

17 Cumulative Environmental Effects

17.1 Scope of Assessment

17.1.1 Cumulative effects can occur in two forms:

- Interactive Cumulative Environmental Effects - could result from the additive environmental impacts of the Proposed Scheme: for example, deterioration in air quality through increased vehicle emissions; increases in traffic-sourced noise levels and /or visual intrusion on a single receptor, receptor groups or resource. These could result from the combinations of environmental effects that have been identified during the studies and assessments reported in Chapters 7-16; or
- In-combination Cumulative Environmental Effects - could be as a result of the environmental effects of the Proposed Scheme in combination with the environmental effects of other road schemes and/ or local developments on a single receptor, receptor groups or resource. These could have an effect of greater significance than the Proposed Scheme in isolation.

17.1.2 Current DMRB guidance (Volume 11, Section 2, Part 5) requires the cumulative effects assessment of trunk roads that have been confirmed (i.e. gone through the statutory processes) and development projects with valid planning permissions granted by the local planning authority, and for which statutory EIA is a requirement or for which non-statutory EIA has been undertaken.

17.1.3 A search for these projects revealed a proposed housing development adjacent to Blairland Farm (allocated in The North Ayrshire Local Development Plan). However there are no committed development proposals for housing at Blairland Farm at the time of this assessment and no planning applications have been lodged for this site.

17.1.4 The search identified proposed alterations and extension of the existing farmhouse at Highfield Farm, the alterations, extension and conversion of outbuildings to form three dwellings and the formation of new access road was approved on 17 March 2009 and is underway (Application Reference 08/00829/PP). Therefore, based on Proposed Scheme construction commencement programmed for 2015, it is anticipated that works to the farmhouse will be complete prior to construction and therefore are outside the temporal scope of the project. This location has therefore only been assessed as a receptor and not subject to an assessment of in-combination cumulative environmental effects.

17.1.5 The search also revealed a proposed realignment of the A737 at The Den, approximately 3km east of Dalry which is being progressed to address road safety concerns. This scheme is not expected to result in any change in traffic flow and characteristics. The potential for in-combination cumulative environmental effects between the proposed A737 The Den scheme and the Proposed Scheme has been assessed as low due to the intervening distance between these schemes.

17.1.6 As a result of the above, no assessment of in-combination cumulative environmental effects has been considered further.

17.1.7 The focus of the interactive cumulative environmental effects assessment has been on the main likely significant cumulative effects rather than all interactions or combinations.

17.2 Study Area

- 17.2.1 The interactive cumulative effects study area is dictated by the study areas adopted during the assessment of the environmental aspects being considered. These are detailed in the respective assessment chapters. Where two or more environmental aspects are being considered, the smaller study area has been adopted, as potential for cumulative effects will not exist outside the scope of the smaller area. For instance, for possible cumulative effects between nature conservation and air quality with regards to habitat loss and dust generation during construction, where habitat loss is restricted to the “immediate zone of influence of the Proposed Scheme”, interactive cumulative effects outside the Proposed Scheme’s immediate zone of influence is not considered as the potential for interaction is removed outside this area. The study area in this instance will be the Proposed Scheme’s immediate zone of influence as defined in Chapter 10: Nature Conservation.
- 17.2.2 Further explanation on the study areas adopted for potential interactive cumulative effects assessment is provided in the scope of assessment sections of each relevant topic chapter.

17.3 Legislative, Regulatory and Planning Context

- 17.3.1 Directive 2011/92/EU in Article 3 requires the consideration of the cumulative effects of a project and the inter-action between the factors mentioned in the first indent in this section (human beings, flora and fauna) and the second indent (soil, water, air, climate and the landscape).

17.4 Method of Assessment

- 17.4.1 Guidance contained in DMRB Volume 11, Section 2, Part 5 and 6 has been consulted during this assessment as well as guidance contained in IAN 125/09: Supplementary guidance for users of DMRB Volume 11 ‘Environmental Assessment’.
- 17.4.2 The following steps have been undertaken in the assessment of cumulative effects:
- Identification of the potential for significant cumulative effects in view of the assessment conclusions in Chapters 7 – 11 and 13 – 16.
 - GIS spatial analysis in the form of overlay mapping, making use of mapping layers prepared as part of the topic assessments to identify the spatial distribution of impacts and where impact interaction may occur, as the potential for cumulative effects exists within these overlap areas.
 - Confirmation of the study area and extent of receptors / resources potentially subject to significant cumulative effects.
 - Assessment of potential cumulative effects on these receptors or resources.
- 17.4.3 No assessment of cumulative effects has been undertaken for materials use and waste generation (Chapter 12) as waste generation will be restricted to development boundaries and any requirements for materials and waste disposal will be dealt with on a development by development basis.
- 17.4.4 The assessment also considers potential cumulative effects arising from past actions (in considering the baseline condition), present and future actions (in considering the Proposed Scheme during the construction and operational phases).

- 17.4.5 Where either neutral and/or minor/slight adverse effects are predicted for one interacting topic area assessment, potential interactive cumulative effects were ruled out as the likelihood of significant cumulative effects occurring is low.
- 17.4.6 The cumulative effects assessment has considered effects during the construction (temporary / short term effects) and operation phase (permanent / long term effects). In doing this, highly mobile receptors have not been considered as a level of immobility is required in order for potentially significant interactive cumulative effects to occur. Users of footpaths, roads and railway lines have therefore not been considered.
- 17.4.7 Where two interacting environmental topic areas result in an assessment of positive and negative impacts, no assessment of cumulative effects was undertaken as these represent two opposite scale of impacts and therefore cannot combine to result in a higher order magnitude of impact.
- 17.4.8 To arrive at a significance of effect, Table 2.6 of DMRB Volume 11, Section 2, Part 5: H205/08 has been used, as set out in Table 17. 1.

Table 17.1 Determining Significance of Cumulative Effects

Significance	Effect
Severe	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Major	Effects that may become a key decision-making issue.
Moderate	Effects that are unlikely to become issues on whether the project should be selected, but where future work may be needed to improve on current performance.
Minor	Effects that are locally significant.
Not Significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

17.5 Predicted Interactive Cumulative Effects

- 17.5.1 The potential key interactions between topic areas reported in Chapter 7 – 11 and 13 – 16 include:

Landscape Effects, Air Quality, Noise and Severance

- 17.5.2 A review of areas predicted to experience air quality, noise impacts and landscape effects was undertaken. During construction, potential exists for interactive cumulative effects resulting from deterioration in air quality (increase in PM₁₀ and dust deposition), increase in noise levels and visual intrusion.
- 17.5.3 Following the methodology outlined in Section 17.2, the study area adopted for this assessment has been 350m from the Proposed Scheme (the Institute of Air Quality Management defined area for the air quality construction assessment). Beyond this area, the potential for interaction with construction noise and visual impacts is removed.
- 17.5.4 Potential for interactive cumulative effects is primarily dictated by the location of receptors, with greater potential for cumulative effects on receptors closer to proposed developments. These include Hillend Farm, Blairland Farm, residential properties south

of Blairland estate, Stoopshill Farm, Coalheughglen, properties at Highfield, PastureHill Cottages and Birkentop cottage.

- 17.5.5 During the construction phase, a number of receptors close to the Proposed Scheme would be subject to moderate adverse visual effects with the Proposed Scheme being a new detractor in their views. These receptors groups would be subject to air quality and noise impacts however construction of the Proposed Scheme is not predicted to result in unmanageable levels of dust, PM₁₀, noise and vibration.
- 17.5.6 Cumulative effects relating to landscape, air quality, noise and severance during construction are expected to be short term and temporary, impacting mainly on receptors within 350m for the duration of the works. The adoption of best practice preventative construction working measures as outlined in the relevant assessment chapters would serve to ensure there are no significant adverse interactive cumulative effects on receptors as a result of this interaction.
- 17.5.7 No interaction with the local air quality is expected during operation of the Proposed Scheme as the operational air quality assessment predicted beneficial impacts on receptors. In line with Section 17.4.7, no further assessment of interactive cumulative effects with air quality during operation has been undertaken.
- 17.5.8 There would be permanent alteration of existing accesses to private properties which would effectively be severed by the Proposed Scheme, particularly at the northern end of the route with the stopping up of the A737 through Highfield and severance of adjoining roads to accommodate the proposed roundabout. Vehicular access to private residential properties and farmsteads would be maintained during operation, albeit with possible minor changes in local journey times as vehicles would need access to these routes via the new roundabout. In line with the methodology outline in 17.4.5, severance has not been considered as part of the interactive cumulative environmental effects assessment during operation of the proposed scheme.
- 17.5.9 Table 17.2 below presents the findings of the GIS overlap exercise aimed at identifying possible interactions between visual effects and noise residual effects (direct effects) with a potential to result in interactive cumulative effects on receptors or receptor groups. This has been presented for the operation phase only (permanent effects) as cumulative effects during construction are temporary, short term and subject to mitigation are unlikely to be significant.
- 17.5.10 A further review exercise was undertaken for interactions that would be likely to result in significant interactive cumulative effects i.e. receptors predicted to be subject to moderate adverse / beneficial effects or more for interacting environmental elements. The outcome of this exercise is presented in Table 17.3.
- 17.5.11 A review for possible interactive cumulative environmental effects on resources did not reveal any potential for interaction that would be likely to give rise to significant cumulative effects following adoption of committed mitigation measures. No indirect cumulative effects on receptors or resources were identified.
- 17.5.12 Topic specific potential effects on receptor groups provided in Table 17.2 have been derived using the closest point or a central point where individual topic assessments were undertaken. For each receptor group presented, the topic receptor number used (as reported in the topic chapter) is also provided.

Tables 17.2 Locations with Potential for Interactive Cumulative Effects

No	Key Receptor Name / Receptor Group	Visual Effect Significance	Visual Receptor No	Noise Effect Significance	Noise Receptor No
1	Laigh Monkcastle	Moderate Adverse	18	Slight Adverse	172
2	Hillend Farm	Moderate Adverse	19	Slight Adverse	18 (Table 13.18)
3	Baidland Hill (Castlehead Stables)	Negligible	20	Slight adverse	133
4	St Andrew's Garden	Minor Adverse	21	Slight Beneficial	101
5	Residential properties to the south of Dalry	Moderate Adverse	22	Slight Beneficial	104
6	Residential properties to the east of Dalry	Minor Adverse	27	Slight Beneficial	94
7	Bridgend	Negligible	23	Neutral / Slight Adverse	95
8	Blairland Farm	Moderate Adverse	15	Very Large Adverse	21 (Table 13.18)
9	Blairland Housing Estate	Minor Adverse	14	Very Large Adverse	11 (Table 13.18)
10	Carriage House, Blair Estate	Negligible	17	Large Adverse	17 (Table 13.18)
11	Stoophill Farm	Minor Adverse	13a	Very Large Adverse	14 (Table 13.18)
12	North Lodge, Blair Estate	Negligible	13b	Large Adverse	15 (Table 13.18)
13	Glenfield	Negligible	4	Slight Beneficial	8 (Table 13.18)
14	Coalbeughglen Farm House	Minor Adverse	5	Large Adverse	20 (Table 13.18)
16	Casrehead (The Lodge)	Minor Adverse	3	Slight Beneficial	7 (Table 13.18)
17	Laiona Highfield (North)	Minor Adverse	6a / 6b	Very Large / Moderate Adverse	19 (Table 13.18)
18	Highfield (South)	Minor Adverse	11	Moderate Adverse	5 (Table 13.18)
19	Highfield Cottage	Negligible	33	Moderate Adverse	6 (Table 13.18)
20	Residential properties on Auchengree Road	Minor Adverse	7	Moderate Beneficial	39
21	Pasturehill Cottage	Negligible	8	Slight Beneficial	2 (Table 13.18)

No	Key Receptor Name / Receptor Group	Visual Effect Significance	Visual Receptor No	Noise Effect Significance	Noise Receptor No
22	Easter Highfield Lodge	Minor Adverse	10	Large Adverse	1 (Table 13.18)
23	Birkentop Farm	Minor Adverse	9	Large Adverse	1 (Table 13.180)

17.5.13 Table 17.2 reveals that Blairland Farm (highlighted above) could be subject to significant interactive cumulative environmental effects with moderate adverse visual effects and very large adverse increase in noise levels predicated during operation of the Proposed Scheme. Table 17.3 presents further information on interactive cumulative environmental effects on this receptor.

Table 17.3 Cumulative Environmental Effects Summary Table

Effect	Cumulative Effect	Spatial Extent	Significance of Individual Effect	Timing / Duration	Mitigation	Uncertainty	Significance of Cumulative Effect
Receptors (Blairland Farm)							
Visual intrusion (Moderate Adverse)	The visual intrusion of the Proposed Scheme with alterations to the landform and increased noise levels.	Local (specific to receptor location)	1 residence Low	15 years / long term	Mitigation landscape earthworks to screen traffic on the proposed viaduct over the River Garnock.	Low	Moderate adverse Due to the scale and nature of the proposed viaduct it is unlikely to be fully visually screened. Proposed low noise road surfacing such as Stone Mastic Asphalt or a pervious material, would be likely to reduce traffic noise levels.
Greater than 10dB increase in noise levels for residents (Very Large Adverse)			Residents High		Earthworks (as above) to provide both landscape and noise screening. Low noise road surfacing.	Low	

17.5.14 The Proposed Scheme will result in cumulative beneficial effects on residents of Dalry. The transfer traffic from the busy city centre of Dalry is predicted to result in beneficial and permanent cumulative effects with overall improvements in air quality, decrease in traffic related noise levels, relief of severance and improvement in journey times with the Proposed Scheme in place when compared to the future year without the Proposed Scheme.

17.6 Summary

17.6.1 The Proposed Scheme is expected to result in moderate adverse direct interactive cumulative effects (air quality, noise, disruption, severance and visual effects) on properties located close to it during the construction phase. These impacts are however temporary and short term. Mitigation measures detailed in the assessment chapters will serve to reduce these impacts and therefore as synergistic effects they may have on receptors.

- 17.6.2 During the operational phase, the potential for interactive cumulative effects between the aforementioned environmental subject areas and air quality is removed as beneficial air quality effects are predicted. Potential however remained for interactive cumulative effects between visual and noise effects on receptors within the scheme corridor. Only one receptor – Blairland Farm was identified as possibly being subject to significant cumulative effects during operation. Committed visual and noise mitigation are not expected to fully mitigate the predicted effects on this receptor. The significance of interactive cumulative effects during operation on this receptor is considered to be moderate adverse.
- 17.6.3 Beneficial effects are also predicted for receptors within Dalry with the transfer of traffic away from the city centre. This transfer is predicted to results in beneficial and permanent cumulative effects with overall improvements in air quality, reduction in traffic related noise levels, relief in severance and improvement in journey times.