Seagreen Wind Energy Limited

Seagreen Offshore Wind Farm
Gateway documentation:
Stage 2 Develop and Assess

2A(ii): Design Principle Evaluation, Options Assessment

Publication history

Issue	Month/Year	Change Requests in this issue
Issue 1	July 2019	First issue released to SARG.

Contents

1. Introduction

1.1 This document forms part of the document set required in accordance with the requirements of the CAP1616 airspace change process.

1.2 This document aims to provide adequate evidence to satisfy

Stage 2 Develop and Assess Gateway, Step 2A(ii) design principles evaluation.

1.3 It is advised that this document is read alongside the Stage 2A(i) Design Options Document which gives diagrams and descriptions of each option.

1.4 The following options for changes to the airspace to provide mitigation are proposed for consideration.

- Do nothing
- Option A: TMZ in line with proposed wind turbine locations
- Option B: TMZ in line with proposed wind turbine locations plus 2nm buffer
- Option C: TMZ aligned to smoothed/rounded off boundary
- Option D: TMZ aligned to smoothed/rounded off boundary plus 2nm buffer

2. Options Assessment: Design Principle Evaluation

Table 1 below summarises the impacts/benefits of the options evaluated. This table is based on the pro-forma CAP1616 Appendix E, page 166. The degree to which the design principle has been met is indicated by the following colour coding:

Green – MET
Yellow – PARTIAL
Red – NOT MET (design principle not met or change represents a detriment)

2.1 Do Nothing Option

Design Principle Evaluation		
Do Nothing Option		REJECT
No mitigation against radar clutter. This option assumes that the wind farm is built but no measures are implemented to prevent radar clutter & interference.		
Design Principle	Summary of assessment	MET?
1. Safety: airspace change should maintain or enhance current levels of safety.	The wind farm would result in unacceptable radar clutter/interference, this would have an impact on ATC surveillance and aviation safety.	Not met
2. Safety: airspace change should be subject to the approval of a NATS safety assessment.	The negative impact of the wind farm on primary surveillance radar would result in non-approval of the safety assessment by NATS.	No met
3. Economic: airspace change will minimise economic impact on Aircraft Operators (AOs).	No change	Met
4. Environmental: airspace change will have minimal impact on the number of track miles flown and CO_2 emissions per flight.	No change	Met
5. Environmental (Impact to Stakeholders on the Ground): minimise environmental impacts to stakeholders on the ground *(note: due to the offshore location of the proposed changes, it is not expected that there will be any significant environmental impacts to stakeholders on the ground due to noise, visual intrusion and local air quality)*	No change	Met
6. Environmental: minimise the impact of noise below 7,000ft.	No change	Met
7. Operational (General): airspace change will maintain or enhance operational resilience of the ATC network.	No change	Met
8. Operational (Aircraft Operators): the proposed airspace will allow AOs to flight plan as per current day operations.	No change	Met

9. Operational (ANSPs): connectivity to adjacent airspace will be maintained or enhanced.	No change	Met
10. Operational (ANSPs): airspace change should be designed to have minimal impact on Air Traffic Controllers' workload.	The presence of radar clutter and interference would result in increased ATC workload. For example additional vectoring of aircraft around clutter, and ATC modifying the routes/behaviours for managing conflicts.	Not met
11. Operational (Capacity): airspace change will have minimal impact on operations of AOs.	Increase in ATC workload has a corresponding impact on ATC capacity. In busy periods this in turn can result in delays for AOs.	Not met
12. Operational (Capacity): airspace change will have minimal impact on operations of ANSPs.	Increase in ATC workload has a corresponding impact on ATC capacity. In busy periods this results in sector flow rates being imposed by the ANSP which generate delays.	Not met
13. Operational (Flexible Use Airspace): the proposed airspace change will be compatible with the Flexible Use Airspace (FUA) concept.	No change	Met
14. Technical (General): airspace change should be designed to fit with existing background airspace classification.	No change	Met
15. Technical (General): the interface between the airspace change and the ATS route network will maintain or improve flight efficiency compared with current operations.	No change	Met
16. Technical (MoD): the airspace change will be compatible with the requirements of the MoD (if required).	No change	Met
17. Technical (GA): the impacts on GA and other civilian airspace users will be minimised.	No change	Met
18. Policy: the proposed airspace change will take account of government policy documents (such as the Air Navigation Guidance).	No change	Met

Table 1: Do nothing Option, design principle evaluation

2.1.1 Do Nothing Option Conclusion

Unless appropriate mitigation to prevent radar clutter and interference is put in place the suspensive planning "Condition 23" will not be discharged, and construction of the Seagreen Wind Farm will not be able to proceed. For this reason the "Do Nothing" option is rejected.

2.2 Option A –: TMZ in line with proposed wind turbine locations

Design Principle Evaluation		
Option A : TMZ in line with proposed wind turbine locations		REJECT
Mitigation against radar clutter, with smallest area of TMZ. (See 2A(i) document for a detailed description of Option A).		
Design Principle	**Summary of qualitative assessment**	**MET?**
1. Safety: airspace change should maintain or enhance current levels of safety.	While the wind turbines are blanked to prevent radar clutter, this option has no buffer around the RAG blanked area. Hence in the case of a non-transponder equipped aircraft infringing the TMZ, ATC would have no warning or time to identify and react to the situation. The infringing aircraft would simple disappear, as soon as the TMZ boundary is crossed. This would increase ATC workload where non transponder-equipped aircraft are flying (legitimately) close to/along the TMZ boundary.	Not met
2. Safety: airspace change should be subject to the approval of a NATS safety assessment.	For the reasons stated against DP1 above, option A would not be approved by a NATS safety assessment.	Not met
3. Economic: airspace change will minimise economic impact on Aircraft Operators (AOs).	There would be no impact on commercial aircraft operators.	Met
4. Environmental: airspace change will have minimal impact on the number of track miles flown and CO_2 emissions per flight.	There would be no impact on commercial aircraft operators.	Met
5. Environmental (Impact to Stakeholders on the Ground): minimise environmental impacts to stakeholders on the ground *(note: due to the offshore location of the proposed changes, it is not expected that there will be any significant environmental impacts to stakeholders on the ground due to noise, visual intrusion and local air quality)*	There will be no CO_2 or noise impacts on stakeholders due to changes in airspace and aviation impacts. There would be significant environmental benefits accrued due to the substantial CO_2e emissions savings that the wind farm will deliver during its lifetime in service.	Met
6. Environmental: minimise the impact of noise below 7,000ft.	As per the current day, there will be no noise impact due to aviation on any stakeholder below the proposed TMZ since it is 27km offshore and hence does not impact any population.	Met
7. Operational (General): airspace change will maintain or enhance operational resilience of the ATC network.	Operational resilience of the ATC network will be maintained.	Met
8. Operational (Aircraft Operators): the proposed airspace will allow AOs to flight plan as per current day operations.	The proposed airspace will allow AOs to flight plan as per current day operations.	Met

9. Operational (ANSPs): connectivity to adjacent airspace will be maintained or enhanced.	Connectivity to adjacent airspace will be maintained.	Met
10. Operational (ANSPs): airspace change should be designed to have minimal impact on Air Traffic Controllers' workload.	The TMZ is beneficial but the lack of buffer region would create workload and anxiety for ATC when monitoring non-transponder equipped aircraft close to the TMZ.	Not met
11. Operational (Capacity): airspace change will have minimal impact on operations of AOs.	Increase in ATC workload has a corresponding impact on ATC capacity. In busy periods this in turn can result in delays for AOs.	Not met
12. Operational (Capacity): airspace change will have minimal impact on operations of ANSPs.	Increase in ATC workload has a corresponding impact on ATC capacity. In busy periods this results in sector flow rates being imposed by the ANSP which generate delays.	Not met
13. Operational (Flexible Use Airspace): the proposed airspace change will be compatible with the Flexible Use Airspace (FUA) concept.	The option A proposed TMZ will be compatible with the Flexible Use Airspace (FUA) concept.	Met
14. Technical (General): airspace change should be designed to fit with existing background airspace classification.	The option A proposed TMZ will not require a change in the existing background airspace classification.	Met
15. Technical (General): the interface between the airspace change and the ATS route network will maintain or improve flight efficiency compared with current operations.	The option A proposed TMZ will be compatible with the existing ATS route network and will maintain flight efficiency compared with current operations.	Met
16. Technical (MoD): the airspace change will be compatible with the requirements of the MoD (if required).	The option A proposed TMZ will be compatible with the requirements of the MoD.	Met
17. Technical (GA): the impacts on GA and other civilian airspace users will be minimised.	The option A proposed TMZ will minimize impact on GA and other civilian airspace users. However since an inadvertent infringer may disappear from radar surveillance before ATC are able to identify the infringement, this does represent a possible negative impact.	Partially met
18. Policy: the proposed airspace change will take account of government policy documents (such as the Air Navigation Guidance).	The option A proposed TMZ takes account of government policy documents (e.g. the Air Navigation Guidance).	Met

Table 2: Option A TMZ in line with proposed wind turbine locations

2.2.1 Option A Conclusion

While the wind turbines are blanked to prevent radar clutter, this option has no buffer around the RAG blanked area. Hence in the case of a non-transponder equipped aircraft infringing the TMZ, ATC would have no warning or time to identify and react to the situation. The infringing aircraft would simple disappear, as soon as the TMZ

boundary is crossed. This would increase ATC workload where non transponder-equipped aircraft are flying (legitimately) close to/along the TMZ boundary. Hence it is unlikely that this option would pass the NATS safety assessment. This would result in "Condition 23" not being discharged, and construction of the Seagreen Wind Farm would not be able to proceed. For this reason the option A is rejected.

2.3 Option B –: TMZ in line with proposed wind turbine locations plus 2nm buffer

Design Principle Evaluation		
Option B: TMZ in line with proposed wind turbine locations plus 2nm buffer		REJECT
Mitigation against radar clutter, with TMZ 2nm buffer around RAG blanked area. (See 2A(i) document for a detailed description of Option B).		
Design Principle	**Summary of qualitative assessment**	**MET?**
1. Safety: airspace change should maintain or enhance current levels of safety.	The wind turbines are blanked to prevent radar clutter, and the introduction of TMZ with buffer region will ensure only transponder equipped aircraft overfly the blanked region.	Met
2. Safety: airspace change should be subject to the approval of a NATS safety assessment.	Option B would most likely be approved by a NATS safety assessment.	Met
3. Economic: airspace change will minimise economic impact on Aircraft Operators (AOs).	There would be no impact on commercial aircraft operators.	Met
4. Environmental: airspace change will have minimal impact on the number of track miles flown and CO_2 emissions per flight.	There would be no impact on commercial aircraft operators.	Met
5. Environmental (Impact to Stakeholders on the Ground): minimise environmental impacts to stakeholders on the ground *(note: due to the offshore location of the proposed changes, it is not expected that there will be any significant environmental impacts to stakeholders on the ground due to noise, visual intrusion and local air quality)*	There will be no CO_2 or noise impacts on stakeholders due to changes in airspace and aviation impacts. There would be significant environmental benefits accrued due to the substantial CO_2e emissions savings that the wind farm will deliver during its lifetime in service.	Met
6. Environmental: minimise the impact of noise below 7,000ft.	As per the current day, there will be no noise impact due to aviation on any stakeholder below the proposed TMZ since it is 27km offshore and hence does not impact any population.	Met
7. Operational (General): airspace change will maintain or enhance operational resilience of the ATC network.	Operational resilience of the ATC network will be maintained.	Met
8. Operational (Aircraft Operators): the proposed airspace will allow AOs to flight plan as per current day operations.	The proposed airspace will allow AOs to flight plan as per current day operations.	Met
9. Operational (ANSPs): connectivity to adjacent airspace will be maintained or enhanced.	Connectivity to adjacent airspace will be maintained.	Met

10. Operational (ANSPs): airspace change should be designed to have minimal impact on Air Traffic Controllers' workload.	The TMZ would have minimal impact on Air Traffic Controllers' workload.	Met
11. Operational (Capacity): airspace change will have minimal impact on operations of AOs.	The option B proposed TMZ will have minimal impact on operations of AOs.	Met
12. Operational (Capacity): airspace change will have minimal impact on operations of ANSPs.	The option B proposed TMZ will have minimal impact on the operations of the ANSP.	Met
13. Operational (Flexible Use Airspace): the proposed airspace change will be compatible with the Flexible Use Airspace (FUA) concept.	The option B proposed TMZ will be compatible with the Flexible Use Airspace (FUA) concept.	Met
14. Technical (General): airspace change should be designed to fit with existing background airspace classification.	The option B proposed TMZ will not require a change in the existing background airspace classification.	Met
15. Technical (General): the interface between the airspace change and the ATS route network will maintain or improve flight efficiency compared with current operations.	The option B proposed TMZ will be compatible with the existing ATS route network will maintain flight efficiency compared with current operations.	Met
16. Technical (MoD): the airspace change will be compatible with the requirements of the MoD (if required).	The option B proposed TMZ will be compatible with the requirements of the MoD.	Met
17. Technical (GA): the impacts on GA and other civilian airspace users will be minimised.	The option B proposed TMZ will minimize impact on GA and other civilian airspace users.	Met
18. Policy: the proposed airspace change will take account of government policy documents (such as the Air Navigation Guidance).	The option B proposed TMZ takes account of government policy documents (e.g. the Air Navigation Guidance).	Met

Table 3: Option B TMZ in line with proposed wind turbine locations plus 2nm buffer

2.3.1 Option B Conclusion

With the Option B design the wind turbines are blanked to prevent radar clutter, and this option does have a 2nm buffer around the RAG blanked area. This option does present an operationally feasible solution. However the dimensions/shape of the option B TMZ are not ideal, and option D represents a simpler geometry. For this reason the option B is rejected in preference for option D.

2.4 Option C –: Simplified polygon TMZ "rubber banded" around proposed wind turbine locations, with no buffer

Design Principle Evaluation		
Option C: Simplified polygon TMZ "rubber banded" around proposed wind turbine locations with no buffer		REJECT
Mitigation against radar clutter, with simplified shape and small area of TMZ. (See 2A(i) document for a detailed description of Option C).		
Design Principle	**Summary of qualitative assessment**	**MET?**
1. Safety: airspace change should maintain or enhance current levels of safety.	The wind turbines are blanked to prevent radar clutter, and the introduction of TMZ with buffer region will ensure only transponder equipped aircraft overfly the blanked region.	Met
2. Safety: airspace change should be subject to the approval of a NATS safety assessment.	Option C would most likely be approved by a NATS safety assessment.	Met
3. Economic: airspace change will minimise economic impact on Aircraft Operators (AOs).	There would be no impact on commercial aircraft operators.	Met
4. Environmental: airspace change will have minimal impact on the number of track miles flown and CO_2 emissions per flight.	There would be no impact on commercial aircraft operators.	Met
5. Environmental (Impact to Stakeholders on the Ground): minimise environmental impacts to stakeholders on the ground *(note: due to the offshore location of the proposed changes, it is not expected that there will be any significant environmental impacts to stakeholders on the ground due to noise, visual intrusion and local air quality)*	There will be no CO_2 or noise impacts on stakeholders due to changes in airspace and aviation impacts. There would be significant environmental benefits accrued due to the substantial CO_2e emissions savings that the wind farm will deliver during its lifetime in service.	Met
6. Environmental: minimise the impact of noise below 7,000ft.	As per the current day, there will be no noise impact due to aviation on any stakeholder below the proposed TMZ since it is 27km offshore and hence does not impact any population.	Met
7. Operational (General): airspace change will maintain or enhance operational resilience of the ATC network.	Operational resilience of the ATC network will be maintained.	Met
8. Operational (Aircraft Operators): the proposed airspace will allow AOs to flight plan as per current day operations.	The proposed airspace will allow AOs to flight plan as per current day operations.	Met
9. Operational (ANSPs): connectivity to adjacent airspace will be maintained or enhanced.	Connectivity to adjacent airspace will be maintained.	Met

10. Operational (ANSPs): airspace change should be designed to have minimal impact on Air Traffic Controllers' workload.	The simplified shape TMZ is beneficial but the lack of buffer region would create workload and anxiety for ATC when monitoring non-transponder equipped aircraft close to the TMZ.	Not met
11. Operational (Capacity): airspace change will have minimal impact on operations of AOs.	Increase in ATC workload has a corresponding impact on ATC capacity. In busy periods this in turn can result in delays for AOs.	Not met
12. Operational (Capacity): airspace change will have minimal impact on operations of ANSPs.	Increase in ATC workload has a corresponding impact on ATC capacity. In busy periods this results in sector flow rates being imposed by the ANSP which generate delays.	Not met
13. Operational (Flexible Use Airspace): the proposed airspace change will be compatible with the Flexible Use Airspace (FUA) concept.	The option C proposed TMZ will be compatible with the Flexible Use Airspace (FUA) concept.	Met
14. Technical (General): airspace change should be designed to fit with existing background airspace classification.	The option C proposed TMZ will not require a change in the existing background airspace classification.	Met
15. Technical (General): the interface between the airspace change and the ATS route network will maintain or improve flight efficiency compared with current operations.	The option C proposed TMZ will be compatible with the existing ATS route network and will maintain flight efficiency compared with current operations.	Met
16. Technical (MoD): the airspace change will be compatible with the requirements of the MoD (if required).	The option C proposed TMZ will be compatible with the requirements of the MoD.	Met
17. Technical (GA): the impacts on GA and other civilian airspace users will be minimised.	The option C proposed TMZ will minimize impact on GA and other civilian airspace users. However since an inadvertent infringer may disappear from radar surveillance before ATC are able to identify the infringement, this does represent a possible negative impact.	Partially met
18. Policy: the proposed airspace change will take account of government policy documents (such as the Air Navigation Guidance).	The option C proposed TMZ takes account of government policy documents (e.g. the Air Navigation Guidance).	Met

Table 4: Option C TMZ in line with proposed wind turbine locations plus 2nm buffer

2.4.1 Option C Conclusion

While the wind turbines are blanked to prevent radar clutter, this option has no buffer around the RAG blanked area. Hence in the case of a non-transponder equipped aircraft infringing the TMZ, ATC would have no warning or time to identify and react to the situation. The infringing aircraft would simply disappear, as soon as the TMZ boundary is crossed. This would increase ATC workload where non transponder-equipped aircraft are flying

(legitimately) close to/along the TMZ boundary. Hence it is unlikely that this option would pass the NATS safety assessment. This would result in "Condition 23" not being discharged, and construction of the Seagreen Wind Farm would not be able to proceed. For this reason the option C is rejected.

2.5 Option D –: TMZ aligned to smoothed/rounded off boundary plus 2nm buffer

Design Principle Evaluation		
Option D: TMZ aligned to smoothed/rounded off boundary plus 2nm buffer		ACCEPT
Mitigation against radar clutter, with TMZ 2nm buffer around the simplified (rubber banded) shaped RAG blanked area. (See 2A(i) document for a detailed description of Option D).		
Design Principle	**Summary of qualitative assessment**	**MET?**
1. Safety: airspace change should maintain or enhance current levels of safety.	The wind turbines are blanked to prevent radar clutter, and the introduction of TMZ with 2nm buffer region will ensure only transponder equipped aircraft overfly the blanked region.	Met
2. Safety: airspace change should be subject to the approval of a NATS safety assessment.	Option D would most likely be approved by a NATS safety assessment.	Met
3. Economic: airspace change will minimise economic impact on Aircraft Operators (AOs).	There would be no impact on commercial aircraft operators.	Met
4. Environmental: airspace change will have minimal impact on the number of track miles flown and CO_2 emissions per flight.	There would be no impact on commercial aircraft operators.	Met
5. Environmental (Impact to Stakeholders on the Ground): minimise environmental impacts to stakeholders on the ground *(note: due to the offshore location of the proposed changes, it is not expected that there will be any significant environmental impacts to stakeholders on the ground due to noise, visual intrusion and local air quality)*	There will be no CO_2 or noise impacts on stakeholders due to changes in airspace and aviation impacts. There would be significant environmental benefits accrued due to the substantial CO_2e emissions savings that the wind farm will deliver during its lifetime in service.	Met
6. Environmental: minimise the impact of noise below 7,000ft.	As per the current day, there will be no noise impact due to aviation on any stakeholder below the proposed TMZ since it is 27km offshore and hence does not impact any population.	Met
7. Operational (General): airspace change will maintain or enhance operational resilience of the ATC network.	Operational resilience of the ATC network will be maintained.	Met
8. Operational (Aircraft Operators): the proposed airspace will allow AOs to flight plan as per current day operations.	The proposed airspace will allow AOs to flight plan as per current day operations.	Met
9. Operational (ANSPs): connectivity to adjacent airspace will be maintained or enhanced.	Connectivity to adjacent airspace will be maintained.	Met

10. Operational (ANSPs): airspace change should be designed to have minimal impact on Air Traffic Controllers' workload.	The option D proposed TMZ would have minimal impact on Air Traffic Controllers' workload.	Met
11. Operational (Capacity): airspace change will have minimal impact on operations of AOs.	The option D proposed TMZ will have minimal impact on operations of AOs.	Met
12. Operational (Capacity): airspace change will have minimal impact on operations of ANSPs.	The option D proposed TMZ will have minimal impact on the operations of the ANSP.	Met
13. Operational (Flexible Use Airspace): the proposed airspace change will be compatible with the Flexible Use Airspace (FUA) concept.	The option D proposed TMZ will be compatible with the Flexible Use Airspace (FUA) concept.	Met
14. Technical (General): airspace change should be designed to fit with existing background airspace classification.	The option D proposed TMZ will not require a change in the existing background airspace classification.	Met
15. Technical (General): the interface between the airspace change and the ATS route network will maintain or improve flight efficiency compared with current operations.	The option D proposed TMZ will be compatible with the existing ATS route network will maintain flight efficiency compared with current operations.	Met
16. Technical (MoD): the airspace change will be compatible with the requirements of the MoD (if required).	The option D proposed TMZ will be compatible with the requirements of the MoD.	Met
17. Technical (GA): the impacts on GA and other civilian airspace users will be minimised.	The option D proposed TMZ will minimize impact on GA and other civilian airspace users.	Met
18. Policy: the proposed airspace change will take account of government policy documents (such as the Air Navigation Guidance).	The option D proposed TMZ takes account of government policy documents (e.g. the Air Navigation Guidance).	Met

Table 5: Option D TMZ in line with proposed wind turbine locations plus 2nm buffer

2.5.1 Option D Conclusion

With the Option D TMZ design the wind turbines are blanked to prevent radar clutter, and the TMZ dimensions include a 2nm buffer around the RAG blanked area, with a simplified geometry. This option presents the preferred, operationally feasible solution.

For this reason the option D TMZ is accepted as the preferred solution and will be carried forward.

2.6 Safety Assessment –Option D TMZ (preferred)

Safety analysis (Hazard Identification) has been performed as follows. The primary list of hazards identified is:

- WTGs cause clutter on primary radar displays;
- RAG blanking of the Perwinnes PSR over the WTGs will leave an area where no PSR data is displayed to the ATCO;
- Aircraft which are non-transponder equipped will not be presented to the ATCO within the RAG blanked area;
- Aircraft which are not operating their transponders will not be presented to the ATCO within the RAG blanked areas;
- The promulgation of a TMZ over the RAG blanked area will ensure that aircraft within the TMZ area must be transponder equipped and hence will be visible on secondary radar.
- The extension of the TMZ 2nm around the RAG blanked area (buffer zone) will ensure that ATC have sufficient time to identify when an infringement of the TMZ is taking place and take appropriate action.

Experience from previous wind farm developments has demonstrated that the implementation of radar range azimuth gating (RAG) coupled with an associated TMZ provides effective and safe mitigation against the radar issues associated with WTGs.

Initial qualitative assessment from NATS safeguarding has confirmed that the proposed Option D TMZ design would provide adequate mitigation to fulfil the requirements required of the NERL Perwinnes: PSR Mitigation Scheme.

Detailed safety analysis will be undertaken in due course by NATS based on the TMZ Option D proposed herein.

2.7 Safety Assessment Conclusion

The proposed Option D TMZ coupled with radar RAG blanking provides effective and safe mitigation against the radar issues associated with WTGs.

3. High Level Qualitative Cost Assessment

3.1 The costs associated with implementing the required airspace measures are relatively small when compared to the substantial environmental and economic benefits enabled by permitting the wind farm development to proceed. Hence this assessment incorporates all of these factors. The headline figures are:

- Cost of implementing TMZ + RAG blanking: [redacted]
- Value of CO_2e emissions saved (calculated using WebTAG):£2.3bn (range £1.1bn-£3.4bn, over 25 years).
- Value of [redacted]

3.2 The Option D TMZ solution has been evaluated as beneficial due to the mitigation it provides against the impacts of the proposed Seagreen Wind farm on radar systems. The relatively small expenditure required to implement this mitigation solution will enable significant multiple benefits (including environmental benefits of substantial savings in CO_2e emissions). These benefits justify the cost associated with progressing this change, and hence it will be progressed.

4. Conclusion and Shortlist

4.1 We conclude that Options B and D meet all of the design principles. However Option D (TMZ aligned to smoothed/rounded off boundary plus 2nm buffer) is preferred due to the simpler shape proposed. As such only Option D will be progressed.

End of document