11.1 APPENDIX TO CHAPTER 11 – Carbon Calculations

Total Construction Emissions tCO2e)	5,646
Lifecycle Years	50
Annualised over project (tCO2e)	112.917

Note: Table 1 and 2 demonstrates an approach used by clients for residential/commercial style developments. We will need pre-construction, construction and operational carbon emissions to be calculated and provided to us in order to complete the climate chapter. These calculations are not in scope for DNV, the client must conduct this exercise or appoint to a carbon consultant and PM. The TII tool is free and can be used to calculate certain activities, however the entire construction and operation of the development must be included for the planning authority. Please provide data in yellow cells.

Table 1

Stage (iGBC)	Stage	GHG Assessment Category	Notes	Predicted GHG Emissions (tCO_2e) Civils Data	Predicted GHG Emissions (tCO_2e) Building Data	Total Predicted GHG Emissions (tCO_2e) Building Data	
A1-A3	Production Stage	Materials	**Carbon Designer 3D (CD3D) by One Click LCA tool should be used to assess the embodied carbon impact of the proposed development.** Embodied carbon is the carbon contained within a material or product. It is the sum of all carbon emissions that have been generated during the extraction, processing, and manufacturing of a particular product. Mitigation will be required as part of the demolition works to reduce the embodied carbon impact. Where possible demolished materials should be re-used on site or sent to a suitably licenced waste facility for re-use on other sites. Brickwork, concrete, steel and glazing are materials which have the potential for very high embodied carbon but also have to potential for recovery or recycling. Specific items should be identified within the Demolition Justification Report and it should also detail whether these can be salvaged and re-used on site or if they are suitable for salvage and re-use off site by providing them to a salvage merchant. A section of the Demolition Justification Report should detail the embodied carbon mitigation measures required for the demolition phase of the development The TII Calculator can also be used for any infrastructure elements but please make sure you are not double counting. This can be used for below ground work, including foundations, roads, paths, drainage, ducting, fil etc. **TII Calculator> Tab Embodied Cabon>Raw Materials Embodied Carbon**	3,838	18,033	21,870	78%
A4	Transportation to site	Material Transport	**TII Calculator> Tab Embodied Cabon> Transport> Add Transport type and Distance** Emissions associated with the carbon miles of the project materials. The impact of transporting materials from factory/source to site to facilitate construction should be reported separately. A series of assumptions are made about the variables that impact transport emissions (material density, vehicle type, vehicle capacity and distance travelled) and assuming that the material may be transported from sources locally within 50km, regionally within 100km and nationally within 250km;	31.23	402.531	434	2%
A5	Site Operations/Construction activities	Clearance and demolition	TII Calculator> Pre-Construction> Clearance and Demolition Activities > Add Activity, Quantity and Unit TII Calculator> Pre-Construction> Land Use Change and Vegetation Loss > Add Vegetation Type, Quantity and Unit TII Calculator> Pre-Construction>Water Use Emissions >Add Activity, Quantity and Unit Site clearance emissions associated with plant and machinery required to clear the site. The carbon tool has a range of assigned land use categories for estimating site clearance. Different land use types have higher or lower carbon intensity for site clearance, which is linked to the energy required to clear the site. This also encompasses any land use/vegetation loss and water used during clearance and demolition.	60.25	141.51581	202	1%
A5	Site Operations/Construction activities	Excavation	**TII Calculator> Construction> Excavation Activities > Add Excavation Sub Category, Activity, Quantity and Unit** Emissions arising from excavation activities based on the energy used in excavation activities. Energy expenditure varies depending on the type of ground to be excavated, e.g., rock excavation is much more energy intensive than topsoil excavation;	25.58	0	26	0%
A5	Site Operations/Construction activities	Construction Worker Travel to Site	**TII Calculator> Construction> Construction Worker Travel to Site > Add Mode of Transport and Total Distance Travelled** Emissions arising from employee commuting to and from the development site.	109.57	0	110	0%
A5	Site Operations/Construction activities	Construction Waste Disposal	**TII Calculator> Construction> Construction Waste Emissions > Add Waste Type, Waste Route, Quantity, Unit, Transport Mode, Distance**	40.47	0	40	0%
A5	Site Operations/Construction activities	Construction Waste Transport	**TII Calculator> Construction> Construction Waste Emissions > Add Waste Type, Waste Route, Quantity, Unit, Transport Mode, Distance**	1.29	0	1	0%
A5	Site Operations/Construction activities	Construction Fuel Use	**TII Calculator> Construction> Construction Activities > Add Activity Category, Energy Type Quantity** Emissions arising from excavation activities based on the energy used in excavation activities. Energy expenditure varies depending on the type of ground to be excavated, e.g., rock excavation is much more energy intensive than topsoil excavation;	1,539.76	1418.78	2,959	11%
B4-B5	Material replacement & refurbishment	Maintenance Material	*** Same calc as production stage only automatically populated at the very end of the design inputs to get to this: Carbon Designer 3D (CD3D) by One Click LCA tool should be used** Maintenance material impact is calculated automatically based upon defined replacement rates of materials during the project's lifetime. The replacement rates are expressed as a percentage of the material initially used for construction.	0	2392.09	2,392	9%
	Total			5,646	22,388	28,033	

Note 1 Project lifespan assumed 50 years for calculation purposes in line with best practice

Note: This data should be captured from BER & DEAP/NEAP data	
Total Operational Emissions tCO2e)	9260.68714
Lifecycle Years	50
Annualised over project (tCO2e)	185.2137428

Table 2

	Unit Type	Number of Units	m2/unit	BER/NEAP RATING	KgCo2/m2/year	Total Kg CO2	Total Tonnes CO2
Example	*Apartment*	*10*	*100*	*A2*	*4.17*	*4170*	*4.17*
	*Studio**	*8*	*38.97*	*A3*	*8.51*	*2653.0776*	*2.6530776*
	*1 Bed**	*56*	*49.11*	*A3*	*9.28*	*25521.4848*	*25.5214848*
	*2 Bed 3P**	*10*	*69.33*	*A3*	*8.26*	*5726.658*	*5.726658*
	*2 Bed 4P**	*114*	*82.68*	*A3*	*8.87*	*83604.3624*	*83.6043624*
	*3 Bed 5P**	*64*	*101.1*	*A3*	*8.1*	*52410.24*	*52.41024*
						0	*0*
	Creche	*1*	*401*	*A3*	*16.4*	*6576.4*	*6.5764*
	Amenity	*1*	*451*	*A3*	*17.5*	*7892.5*	*7.8925*
	Café	*1*	*67.4*	*A3*	*12.3*	*829.02*	*0.82902*
							0
							0

*Based on worst case scenario