Cardiff East Park and Ride, Llanrumney
Environmental Statement

Chapter 11: Residual Effects, Mitigation and Cumulative Effects

Iceni Projects on behalf of

Curtis Hall Limited

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11. RESIDUAL EFFECTS, MITIGATION, MONITORING AND CUMULATIVE EFFECTS

Introduction

11.1 The following chapter provides a summary of the anticipated residual effects and the potential cumulative effects for each technical topic considered within this ES.

11.2 This chapter is accompanied by the following technical appendices:

- **Appendix 11.1**: Schedule of Mitigation Measures within the ES.

11.3 This chapter of the ES summarises the residual effects of the EIA of the Proposed Development. Tables 11.2 to 11.5 report the possible environmental effects associated with the Proposed Development, proposed mitigation and monitoring where appropriate, and the identification of residual effects.

11.4 Residual effects are defined as those effects which remain following the implementation of identified mitigation measures.

11.5 The formulation of the Proposed Development has been an iterative process undertaken in parallel with the assessment of environmental effects. As a consequence, some measures to mitigate potentially significant negative effects have been incorporated into the design of the Proposed Development in order to avoid, reduce or offset such effects. An example of this is wind canopies.

11.6 However, where it has not been possible to incorporate mitigation measures into the iterative design process, mitigation may be achieved by one of the following means:

- Mitigation through controls on demolition and construction activities; or
- Mitigation to be applied through ongoing management and monitoring once the Proposed Development commences; or
- During the operation of the Proposed Development.

11.7 Each technical ES Chapter includes detailed consideration of the beneficial and adverse residual effects anticipated as a result of the Proposed Development. The general criteria applied to determine the significance of the residual effects is set out in **Chapter 1: Introduction and EIA Methodology** of this ES, with topic-specific methodologies presented in each technical chapter.

11.8 The residual effects listed within the technical chapters of this ES are described with reference to:

- The scale of the effect (i.e. negligible, minor, moderate or major) and whether this is significant or not;
- The geographic scale (i.e. global, national, regional, district, borough, local etc.); and
- The nature of the effect (i.e. adverse, negligible or beneficial).

11.9 Within **Table 11.2** to **11.5** the following shading has been applied to identify significant residual effects.

Table 11.1 Shading Applied to Identify Residual Effects

Description	Shading
Major Beneficial / Major to Moderate Beneficial	
Moderate Beneficial	
Minor Beneficial / Negligible / Minor Adverse	No shading (not significant)
Moderate Adverse	
Major Adverse	

Table 11.2 Summary of Demolition and Construction Phase Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Air Quality						
Demolition	High	Local	Medium	Moderate Adverse	See 'Mitigation Measures' in Chapter 4	Negligible
Earthworks	High	Local	High	Moderate Adverse	See 'Mitigation Measures' in Chapter 4	Negligible
Construction	High	Local	High	Moderate Adverse	See 'Mitigation Measures' in Chapter 4	Negligible
Trackout	High	Local	Medium	Minor Adverse	See 'Mitigation Measures' in Chapter 4	Negligible
Ecology and Biodiversity						
Determined through HRA	Severn Estuary SAC, SPA and Ramsar, Cardiff Beech Woods SAC, Mendip Limestone Grasslands SAC, North Somerset and Mendip Bats	International	High	Major adverse	Mitigation identified as a result of the Stage 2 (Appropriate Assessment) of HRA	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
	SAC, and Wye Valley and Forest of Dean Bat Sites SAC (High)					
Changes to water quality	Rhymney River SINC (High)	Local	Very low	Negligible	Adherence to CEMP.	Negligible
Indirect habitat impact from dust and pollution; Damage to tree roots and from accidental access; Spread of INNS	ASNW (High)	National	Very low	Minor adverse	Adherence to the CEMP, including TPOs; Implementation of WMP and ISMP.	Negligible
Habitat loss; Impact from dust and pollution; Damage to habitat structure and tree roots.	Natural habitats on Site – semi-natural broadleaved woodland, dense scrub, scattered scrub, broadleaved parkland / scattered trees and poor semi-improved grassland (Medium)	Local	Medium	Moderate adverse	Adherence to the CEMP, including TPOs; Implementation of WMP and ISMP.	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Habitat loss; Disturbance from lighting, noise and vibration.	Bats (High)	Local	Medium	Major adverse	Additional surveys of T8, T9, T12 and T13; Pre-works checks by an ECoW; Adherence to the CEMP, including TPOs; Implementation of WMP; Installation of bat boxes.	Negligible
Habitat loss; Disturbance from noise and vibration.	Birds (Medium)	Local	Medium	Moderate adverse	Pre-works check within 48 hours prior to vegetation clearance (if outside main breeding season); Detailed pre-works check prior to works, with work to proceed within following 24 hours, Adherence to the CEMP, including TPOs; Implementation of WMP; Installation of bird boxes (adherence to the future Green infrastructure and	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
					Landscape Ecological Management Plan GILEMP).	
Killing/injury due to falling in open excavations or while crossing bridge construction area; Temporary disturbance from lighting and noise	Otter (Medium)	Local	Low	Minor adverse	Pre-works check to be carried immediately prior to works; Adherence to the PMoW; Adherence to the CEMP; Implementation of WMP; Installation of otter ledges; Adherence to the GILEMP.	Negligible
Habitat loss; Direct killing/injury.	Reptiles (Medium)	Local	Medium	Moderate adverse	Vegetation clearance in the presence of an ECoW; Adherence to the PMoW; Pre-clearance mat deployment, hand searches, and destructive searches prior to topsoil removal;	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
					Adherence to the CEMP; Implementation of WMP and Reptile Mitigation Strategy.	
Habitat loss; Direct killing/injury; Disturbance from lighting, noise and vibration.	Badger (Medium)	Local	Low	Minor adverse	Exclusion zones around the setts; Pre-works check; Adherence to the CEMP; Adherence to the PMoW; Implementation of WMP.	Negligible
Habitat loss; Direct killing/injury; Disturbance from lighting, noise and vibration.	Dormouse (High)	County	Medium	Moderate adverse	Off-Site Dormouse Habitat Planting Area along with 50 dormouse nest boxes, dormouse bridges, vegetation clearance in accordance with dormouse EPSL; Long term habitat and dormouse monitoring; Adherence to WMP/GILEMP.	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Accidental killing/injury; Potential habitat loss; Disturbance from lighting, noise and vibration.	Hedgehog (Medium)	Local	Medium	Moderate adverse	Pre-works check; Adherence to the CEMP; Adherence to the PMoW; Adherence to the GILEMP; Implementation of WMP.	Negligible
N/A (not a constraint)	GCN (Very Low)	N/A (not a constraint)	N/A (not a constraint)	N/A (not a constraint)	N/A (not a constraint)	Negligible
Incidental mortality	Amphibians (excluding GCN) (Low)	Local	Low	Negligible	Adherence to the PMoW.	Negligible
Habitat loss	Invertebrates (Low)	Local	Low	Negligible	Adherence to the GILEMP (e.g. species rich habitat mosaics to provide a resource for a range of species).	Negligible
Change in water quality	Aquatic and Riverine Features (Medium)	Local	Very low	Negligible	Adherence to the CEMP.	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Spread of INNS in other habitats	INNS (N/A)	Local	N/A	Moderate adverse	Adherence to the CEMP; Adherence to the PMoW; Implementation of WMP and ISMP.	Negligible
Landscape and Visual Impact						
Please refer to Tables 11.4 and 11.5 below.						
Socio-Economics						
Increase in employment	Existing construction employment/labour market	Short Term Temporary Local and Wider Impact Areas	Minor	Minor Beneficial (Not Significant)	None is required although could be enhanced through the use of local businesses and offering local training/employment initiatives	Minor Beneficial (Not Significant)
Increase in GVA	Local economy	Short Term Temporary across Local and Wider Impact Areas	Moderate	Minor Beneficial (Not Significant)	None required	Minor Beneficial (Not Significant)
Water Resources and Flood Risk						
Please refer to Chapter 9 of this ES						

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Transport and Access						
Severance	Low	Local	Minor	Adverse	CEMP	Short term, Minor Adverse (not significant)
Pedestrian Delay	Low	Local	Minor	Adverse	CEMP	Short term, Minor Adverse (not significant)
Pedestrian Amenity	Low	Local	Minor	Adverse	CEMP	Short term, Minor Adverse (not significant)
Driver Delay	Low	Local	Negligible	Negligible	CEMP	Negligible (not significant)
Accidents and Safety	Low	Local	Negligible	Negligible	CEMP	Negligible (not significant)
Climate Change						
GHG Emissions						

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Production of GHG emissions	Global Climate (High)	Short and Long Term Local and Global	High	Negligible	Adherence to the CEMP, CTMP, SWMP and MMP	Negligible (not significant)
Climate Change Resilience						
Increased temperatures	Pavement and Road Infrastructure (High)	Short Term Local	Very High	Negligible	N/A	Negligible (not significant)
Increased temperatures and decreased precipitation	Geotechnical Conditions (High)	Short Term Local	Very High	Negligible	Adherence to the CEMP	Negligible (not significant)
Increased mean and extreme temperatures, increased wind speeds, and variation (both increased and decreased) in precipitation	Buildings (High)	Short Term Local	Very High	Negligible	Adherence to the CEMP and SWMP	Negligible (not significant)

Table 11.3 Summary of Operational Phase Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Air Quality						

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Impact of NO_2 emissions generated by road vehicles movements during operational phase on human sensitive receptors	High	Local	No Impact	Negligible	Travel Plan Measures	Negligible
Impact of PM_{10} emissions generated by road vehicle movements during operational phase on human sensitive receptors	High	Local	No Impact	Negligible	Travel Plan Measures	Negligible
Impact of $PM_{2.5}$ emissions generated by road vehicle movements during operational phase on human sensitive receptors	High	Local	No Impact	Negligible	Travel Plan Measures	Negligible
Impact of NO_x emissions generated by road vehicles movements during operational phase on ecoogical sensitive receptors	High	Local	No Impact	Negligible	Travel Plan Measures	Negligible
Ecology and Biodiversity						

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Determined through HRA	Severn Estuary SAC, SPA and Ramsar, and Cardiff Beech Woods SAC (High)	International	High	Major adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release	Negligible
Fire water runoff during emergency event	Rhymney River SINC (High)	Local	High	Major adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release	Negligible
Fire water runoff during emergency event; Ecological succession leading to habitat degradation and reduced biodiversity	ASNW (High)	National	High (due to fire water runoff); Medium	Major adverse (due to fire water runoff); Moderate adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release; Implementation of	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
					WMP and dormouse EPSL.	
Fire water runoff during emergency event; Ecological succession leading to habitat degradation and reduced biodiversity	Natural habitats on site – semi-natural broadleaved woodland, dense scrub, scattered scrub, broadleaved parkland / scattered trees and poor semi-improved grassland (Medium)	Local	High (due to fire water runoff); Medium	Major adverse (due to fire water runoff); Moderate adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release; Implementation of WMP, GILEMP, dormouse EPSL and Reptile Mitigation Strategy.	Negligible
Fire water runoff during emergency event; Disturbance due to external lighting	Bats (High)	Local	High (due to fire water runoff); Medium	Major adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release; Implementation of Lighting Strategy.	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Fire water runoff during emergency event	Birds (Medium)	Local	High	Major adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release	Negligible
Fire water runoff during emergency event; Disturbance due to external lighting	Otter (Medium)	Local	High (due to fire water runoff); Medium	Major adverse (due to fire water runoff); Moderate adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release; Implementation of Lighting Strategy.	Negligible
Fire water runoff during emergency event	Reptiles (Medium)	Local	High	Major adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
					uncontrolled release; Sensitive habitat management during operation – adherence to the Reptile Mitigation Strategy.	
Fire water runoff during emergency event; Disturbance due to external lighting	Badger (Medium)	Local	High (due to fire water runoff); Medium	Major adverse (due to fire water runoff); Moderate adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release; Implementation of Lighting Strategy	Negligible
Fire water runoff during emergency event; Disturbance due to external lighting	Dormouse (High)	Local	High (due to fire water runoff); Medium	Major adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release; Implementation of Lighting Strategy;	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
					Implementation of WMP and dormouse EPSL.	
Fire water runoff during emergency event; Disturbance due to external lighting	Hedgehog (Medium)	Local	High (due to fire water runoff); Medium	Major adverse (due to fire water runoff); Moderate adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release; Implementation of Lighting Strategy	Negligible
N/A (not a constraint)	GCN (Very Low)	Local	N/A (not a constraint)	N/A (not a constraint)	N/A (not a constraint)	Negligible
Fire water runoff during emergency event	Amphibians (excluding GCN) (Low)	N/A (not a constraint)	High	Major adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release.	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Fire water runoff during emergency event	Invertebrates (Low)	Local	High	Major adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release.	Negligible
Fire water runoff during emergency event	Aquatic and Riverine Features (Medium)	Local	High	Major adverse	On-site containment, treatment and controlled discharge of fire-water using industry best practice systems to prevent uncontrolled release.	Negligible
Spread of INNS in other habitats	INNS (N/A)	Local	Medium	Moderate adverse	Adherence to the CEMP; Implementation of WMP and ISMP.	Negligible
Landscape and Visual Impact						
Please refer to Tables 11.4 and 11.5 below.						
Socio-Economics						

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Increase in employment	Local labour market	Permanent in the Local and Wider Impact Area, as well as National	Minor	Minor Beneficial (Not Significant)	None required	Minor Beneficial (Not Significant)
Increase in GVA	Local economy	Permanent in the Local Impact Area and Wider Impact Area, as well as National	Minor	Moderate Beneficial (Not Significant)	None required	Minor Beneficial (Not Significant)
Deprivation	Existing levels of deprivation	Permanent across the Local and Wider Impact Area	Moderate to Minor	Minor to Moderate Beneficial (Significant)	None required	Minor to Moderate Beneficial (Significant)
Water Resources and Flood Risk						
Please refer to Chapter 9 of this ES.						
Transport and Access						
Severance	Low	Local	Minor	Adverse	Implementation of Travel Plan	Long term, Minor Adverse (not significant)
Pedestrian Delay	Low	Local	Minor	Adverse	Implementation of Travel Plan	Long term, Minor Adverse (not significant)

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Pedestrian Amenity	Low	Local	Minor	Adverse	Implementation of Travel Plan	Long term, Minor Adverse (not significant)
Driver Delay	Low	Local	Negligible	Negligible	Implementation of Travel Plan	Negligible (not significant)
Accidents and Safety	Low	Local	Negligible	Negligible	Implementation of Travel Plan	Negligible (not significant)
Climate Change						
GHG Emissions						
Production of GHG emissions	Global Climate (High)	Short and Long Term Local and Global	High	Negligible	Monitoring of operational energy usage	Without future grid decarbonisation: Moderate Adverse (significant) With future grid decarbonisation: Minor Adverse (not significant)
Climate Change Resilience						

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Increased extreme temperatures, greater variation in temperatures, and changes to the frequency and magnitude of rainfall and storm events	Pavement and Road Infrastructure (High)	Short and Long Term Local	Very High	Negligible	N/A	Negligible (not significant)
Increased temperatures and changes to the frequency and magnitude of rainfall events	Geotechnical Conditions (High)	Short and Long Term Local	Very High	Negligible	N/A	Negligible (not significant)
Increased mean and extreme temperatures, increased humidity, increased precipitation and increased drought	Buildings (High)	Short and Long Term Local	Very High	Negligible	N/A	Negligible (not significant)
Increased temperatures, variations (both increased and decreased) in precipitation, and increased wind speeds	Landscape (High)	Short and Long Term Local	Very High	Negligible	N/A	Negligible (not significant)

Effect	Receptor (Sensitivity)	Geographic Scale	Magnitude of Impact	Classification of Effect	Mitigation and Monitoring	Residual Effect
Increased drought and decreased temperatures during the winter	Water (High)	Short and Long Term Local	Very High	Negligible	N/A	Negligible (not significant)
Increased mean temperatures	Ecology (High)	Short and Long Term Local	Very High	Negligible	N/A	Negligible (not significant)
Increased temperatures and variations (both increased and decreased) in precipitation	Human Health (High)	Short and Long Term Local	Very High	Negligible	N/A	Negligible (not significant)

Table 11.4 Summary of Landscape Residual Effects

Landscape Receptor		**Sensitivity** of characteristic (at baseline) to this specific proposal (Negligible, Low, Medium, High)	**Residual Effect** Magnitude is determined by considering the degree of change on the characteristic comparing the baseline conditions with that at the specific year. Magnitude of Change: *Negligible, Low, Medium, High* Significance (sensitivity and magnitude): *Negligible, Minor, Moderate, Major* Effect (change resulting): *Beneficial, Neutral, Adverse*							
			Completion		Year 5		Year 10		**Year 15**	
		Sensitivity	**Magnitude of change**	**Significance and Effect**	Magnitude of change	Significance and Effect	Magnitude of change	Significance and Effect	**Magnitude of change**	**Significance and Effect**
A: Application Site										
Natural/ Physical	A.1 Landform	**Low/Medium**	**Low**	**Minor Adverse**	Low	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
	A.2 Vegetation Structure	**Medium**	**Low/ Medium**	**Minor / Moderate Adverse**	Low/ /Medium	Minor / Moderate Adverse	Low	**Minor adverse**	Low	**Minor Adverse**
	A.3 Biodiversity/ Habitat	**Medium**	**Low**	**Minor Adverse**	Low	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
Cultural/ Social	A.4 Land Use	**Low**	**Medium**	**Minor / Moderate Adverse**	Medium	**Minor / Moderate Adverse**	Low	**Minor Adverse**	Low	**Minor Adverse**
	A.5 Recreational resource	**Medium**	**Low**	**Minor beneficial**	Low	**Minor beneficial**	Low	**Minor beneficial**	Low	**Minor beneficial**
Perceptual	A.6 Tranquillity	**Low**	**Low**	**Minor Adverse**	Low	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
	A.7 Openness/ Visibility	**Low**	**Low**	**Minor Adverse**	Low	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
B: CRDFFVS051 Rhymney Valley floor and sides (Visual/Sensory Landscape in which application Site is located)										

Landscape Receptor		**Sensitivity** of characteristic (at baseline) to this specific proposal (Negligible, Low, Medium, High)	**Residual Effect** Magnitude is determined by considering the degree of change on the characteristic comparing the baseline conditions with that at the specific year. Magnitude of Change: *Negligible, Low, Medium, High* Significance (sensitivity and magnitude): *Negligible, Minor, Moderate, Major* Effect (change resulting): *Beneficial, Neutral, Adverse*							
			Completion		Year 5		Year 10		**Year 15**	
		Sensitivity	**Magnitude of change**	**Significance and Effect**	Magnitude of change	Significance and Effect	Magnitude of change	Significance and Effect	**Magnitude of change**	**Significance and Effect**
Natural/ Physical	B.1 Landform	**Medium**	**Low**	**Minor Adverse**	Low	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
	B.2 Vegetation Structure	**Medium**	**Negligible**	**Minor beneficial**	Negligible	**Minor beneficial**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
	B.3 Biodiversity/ Habitat	**Medium**	**Negligible**	**Minor Adverse**	Negligible	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
Cultural/ Social	B.4 Land Use	**Medium**	**Negligible**	**Minor Adverse**	Negligible	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
	B.5 Recreational resource	**Low**	**Low**	**Minor beneficial**	Low	**Minor beneficial**	Low	**Minor beneficial**	Negligible	**Minor beneficial**
Perceptual	B.6 Tranquillity	**Low**	**Negligible**	**Minor Adverse**	Negligible	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
	B.7 Openness/ Visibility	**Low**	**Negligible**	**Minor Adverse**	Negligible	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
C: CRDFFCH010 River Rhymney and surrounds (Landscape Habitat in which application Site is located)										
Natural/ Physical	C.1 Vegetation Structure	**Medium**	**Negligible**	**Minor Beneficial**	Negligible	**Minor Beneficial**	Negligible	**Minor Beneficial**	**Negligible**	**Minor Beneficial**
	C.2 Biodiversity/ Habitat	**Medium**	**Negligible**	**Minor Adverse**	Negligible	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
D: CRDFFCL015 Rhymney Valley Corridor (Cultural Landscape in which application Site is located)										

Landscape Receptor		**Sensitivity** of characteristic (at baseline) to this specific proposal (Negligible, Low, Medium, High)	**Residual Effect** Magnitude is determined by considering the degree of change on the characteristic comparing the baseline conditions with that at the specific year. Magnitude of Change: *Negligible, Low, Medium, High* Significance (sensitivity and magnitude): *Negligible, Minor, Moderate, Major* Effect (change resulting): *Beneficial, Neutral, Adverse*							
			Completion		Year 5		Year 10		**Year 15**	
		Sensitivity	**Magnitude of change**	**Significance and Effect**	Magnitude of change	Significance and Effect	Magnitude of change	Significance and Effect	**Magnitude of change**	**Significance and Effect**
Cultural/ Social	Land Use	**Medium**	**Negligible**	**Minor Adverse**	Negligible	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**

Table 11.5 Summary of Visual Residual Effects

No.	Representative Viewpoint	Sensitivity considering the extent to which the attention is on the view (Negligible, Low, Medium, High)	Residual Effect Magnitude is determined by considering the degree of change on the view comparing the baseline conditions with that at the specific year. Magnitude of Change: *Negligible, Low, Medium, High* Significance (sensitivity and magnitude): *Negligible, Minor, Moderate, Major* Effect (change resulting): *Beneficial, Neutral, Adverse*							
			Completion		Year 5		Year 10		**Year 15**	
		Sensitivity	**Magnitude of change**	**Significance and Effect**	Magnitude of change	Significance and Effect	Magnitude of change	Significance and Effect	**Magnitude of change**	**Significance and Effect**
1	Bridge over A48	**Low**	**Low / Medium**	**Minor / Moderate Adverse**	Low / Medium	**Minor / Moderate Adverse**	Low	**Minor Adverse**	Negligible	**Minor Adverse**
2	Bridge over A48	**Low**	**Low**	**Minor Adverse**	Low	**Minor Adverse**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
5	Ball Lane	**Medium**	**Medium / High**	**Moderate / Major Adverse**	Medium	**Moderate / Major Adverse**	Medium	**Moderate Adverse**	Low	**Moderate Adverse**
6	Rhymney Tail	**Low / Medium**	**Negligible**	**Negligible Neutral**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
8	Bridge over A48	**Low**	**Negligible**	**Negligible Neutral**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
9	Circle Way East / Parc Coed y Nant	**Low / Medium**	**Negligible / Low**	**Negligible Neutral / Minor adverse**	Negligible / Low	**Negligible Neutral**	Negligible	**Negligible Neutral**	Negligible	**Negligible Neutral**
10	Clovelly Crescent	**Medium**	**Medium**	**Moderate Adverse**	Medium	**Moderate Adverse**	Medium	**Moderate Adverse**	Low	**Moderate/ Minor Adverse**

No.	Representative Viewpoint	Sensitivity considering the extent to which the attention is on the view (Negligible, Low, Medium, High)	Residual Effect Magnitude is determined by considering the degree of change on the view comparing the baseline conditions with that at the specific year. Magnitude of Change: *Negligible, Low, Medium, High* Significance (sensitivity and magnitude): *Negligible, Minor, Moderate, Major* Effect (change resulting): *Beneficial, Neutral, Adverse*							
			Completion		Year 5		Year 10		**Year 15**	
		Sensitivity	**Magnitude of change**	**Significance and Effect**	Magnitude of change	Significance and Effect	Magnitude of change	Significance and Effect	**Magnitude of change**	**Significance and Effect**
11	Glastonbury Terrace	**Medium**	**Medium / High**	**Moderate / Major Adverse**	Medium / High	**Moderate / Major Adverse**	Medium	**Moderate Adverse**	Medium	**Moderate Adverse**
13	Ball Road	**Medium**	**Medium / High**	**Moderate / Major Adverse**	Medium / High	**Moderate / Major Adverse**	Medium	**Moderate Adverse**	Medium	**Moderate Adverse**

Summary of Residual Effects

11.10 A comprehensive and robust assessment of the potential impacts of the demolition / construction and operation phases of the Proposed Development has been undertaken. A summary of the significant residual effects during the demolition / construction and operational phases are outlined below.

Summary of Residual Effects during Demolition and Construction

11.11 There would be no significant residual effects during the construction phase.

Summary of Residual Effects during the Operational Phase

11.12 There would be significant residual effects during the operational phase, as follows:

- Minor to moderate beneficial socio-economic effects on deprivation levels;
- Moderate adverse visual effects at Ball Lane, Clovelly Crescent, Glastonbury Terrace and Ball Road; and
- Moderate adverse climate change effects on the global climate from the production of GHG emissions if the National Grid is not decarbonised.

Cumulative Effects

11.13 In addition to the assessments already undertaken in relation to environmental topics, the EIA Regulations 20171 require an ES to consider 'cumulative effects'. These are defined as effects which result from incremental changes caused by other past, present or reasonably foreseeable actions together (i.e. cumulatively) with the Proposed Development.

11.14 This section gives consideration to 'cumulative effects' for the schemes listed in **Appendix 1.6** of the ES, as agreed with CC. **Chapter 1: Introduction and EIA methodology** also provides a brief summary of the cumulative schemes.

11.15 For the cumulative assessment, two types of effects have been considered:

- **Type 1:** The combined effect of individual effects, for example noise, airborne dust or traffic on a single receptor (defined as 'effect interactions'); and
- **Type 2:** The combined effects of nearby development schemes which are either consented or under construction which may, on an individual basis, not be significant but, cumulatively, have

[1] Her Majesty's Stationery Office (HMSO), (2018); Town and Country Planning (Environmental Impact Assessment) Regulations 2017

a likely significant effect (defined as 'cumulative effects'). The schemes considered within this assessment vary according to topic, however a comprehensive list is provided in **Chapter 1: Introduction and EIA Methodology** of this ES.

Effect Interactions (Type 1 Effects)

11.16 There is no established EIA methodology for assessing and quantifying effect interactions that lead to combined effects on sensitive receptors. The European Commission (EC) has produced guidelines for assessing these Type 1 Effects[2], however these *"are not intended to be formal or prescriptive but are designed to assist EIA practitioners in developing an approach which is appropriate to a project…"*. These have been reviewed by Iceni Projects and used to develop the approach to the assessment of effect interactions presented in this ES.

11.17 Whilst not necessarily considered significant individually, several effects on one receptor or receptor group could interact or combine to produce a significant overall effect. For the purposes of the assessment, only adverse or beneficial effects classified as minor, moderate or major have been considered in the effect interactions assessment.

11.18 **Table 11.6** presents a summary of the residual effects on sensitive receptors which have been scoped into the effect interactions assessment. On the basis of the below no effect interactions are anticipated to occur during either the construction or operational phases of the Proposed Development.

Table 11.6 Summary of Residual Effects on Sensitive Receptors

Receptor	Demolition and Construction Phase	Operational Phase
Existing nearby residents/occupants surrounding the Site		SE / LV
New (future users of the Site)		
Users of the local highways network	(T)*	(T) / (LV) - LV
Users of Public Rights of Way, footpaths and cycleways	(T)*	(T) / LV
Landscape character of the local area		
Local economy	(SE)*	(SE) - SE
Local labour market	(SE)*	(SE)
Recreational facilities and open space		(LV) – (LV)
Ecological Sites (i.e. Local Wildlife Sites)		
Species		

[2] European Commission (EC), (1999); Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions. Available at: http://ec.europa.eu/environment/archives/eia/eia-studies-and-reports/pdf/guidel.pdf

Habitats		(LV)
Water networks		
Global Climate		(CC) - CC

Key: **AQ** – Air Quality; **E** – Ecology and Biodiversity; **LV** – Landscape and Visual; **SE** – Socio-Economics; **T** – Transport and Access; **W** – Water Environment and Flood Risk; **CC** – Climate Change

RED – adverse effect; GREEN – beneficial effect; () – non-significant effect; * - intermittent/short-term effect.

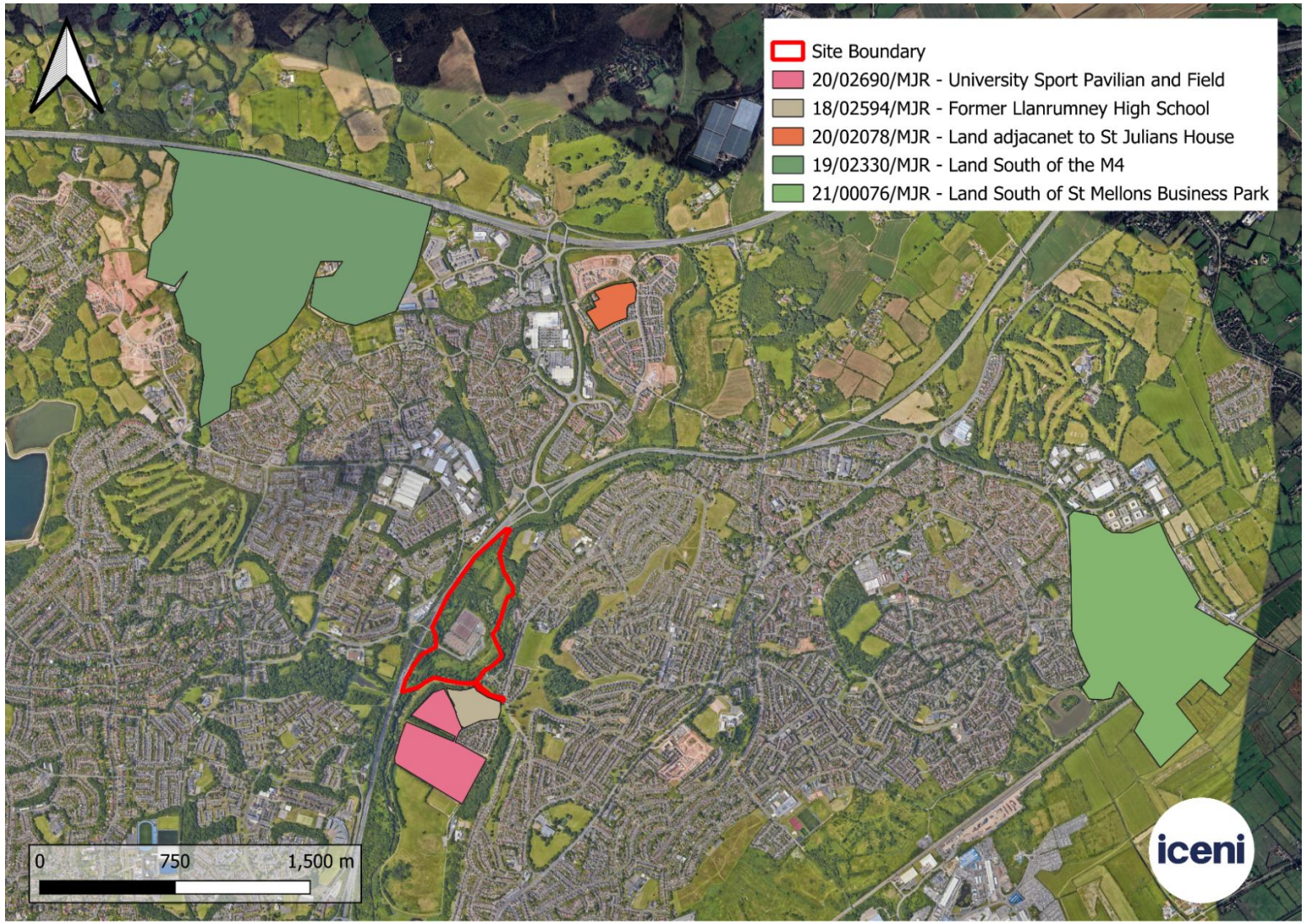
11.19 Given the above, it is not considered that any additional significant environmental effects are identified when effects are considered in-combination.

Cumulative Effects (Type 2 Effects)

11.20 The following schemes are considered within the cumulative effects assessment within each of the technical ES chapters (Chapters 4 to 10, and Volume II) and were agreed with CC. The cumulative schemes as agreed by CC are illustrated in Figure 11.1 below.

11.21 The below sections identify whether the effects from the above developments when considered alongside the Proposed Development, may cause significant cumulative effects which may require mitigation.

Figure 11.1 Cumulative Schemes



Air Quality

Cumulative Effects During Construction

11.22 Following the implementation of the standard mitigation measures discussed earlier, there will be no effects from the Development that could combine with effects from other developments to lead to cumulative effects during the construction phase. It is anticipated that any committed developments would implement best practise mitigation measures in a CEMP for their respective construction phases.

Cumulative Effects Once the Proposed Development is Operational

11.23 Using the provided traffic data, which includes an allowance for the committed developments, the effect of the development is predicted to be '**negligible**' at all receptors in the assessment year of 2028 which is considered not significant.

11.24 It should be noted that the background concentrations used in the assessment of the operations of the energy centre include the contributions from the traffic emissions, which produce a cumulative impact assessment by assessing both road traffic emissions and generator emissions. The predicted cumulative effect of both long-term and short-term impacts of from the operation of the energy centre are not significant for the protection of the human health and for the protection of vegetation and ecosystems.

Ecology and Biodiversity

Cumulative Effects of the Proposed Development with Other Development Schemes

11.25 A cumulative effects assessment has not been undertaken because the EcIA concludes that no significant adverse residual effects will occur once the proposed mitigation, compensation, and long-term management measures are implemented. All potential impacts on habitats and species are either fully avoided or reduced to a level that does not give rise to meaningful ecological change. As a result, there are no remaining residual effects with the potential to interact cumulatively with other plans or projects in the surrounding area. In the absence of any such residual impacts, there is no viable mechanism through which cumulative effects could arise. On this basis, a cumulative assessment is not required for this EcIA.

Landscape and Visual Impact

11.26 The following is a description of effects from the Proposed Development in combination with other areas of development, which together could give rise to possible significant cumulative effects.

20/02690/MJR

11.27 This is an application for the construction of sports academy building and community clubhouse together with new 3G pitches with floodlighting and amendments to car parking situated off Mendip Road. At its nearest point it is approximately 100m to the south of the application site across the river. The vegetation that runs along the banks of the river will limit intervisibility between the sites however there is the possibility of some views towards both developments in particular from the elevated ground around VP 11.

11.28 The proposed masterplan suggests that much of the vegetation along the river corridor to the north will be retained. The separation caused by the river and associated vegetation between the two developments will limit the cumulative landscape and visual effect to Minor Adverse.

18/02594/MJR

11.29 This is an application for 98 residential dwellings (use Class C3, including affordable housing), vehicular and pedestrian access, landscaping, drainage, related infrastructure and engineering works. At its nearest point it is approximately 60m immediate south of the application site across the river. The vegetation that runs along the banks of the river will limit intervisibility between the sites however there is the possibility of some views towards both developments in particular from VP 10, elevated ground around VP 11 and VP 13.

11.30 The proposed illustrative masterplan for the development suggests that the vegetation along the river will be retained with additional landscape buffer added along the northern boundary. Due to the distance it is likely that there will be a degree of intervisibility between this development and the application site including the proximity of the proposed elevated new access road and associated bridge. The cumulative landscape and visual effect of both developments is therefore considered to be Minor / Moderate Adverse.

20/02078/MJR

11.31 This is an application for 143 residential dwellings, vehicular and pedestrian access, landscaping, drainage, related infrastructure and engineering works. At its nearest point it is approximately 1.3km to the north east of the application Site. The approved landscape plan indicates that existing trees will be retained around the boundaries of the site with belts of new woodland edge planting serving to reinforce the boundaries.

11.32 Due to the distance to the site combined with the layers of built residential form and intervening vegetation it is not anticipated that there will be any intervisibility between the two sites. The cumulative landscape and visual effect is therefore assessed as Negligible.

19/02330/MJR

11.33 An outline application (appearance, landscaping, layout and scale reserved) for a mixed use development of up to 2,500 new homes, to include affordable housing; land for employment use (B1); district centre and mixed use areas accommodating uses within classes A1-A3 (shops; financial and professional services; and food and drink outlets), B1 (business), C1 (residential institutions, including care accommodation), C3 (dwellings), D1 (non-residential institutions, including medical and health services, creches, library, conference centre, community centres and places of worship), D2 (assembly and leisure, including indoor sports facilities); one 2 FE primary school and land for a secondary school (10 FE & 6th form) comprising a total of 10 hectares; green infrastructure including formal and informal open space comprising green corridors, amenity green space, play areas, semi-natural/natural open space, woodland, allotments/community orchards and civic spaces and surface water attenuation features; highway, cycle and pedestrian routes including partial diversion/creation of public rights of way; car parking; drainage and utilities infrastructure, including diversion of the 132kv and 11 overhead electricity tramsmission lines traversing the site and removal of pylon structures; engineering works including ground remodelling; demolition site reclamation and removal of structures; approval is also sought for the formation of new accesses from Lisvane Road, Ty Draw Road, and Heol Glandulais/St. Mellons Road.

11.34 Due to the distance to the site combined with the layers of built residential form and intervening vegetation it is not anticipated that there will be any intervisibility between the two sites. The cumulative landscape and visual effect is therefore assessed as Negligible.

21/00076/MJR

11.35 Land South Of St Mellons Business Park And Bounded By Fortran Road/Cobol Road To The North Cypress Drive To The West St Mellons Cardiff

11.36 Construction of a business park (up to 90,000m2 - use classes B1, B2 and B8), ancillary uses and infrastructure associated with; biodiversity; landscape; drainage; walking, cycling and other transport modes. Together with the construction of a new transport hub facility, comprising railway station buildings (up to 2,500m2 - use class sui generis) including ancillary uses; 4 no. Platforms; surface car park (up to 650 no. Spaces) and associated infrastructure work. At its nearest point it is approximately 3km to the north east of the application Site.

11.37 Due to the distance to the site combined with the undulating landform, layers of built residential and intervening vegetation it is not anticipated that there will be any intervisibility between the two sites. The cumulative landscape and visual effect is therefore assessed as Negligible.

Cumulative Effects During Construction

11.38 It is recognised that adverse cumulative socio-economic effects could arise if all the developments were to all come forward at the same time, as the availability of labour could be constrained. However, these projects are at different stages of the development process, have varying lead-in times and are expected to come forward on a phased basis. As such, the demand for labour and specific skills is likely to be distributed over a number of years as individual schemes are built out. Furthermore, construction firms often use their own, permanent workforce on projects supported by local contractors, meaning that the availability of local labour would not necessarily act as a constraint to the delivery of projects.

11.39 Following the uplift in construction activity in recent years, it is likely there will now be a supply of local workers with construction skills and businesses which have developed to support/supply this activity. Therefore, it is considered that the magnitude of any adverse cumulative effects at the construction phase will be negligible and no mitigation measures are required.

Cumulative Effects Once the Proposed Development is Operational

11.40 Considering the cumulative schemes, a substantial number of major developments would come forward in the area. Several of the cumulative schemes will provide community uses, including education, retail, amenity space and cultural uses.

Cumulative Schemes – Social Infrastructure Provision

Uses	**20/02690/MJR** – University Sport Pavilion and Field, Mendip Road, Llanrumney, Cardiff, CF3 4JN	**18/02594/MJR –** Former Llanrummey High School, Ball Road, Llanrummney, Cardiff, CF3 4YW	**20/02078/MJR** – Land Adjacent To St Julians House Bridge Road Old St Mellons Cardiff	**19/02330/MJR** – Land South Of The M4 To The East Of Lisvane West Of Pontprennau And North Of Cyncoed Cardiff	**21/00076/MJR** – Land South Of St Mellons Business Park And Bounded By Fortran Road/Cobol Road To The North Cypress Drive To The West St Mellons Cardiff
Residential (units)	-	98 units	160 units	2,500 units	-
Retail (sqm)	-	-	-	-	-
Employment space (sqm)	-	-	-	11,500sqm	90,000sqm
Education (ha)	-	-	-	10ha	-
Healthcare (sqm)	-	-	-	2,000sqm	-

Open space, sport, recreation, playspace (sqm)	3,589sqm	-	-	51ha	-
Community facilities (sqm)	-	-	-	2,000sqm	-

Population

11.41 The provision of an additional 2,758 dwellings is likely to lead to approximately 6,234 additional residents' population across Cardiff. This is based on applying average household size of 2.26 persons per household for Wales to the number of cumulative schemes dwellings. However, a proportion of the additional residents' population will be people who already live in Cardiff.

Labour Market

11.42 Based on the proportion of residents who are economically active in Cardiff (77.2%), it is estimated that approximately 4,813 residents of the generated population will be economically active aged between 16 to 64. This represents a 1.8% increase in the proportion of economically active people within Cardiff. Based on a median annual wage of £32,756, across both full and part time work, the 4,813 additional working aged residents could generate an additional £157.7m in wages. The additional labour force would help to support business activity in Cardiff resulting in a direct, permanent, minor beneficial, cumulative effect in the Wider and Local Impact Areas.

Deprivation and Crime

11.43 The Site is located within the 10% most deprived neighbourhoods in Wales in terms of overall deprivation and within the 10% most deprived neighbourhoods for income, employment, health, education, community safety and physical environment. The delivery of 2,578 dwellings and over 100,000sqm of employment floor space, together with the delivery of public amenity and open space could reduce the barriers that residents in Cardiff experience, leading to an improvement in quality of life and work. This would result in a minor beneficial cumulative effect across the Wider Impact Area.

Summary

11.44 Overall, these cumulative schemes, together with the Proposed Development, would deliver new housing, generate new employment and have a positive impact on the local economy through increased residential spending, which together would have a beneficial effect in terms of socio-economics.

Water Resources and Flood Risk

11.45 Please refer to Chapter 9 of this ES.

Transport and Access

11.46 This section of the chapter assesses the Transport effects of the Proposed Development in combination with other Transport effects of committed developments as listed within **Chapter 1: Introduction and EIA Methodology** of this ES.

Cumulative Effects During Construction

11.47 All sites which produce material volumes of construction traffic will likely be required to prepare a CEMP which will include information on vehicle numbers, routing, any restrictions on routing etc. The aim of a CEMP is to minimise as much as possible, the potential impacts of construction traffic on the local highway network and on other road users.

11.48 The Proposed Development is located adjacent to the A48. The majority of construction traffic will be routed to / from the A48, therefore minimising the impact of construction traffic. This in turn will minimise the potential for cumulative construction effects.

Cumulative Effects Once the Proposed Development is Operational

11.49 As described above, the cumulative impacts of the Proposed Development are as set out within the operational effects section of this report.

Climate Change

Cumulative Effects During Construction and Once the Proposed Development is Operational

11.50 As detailed within the ISEP 'Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance':

"GHG emissions from all projects will contribute to climate change; the largest interrelated cumulative environmental effect".

11.51 The reference to 'cumulative' in the statement above relates to a global scale, as all emissions of GHGs contribute to climate change. In this way, the definition of 'cumulative effects' associated with GHG emissions and climate change go beyond the typical definition for EIA, which typically focusses on other proposed and consented development within the area surrounding the Proposed Development.

11.52 The ES has identified three cumulative committed developments within the area surrounding the Site that are to be considered within the assessment. It is difficult to quantify the GHG emissions associated with the identified committed developments, and as detailed above, the cumulative contributions of GHGs to climate change will go beyond the extent of these developments. In addition, it is expected that mitigation measures will be both employed both during the construction of, and embedded within the design of, the identified cumulative developments. In particular, it is expected that these measures will be employed principally to reduce GHG emissions associated with the consumption of energy during the operation of the surrounding developments, and with transport during both their construction and operation, to ensure policy compliance. This will aid in minimising on-Site GHG emissions across the respective lifetimes of each of the committed developments.

11.53 The residual cumulative GHG emissions associated with the Proposed Development and the identified committed developments is considered likely to be small in the context of national GHG emissions. It is expected that GHG emissions per capita within Cardiff will continue to decrease, in line with the trends identified in **Table 10.12** of **Chapter 10**, as the committed developments come forward. This is due to the anticipated improvement in the energy efficiency of the building stock that will be realised through these developments coming forward, as well as anticipated changes to travel patterns and the future decarbonisation of the National Grid. In this way, it is expected that the cumulative effect of the Proposed Development and the identified committed developments in the surrounding area will be negligible, and therefore not significant, with respect to GHG emissions.

11.54 In addition to this, it is expected that the identified committed developments will include for measures embedded within their respective designs that will aid in mitigating against the anticipated effects of projected climate change on sensitive receptors. In particular, it is expected that measures to mitigate the risk of surface water flooding, overheating and water scarcity will be implemented, as is required by local, regional and national policy. It is therefore considered that the effects of climate change on the Proposed Development itself and the committed developments located within the surrounding area are anticipated to be **Minor Adverse** (**not significant**).

11.55 In summary, there are no significant adverse cumulative effects anticipated during the demolition and construction of the Proposed Development that would give rise to the need for additional mitigation. The likely cumulative effects once the Proposed Development is in operation are set out below:

- Minor / Moderate adverse cumulative landscape and visual effects of the Proposed Development and 18/02594/MJR; and
- Major beneficial cumulative socio-economic effects in regard to residential expenditure.

Summary of Cumulative Effects

11.56 In summary, there are no adverse cumulative effects that are anticipated during the construction phase of the Proposed Development. Where topics have identified that there is potential for adverse effects to arise, these effects can be addressed and mitigated.

11.57 With regards to the operational phase, the cumulative schemes, together with the Proposed Development, will deliver positively on housing demand, employment opportunities, and residential expenditure.