Area		Impact			Specific I				
Site Name	Im- portance	Nature of Impact	Description of Impact	Impact Rating	Mitigation Measure	Residual Impact			
Peak-Mantua GWS CH 15+850	High	Construction							
		Restriction and interception of subsurface flow resulting in reduction in groundwater flow and yield. Damage to Feature by Con- struction Works (collapse, infill etc.).	The proposed road and its construction site area is located to the north and outside of the mapped recharge zone for the spring which the GSI have shown to extend southwards of the spring and away from the road development. This is currently only draft mapping and has not been confirmed through dye tracing surveys and therefore extension of the recharge zone to the north where the road alignment traverses cannot be ruled out. The road is underlain by a Regionally Important bedrock aquifer with conduit flow and has been deemed low vulnerability at this location.	Slight to Moderate	The implementation of the CESCP will ensure no construction related impacts to the Peak-Mantua spring supply. This will include silt fences erected on or inside the development boundary which togeth- er with the fenceline will restrict construc- tion activity in the vicinity of the zone of contribution and inhibit silt or sediment material from moving southwards into the ZOC and entering the recharge zone. No works will take place outside the land acquisition boundary and therefore works within the ZOC will not be permitted.	Negligible	All of propo tested proje M17 stanc of dra with a does		
		Potential contaminated infiltra- tion / discharge entering aquifer via karst feature construction site works construction runoff and potential spillages.	In terms of construction impacts a reasonable buffer of some 150m is available between the potential site works and the source which is sufficient to minimise any potential construction impacts involving contaminated runoff water impacting the source and any potential well yield impacts arising from temporary de- watering of excavations and potential interference with groundwa- ter flows.	Negligi- ble / Slight	N/A	Negligible / Slight	The s asset Asse 10 Hy Prelir veys geolo aquifi at 9.4 meas out o has a out ir area. Curra ried c of the incluo otech		
		Operational							
		Direct encroachment of feature by proposed road development	The road alignment passes within 150m to the North of the spring source at Ch 15+850. At this location the road alignment is at grade, to the west it is in embankment and to the east it is slightly in cut. The local road near the spring is to be realigned forming an underpass under the mainline which will involve locally deep excavation into the subsoils. There is no direct encroachment of the spring source.	Negligi- ble	N/A	Negligible	The in have featu		
		Contamination of feature by road drainage outfalls and by the drainage system – Routine runoff Accidental road spillage	There are no proposed road drainage outfalls discharging to this feature and the aquifer vulnerability along the road alignment in the contribution zone is typically moderate to low vulnerability.	Slight	N/A	Slight			
		Impact of road alignment on recharge to or discharge from hydro feature	The zone of contribution of the spring source is believed to ex- tend southwards from the spring source based on a draft map- ping by the GSI. The road alignment is located to the north of the spring placing it outside if the recharge zone. This zone of contri- bution has not been confirmed by the GSI with recent dye tracing of springs and swallow-holes inconclusive and therefore the po- tential for the road alignment to be located within the zone of contribution cannot be completely ruled out. However given the impermeable nature and generally deep depth of overburden (Low aquifer vulnerability) it is highly unlikely that a preferential flow path would be encountered that would significantly impact the yield and water quality of the spring source as a result of the road development.	Slight to Moderate	The implementation of the CESCP will be required by the contractor. The design will ensure surface and groundwater flows in the area are maintained largely intact. Streams will be maintained through culverting (Refer to Chapter 10) and diversions. The road is not in cut at this point and will stay outside the ZOC for the spring supply. This will ensure that there is no appreciable change in recharge/discharge to the spring supply.	Negligible			

Annual Average Wate	r Balance Surface & Gro	und Water	
	Area 1(ii) - ZOC	Peak-Mantua	
	Existing Col	nditions	
	Surface V	Vater	
	River Sub-basin Catchment &	Portion of road alignment	
<b>River Basin Catchment</b>	Area	within sub-basin catchment	Receiving Watercourse
Upper Shannon	Breedoge_010	13+400 - 19+750	Owenforeesha River
Area: 675km <sup>2</sup>	Area: 62.2km <sup>2</sup>	Total Length: 6.35km	Breedoge River
Recharge Proportion across catchment (avg)	Catchment losses and storages (avg.)	Runoff Proportion	Annual Avg. Dischagre from catchment
10%	20%	70%	34.83 x 10 <sup>6</sup> m <sup>3</sup>
	Groundv	vater	-
Groundwater Body (GWB)*	Portion of road alignment within GWB (AT THIS AREA ONLY)	Annual Average Recharge (mm/yr)	
Carrick on Shannon	14,500 10,750	20, 192	
Area: 915km <sup>2</sup>	14+500 - 19+750	30 - 182	
ZOC Peak Mantua	Portion of road alignment within GWB (AT THIS AREA ONLY)	*Bellangare GWB description and proposed alterations wer addressed under Area 1 Sheet 7 of 12	
6.4km <sup>2</sup>	None		
	Catchment C	onditions	
Annual Average Recharge (mm)	Soil Type	SAAR (mm)	Effective Rainfall (mm)
106	Peat/Cut Peat c.50% Tills >30% Alluvium <15%	1120	800
	Proposed Alteration	s - Ground Water	
Existing Average Recharge		Reduction in recharge	Proportionl Reduction in
Across GWB	Impermeable Area of Road	(max)	recharge to GWB
96.99 x 10 <sup>6</sup> m <sup>3</sup>	0.0735km <sup>2</sup>	$7.79 \times 10^3 \text{ m}^3$	0.008%*
No change in the water balance	or recharge of the Peak-Mantua Z	one of Contribution	I
*Note: this water is being divert	ed to the Owenforeesha River; son	ne portion of this water may b	pe returned to the aquifer as
portions of the river are losing t	hrough karst areas		
	Proposed Alteration	s - Surface Water	-
Portion of road drainage			
draining to sub-basin			
catchment	Drainage Outfalls	Impermeable Area of Road	Outfall Catchment
Ch.12+700 - Ch.17+800 5.1km	OUT14.01 & OUT14.02	0.063km <sup>2</sup>	Breedoge_010
Portion of road drainage			
diverted to adjacent sub-basin			Annual Runoff Volume
catchment		Impermeable Area of Road	Reduction
Ch.17+800 - 19+750		0.0273km <sup>2</sup>	21.84 x 10 <sup>3</sup> m <sup>3</sup>
Portion of additional road			
drainage diverted from			Annual Runoff Volume
adjacent sub-basin catchment		Impermeable Area of Road	Increase
Ch.12+700 - 13+400		0.0098km <sup>2</sup>	7.84 x 10 <sup>3</sup> m <sup>3</sup>
			Additional runoff not infilltrating as groundwater
			recharge
			9.42 x 10 <sup>3</sup> m <sup>3</sup>
		Total Net change in discharge to Sub-basin	Total Net Proportionl change in discharge to Sub-basin
		$458 \times 10^3 \text{ m}^3$	- 0.013%







