLE EXPOSED 2025 COMPARED TO 2018
Number of People Highly Sleep Disturbed	L_{night}	40 dB	- 16,931
Number of People Highly Annoyed	L_{den}	45 dB	- 51,267
Medium Impact	L_{night}	50 dB	-743
High Impact	L_{night}	55 dB	-334

NOTES:

Decrease Increase

Population analysis includes a 5 dB reduction factor for eligible dwelling units under the existing and planned residential sound insulation schemes. The 5 dB reduction does not represent a reduction in exterior levels and does not change the location of the dwelling unit within exterior noise exposure levels.
Negative value represents a decrease compared to 2018.
dB – decibels
L_{night} – average sound pressure level for an 8-hour period (recommended period of sleep for adults) between 23:00 and 07:00
L_{den} – average sound pressure for 24 hours with noise events weighted at 10 dB for night-time (23:00 to 07:00) and 5 dB for evening (19:00 to 23:00)
SOURCE: Bickerdike Allen Partners LLP, *A11267_23_CA029_3.0 Summary of Results Including Mitigation*, September 10, 2023 (noise effect threshold, number of people exposed).

The comparison results did not change as a result of the update. The Forecast Without New Measures scenario results in lower noise exposure compared to the 2018 condition. The change in number of people that are no longer exposed to the noise exposure metric levels is higher compared to the previous assessment.

Revised Table 3-4 compares the 2018 situation population exposure levels to those modelled for the Forecast without New Measures scenario to determine the degree of change in noise levels without Condition 3(d) and Condition 5 operating restrictions in place. Refer to Section 2.1 of the 2021 CEA Report for a definition of significant adverse effect changes.

REVISED TABLE 3-4: FORECAST WITHOUT NEW MEASURES NOISE EXPOSURE – NUMBER OF PEOPLE EXPOSED TO SIGNIFICANT ADVERSE EFFECT CHANGES IN NOISE COMPARED TO 2018

NOISE EFFECT	METRIC	THRESHOLD	NUMBER OF PEOPLE EXPOSED 2025 COMPARED TO 2018
24-Hour Noise Levels	L_{den}	45 dB and Higher	21,857
Night-Time Noise	L_{night}	40 dB and Higher	33,384

NOTES:

Decrease Increase

Population analysis includes a 5 dB reduction factor for eligible dwelling units under the existing and planned residential sound insulation schemes. The 5 dB reduction does not represent a reduction in exterior levels and does not change the location of the dwelling unit within exterior noise exposure levels.
Negative value represents a decrease compared to 2018.
dB – decibels
L_{night} – average sound pressure level for an 8-hour period (recommended period of sleep for adults) between 23:00 and 07:00
L_{den} – average sound pressure for 24 hours with noise events weighted at 10 dB for night-time (23:00 to 07:00) and 5 dB for evening (19:00 to 23:00)
SOURCE: Bickerdike Allen Partners LLP, *A11267_23_CA029_3.0 Summary of Results Including Mitigation*, September 10, 2023 (noise effect threshold, number of people exposed).

The comparison results did not change as a result of the update. The Forecast Without New Measures scenario does increase the number of people exposed to a significant adverse level when compared to 2018 levels. The number of people is higher compared to the previous analysis. The number of people at significant noise exposure level changes based on the day-evening-night level (Lden) metric increased by 65 percent compared to the previous results; and those exposed to significant adverse changes in night level (Lnight) increased by 50 percent.

4. NOISE ABATEMENT OPERATIONAL PROCEDURE MEASURES

4.1 EFFECTIVENESS RESULTS FOR PREFERENTIAL RUNWAY USE MEASURES

Section 4.1.2 of the 2021 CEA Report summarises the effectiveness of each feasible preferential runway use scenario described in Table 4.1 of the 2021 CEA Report in meeting the cNAO and addressing priorities related to potential significant adverse effects caused by changes in Lden and Lnight levels. Values in Table 4-2 of the 2021 CEA Report change as a result of the update. **Revised Table 4-2** provides the updated values and comparison results.

REVISED TABLE 4-2: EFFECTIVENESS OF FEASIBLE MEASURES TO ACHIEVE NOISE ABATEMENT OBJECTIVE – COMPARISON TO THE 2018 SITUATION

SCENARIO	POPULATION RESULTS		COMPARISON TO 2018 SITUATION		STATUS
	NO. OF PEOPLE HIGHLY ANNOYED	NO. OF PEOPLE HIGHLY SLEEP DISTURBED	NO. OF PEOPLE HIGHLY ANNOYED	NO. OF PEOPLE HIGHLY SLEEP DISTURBED	
Forecast without New Measures	58,929	25,303	- 51,267	-16,931	Proceed
Scenario 2	53,810	23,855	-56,386	-18,378	Proceed
Scenario 3	49,022	21,107	-61,173	-21,127	Proceed
Scenario 4	61,672	25,815	-48,524	-16,419	Proceed
Scenario 5	58,419	26,285	-51,776	-15,949	Proceed
Scenario 7	58,694	25,672	-51,502	-16,562	Proceed
Scenario 8	62,326	27,813	-47,869	-14,421	Proceed
Scenario 9	50,411	21,360	-59,785	-20,874	Proceed
Scenario 10	52,765	23,518	-57,431	-18,716	Proceed

NOTES:

Decrease Increase

Population analysis includes a 5 dB reduction factor for eligible dwelling units under the existing and planned residential sound insulation schemes. The 5 dB reduction does not represent a reduction in exterior levels and does not change the location of the dwelling unit within exterior noise exposure levels.
Negative value indicates a decrease in population exposure compared to the 2018 situation.
SOURCE: Bickerdike Allen Partners LLP, *A11267_23_CA029_3.0 Summary of Results Including Mitigation*, September 10, 2023 (population values).

The comparison results did not change as a result of the update. The Forecast without New Measures scenario and all of the preferential runway use scenarios meet the cNAO (fewer people that are highly annoyed or highly sleep disturbed compared to 2018 conditions).

Revised Table 4-3 reports the HSD and HA populations for each scenario compared to the Forecast Without New Measures scenario.

REVISED TABLE 4-3: EFFECTIVENESS OF FEASIBLE MEASURES TO ACHIEVE NOISE ABATEMENT OBJECTIVE – COMPARISON TO FORECAST WITHOUT NEW MEASURES

SCENARIO	POPULATION RESULTS		COMPARISON TO FORECAST WITHOUT NEW MEASURES SCENARIO		STATUS
	NO. OF PEOPLE HIGHLY ANNOYED	NO. OF PEOPLE HIGHLY SLEEP DISTURBED	NO. OF PEOPLE HIGHLY ANNOYED	NO. OF PEOPLE HIGHLY SLEEP DISTURBED	
Scenario 2	53,810	23,855	-5,119	-1,448	Proceed
Scenario 3	49,022	21,107	-9,906	-4,196	Proceed
Scenario 4	61,672	25,815	2,743	512	Proceed
Scenario 5	58,419	26,285	-509	981	Proceed
Scenario 7	58,694	25,672	-235	368	Proceed
Scenario 8	62,326	27,813	3,398	2,510	Proceed
Scenario 9	50,411	21,360	-8,518	-3,943	Proceed
Scenario 10	52,765	23,518	-6,164	-1,785	Proceed

NOTES:

Decrease Increase

Population analysis includes a 5 dB reduction factor for eligible dwelling units under the existing and planned residential sound insulation schemes. The 5 dB reduction does not represent a reduction in exterior levels and does not change the location of the dwelling unit within exterior noise exposure levels.
Negative value indicates a decrease in population exposure compared to the 2018 situation.
SOURCE: Bickerdike Allen Partners LLP, *A11267_23_CA029_3.0 Summary of Results Including Mitigation*, September 10, 2023 (population values).

The previous CEA assessment maintained all preferential runway use scenarios for further consideration because the difference between each scenario and the Forecast Without New Measures scenario was not substantially different (less than 1,000 additional people highly annoyed or highly sleep disturbed). The updated results indicate Scenarios 4 and 8 will result in more than 1,000 additional people who may be highly annoyed or highly sleep disturbed. These scenarios may be considered candidates for elimination from further consideration because they are not as effective as the Forecast Without New Measure scenario. This does not affect the overall conclusion of the previous CEA assessment.

Revised Table 4-4 lists the number of people exposed to noise level changes equivalent to significant adverse effects for each remaining preferential runway use scenario and indicates those eliminated from further consideration.

REVISED TABLE 4-4: EFFECTIVENESS OF FEASIBLE MEASURES TO MINIMISE SIGNIFICANT ADVERSE EFFECTS CAUSED BY CHANGES IN L_{DEN} AND L_{NIGHT} LEVELS – COMPARISON TO 2018 SITUATION

SCENARIO	NUMBER OF PEOPLE SIGNIFICANTLY ADVERSELY EFFECTED – L_{DEN}	NUMBER OF PEOPLE SIGNIFICANTLY ADVERSE EFFECTED – L_{NIGHT}	STATUS
Forecast without New Measures	25,893	25,613	Eliminate
Scenario 2	16,119	1,860	Proceed
Scenario 3	20,262	2,738	Eliminate
Scenario 4	33,579	29,954	Eliminate
Scenario 5	22,767	21,062	Eliminate
Scenario 7	11,150	14,253	Eliminate
Scenario 8	31,545	28,543	Eliminate
Scenario 9	30,547	19,254	Eliminate
Scenario 10	23,482	11,642	Eliminate

NOTES:

Decrease Increase

Population analysis includes a 5 dB reduction factor for eligible dwelling units under the existing and planned residential sound insulation schemes. The 5 dB reduction does not represent a reduction in exterior levels and does not change the location of the dwelling unit within exterior noise exposure levels.
Negative value indicates a decrease in population exposure compared to 2018 conditions.
n/a – not applicable because it is the baseline scenario.
L_{night} – average sound pressure level for an 8-hour period (recommended period of sleep for adults) between 23:00 and 07:00
L_{den} – average sound pressure for 24 hours with noise events weighted at 10 dB for night-time (23:00 to 07:00) and 5 dB for evening (19:00 to 23:00)
SOURCE: Bickerdike Allen Partners LLP, *A11267_23_CA029_3.0 Summary of Results Including Mitigation*, September 10, 2023 (population values).

The previous assessment indicated that the preferential runway use scenario with the lowest number of people exposed to changes that potentially cause significant adverse effects resulting from the change in noise levels for both L_{night} and L_{den} levels was Scenario 2. Based on the updated results, Scenario 2 remains the lowest for number of people adversely significantly affected by Lnight, but is the second lowest for Lden levels. Scenario 7 results in the lowest number of people significantly adversely affected by Lden levels when compared to 2018. Because the Permitted Conditions under consideration are primarily related to nighttime noise, when compared to the Forecast without New Measure scenario, Scenario 2 results in the lowest number of people exposed to significant adverse changes in L_{night} levels and is considered more effective than the Forecast without New Measures scenario.

4.2 COSTS TO IMPLEMENT PREFERENTIAL RUNWAY USE MEASURES

The cost estimates to implement proposed measures were not updated for this assessment as they would not change based on the updated forecasts; therefore, costs used for the previous CEA were maintained.

4.3 PREFERENTIAL RUNWAY USE MEASURES COST-EFFECTIVENESS

Revised Table 4-6 presents the cost-effectiveness results based on the costs divided by the change in the HA and HSD population compared to the Forecast without New Measures scenario. When calculating cost-effectiveness ratios, decreases in number of people exposed were treated as positive values and increases were negative values. If a decrease is expected with some additional cost, the cost-effectiveness ratio would be

positive. If an increase is expected with a reduction in cost, the cost-effectiveness ratio would also be positive. If a decrease is expected with a cost savings, a negative cost-effectiveness ratio would occur. A negative ratio would also occur if an increase in number of people is expected with an additional cost. It is critical the values used to calculate the ratio are considered when determining which proposal is more cost-effective. The results are consistent with the previous assessment indicating that Scenario 2 is cost-effective.

REVISED TABLE 4-6: COST-EFFECTIVENESS RATIO OF PREFERENTIAL RUNWAY USE SCENARIO 2 COMPARED TO 2018 SITUATION

SCENARIO	HIGHLY ANNOYED POPULATION EFFECTIVENESS	HIGHLY SLEEP DISTURBED POPULATION EFFECTIVENSS	COST	HIGHLY ANNOYED POPULATION RATIO (€/PERSON)	HIGHLY SLEEP DISTURBED POPULATION RATIO (€/PERSON)
Scenario 2	53,810	23,855	-€3,326,475	-€59	-€181

SOURCE: Ricondo & Associates, Inc., September 10, 2023.

The updated results continue to indicate that Scenario 2 is cost-effective because it:

- reduces the HSD and HA populations below the 2018 situation levels.
- causes the lowest number of people exposed to changes in L_{night} at potential significant adverse effect levels compared to the 2018 situation.
- provides a cost savings compared to the Forecast without New Measures scenario, which assumed additional air traffic controller staff during nighttime hours to manage two runways.

5. LAND USE AND MANAGEMENT MEASURES

Based on the updated noise model results, Scenario 2 continues to meet the cNAO and addresses the priority to limit potential significant adverse effects caused by increases in L_{night} and L_{den} noise levels without the addition of other measures. However, Scenario 2 in forecast year 2025 conditions continues to cause an increase in the number of people exposed to 55 dB L_{night} levels by 960 and 650 people compared to the Forecast without New Measures and the 2018 situation, respectively, indicating that the scenario does not adequately address those people highly impacted by night-time noise. This results in the continued need for proposed land use mitigation measures intended to mitigate people exposed to levels that are considered to potentially cause a high impact based on the most cost-effective noise operational procedure runway use scenario, Scenario 2. The following presents an update to the cost-effectiveness results associated with the same proposed measure in the 2021 CEA Report.

5.1 LAND USE MEASURE EFFECTIVENESS

This updated results for the effectiveness assessment of each feasible measure in reducing the number of people exposed to 55 dB L_{night} or higher compared to Scenario 2 is provided in **Revised Table 5-1.** Revised Table 5-1 presents the number of people exposed under 2025 operation conditions if the proposed 55 dB L_{night} sound insulation grant scheme was implemented separately under Scenario 2 conditions.

REVISED TABLE 5-1: EFFECTIVENESS OF PROPOSED SOUND INSULATION MEASURE - 2025

SCENARIO	NUMBER OF PEOPLE EXPOSED TO 55 DB OR HIGHER L_{NIGHT}	CHANGE IN PEOPLE EXPOSED COMPARED TO SCENARIO 2	STATUS
Scenario 2	1,174	N/A	N/A
Scenario 2 with the addition of 55 dB L_{night} Residential Sound Insulation Grant Scheme	80	-1,094	Proceed

NOTES:

Decrease Increase

Population analysis includes a 5 dB reduction factor for eligible dwelling units under the proposed 55 dB L_{night} grant scheme. The 5 dB reduction does not represent a reduction in exterior levels and does not change the location of the dwelling unit within exterior noise exposure levels.
Negative value indicates a decrease in population exposure compared to Situation Scenario 2 conditions.
dB – decibels
N/A – comparison of Scenario 2 on itself is not applicable.
L_{night} – average sound pressure level for an 8-hour period (recommended period of sleep for adults) between 23:00 and 07:00
SOURCE: Bickerdike Allen Partners LLP, *A11267_23_CA029_3.0 Summary of Results Including Mitigation*, September 10, 2023 (population values).

The result indicates the measure will reduce the total number of people exposed to 55 dB or higher L_{night} levels (high impact levels) compared to Scenario 2 without proposed new land use measures by 1,118 people.

5.2 LAND USE MEASURES COST TO IMPLEMENT

The costs to implement the proposed Residential Sound Insulation Scheme described in Section 5.1 of the 2021 CEA Report were updated to reflect the duration of the program. Assuming the program is completed by 2025, there will be two years to complete. The previous assessment considered three years. The cost per unit remains the same as the previous assessment at €20,000 per dwelling. **Revised Table 5-2** indicates the updated cost to implement.

REVISED TABLE 5-2: CUMULATIVE COST ESTIMATE TO IMPLEMENT PROPOSED SOUND INSULATION MEASURE

SITUATION SCENARIO	2025
Scenario 2 with the addition of 55 dB L_{night} RSIGS	€7,160,000

NOTES: Cost estimate based on constant prices and is sum of costs for two years.
dB – decibels
L_{night} – average sound pressure level for an 8-hour period (recommended period of sleep for adults) between 23:00 and 07:00
SOURCES: Ricondo & Associates, Inc., September 2023 (cumulative cost for forecast year); Bickerdike Allen Partners LLP, *A11267_23_CA029_3.0 Summary of Results Including Mitigation*, September 10, 2023 (dwelling unit counts); daa, October 2019 (estimated residential sound insulation costs).

5.3 LAND USE MEASURES COST-EFFECTIVENESS ANALYSIS

Revised Table 5-3 presents the cost-effectiveness results based on the cost to implement the proposed 55 dB or higher L_{night} residential sound insulation grant measure divided by the change in people exposed to 55 dB or higher L_{night} noise levels compared to Scenario 2 without new land use measures. The cost ratio reduced because the proposed measure addresses more people exposed to 55 dB or higher L_{night} levels based on the updated noise model input compared to the previous assessment.

REVISED TABLE 5-3: COST-EFFECTIVENESS RATIO OF PROPOSED SOUND INSULATION MEASURE

SITUATION SCENARIO	2025 RATIO (€ PER PERSON)
Scenario 2 with the addition of 55 dB L_{night} RSIGS	€6,542

NOTES:
dB – decibels
L_{night} – average sound pressure level for an 8-hour period (recommended period of sleep for adults) between 23:00 and 07:00
SOURCE: Ricondo & Associates, Inc., September 10, 2023.

6. OPERATING RESTRICTION MEASURE

Scenario 2 with the addition of the proposed 55 dB Lnight RSIGS for people exposed to high level of impact caused by night-time noise levels above 55 dB Lnight continues to meet the cNAO and priority associated with reducing high level night-time disturbance. Therefore, operating restriction measures are not necessary.

7. COMPARISON OF FORECAST INCLUDING ADDITIONAL MEASURES AND PERMITTED OPERATIONS SITUATION SCENARIOS

Section 7 of the 2021 CEA Report describes the comparison between the Scenario 2 with the Residential Sound Insulation Grant Scheme (Forecast Including Additional Measures) and the Permitted Operations Situation scenario that includes the North Runway restrictions:

- Condition 3(d) – Runway 10L-28R shall not be used for take-off or landing between 23:00 and 07:00.
- Condition 5 – The average number of night-time aircraft movements at the Airport shall not exceed 65 per night (between 23:00 and 07:00) when measured over the 92-day modelling period.

The purpose of the comparison was to evaluate which of the two is more cost-effective to address the same cNAO and related priorities.

7.1 EFFECTIVENESS COMPARISON

Revised Table 7-1 presents the HSD and HA populations for the Forecast including Additional Measures scenario and the Permitted Operations Situation scenario. **Revised Table 7-2** compares the metrics of the two scenarios to the 2018 situation. Both the Forecast including Additional Measures and Permitted Operations Situation scenarios reduce the HSD and HA populations. Based on the updated results, both scenarios continue to meet the cNAO and associated night-time disturbance priorities.

REVISED TABLE 7-1: SCENARIO POPULATION EXPOSURE LEVEL RESULTS

SCENARIO	HIGHLY SLEEP DISTURBED POPULATION	HIGHLY ANNOYED POPULATION
Forecast including Additional Measures	23,790	53,762
Permitted Operations Situation	22,250	54,998

SOURCE: Bickerdike Allen Partners LLP, *A11267_23_CA029_3.0 Summary of Results Including Mitigation*, September 10, 2023 (population values).

REVISED TABLE 7-2: EFFECTIVENESS OF SCENARIOS COMPARED TO 2018 SITUATION

SCENARIO	CHANGE IN PEOPLE EXPOSED COMPARED TO 2018 SITUATION	
	HIGHLY SLEEP DISTURBED POPULATION	HIGHLY ANNOYED POPULATION
Forecast including Additional Measures	- 18,444	- 56,433
Permitted Operations Situation	- 19,984	- 55,198

NOTES:

Decrease Increase

Negative value indicates a decrease in population exposure.
N/A – Not Applicable to compare Forecast without New Measures to itself.
L_{night} – average sound pressure level for an 8-hour period (recommended period of sleep for adults) between 23:00 and 07:00
SOURCE: Bickerdike Allen Partners LLP, *A11267_23_CA029_3.0 Summary of Results Including Mitigation*, September 10, 2023 (population values).

Revised Table 7-3 presents the cumulative costs for the Forecast including Additional Measures scenario and the Permitted Operations Situation scenario. Costs for the Forecast including Additional Measures scenario are the combined sum of the preferential runway use measure costs listed in Table 4-5 of the 2021 CEA Report and the revised RSIGS costs summarised in Revised Table 5-2. The cumulative cost for the Permitted Operation Condition scenario is based on updated figures provided by InterVISTAS for over the three-year period between 2023 and 2025.

REVISED TABLE 7-3: ESTIMATED TOTAL COST COMPARISON TO IMPLEMENT – FORECAST INCLUDING ADDITIONAL MEASURES VERUS PERMITTED OPERATIONS SITUATION SCENARIOS

SCENARIO	CUMULATIVE COST
	2025
Forecast including Additional Measures[1]	€3,833,525
Permitted Operations Situation [2]	€842,000,000

NOTES:
1 Forecast including Additional Measures scenario cost estimate is expressed in constant prices.
2 Permitted Operations Situation scenario costs are in 2020 euros.
SOURCES: Ricondo & Associates, Inc., September 2023 (sum of costs for Forecast including Additional Measures scenario); InterVISTAS, August 2023 (InterVISTAS_EconImpact_Update_30Aug2023.xls) (total gross value-added cost estimates).

7.2 COST TO IMPLEMENT COMPARISON

Costs associated with the Permitted Operations Situation scenario are related to the constrained number of movements forecast for 2023 to 2025 due to the North Runway operating restrictions compared to unconstrained levels up to 2025, which is when the 32 mppa is expected to be reached. The updated movements forecast conducted by Mott MacDonald indicates the 32 mppa level is expected to occur in 2024 after which there would be no growth in passenger volumes.[1] An updated economic impact study conducted by InterVISTAS based on the updated forecast movement conditions conducted by Mott MacDonald determined the constrained number of movements would lead to loss in value of goods and services produced (gross value added [GVA]) compared to the unconstrained scenario. All costs are expressed in 2022 prices.[2]

[1] Mott MacDonald, *Dublin Airport Operating Restrictions - Quantification of Impacts on Future Growth Addendum to the Analysis of June 2021 (Version 1.3.1),* September 2023.

[2] InterVISTAS, *Update Report Dublin Airport Economic Impact on Operating Restrictions*, June 2021.

In the most current forecasts and design day flight scheduled developed by Mott MacDonald, InterVISTAS indicated that the unconstrained scenario projects that passenger traffic will reach the 32 annual passenger cap in 2024 after which there would be no growth in passenger volumes. The constrained scenario forecasts 0.9 million fewer passengers in 2024 (-2.9 percent) and 0.2 million fewer (-0.5 percent) in 2025 as a result of the operating restrictions. The connectivity at Dublin Airport is also forecast to be lower, with total seats operated projected to be 3.6 percent lower in the constrained forecast in 2024 and 2.3 percent lower in 2025.[3]

Comparing with the 2021 forecasts, InterVISTAS indicated that traffic has recovered faster than originally anticipated, and passenger traffic is projected to be closer the 32 passenger cap in the 2024-2025 period. As a result, the gap between the unconstrained and constrained forecasts is significantly reduced in 2024 (0.9 million vs 1.6 million) and 2025 (0.2 million vs 1.6 million). As discussed in the next chapter, this has implications for the economic impact estimates.[4]

InterVISTAS indicated that as a result of the operating restrictions, the Irish economy could forgo an additional 3,130 jobs and €256 million in GDP by 2024, relative to the night operations with the ANCA June 2022 conditions. The forgone economic impact is projected to decline in 2025 as the 32 mppa cap starts to reduce the gap between the forecast scenarios. By 2025, the forgone economic impact is estimated to be 1,510 jobs and €122 million in GDP. The economic impact results are lower than estimated in 2021 due to the narrower gap between the unconstrained and constrained forecasts.[5]

7.3 COST-EFFECTIVENESS COMPARISON

Revised Table 7-4 presents the cost-effectiveness results for Forecast including Additional Measures scenario and the Permitted Operations Situation scenario based on the cost to implement divided by the change in population noise exposure levels compared to the 2018 situation. The intent of this comparison is to assess which of the two scenarios is most cost-effective in meeting the cNAO. The HSD and HA populations are the units of measure used to determine effectiveness.

REVISED TABLE 7-4 COST-EFFECTIVENESS OF FORECAST INCLUDING ADDITIONAL MEASURES VERSUS PERMITTED OPERATIONS SITUATION SCENARIO COMPARED TO 2018 SITUATION

SCENARIO	COST-EFFECTIVENESS RATIO TO REDUCE THE HIGHLY SLEEP DISTURBED POPULATION		COST-EFFECTIVENESS RATIO TO REDUCE THE HIGHLY ANNOYED POPULATION	
	2025	CER RANKING	2025	CER RANKING
Forecast including Additional Measures	€207.84	1	€67.93	1
Permitted Operations Situation	€42,133.47	2	€15,254.15	2

NOTES: CER Ranking based on lowest to highest absolute value ratio.
CER – Cost-Effectiveness Ratio
SOURCE: Ricondo & Associates, Inc., September 2023.

The cost-effectiveness ratio for the Forecast including Additional Measures scenario is significantly lower compared to the Permitted Operations Situation scenario for all metrics because of the lower cost. The cost associated with loss in economic growth is substantially higher compared to implementing a preferential runway use measure and additional sound insulation. Both scenarios meet the cNAO, but the Permitted Operations Situation scenario is far more restrictive compared to the Forecast including Additional Measures scenario.

[3] InterVISTAS, *Dublin Airport Economic Impact of Operating Restrictions - Update*, September 2023.

[4] InterVISTAS, *Dublin Airport Economic Impact of Operating Restrictions - Update*, September 2023.

[5] InterVISTAS, *Dublin Airport Economic Impact of Operating Restrictions - Update*, September 2023.

According to the Aircraft Noise Regulation, operating restrictions should only be considered if needed to meet an objective and if not more restrictive than necessary to meet an objective.

8. RECOMMENDATIONS

The updated cost-effectiveness analysis results in the same recommended measures as those in the 2021 CEA Report.