Area			Impact		Spe	cific Mitigati
Site Name	lm-	Nature of Impact	Description of Impact	Impact	Mitigation Measure	Residual
Lough Cloon-	portance Annex I	Construction		Rating		Impact
cullaan, and Surrounding Tullyloyd Wetland Com- plex, 15a(LH), 15b(LL), 15c (N), 15d(C) & 15e(C) Ch. 33+350 to 34+350	Transition Mire and Rich Fen Habitat Local Im- portance (Higher & lower Val- ue) and National & County Importance	Silts and sediments arising from in stream works and works adjacent to watercourses and construction site runoff. Silts and sediments and nutrient pollution arising from handling of peat (excavation, removal, deposition) Spillages (hydrocarbons, ce- ment etc.) into watercourses and onto wetlands. Disturbance due to construction machinery and carrying out of temporary works (cofferdams culverts channel diversions, sediment ponds, silt fences	Lough Clooncullaan and Wetland complex is reasonably buffered from the road construction site and unlikely assuming reasonable construction practices to be im- pacted by road construction works through direct en- croachment of such habitats or by impacts from sedi- ment runoff or potential spillages during construction.	Slight	A Construction Sediment Erosion and Control Plan (CSECP) has been developed – see Appendix 10.1. The measures outlined in the CSECP will ensure no adverse impacts on water quality oc- cur.	Slight
		Operational				
		Road drainage and outfalls impacting on water quality:- Routine road runoff discharges. - Accidental fuel spills from road.	Road drainage will discharge to a local drain that bor- ders Alkaline Fen to the north and also to the Ovaun Stream that enters the Lough immediately to the South of the KER. The potential water quality impact of these drains on the KER is likely to be slight given that these drains direct water into the Lough. Given the volume of water available in the Lough and the low volume of road runoff, there will be an imperceptible impact on water quality. The potential for spillage represents a slight to moderate impact. Road drainage will discharge to the Ovaun Stream downstream of these KERs and there- fore road drainage discharges and potential spillages from the Road are unlikely to impact the water quality status of the Transition Mire and Fen and Wetland Habi- tat.	Slight to Moderate	Road drainage will be treated in an attenuation pond with a treat- ment forebay provided prior to outfalling to receiving water- course. The attenuation pond will be fitted with a penstock or similar restriction at the outfall to the receiving channel.	Negligi- ble
		Road drainage system – out- falls, culverts, interceptor drains, diversions and trunca- tions affecting the water flow regime.	Road drainage outfalls will undergo attenuation and the road drainage and interceptor drains are designed to have a negligible impact. The annual increase in flows in the Orvan Stream (catchment area 3.9km2) as a result of the road pavement drainage is 0.29% which is small and for the Clooncullaan Lough (catchment area of 6.3km2) this increase is further reducted and considered insignificant.	Negligible	N/A	Negligi- ble
		Changes to stream channel morphology as a result of cul- verting, diversions, channel regrading works and outfall discharges giving rise to short	Impact on stream channel morphology at this section will be negligible as no encroachment outfall or culvert is proposed.	Negligible	N/A	Negligi- ble
		Interception of drainage paths by the permeable Road for- mation resulting in diversion of waters and in a dewatering effect on adjacent soils and wetland areas.	Up gradient of these KERs the alignment is in deep cutting into bedrock which is likely to intercept surface and sub-surface flows off the hillslopes to the northeast. The impact of the cutting and cut-off drains on hydrolog- ical regime of the KERs is likely to represent a small adverse impact.	Slight to Moderate	Transverse barriers every 100m in the road formation. Maintain transverse flow paths/ditches. Shallow toe drain with check dams if required.	Slight
Area	3		Impact		Spe	cific Mitigati
Site Name	Im- portance	Nature of Impact	Description of Impact	Impact Rating	Mitigation Measure	Residual Impact
Tullyloyd	Locally	Construction		inding		inipuot
(Ovaun Stream) Swal- low hole fea- ture Ch 34+400	High	Restriction and interception of subsurface flow resulting in reduction in groundwater flow and yield. Damage to Feature by Con- struction Works (collapse, infill etc.).	This feature is located adjacent to a maintained arterial drainage stream channel that outfalls into the Cloon- cullaan Lough. The swallow hole feature has a spur channel that is connected to the Ovaun Stream. Site visits throughout the year have shown that flow in the Ovaun Stream outfalls both to Clooncullaan Lough and to this swallow-hole feature with the proportionality vary- ing significantly over the summer/winter season with water levels in the Lough dictating flow conditions. This feature is located 150m down gradient of the road alignment which is at grade and in embankment to the east of this feature.	Negligi- ble / Slight Slight	NA The construction works will not take place within 100m of this feature. The CESCP will ensure that construction works do not impact on this feature.	Negligi- ble / Slight Slight
		Potential contaminated infiltra- tion / discharge entering aquifer via karst feature construction site works construction runoff and potential spillages.	The construction activity will be reasonably proximate to this feature which increases the risk for damage from potential uncontrolled site runoff resulting in potential deposition of sediment in the bed of this feature and potential contamination (sediment laden runoff, water quality and construction spillages) of the connected groundwater aquifer. This swallow-holes represent a point sources of pollution to the Regionally important karst bedrock aquifer and may potentially be connected to springs further to the east, however dye tracer studies undertaken as part of this assessment showed this fea- tures is not connected to the Polecat Springs GWS or the Cl.	Moderate	All site drainage is being routed through an attenuation pond which is to be constructed in advance of any works and will pro- vide treatment prior to discharge. In addition the CESCP will en- sure that construction works do not impact on this feature.	Slight
		Operational				
		Direct encroachment of feature by road alignment.	The proposed road alignment is located at grade and on embankment over 150m upgradient of the feature and therefore no direct encroachment of the feature will oc- cur. This distance and proposed road vertical alignment provide ample buffer distance to minimise any potential for direct impact in respect to flow capacity. The catch- ment area of the receiving Ovaun stream is 3.9km <sup>2</sup> and the proposed road drainage discharge represents an increase of 0.29% runoff in the Ovaun Stream.	Negligi- ble / Slight	NA	Negligi- ble / Slight
		Contamination of feature by road drainage outfalls and by the drainage system - Routine Runoff - Accidental Spillage	There are no proposed road drainage outfalls discharg- ing directly to this swallow-hole feature however the proposed road drainage will discharge to a small tribu- tary drain that connects to the Ovaun Stream approxi- mately 400m upstream of this feature. Dye tracing re- sults show that a proportion of the Ovaun Stream Flow discharges to this feature with the remainder of flow discharging westwards to the Clooncullaan Lough. The proportional split varies considerably depending on sea- sonality. There is a potential for point source contami- nation of the regionally important karst aquifer system from the road drainage discharge via this feature both routine road drainage and potential road accident spill-	Moderate	An assessment of flows in the Ovaun has shown that only a small proportion enters groundwater through the swallow hole feature. This occurs some 150m downstream of where the road drainage outfall is located. The road drainage is treated to a high standard in an attenuation pond with a treatment forebay and penstock provided prior to this outfall point. Given the low level of contaminants anticipated and the treatment measures involved the risk to groundwater is very low.	Slight
		Impact of road alignment on recharge to or discharge from hydro feature	The impact of the road drainage discharge on this fea- ture in respect to flooding is shown to be negligible in respect to increased flood levels at this feature as result of the road drainage discharge to the Ovaun Stream. The catchment area of the receiving Ovaun stream is 3.9km <sup>2</sup> and the proposed road drainage discharge rep- resents an increase of 0.29% runoff in the Ovaun Stream.	Slight	NA	Slight

## Annual Average Water Balance Surface & Ground Water

Area 1(ii) &	(iii) - Cloonyeffer (East)	& Tulyloyd / Cloond	ullaan Lough				
	Existing Co	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	Owenur 010	Ch.30+000 - 36+100	Owenur River				
Area: 675km <sup>2</sup>	Area: 36.14km <sup>2</sup>	Total Length: 4.55km	Ovaun River				
Recharge Proportion across	Catchment losses and storages		Annual Avg. Dischagre from				
catchment (avg)	(avg.)	Runoff Proportion	catchment				
14%	12%	74%	$21.4 \times 10^{6} m^{3}$				
1470	Groundy	vater	21.4 x 10 111				
Groundwater							
Groundwater Body (GWB)*	Portion of road alignment within	Annual Average Recharge					
	GWB (AT THIS AREA ONLY)	(mm/yr)					
Carrick on Shannon	19+750 - 24+150	28 - 172					
Area: 915km <sup>2</sup>	131730 241130	20 172					
			Portion of road alignment				
ZOC Polecat	Portion of road alignment within	ZOC Cloonyquinn	within GWB (AT THIS AREA				
	GWB (AT THIS AREA ONLY)		ONLY)				
52.3km <sup>2</sup>	Ch.30+000 - 36+100	25.6km <sup>2</sup>	None				
	Catchment C	onditions					
Annual Average Recharge							
(mm)	Soil Type	SAAR (mm)	Effective Rainfall (mm)				
100	Peat/Cut Peat <30%	1120	200				
106	Tills >70%	1120	800				
	Proposed Alterations	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>	0.148km <sup>2</sup>	15.69 x 10 <sup>3</sup> m <sup>3</sup>	-0.016%*				
Existing Average Recharge	Reduction in recharge (max) to	<b>Proportionl Reduction in</b>					
Across Polecat ZOC	Polecat ZOC	recharge to Polecat ZOC					
$5.54 \times 10^{6} \text{ m}^{3}$	15.69 x 10 <sup>3</sup> m <sup>3</sup>	-0.28%*					
*Note: this water is being divert	ed to the Ovaun River; some portion	on of this water may be returi	ned to the aquifer as portions of				
the river are losing through kars	st areas. Additionally the majority o	of recharge to the Polecat ZOO	Coccurs as point recharge				
through swallow holes and the	refore the reduction shown above i	s likely not applicable					
	Proposed Alteration	s - Surface Water					
Portion of road drainage							
draining to sub-basin							
catchment	Drainage Outfalls	Impermeable Area of Road	Outfall Catchment				
22+950 - 38+975	OUT30.01, 30.02, 24.01, 33.01.	2					
10.225km	33.02 & 34.01	0.148km <sup>2</sup>	Owenur_010				
Portion of additional road							
drainage diverted from			Annual Runoff Volume				
adiacent sub-basin catchment		Impermeable Area of Road	Increase				
Ch.22+950 - 30+000	1	2	2 2				
Ch.36+100 - 38+975		0.05705km <sup>2</sup>	45.64 x 10° m°				
			Additional runoff				
			not infilltrating as groundwate				
			recharge				
			15.69 x 10 <sup>3</sup> m <sup>3</sup>				
		Total Net change in	Total Net Proportionl change in				
		discharge to Sub-basin	discharge to Sub-basin				
		$61.33 \times 10^3 \text{ m}^3$	+ 0.29%				







