

**Table 1.4 – Peak Hour Person-trip Movements for Proposed Residential Element (1500 units) at An Camas More by Distance Travelled to Place of Work or Study**

DISTANCE FROM HOME	MODIFIED %AGES	AM IN	AM OUT	PM IN	PM OUT
Less than 2km	57.13	110	436	321	171
2km – 5km	3.62	7	28	20	11
5km – 10km	6.61	13	50	37	20
10km – 20km	14.96	29	114	84	45
20km – 40km	8.42	16	64	47	25
More than 40km	9.26	18	71	52	28
Total	100.00	192	763	562	299

\* All figures in the table were rounded to the nearest whole number. Accordingly, the totals in this table may appear to be incorrect but correspond with the control totals from Table 6.1 above.

**1.6.21** Thus, of the total of 763 people leaving the residential elements of the development during the morning peak hour, 436 would travel less than 2 kilometres and a further 27 would travel between 2 and 5 kilometres. These figures indicate that more than 60% of all people (both adults and children) leaving the residential elements of the development in the morning peak hour would be travelling within An Camas Mòr and Aviemore.

## **1.7 Road Traffic Generation, Distribution, Assignment and Impact Assessment - 2028**

### **Introduction**

**1.7.1** This chapter of the report deals with estimates of the additional vehicular trips that will result from the proposed development and their distribution on the surrounding road network. From these figures, a series of traffic calculations was carried out to assess the capability of the existing road network to accommodate the likely traffic flows. Where appropriate, these results were then compared with the corresponding results of the 'without development' calculations. This comparison gave a measure of the traffic impact of the development.

### **Base Traffic Flows**

**1.7.1** The existing traffic flows in the area around the site were surveyed on behalf of Munro Consultants by two separate firms of survey contractors, Count On Us and PMA Data Collection Ltd. The results of these surveys are given in Appendix 2 and are summarised, diagrammatically, in Appendix 3.

### **Design Year**

**1.7.2** It is suggested in the Transport Assessment and Implementation Guide that any proposal should be examined for the traffic conditions pertaining one year after the opening or completion of the proposed development. If planning consent is granted during 2009, the development would be completed during

2227. Thus, the 'design year' should be 2028 and, accordingly, this has been taken as the ultimate 'design year' for the present analysis.

- 1.7.3** As part of the Indicative Land-use Plan (ILUP), the development has been divided into four intermediate assessment periods for analysis and consideration purposes. The 'design years' for these intermediate assessment periods have been taken as 2012, 2016 and 2018.

## Growth Factors

- 1.7.4** In order to convert the survey results to their equivalent design year values, the survey data were factored by applying the National Road Traffic Forecast 1997 (NRTF) 'High' growth index. The derivation of the growth factors applied within the assessment is shown in Table 1.5.

**Table 1.5 Growth Factor – NRTF 1997 high growth**

FROM and TO (years)	Indices	Growth Factor
		High
2008 – 2012	131.8 > 141.4	1.072837
2008 – 2016	131.8 > 151.0	1.145675
2008 – 2018	131.8 > 155.8	1.182094
2008 - 2028	131.8 > 177.4	1.345979

- 1.7.5** This exercise gave the base traffic flows to be expected in each of the design years without the proposed development. These were the figures used in the calculations of the future year traffic loadings. They can be seen schematically in Appendix 3.

## Traffic Generation – Multi-modal Vehicles

- 1.7.6** To determine the volumes of traffic generated by the proposed development, trip generation rates were taken from the current version of the TRICS trip rate database. These data related to multi-modal surveys and, in addition to providing details of movements by pedestrians, cyclists, public transport users, car occupants, total people, they also provide information relating to vehicle movements. The ensuing trip rates can be seen, for each of the proposed land-uses, in Appendix 1 to this report.
- 1.7.7** Because the road network is under most pressure at peak times, the most relevant figures are those for the peak hours. Table 1.6 summarises the output of the TRICS database when applied to the particular components that form part of the An Camas Mor development proposals.

**Table 1.6 Total Peak Hour (8am – 9am and 5pm – 6pm) Generated traffic movements in vehicles from the completed An Camas Mor development.**

	AM IN	AM OUT	AM TOTAL	PM IN	PM OUT	PM TOTAL
Residential	129	324	452	312	166	478
Hotel	8	16	24	13	8	22
Primary school	111	78	191	5	10	14
Nursing home	7	2	9	4	8	12
Shops etc	83	77	160	91	92	184
Studios / Offices	62	8	70	7	50	57
Totals	400	505	905	432	334	767

**1.7.8** Table 1.6 shows the highest single number of generated trips would be 505 'leaving' the various component parts of the development in the morning peak hour with 400 'entering' in the same hour, a total of 905 vehicles. This equates to a two-way total flow of 15 vehicles per minute summed over all of the 'entrance' points to each element of the An Camas Mor development.

**1.7.9** In considering these flows, it should be remembered that there is an element of double counting built into this analysis. This is because, many of the vehicle movements listed in Table 1.6 will be made between different elements of the development, rather than between the development and outside destination. For example, some of the trips 'out' from the residential element will also be trips 'in' to the primary school, the shops and the studios / offices.

## Distribution of Generated Vehicular Traffic

**1.7.10** To make predictions of the actual numbers of vehicle movements between An Camas Mòr and the surrounding area, an analysis was carried out of the likely distribution pattern of such trips. The likelihood of any vehicle movement being made between any two points may be described in terms of its statistical probability. This probability is based on the 'deterrence function' used in the gravity-based distribution model.

**1.7.11** In order to use a deterrence function that is specific to Aviemore and its surrounding area, the results of the 2001 Census were used. These show that 60.74% of all journeys to places of work or study from An Camas Mòr would stay within Aviemore and its immediately surrounding area (within 5 kilometres radius).

**Table 1.7 – Peak Hour Vehicular Movements for the Proposed Residential Element of the Development (1500 units) at An Camas Mor by Distance Travelled to Place of Work or Study**

DISTANCE FROM HOME	MODIFIED PERCENTAGES	AM IN	AM OUT	PM IN	PM OUT
Less than 2km	57.13	74	185	178	95
2km – 5km	3.62	5	12	11	6
5km – 10km	6.61	9	21	21	11
10km – 20km	14.96	19	48	47	25
20km – 40km	8.42	11	27	26	14
More than 40km	9.26	12	30	29	15
Total	100.00	129	324	312	166

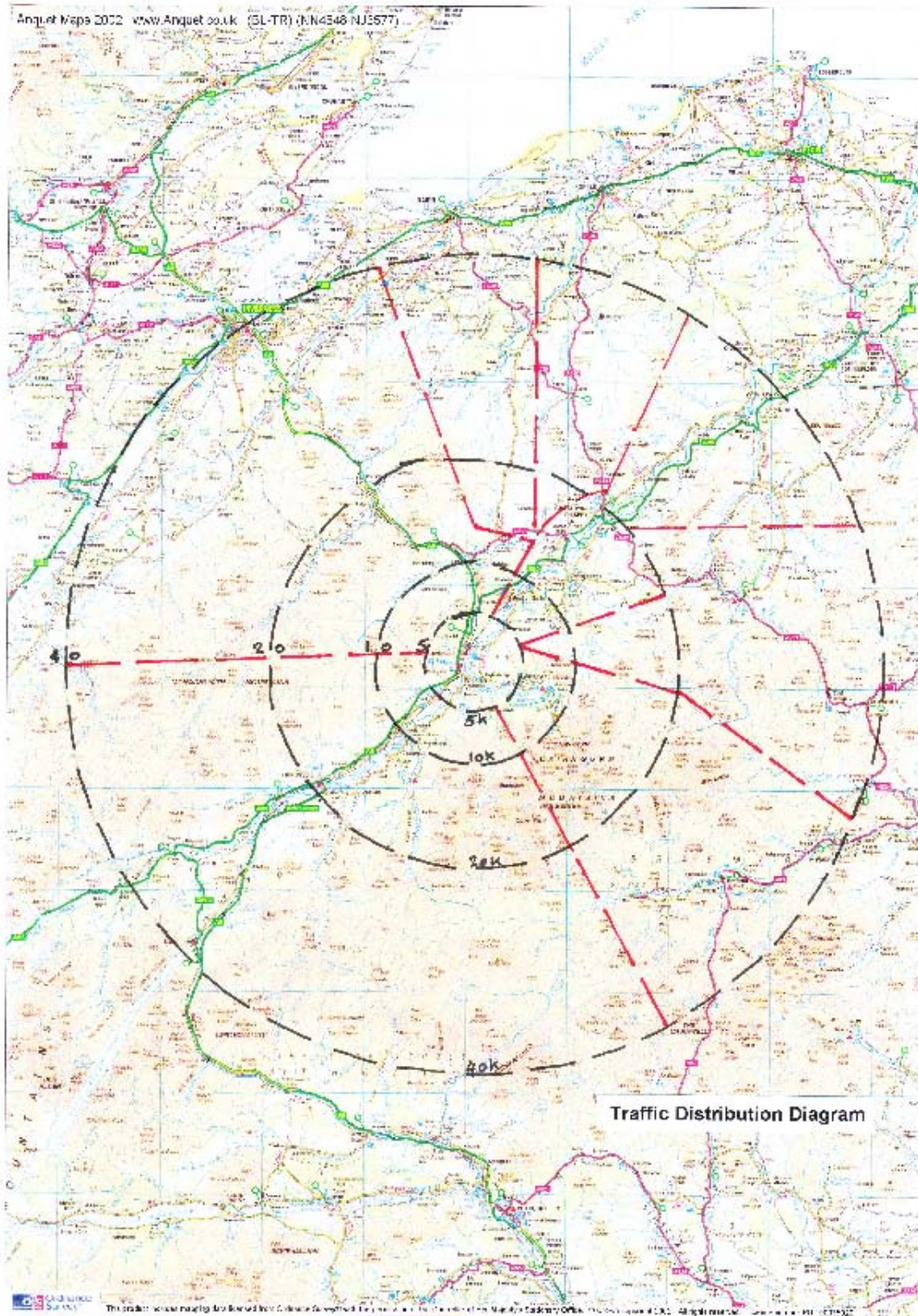
\* All figures in the table were rounded to the nearest whole number. Accordingly, the totals in this table may appear to be incorrect but correspond with the control totals from Table 7.2 above.

**1.7.12** Of the vehicles that are expected to travel further afield, 6.57% would travel between 5 and 10 kilometres. The other 32.44% of traffic would travel to the three destination bands beyond the 10 kilometre distance, ie, 10 – 20 kilometres; 20 – 40 kilometres and beyond 40 kilometres. The boundaries of these bands are shown as black dotted lines or isochrones on the following trip distribution diagram. Each isochrone is a line connecting points that are equidistant from the centre of An Camas Mor.

**1.7.13** The diagram also shows a series of red dotted lines that radiate from An Camas Mor. They represent the ‘traffic watersheds’ between the major traffic routes. For example, for journeys to the south, whether travelling onwards via the A9 or the B9152, all traffic would use the B970 and the B9152 to approach or leave the immediate vicinity of the development. Continuing the example, the figure also shows a straight line from An Camas Mor, heading due west and passing through the Monadhliath Mountains. This represents the traffic watershed between vehicles that would use the A9 route corridor to travel south and those that would use the A9 route corridor to travel north.

**1.7.14** There are three main route corridors shown on the figure, the A9 south, the A95 and the A9 north. These are further sub-divided to reflect the watersheds for more ‘local’ traffic such as the B970. This combination of travel destination bands and route corridors represents the destinations for all development trips travelling more than 10 kilometres for work or study.

### Traffic Distribution Diagram



**Table 1.8 – Peak Hour Vehicular Percentages for the fully completed Residential Development (1500 units) at An Camas Mor by Route Corridor and Isochrone Sector**

<b>ROUTE CORRIDOR</b>	<b>10 KM – 20 KM DISTANCE (14.96%)</b>	<b>20 KM – 40 KM DISTANCE (8.42%)</b>	<b>MORE THAN 40 KM DISTANCE (9.26%)</b>	<b>ROUTE ZONE TOTALS</b>
A9 south	Kingussie – 6%	Newtonmore, Dalwhinnie – 0.25%	Laggan, Blair Atholl, Pitlochry – 1%	7.25%
A95	Grantown – 3.5%	Cromdale, Dava, Logie – 0.17%	Aberlour, Nairn, Forres, Elgin Kinloss – 1.26%	4.93%
B970	Nethy Bridge, Grantown – 4.5%	- 0%	- 0%	4.5%
A9 north	Tomatin – 0.96%	Inverness (central and southern), Balloch, Daviot – 8%	Inverness (north), Black Isle – 7%	15.96%
Total	14.96%	8.42%	9.26%	32.64%

**1.7.15** The percentage figures shown in Table 1.8 are best estimates based on the control totals for the isochrone bands. Other estimates are possible but they would make only marginal differences to the ensuing route zone totals.

**1.7.16** When these percentage figures from Table 1.8 were applied to the total residential trip generation they show that the additional number of vehicle movements would be as follows: -

- A9 south - 9 in-am / 23 out-am / 23 in-pm / 12 out-pm.
- A95 - 6 in-am / 16 out-am / 15 in-pm / 8 out-pm.
- B970 - 6 in-am / 15 out-am / 14 in-pm / 7 out-pm.
- A9 north - 21 in-am / 52 out-am / 50 in-pm / 26 out-pm.

**1.7.17** The overall total amount of traffic that is predicted to be generated by the hotel and by the nursing home, especially during the peak hours, represents a maximum of 34 vehicles per hour. This represents less than 5% of the total traffic generated by the proposed development. As such, any detailed analysis of the trip distribution pattern would be spurious. Therefore, the hotel and the nursing home traffic was taken in the same category as the commercial land-use and distributed accordingly.

**1.7.18** A total of 111 vehicular trips would be attracted to the primary school in the morning peak hour with 78 leaving in the same time period. These represent

**1.7.19** The same would be true of the vehicular movements to the shops which, while there might be some visitors from outside An Camas Mor during the day, would be essentially local movements during the peak hours.

**1.7.20** The distribution of the 'studio/offices' trips was assumed to be in the same proportions as those of the residential trips but in the opposite direction in each peak hour.

**1.7.21** The resulting figures were then summed for all elements of the proposed development. This gave the traffic volumes that are expected to be generated in total by the proposed development on the roads surrounding the proposed development. These figures are shown in Table 1.9 and are represented schematically in Appendix 3.

**Table 1.9 - Total Peak Hour Generated Traffic in Vehicles by Route Corridor.**

	AM IN	AM OUT	AM TOTAL	PM IN	PM OUT	PM TOTAL
Residential	129	324	453	312	166	478
- A9 south	9	23	32	23	12	35
- A95	6	16	22	15	8	23
- B970	6	15	21	14	7	21
- A9 north	21	52	73	50	26	76
- Local	87	218	305	210	112	322
Hotel and nursing home	15	18	33	17	16	34
-.A9 south	1	1	2	1	1	2
-.A95	1	1	2	1	1	2
-.B970	1	1	1	1	1	2
-.A9 north	2	3	5	3	3	5
-.Local	10	12	22	11	11	23
Primary School	111	78	191	5	10	14
-.Local only	111	78	191	5	10	14
Shops etc	83	77	160	91	92	184
- Local only	83	77	160	91	92	184
Studios / offices	62	8	70	7	50	57
-.A9 south	4	1	5	1	4	4
-.A95	3	0	3	0	2	3
-.B970	3	0	3	0	2	3
-.A9 north	10	1	11	1	8	9
-.Local	42	5	47	5	34	38
Totals	400	505	905	432	334	767
- A9 south	29	37	66	31	24	56
- A95	20	25	45	21	16	38
- B970	18	23	41	19	15	35
- A9 north	64	81	144	70	53	122
- Local	269	340	610	291	225	517

- 1.7.22** All the figures in Table 1.9 were rounded to the nearest whole number. Accordingly, the totals in this table may appear to be inconsistent but are correct.
- 1.7.23** These additional traffic flows were added to the flows in the 2028 'base' case to produce the 2028 'design' case. This allowed a comparison to be made of the 'without development' and 'with fully completed development' cases. The traffic figures for the 2028 AM and PM 'design' cases are shown in Appendix 3.

## **Assignment and Assessment of Traffic Impact**

- 1.7.24** The assignment of the predicted two-way generated traffic flows as described above showed that peak flows of 458 vehicles in the AM peak hour and 386 in the PM peak hour would use the B970 from An Camas Mor to the new Aviemore roundabout to travel to or from Aviemore. The additional two-way flows on Grampian Road between the new roundabout and the centre of Aviemore would be 248 vehicles in the morning peak hour and 210 in the evening peak hour.
- 1.7.25** The number of vehicles that would use the B970 to travel to or from the north (the Boat of Garten, Carrbridge and some of the Inverness, Grantown on Spey and Elgin traffic) would be a two-way total of 41 in the morning peak hour and 35 in the evening peak hour.
- 1.7.26** A total of 110 vehicles would join the A9 by means of the B9152 / A9 junction in the morning peak hour. Of these, 81 would turn right to travel in the Inverness-bound direction. The reverse movement from the A9 would extend to 100 vehicles in the evening peak hour. The capacity of the right-turn movement is such that this additional traffic is likely to lead to overloading at peak times.
- 1.7.27** Of the other road sections, the largest increase would be on the B970 between the new 'Aviemore south' roundabout and the An Camas Mor distributor road. This increase would be a two-way total of 458 vehicles in the morning peak hour and a two-way total of 386 in the evening peak hour. These flows would be able to be accommodated satisfactorily without road widening, except to provide additional turning lanes at junctions.

## **Freight**

- 1.7.28** Information regarding freight or other goods traffic (OGV) was extracted from the TRICS database for each of the land-uses contained within the proposed development. The output is contained in Appendix 1 to this report. Numerically, these flows would be insignificant.
- 1.7.29** They are likely to comprise postal and milk deliveries to or from the residential part development. These are likely to be made mainly by small vans and 'transit' type vans.
- 1.7.30** There will be deliveries to the office, shop units and hotel but these are most likely to be made by 'transit' type vans and the slightly larger 'bread' vans. There will also be deliveries to the bar part of the hotel and these will include a 'beer' lorry, probably once per week or less.

## Junctions

**1.7.31** In total, five junctions were examined. These were as follows:

- The junction (at Coylumbridge) of the B970 with the Ski Road;
- The junction (near the sub station) of the B970 with the new distributor road;
- The roundabout junction of the B970 and the B9152 in Aviemore;
- The junction of the B9152 with the A9 link road;
- The junction of the A9 link road with the main A9 trunk road.

**1.7.32** Details of the traffic flows through each of these junctions, in each of the assessment scenario, are given in Appendix 3.

**1.7.33** With one exception, all junctions would operate satisfactorily in the design year. That exception is the junction of the A9 link road with the main A9 trunk road.

**1.7.34** This junction is situated on a high-speed section of the A9 and is designed to permit all movements to take place. The southbound slip road from the link road onto the A9 is of limited length and does not conform to current design guidance, as set out in the Design Manual for Roads and Bridges (DMRB).

**1.7.35** The Scottish Government has plans to improve the whole length of the A9 trunk road to current dual carriageway standards between Perth and Inverness. No firm date has been put on this improvement but it is reasonable to expect that the 'Aviemore' section will be carried out near the beginning of the process because of the relatively large proportions of present-day traffic that either turns into Aviemore or onto the A95 to Elgin. Any such improvement would include major improvements to these junctions.

**1.7.36** The junctions that will be constructed to serve An Camas Mòr will be designed to accommodate the forecast 2028 traffic flows. These include:-

- The site access junctions;
- The junction of the new distributor road with the B970 at the substation entrance;
- The Coylum Bridge junction re-alignment
- As indicated earlier, all of the other junctions were found to be capable of operating in a safe manner without overloading as a result of the An Camas Mor development.

**1.7.37** This was true even in the year 2028 and even with the assumption that all traffic flows will grow at the National Road Traffic Forecast (NRTF), 'High' growth prediction. This represents a very onerous test for any existing road system.

## Road link flows, speeds and HGV percentages

**1.7.38** The predicted traffic flows were converted into 24-hour daily traffic flows on each of the affected road links and the percentage changes that would arise from the implementation of the An Camas Mòr development were calculated. These figures are shown on table 1.10.

**1.7.39** Predictions were also made of the ensuing vehicle speeds and of the heavy goods vehicle percentages. These results are shown on table 1.11 below.

**Table 1.10 – 24-Hour Average Annual Daily Traffic (AADT) flows, in Vehicles per day (total two-way), for road links affected by the proposed new community at An Camas Mor, Aviemore.**

	FROM	TO	2008 FLOW	2028 BASE	2028 DESIGN	%AGE CHANGE
Link						
1) A9 south	Aviemore Southern Junction	South	10900	14650	15200	+3.6%
2) A9 north	Aviemore Southern Junction	North	9200	12400	13200	+6.4%
3) A9 Junction Link Road	A9	B9152	2200	3000	5150	+71.9%
4) B9152 south	A9 junction link rd	South	2100	2850	2850	0
5) B9152	A9 junction link rd	B970	6250	8400	10550	+25.7%
6) B9152 in Aviemore	B970	Aviemore central	6850	9200	14350	+56%
7) B970	B9152	'Sub-Stat' Rd	4000	5400	12700	+135%
8) B970	'Sub-Stat' Rd	Nethy Bridge Rd	2100	2850	2400	-16%
9) B970	Ski Rd	An Camas Mor SE access	350	450	150	-67%
10) B970	An Camas Mor SE access	North	350	450	800	+78%
11) Ski Road	B970	Glenmore	2050	2750	2750	0
12) 'Sub-Stat' Rd	B970	An Camas Mor	0	0	7500	n/a

Note 1 - All figures in the table were rounded to the nearest 50.

Note 2 - 'Base' represents the situation without the An Camas Mor development.

Note 3 - 'Design' represents the situation with the An Camas Mor development.

Note 4 - Growth factors were derived from the National Road Traffic Forecasts (NRTF 1997) using the 'high' forecast.

**Table 1.11 - Two-way, 24-hour, existing and estimated future HGV percentages and average (all vehicle) speeds in mph, for road links affected by the proposed new community at An Camas Mor, Aviemore.**

Link	FROM	TO	2008 HGV %AGES	2028 HGV %AGES	AVERAGE SPEED	
					2008	2028
A9 south	Aviemore Southern Junction	South	16.8	18.6	55	53
A9 north	Aviemore Southern Junction	North	19.0	21.0	55	52
A9 Junction Link Road	A9	B9152	6.4	7.1	24	20
B9152 south	A9 junction link rd	South	2.0	2.6	42	40
B9152	A9 junction link rd	B970	4.7	5.2	45	41
B9152 in Aviemore	B970	Aviemore central	4.7	5.2	28	20
B970	B9152	'Sub-Stat' Rd	2.9	3.2	30	25
B970	'Sub-Stat' Rd	Nethy Bridge Rd	2.9	3.2	35	36
B970	Ski Rd	An Camas Mor SE access	2.0	2.2	32	34
B970	An Camas Mor SE access	North	2.0	2.2	43	40
Ski Road	B970	Glenmore	1.8	1.8	45	40
'Sub-Stat' Rd	B970	An Camas Mor		2.2		35

**Note - Growth factors were derived from surveyed information by the application of the National Road Traffic Forecasts (NRTF 1997) using the 'high' forecast.**

## **1.8 Road Traffic Generation, Distribution, Assignment and Impact Assessment for the Intermediate Assessment Periods**

### **Intermediate Assessment Period 1 – to 2012**

**1.8.1** During this period, some 100 houses would be constructed, of which, 50 would be low-cost. However, the other elements of the planned An Camas Mor development would not be present at this early stage. Specifically, there would not be a hotel, primary school, nursing home, shops or studios / offices.