Melling — Summary

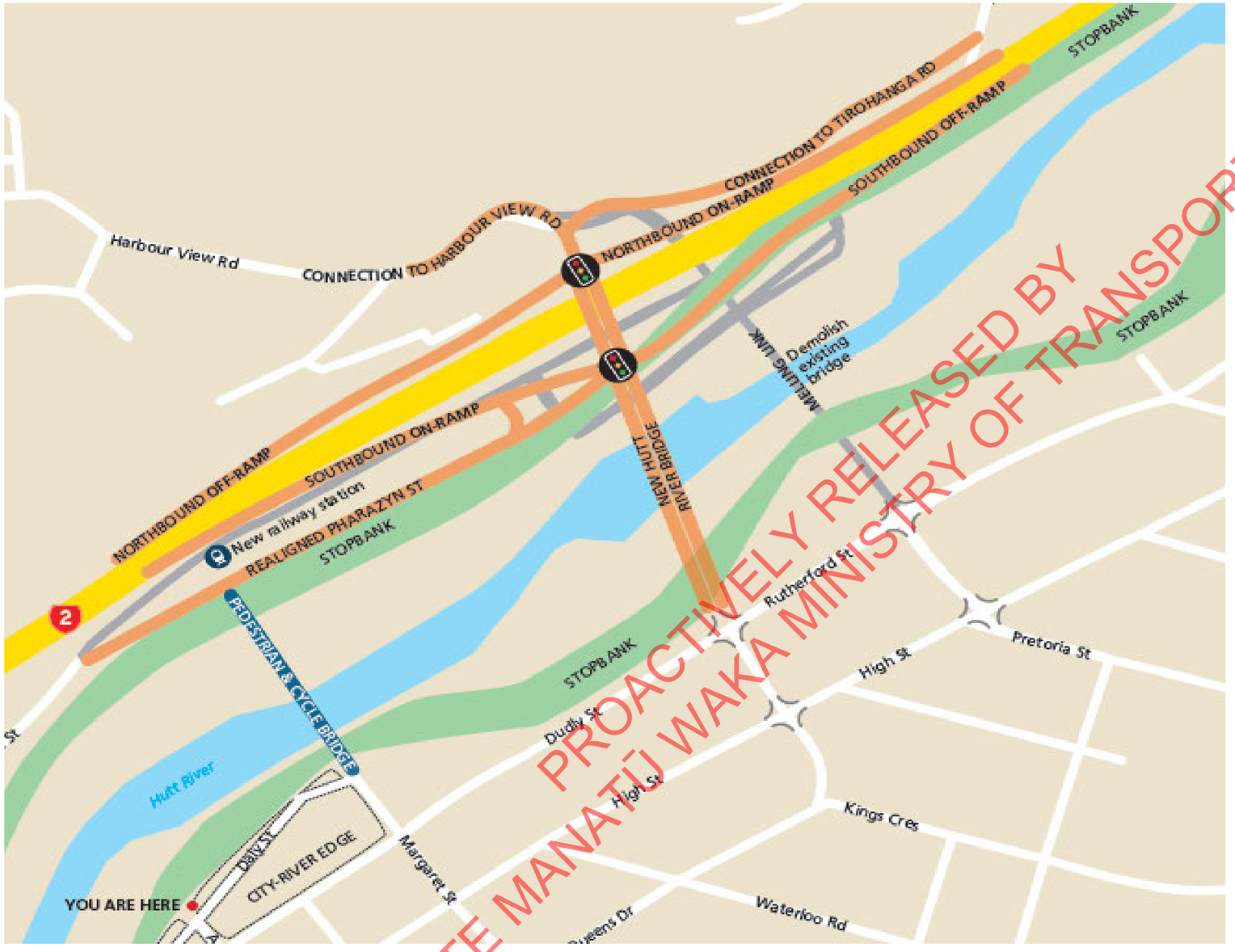
Intersection improvements

Grade separated interchange; new Melling Link and Hutt River Bridge; associated shared paths

			Units	Assumptions and notes
General Project Information				
Construction Start	2023			
Construction Finish Date	2027			Opening year
Do Minimum	**Existing intersection**			
Road Length	0		km	N/A (project comprises bridges and on-ramps)
Number of lanes	0			N/A (project comprises bridges and on-ramps)
Lane kilometres	0		km	N/A (project comprises bridges and on-ramps)
Emissions				
Construction	0		tCO2e	
Cumulative Enabled	395647	2031-2040	tCO2e	Cumulative enabled 'Do Minimum' emissions over the period (see worksheets)
Do Intervention	**Vehicle overbridge of SH2, new river crossing bridge**			
Infrastructure Type	Motorway with Shared Path			
Emissions				
Construction	12,294		tCO2e	Total estimated construction emissions. See Construction worksheet.
Cumulative Enabled	394,827	2031-2040	tCO2e	Cumulative enabled 'Do Intervention' emissions over the period (see worksheets)
Emissions Summary				
Construction	12,294			Total estimated construction emissions. See Construction worksheet.
Enabled Emissions				
Part A Changes in emissions associated with traffic flow				
	2031			
Do Minimum Cumulative Enabled emissions	395,647		tCO2e	Cumulative enabled 'Do Minimum' emissions over the period (see worksheet)
Do Intervention Cumulative Enabled emissions	394,827		tCO2e	Cumulative enabled 'Do Intervention' emissions over the period (see worksheet)
CHANGE IN EMISSIONS, in one year (2031)	-820	2031	tCO2e	
	2031-2040			
CHANGE IN EMISSIONS, in 10 years				See assumptions on enabled worksheet
Cumulative Change in Enabled emissions (2031-2041)	-4,100	2031-2040	tCO2e	Calculation assumes 2031 benefit is eroded over 10 years
Part B - Avoided Emissions from mode shift				
Avoided Emissions from Pedestrians/Cyclists 2031	-16	2031	tCO2e	See assumptions on enabled sheet
Avoided Emissions from Pedestrians/Cyclists 2031-2041	-130	2031-2040	tCO2e	See assumptions on enabled sheet
Total (Part A + Part B)				
Net Change in Enabled Emissions due to Intervention	-4,230	2031-2040	tCO2e	Net cumlative enabled emissions from implemening the intervention.

Project Information Summary

Do minimum = All traffic passes through existing SH2/Melling Link intersection (traffic lights on SH2 at grade)
Do Intervention = SH2 traffic is not required to stop at lights; local traffic uses vehicle overbridge to Melling and across river.
Construction emissions have been calculated based on major intersection components: SH2 southbound on and offramps; new Melling Interchange Bridge and river crossing bridge; work on SH2 alignment.
Works associated with stopbanks and relocation of Melling Train Station are not included in construction emissions.
Changes in enabled emissions arise from reduced congestion on SH2 and the avoided emissions from expected increases in ped/cyclists using the interchange to access Melling Station and Hutt Centre.
The enabled assessment does not include any calcuation of avoided emissions arising from an increase in public transport (train and bus).



Melling

Construction Emissions

Expected construction 2023-2027

Intersection improvements

		Units	Emissions Factor	Unit	Sources and notes
Do Intervention					
Material Quantities Estimate					
Construction Fuel Use					
Diesel	314000	L	0.00269	tCO2e/L	MfE 2020
Construction Materials					
Concrete	36,335	tonnes	0.11	tCO2e/tonne	AECOM derived factor
Steel	2,384	tonnes	2.85	tCO2e/tonne	MfE 2020
Road Surface					
Crushed rock or recycled material		tonnes	0.00315	tCO2e/tonne	IS Calculator NZ v2.0
Gravel	9,288	tonnes	0.0182	tCO2e/tonne	IS Calculator NZ v2.0
Bitumen		tonnes	0.3966	tCO2e/tonne	IS Calculator NZ v2.0
Asphalt	9030	tonnes	0.0542	tCO2e/tonne	IS Calculator NZ v2.2
Project Breakdown Total	12,294	tonnes of CO2e			
Calculated Emissions					
Best estimate of calculated emissions	12,294	tonnes of CO2e			

Assumptions

Emissions for construction have been calculated from data provided by Waka Kotahi for this project. When possible assumptions have been made in a consistent manner to ensure comparability between projects.
Refer to construction schedule worksheet for indicative schedule of quantities of concrete, steel, aggregates, gravels and fuels used during construction.
Based on previous research for Waka Kotahi, only emissions from the largest emission sources from construction of infrastructure projects have been estimated
Materials and works related to bridge abutments have been included where relevant.
Fuel used in the construction is assumed to be 2 litres of diesel for every m3 of earth works (AECOM derived fuel-use ratio).
The following were not included in the estimate: fuel used in quarrying activity; emissions from the transportation of construction materials to/from site.

Emission factors are sourced from MfE's 2020 Guide (see link below) where appropriate, or from the ISCA-IS Calculator v2.0.
https://environment.govt.nz/publications/measuring-emissions-detailed-guide-2020/
The ISCA-IS Calculator v2.0 is available for ISCA members at https://www.isca.org.au/Tools-and-Resources
The emission factor for concrete is based on MfE 2020 guidance and is based on a standard concrete mix.

Melling — Construction Quantities

Construction emissions have been calculated based on major intersection components: SH2 southbound on and offramps; new Melling Interchange Bridge and river crossing bridge; work on SH2 alignment.

Source: Summary quantity data provided by WK (extracted from RiverLink NZUP Design Freeze 1 Estimate, 15 February 2021, by WT Partnership Infrastructure)

1.75

Schedule of Prices

Code	Description	Unit	Quantity	Material: Concrete	Unit	Material: Steel	Unit	Material: Asphalt	Unit	Material: Aggregates	Unit	Material: Fuel	Unit	Assumptions/ Notes
	Main Alignment SH2													
	Earthworks	m3	65,000									130000	L	assume 2l/m3
	Pacement/surfacing	m2	38,000					5700	t					Assume 0.1m depth, 1.5t/m3
	MSE retaining wall	m2	1,350	2362.5	t	186.6375	t			4,860.00	t			Assumed 350 wide Concrete facing and concrete foundation. Assumed 2m high wall, aggregate backfill to full wall height, 2m width. 20% allowance for backfill beyond aggregate
	South bound on ramp SH2													
	Earthworks	m3	62,000.00									124,000.00	L	assume 2l/m3
	Pacement/surfacing	m2	14,000.00					2,100.00	t					Assume 0.1m depth, 1.5t/m3
	MSE retaining wall	m2	570.00	997.5	t	78.8025	t			2,052.00	t			Assumed 350 wide Concrete facing. Assumed 2m high wall, aggregate backfill to full wall height, 2m width. 20% allowance for backfill beyond aggregate
	South bound off ramp SH2													
	Earthworks	m3	30,000.00									60,000.00	L	assume 2l/m3
	Pacement/surfacing	m2	5,000.00					750.00	t					Assume 0.1m depth, 1.5t/m3
	MSE retaining wall	m2	660.00	1155	t	91.245	t			2,376.00	t			Assumed 350 wide Concrete facing. Assumed 2m high wall, aggregate backfill to full wall height, 2m width. 20% allowance for backfill beyond aggregate
	Melling interchange bridge													
	Earthworks m3	m3	0											
	Pavement/surfacing m2	m2	1,600					240	t					Assume 0.1m depth, 1.5t/m3
	Piles (300 sq precast RC) m3	m3	1,400	3500	t									Assume 2.5t/m3 of concrete.
	Super Tee beams 30 m x 1500 deep approx., no	#	14	707.7	t	135.485	t							Volume for 30m span - 24.5m3 Assumed 5% of volume to be steel at 7.9t/m3. Mass from https://www.nationalprecast.com.au/wp-content/uploads/2015/10/Products-Super-Tees.pdf
	40 MPa concrete m3	m3	700	1750	t									Assume 2.5t/m3 of concrete.
	Reinforcement (range 150-250 kg/m3) kg		130,000											
	Precast RC panels (200 mm) m3	m3	200	500	t									Assume 2.5t/m3 of concrete.
	New melling river bridge													
	Earthworks m3	m3	0											
	Pavement/surfacing m2	m2	1,600					240	t					Assume 0.1m depth, 1.5t/m3
	Piles (300 sq precast RC) m3	m3	4,200	10500	t									Assume 2.5t/m3 of concrete.
	Casings (mostly 1200 mm x 25 thick)		480											
	40 MPa concrete m3	m3	5765	14412.5										Assume 2.5t/m3 of concrete.
	Reinforcement (320 kg/m3) kg	kg	1065200			1065.2	t							Assumed to be in kgs already. If in metres, the total
	Reinforcement (100-250 kg/m3) kg	kg	300,100			300.1	t							Assumed to be in kgs already. If in metres, the total
	Super Tee beams 30 m x 1500 deep approx., no	#	38											4 lane highway, https://www.nationalprecast.com.au
	Structural beams 310UC158, ton	tonne	580			526.3	t							1 ton = .907 metric tonnes
	Precast RC panels (200 mm) m3	m3	180	450										Assume 2.5t/m3 of concrete.
			Total	36335.2	t	2383.78579	t	9030	t	9288	t	314000	l	

Melling — Enabled Emissions

Intersection improvements

Part A Changes in emissions associated with traffic flow			Units	Assumptions and notes
Do Minimum	All traffic passes through existing SH2/Melling Link intersection (traffic lights on SH2 at grade)			
Inputs for VEPM				**Source: SH2 Melling Interchange Transport Assessment, Flow Transportation Specialists (Nov 2019)**
Forecast Year	2031	2041		Modelled data only available for 2021 and 2031; 2031 data used as basis of do-intervention over 10 year period 2031-2041.
Morning Peak	43		km/hr	
Inter Peak	58		km/hr	
Evening Peak	44		km/hr	
Outputs from VEPM				
	2031	2041		
Morning Peak Light Vehicle Emission Rate	191		g/km	Source: VEPM6.2
Inter Peak Light Vehicle Emission Rate	175		g/km	
Evening Peak Light Vehicle Emission Rate	190		g/km	
VKT Inputs				
	2031	2041		Source: Annual VKT - see Traffic Modelling worksheet
Annual Morning Peak Light Vehicle VKT	269,643,325		VKT	
Annual Inter Peak Light Vehicle VKT	1,644,243,210		VKT	Includes weekday inter peak and weekend peak and off peak
Annual Evening Peak Light Vehicle VKT	296,992,871		VKT	
Calculated Emissions				
	2031	2041		
Annual Morning Peak Light Vehicle Emissions	51,618		tCO2e	No VKT or speed data available for 2041; note that VKT likely to increase while emissions decrease (through fleet changes).
Annual Inter Peak Light Vehicle Emissions	287,638		tCO2e	
Annual Evening Peak Light Vehicle Emissions	56,391		tCO2e	
Total	395,647		tCO2e	
Do Intervention	SH2 traffic is not required to stop at lights; local traffic uses vehicle overbridge to Melling and across river.			
Inputs for VEPM				**Source: SH2 Melling Interchange Transport Assessment, Flow Transportation Specialists (Nov 2019)**
Forecast Year	2031	2041		
Morning Peak	44		km/hr	Data shows increase in speeds compared with do minimum
Inter Peak	58		km/hr	
Evening Peak	45		km/hr	
Outputs from VEPM				
	2031	2041		
Morning Peak Light Vehicle Emission Rate	190		g/km	Source: VEPM6.2
Inter Peak Light Vehicle Emission Rate	175		g/km	
Evening Peak Light Vehicle Emission Rate	188		g/km	
VKT Inputs				
	2031	2041		No VKT or speed data available for 2041; note that VKT likely to increase while emissions decrease (through fleet changes).
Annual Morning Peak Light Vehicle VKT	269,882,543		VKT	
Annual Inter Peak Light Vehicle VKT	1,645,425,999		VKT	
Annual Evening Peak Light Vehicle VKT	295,845,340		VKT	
Calculated Emissions				
	2031	2041		
Annual Morning Peak Light Vehicle Emissions	51,244		tCO2e	See note above; same approach taken as for do-minimum.
Annual Inter Peak Light Vehicle Emissions	287,845		tCO2e	
Annual Evening Peak Light Vehicle Emissions	55,738		tCO2e	
Total	394,827		tCO2e	
CHANGE IN EMISSIONS, in one year	-820	0	2031	No VKT or speed data available for 2041; as VKT likely to increase while emissions decrease (through fleet changes) calculation assumes that 2031 benefit is eroded to zero over following 10 years.
CHANGE IN EMISSIONS, in 10 years	-4,100		2031-2040	

Part B - Avoided Emissions from mode shift

Inputs for VEPM				**Source: SH2 Melling Interchange Transport Assessment, Flow Transportation Specialists (Nov 2019)**
Forecast Year	2031	2041		
Speed Car	30	30	km/hr	Per Section 7.3: "the Project is expected to enable an increase in walking and cycling trips… in the order of 300 trips per day". Assume this to be combination of recreational and utility. Assumed speed of local trip, to be representative of trip that may be replaced by walking or cycling
Speed LCV			km/hr	
Speed HCV			km/hr	
Speed Bus			km/hr	
Outputs from VEPM				
	2031	2041		
CO2	222	151	g/km	Source: VEPM6.2
VKT Inputs				
Length of average replaced trip	4		km	Assumed distance of local trip
	2031	2041		
Daily number of trips (cycling or walking)	150	225		Assumed number of trips that replace cars For 2031 = 300, of which 50% assumed to be recreational; for 2041, assume 50% increase in trips over 10 year period)
Car diversion rate	0.5	0.3		Assumed rate, assuming some pedestrians/cyclists divert from public transport; car diversion rate expected to decrease over time.
	2031	2041		
Vehicle journeys	-72,600	-65,340	VKT	
Public transport	0	0	VKT	
Cycling or walking	145,200	217,800	VKT	
Calculated Emissions				
	2031	2041		
From vehicle journeys	-16	-10	tCO2e	Estimated change in emissions as a result of modeshift
From public transport	0	0	tCO2e	
From cycling and walking	0	0	tCO2e	
Total	-16	-10	tCO2e	
Cumulative calculated Emissions	2031-2040			
From vehicle journeys	-130		tCO2e	Cumulative change in emissions as result of mode shift, assuming linear change over 10 years
From public Transport	0		tCO2e	

7.3 Provision for Walking and Cycling

The plans provided at Appendix A indicate that the Project will provide facilities for pedestrians and cyclists on the new bridge over the Hutt River, and across the motorway bridge, with crossing facilities to be provided at each of the signalised intersections. A cycle path is also proposed between the motorway and the River, in the vicinity of the interchange.

The relocation of the rail station, to the west, will be required as a result of the Project. A pedestrian and cyclist only bridge is proposed (as part of the Riverlink Project) to cross the river between Pharazyn Street and Rutherford Street, to enable better access between the station and the CBD.

As a result, the Project is expected to enable an increase in walking and cycling trips in the vicinity of the Melling interchange. It is estimated that this will be in the order of 300 trips per day (further discussed in Section 8.3). It is also considered that, coupled with the RiverLink Project, new walking and cycling trips are expected to be even greater.

The number of new pedestrian and cyclists due to the improved facilities have been estimated based on survey data collected in August 2019, and a catchment analysis of the area. It is noted in the survey data that the majority of pedestrians crossing the SH2/Melling intersection are travelling between Melling Link and Melling Train Station. The daily trips have been estimated based on the data collected during the morning (7 am to 10 am), midday/afternoon (2 pm to 4:30 pm) and evening (4:30 pm to 7 pm) peak periods.

Based on the estimates provided in Stantec's Single Stage Business Case report, it is assumed that the improved/new facilities will increase the daily pedestrian trips by 20%[3], and cyclist trips by 50%[4] through the Melling Interchange.

Table 11 below provides the predicted active mode benefits, based on a 6% discount rate and a 40 year evaluation period (assuming a 1 year construction period).

Table 11: Active Modes Benefit Summary ($Thousand)

	Number of New Trips (Daily)	Health Benefit Values (EEM, Table A20.3 and A20.4)[5]	Total Benefits
Walking Trips	260	3.27	727.0
Cyclist Trips	33	1.75	579.0

From cycling and walking	0		tCO2e	
Total Avoided Emissions from Pedestrians/Cyclists	-130		tCO2e	
CHANGE IN EMISSIONS, in one year	-16	2031	tCO2e	
CHANGE IN EMISSIONS, in 10 years	-130	2031-2040	tCO2e	Cumulative change in emissions as result of mode shift, assuming linear change over 10 years

References

Source of emissions factors: Vehicle Emission Prediction Model VEPM6.2
https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/technical-disciplines/air-quality-climate/planning-and-assessment/vehicle-emissions-prediction-model/

Melling

Source: EEM Melling Transport Improv Economics_SATURN_report_2019Runs_EEM Update2020 60years capped 40years FINAL.xlsx

SCENARIO				TRAVEL TIME					CRV FACTOR				
SCHEME	PERIOD	PERIODS PER DAY (hrs/day)	DAYS days/year	on links (hours)	on turns (hours)	TOTAL (hours)	TIME VALUE ($/veh.hr)	ANNUAL TRAVEL TIME COST ($/year)	CONGESTION on links and turns (veh.km/hr)	CONGESTION VALUE ($/hour)	ANNUAL CONGESTION COST ($/year)	TOTAL (veh.km/hr)	MEAN SPEED (km/h)
DM	Morning Peak	2	245	8351	2242	10593	$23.30	$120,935,611	3359	$5.98	$9,833,763	505200	48
DM	Inter Peak	9	245	4782	708	5489	$27.64	$334,582,192	793	$5.54	$9,689,155	318774	58
DM	Evening Peak	2	245	9047	2401	11448	$23.04	$129,234,366	3508	$5.84	$10,031,790	552722	48
DM	Off Peak	11	245	1137	168	1305	$22.99	$80,851,830	188	$5.67	$2,877,550	75775	58
DM	Weekend Peak	11	120	5090	753	5844	$21.70	$167,382,373	844	$6.56	$7,307,239	339373	58
DM	Weekend Off Peak	13	120	1149	40	1189	$21.70	$40,251,036	190	$6.56	$1,948,716	76581	64
2021 Total								**$873,237,407**			**$41,688,214**		
DM	Morning Peak	2	245	9478	3311	12789	$23.30	$146,017,833	4921	$5.98	$14,407,354	550293	43
DM	Inter Peak	9	245	5321	811	6132	$27.64	$373,768,757	941	$5.54	$11,505,718	355459	58
DM	Evening Peak	2	245	10264	3533	13797	$23.04	$155,750,665	5107	$5.84	$14,605,397	606108	44
DM	Off Peak	11	245	1265	193	1458	$22.99	$90,321,268	224	$5.67	$3,417,045	84495	58
DM	Weekend Peak	11	120	5665	864	6528	$21.70	$186,986,346	1002	$6.56	$8,677,232	378429	58
DM	Weekend Off Peak	13	120	1278	195	1473	$21.70	$49,866,078	226	$6.56	$2,314,070	85394	58
2031 Total								**$1,002,710,947**			**$54,926,817**		
Option 1	Morning Peak	2	245	8343	2139	10482	$23.30	$119,678,588	3253	$5.98	$9,523,997	505790	48
Option 1	Inter Peak	9	245	4779	683	5461	$27.64	$332,887,704	766	$5.54	$9,367,650	319028	58
Option 1	Evening Peak	2	245	8991	2172	11163	$23.04	$126,014,795	3279	$5.84	$9,378,582	551426	49
Option 1	Off Peak	11	245	1136	162	1298	$22.99	$80,442,356	182	$5.67	$2,782,067	75835	58
Option 1	Weekend Peak	11	120	5087	727	5814	$21.70	$166,534,667	816	$6.56	$7,064,771	339644	58
Option 1	Weekend Off Peak	13	120	1148	164	1312	$21.70	$44,411,963	184	$6.56	$1,884,054	76642	58
2021 Total								**$869,970,073**			**$40,001,121**		
Option 1	Morning Peak	2	245	9490	3032	12522	$23.30	$142,962,618	4664	$5.98	$13,654,605	550781	44
Option 1	Inter Peak	9	245	5317	784	6101	$27.64	$371,848,743	912	$5.54	$11,143,872	355715	58
Option 1	Evening Peak	2	245	10182	3213	13395	$23.04	$151,212,561	4773	$5.84	$13,650,465	603766	45
Option 1	Off Peak	11	245	1264	186	1450	$22.99	$89,857,296	217	$5.67	$3,309,582	84556	58
Option 1	Weekend Peak	11	120	5661	834	6495	$21.70	$186,025,815	971	$6.56	$8,404,340	378701	58
Option 1	Weekend Off Peak	13	120	1277	188	1466	$21.70	$49,609,921	219	$6.56	$2,241,294	85456	58
2031 Total								**$991,516,955**			**$52,404,158**		

VEHICLE OPERATING COST

OPERATING COST ($/veh.km)	FUEL COST WHILE STOPPED (cents/minute)	ANNUAL VOC COST ($/year)
$0.29	2.00	$ 74,129,852
$0.29	2.00	$ 205,990,830
$0.29	2.00	$ 80,834,340
$0.29	2.00	$ 59,846,611
$0.29	2.00	$ 131,282,926
$0.29	2.00	$ 34,873,803
		$586,958,363
$0.30	2.00	$ 82,324,858
$0.29	2.00	$ 229,755,580
$0.30	2.00	$ 90,607,863
$0.29	2.00	$ 66,750,995
$0.29	2.00	$ 146,428,774
$0.29	2.00	$ 39,050,063
		$654,918,134
$0.29	2.00	$ 73,936,596
$0.29	2.00	$ 206,088,008
$0.29	2.00	$ 80,275,795
$0.29	2.00	$ 59,874,844
$0.29	2.00	$ 131,344,860
$0.29	2.00	$ 35,027,440
		$586,547,543
$0.30	2.00	$ 82,231,834
$0.29	2.00	$ 229,845,865
$0.30	2.00	$ 89,426,988
$0.29	2.00	$ 66,777,225
$0.29	2.00	$ 146,486,315
$0.29	2.00	$ 39,065,408
		$653,833,635

VKT		VKT for CIPA	
VKT/year		VKT/year	
247,548,000	am		
702,896,229	interpeak		
270,833,829	pm		
204,212,766	interpeak		
447,972,725	interpeak		
119,466,706	interpeak		
269,643,325	am	269,643,325	
783,787,316	interpeak	1,644,243,210	Total interpeak (including weekends)
296,992,871	pm	296,992,871	
227,714,091	interpeak		
499,526,566	interpeak		
133,215,238	interpeak		
VKT/year			
247,837,247	am		
703,457,402	interpeak		
270,198,887	pm		
204,375,804	interpeak		
448,330,373	interpeak		
119,562,084	interpeak		
269,882,543	am	269,882,543	
784,351,134	interpeak	1,645,425,999	Total interpeak (including weekends)
295,845,340	pm	295,845,340	
227,877,897	interpeak		
499,885,901	interpeak		
133,311,067	interpeak		

Melling Traffic Modelling Methodology and Assumptions

Guideline and Supporting information on methodology for transport modelling

Waka Kotahi Guidelines for transport model development

Research Report 659 Urban transport modelling in New Zealand – data, practice and resourcing

Name of Project	**NZUP Melling Interchange**
Traffic Consultant	Flow Transportation Specialists Ltd
Report (if available)	SH2 Melling Interchange - Transport Assessment of Preferred Option
Model Software	SATURN https://saturnsoftware2.co.uk/
Model	North Wellington SATURN Model.The North Wellington SATURN model (NWSM) was developed by Jacobs. It has been used for the assessment of several transport projects, including the Transmission Gully and Petone to Grenada projects.
	The changes in forecast demands (between the base and forecast models) in the NWSM are derived from the Wellington Transport Strategic Model (WTSM).
Model validation	The model was satisfactorily validated to a base year of 2011.
Time horizons and growth assumptions	This study has used forecasts for 2021 and 2031. Details of the network assumptions relevant to this assessment are included below. An annual growth rate of 1% has been applied to the modelled decongestion values, based on the projected population growth in the area
Network assumptions and interdependencies	Away from the Melling Interchange, the SATURN model includes the assumed completion of the Transmission Gully project (assumed to be complete by 2021). The Petone to Grenada project was assumed to be complete by 2031 in the previous study, however it has now been excluded from the regional network for this assessment.
Model Scenario Assumptions **Do Minimum**	At the Melling interchange itself, the Do Minimum scenario assumed within the SATURN model is the existing layout.
Model Scenario Assumptions **Do Intervention/With Project**	The Project will include a diamond interchange at Melling (i.e. two signalised intersections, which will operate under one controller). These will be located to the west of the existing SH2 intersections with a new bridge passing over the Hutt River to tie into the intersection of Rutherford Street/Queens Drive. Tirohanga Road would tie into Harbour View Road, to the east of the motorway, with Harbour View Road forming the northern leg at the diamond interchange. On the south western side, Block Road/Pharazyn Street would tie into the southern intersection as a fifth arm. At a more local level, various roundabouts within the Lower Hutt City Centre have been assumed to change to signal control, based on layout plans provided by Stantec.
Induced Traffic	The SATURN model indicates that the project will lead to traffic being attracted into the Melling area. This is reflected in the increases in the total numbers of vehicles for the 2031 scenario with the Project.
Interface with Vehicle Emission Prediction Model (Where relevant)	n/a traffic mode ling provided flow/speed data only, which was incorporated into the CIPA spreadsheet and VEPM emissions factors entered manually
General assumptions/Limitations	

Transport model development guidelines (nzta.govt.nz)

https://www.nzta.govt.nz/assets/resources/research/reports/659/659-urban-transport-modelling-in-new-zealand-data-practice-and-resourcing.pdf

Run	Fleet average emissions fa				
	CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km
1	0.44950	225.01100	0.01928	0.36018	0.07440
2	0.43477	204.64438	0.01677	0.30507	0.06692
3	0.45079	223.10899	0.01915	0.35534	0.07370
4	0.21260	165.76117	0.00658	0.13910	0.02745
5	0.20941	151.34437	0.00582	0.11693	0.02471
6	0.21322	164.42178	0.00654	0.13716	0.02719
7	0.45079	223.10899	0.01915	0.35534	0.07370
8	0.43477	204.64438	0.01677	0.30507	0.06692
9	0.45225	221.30605	0.01904	0.35098	0.07303
10	0.21322	164.42178	0.00654	0.13716	0.02719
11	0.20941	151.34437	0.00582	0.11693	0.02471
12	0.21390	163.15332	0.00650	0.13536	0.02694
13	0.44605	261.68818	0.02170	0.44792	0.08735
14	0.44605	261.68818	0.02170	0.44792	0.08735
15	0.44605	261.68818	0.02170	0.44792	0.08735
16	0.21065	191.82786	0.00735	0.17424	0.03224
17	0.21065	191.82786	0.00735	0.17424	0.03224
18	0.21065	191.82786	0.00735	0.17424	0.03224

Year	CO2-e g/km	CO2-e g/km	CO2-e g/km	
2031	191.4291	723.9224	579.9212	
2031	174.9364	646.9039	512.1606	Light
2031	189.8744	716.8489	574.4417	Heavy
2041	131.5259	700.0872	530.7707	Bus
2041	121.0534	625.1624	468.1266	
2041	130.5348	693.3009	525.7743	
2031	189.8744	716.8489	574.4417	
2031	174.9364	646.9039	512.1606	
2031	188.4034	710.1016	569.2152	
2041	130.5348	693.3009	525.7743	
2041	121.0534	625.1624	468.1266	
2041	129.5995	686.8240	521.0105	
2031	221.5255			
2031	221.5255			
2031	221.5255			
2041	151.0192			
2041	151.0192			
2041	151.0192			

The Vehicle Emissions Prediction Model (VEPM) has been developed by Waka Kotal
Auckland Council to predict emissions from vehicles in the New Zealand fleet unde
operating conditions. The model provides estimates that are suitable for air quality
emissions inventories.

Since its release in 2008, VEPM has been successfully used in Auckland and around vehicle emissions in air quality assessments for road projects. An important feature estimate changes to vehicle emissions in future years (out to 2050).

VEPM is a password protected Excel spreadsheet which is publicly available upon r summary of the previous and current versions of VEPM are provided below.

actors			Year	Speed Car	Speed LCV	Speed HCV
PM2.5 E g/km	PM B&T g/km	FC l/100km				
0.00924	0.02698	9.01682	2031	43	43	43
0.00807	0.02188	8.21203	2031	58	58	58
0.00913	0.02664	8.93963	2031	44	44	44
0.00310	0.02630	6.59351	2041	43	43	43
0.00266	0.02133	6.03412	2041	58	58	58
0.00306	0.02597	6.53958	2041	44	44	44
0.00913	0.02664	8.93963	2031	44	44	44
0.00807	0.02178	8.21203	2031	58.3	58.3	58.3
0.00902	0.02626	8.86644	2031	45.1	45.1	45.1
0.00306	0.02597	6.53958	2041	44	44	44
0.00266	0.02123	6.03412	2041	58.3	58.3	58.3
0.00303	0.02561	6.48849	2041	45.1	45.1	45.1
0.01141	0.02799	10.50368	2031	30	30	30
0.01141	0.02799	10.50368	2031	30	30	30
0.01141	0.02799	10.50368	2031	30	30	30
0.00378	0.02729	7.64192	2041	30	30	30
0.00378	0.02729	7.64192	2041	30	30	30
0.00378	0.02729	7.64192	2041	30	30	30

2031	2031	2031	2041	2041	2041	2031
191.4291	174.9364	189.8744	131.5259	121.0534	130.5348	189.8744
723.9224	646.9039	716.8489	700.0872	625.1624	693.3009	716.8489
579.9212	512.1606	574.4417	530.7707	468.1266	525.7743	574.4417

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Speed Bus	PM B&T size	% VKT Light Duty Vehicles <3					
		Car petrol	Car diesel	Car hybrid	Car plugin hybrid	Car electric	LCV petrol
43	PM10	51.25%	6.48%	10.69%	1.26%	3.54%	2.64%
58	PM10	51.25%	6.48%	10.69%	1.26%	3.54%	2.64%
44	PM10	51.25%	6.48%	10.69%	1.26%	3.54%	2.64%
43	PM10	31.70%	3.72%	10.55%	2.66%	24.25%	2.26%
58	PM10	31.70%	3.72%	10.55%	2.66%	24.25%	2.26%
44	PM10	31.70%	3.72%	10.55%	2.66%	24.25%	2.26%
44	PM10	51.25%	6.48%	10.69%	1.26%	3.54%	2.64%
58.3	PM10	51.25%	6.48%	10.69%	1.26%	3.54%	2.64%
45.1	PM10	51.25%	6.48%	10.69%	1.26%	3.54%	2.64%
44	PM10	31.70%	3.72%	10.55%	2.66%	24.25%	2.26%
58.3	PM10	31.70%	3.72%	10.55%	2.66%	24.25%	2.26%
45.1	PM10	31.70%	3.72%	10.55%	2.66%	24.25%	2.26%
30	PM10	51.25%	6.48%	10.69%	1.26%	3.54%	2.64%
30	PM10	51.25%	6.48%	10.69%	1.26%	3.54%	2.64%
30	PM10	51.25%	6.48%	10.69%	1.26%	3.54%	2.64%
30	PM10	31.70%	3.72%	10.55%	2.66%	24.25%	2.26%
30	PM10	31.70%	3.72%	10.55%	2.66%	24.25%	2.26%
30	PM10	31.70%	3.72%	10.55%	2.66%	24.25%	2.26%

2031	2031	2041	2041	2041
174.9364	188.4034	130.5348	121.0534	129.5995
646.9039	710.1016	693.3009	625.1624	686.8240
512.1606	569.2152	525.7743	468.1266	521.0105

EPM 6.2

Current version of the model [ZIP, 22 MB]

Changes to the previous version VEPM 6.1 released in 2020 include:

- Updating the fleet profile based on updated vehicle kilometres travelled (VKT

the Vehicle Fleet Emission Model (VFEM3) provided by Ministry of Transport

- Revising the assumed date of introduction of Euro 6/VI standards in VEPM
- Improving the assumptions in VEPM to split heavy commercial vehicle VKT be and articulated truck categories
- Providing methane (CH4) and nitrous oxide (N2O) emission factors and calcu carbon dioxide equivalent (CO2-e) emission factors
- Incorporating updated emission factors from the latest version of COPERT (th standard vehicle emissions calculator)
- Updating degradation factors for light duty vehicle carbon monoxide (CO) an oxides (NOX) emissions
- Updating light duty gradient correction factors.

.5t						
LCV diesel	LCV hybrid	LCV plugin hybrid	LCV electric	Rigid 3.5-7.5t	Rigid 7.5-10t	Rigid 10-20t
16.89%	0.17%	0.07%	0.48%	1.20%	0.29%	0.33%
16.89%	0.17%	0.07%	0.48%	1.20%	0.29%	0.33%
16.89%	0.17%	0.07%	0.48%	1.20%	0.29%	0.33%
13.80%	0.26%	0.19%	4.31%	1.08%	0.25%	0.30%
13.80%	0.26%	0.19%	4.31%	1.08%	0.25%	0.30%
13.80%	0.26%	0.19%	4.31%	1.08%	0.25%	0.30%
16.89%	0.17%	0.07%	0.48%	1.20%	0.29%	0.33%
16.89%	0.17%	0.07%	0.48%	1.20%	0.29%	0.33%
16.89%	0.17%	0.07%	0.48%	1.20%	0.29%	0.33%
13.80%	0.26%	0.19%	4.31%	1.08%	0.25%	0.30%
13.80%	0.26%	0.19%	4.31%	1.08%	0.25%	0.30%
13.80%	0.26%	0.19%	4.31%	1.08%	0.25%	0.30%
16.89%	0.17%	0.07%	0.48%	1.20%	0.29%	0.33%
16.89%	0.17%	0.07%	0.48%	1.20%	0.29%	0.33%
16.89%	0.17%	0.07%	0.48%	1.20%	0.29%	0.33%
13.80%	0.26%	0.19%	4.31%	1.08%	0.25%	0.30%
13.80%	0.26%	0.19%	4.31%	1.08%	0.25%	0.30%
13.80%	0.26%	0.19%	4.31%	1.08%	0.25%	0.30%

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% VKT HCV >3.5t					
Rigid 20-25t	Rigid 25-30t	Rigid >30t	Articulated 14-20t	Articulated 20-28t	Articulated 28-34t
0.30%	0.03%	1.23%	0.02%	0.04%	0.24%
0.30%	0.03%	1.23%	0.02%	0.04%	0.24%
0.30%	0.03%	1.23%	0.02%	0.04%	0.24%
0.25%	0.07%	1.12%	0.02%	0.04%	0.23%
0.25%	0.07%	1.12%	0.02%	0.04%	0.23%
0.25%	0.07%	1.12%	0.02%	0.04%	0.23%
0.30%	0.03%	1.23%	0.02%	0.04%	0.24%
0.30%	0.03%	1.23%	0.02%	0.04%	0.24%
0.30%	0.03%	1.23%	0.02%	0.04%	0.24%
0.25%	0.07%	1.12%	0.02%	0.04%	0.23%
0.25%	0.07%	1.12%	0.02%	0.04%	0.23%
0.25%	0.07%	1.12%	0.02%	0.04%	0.23%
0.30%	0.03%	1.23%	0.02%	0.04%	0.24%
0.30%	0.03%	1.23%	0.02%	0.04%	0.24%
0.30%	0.03%	1.23%	0.02%	0.04%	0.24%
0.25%	0.07%	1.12%	0.02%	0.04%	0.23%
0.25%	0.07%	1.12%	0.02%	0.04%	0.23%
0.25%	0.07%	1.12%	0.02%	0.04%	0.23%

			% VKT Electric HCV		% VKT B	
Articulated 34-40t	Articulated 40-50t	Articulated >50t	<10t	>10t	Urban <=15t	Urban 15-18t
0.21%	1.16%	0.59%	0.03%	0.04%	0.32%	0.33%
0.21%	1.16%	0.59%	0.03%	0.04%	0.32%	0.33%
0.21%	1.16%	0.59%	0.03%	0.04%	0.32%	0.33%
0.20%	1.03%	0.53%	0.11%	0.14%	0.35%	0.34%
0.20%	1.03%	0.53%	0.11%	0.14%	0.35%	0.34%
0.20%	1.03%	0.53%	0.11%	0.14%	0.35%	0.34%
0.21%	1.16%	0.59%	0.03%	0.04%	0.32%	0.33%
0.21%	1.16%	0.59%	0.03%	0.04%	0.32%	0.33%
0.21%	1.16%	0.59%	0.03%	0.04%	0.32%	0.33%
0.20%	1.03%	0.53%	0.11%	0.14%	0.35%	0.34%
0.20%	1.03%	0.53%	0.11%	0.14%	0.35%	0.34%
0.20%	1.03%	0.53%	0.11%	0.14%	0.35%	0.34%
0.21%	1.16%	0.59%	0.03%	0.04%	0.32%	0.33%
0.21%	1.16%	0.59%	0.03%	0.04%	0.32%	0.33%
0.21%	1.16%	0.59%	0.03%	0.04%	0.32%	0.33%
0.20%	1.03%	0.53%	0.11%	0.14%	0.35%	0.34%
0.20%	1.03%	0.53%	0.11%	0.14%	0.35%	0.34%
0.20%	1.03%	0.53%	0.11%	0.14%	0.35%	0.34%

uses >3.5t		Avg trip length	Amb temp	Petrol type	Diesel type	Cold start?
Coaches <=18t	Elec buses	km	°C	0to 6	0to 5	yes/no
0.08%	0.07%	9.1	13.1	7	5	1
0.08%	0.07%	9.1	13.1	7	5	1
0.08%	0.07%	9.1	13.1	7	5	1
0.09%	0.14%	9.1	13.1	7	5	1
0.09%	0.14%	9.1	13.1	7	5	1
0.09%	0.14%	9.1	13.1	7	5	1
0.08%	0.07%	9.1	13.1	7	5	1
0.08%	0.07%	9.1	13.1	7	5	1
0.08%	0.07%	9.1	13.1	7	5	1
0.09%	0.14%	9.1	13.1	7	5	1
0.09%	0.14%	9.1	13.1	7	5	1
0.09%	0.14%	9.1	13.1	7	5	1
0.08%	0.07%	9.1	13.1	7	5	1
0.08%	0.07%	9.1	13.1	7	5	1
0.08%	0.07%	9.1	13.1	7	5	1
0.09%	0.14%	9.1	13.1	7	5	1
0.09%	0.14%	9.1	13.1	7	5	1
0.09%	0.14%	9.1	13.1	7	5	1

Degradation?	% Cats old car	% Cats new	% Grade	% Load		
yes/no	0-100%	0-100%	-6to 6%	0-100%	**Rigid 3.5-7.5t**	**Rigid 7.5-10t**
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2
1	0%	0%	0%	50%	2	2

HCV number of axles								
Rigid 10-20t	Rigid 20-25t	Rigid 25-30t	Rigid >30t	Articulated 14-20t	Articulated 20-28t	Articulated 28-34t	Articulated 34-40t	Articulated 40-50t
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8
3	4	5	6	5	6	6	7	8

	Petrol Cars					
Articulated >50t	CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km
9	0.6092	212.3747	0.0202	0.0762	0.0023	0.0013
9	0.6642	191.0834	0.0188	0.0635	0.0019	0.0010
9	0.6177	210.4123	0.0202	0.0753	0.0023	0.0013
9	0.4928	212.8761	0.0110	0.0568	0.0014	0.0011
9	0.5140	191.6079	0.0103	0.0463	0.0012	0.0009
9	0.4972	210.9162	0.0110	0.0561	0.0014	0.0010
9	0.6177	210.4123	0.0202	0.0753	0.0023	0.0013
9	0.6642	191.0834	0.0188	0.0635	0.0019	0.0010
9	0.6264	208.5479	0.0203	0.0749	0.0023	0.0013
9	0.4972	210.9162	0.0110	0.0561	0.0014	0.0010
9	0.5140	191.6079	0.0103	0.0463	0.0012	0.0009
9	0.5017	209.0540	0.0110	0.0555	0.0014	0.0010
9	0.5130	249.6446	0.0207	0.0898	0.0027	0.0014
9	0.5130	249.6446	0.0207	0.0898	0.0027	0.0014
9	0.5130	249.6446	0.0207	0.0898	0.0027	0.0014
9	0.4413	250.0568	0.0109	0.0682	0.0017	0.0012
9	0.4413	250.0568	0.0109	0.0682	0.0017	0.0012
9	0.4413	250.0568	0.0109	0.0682	0.0017	0.0012

		Diesel Cars					
PM B&T g/km	FC l/100km	CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km
0.0204	9.0075	0.0766	225.9388	0.0106	0.4637	0.1833	0.0211
0.0165	8.1165	0.0530	208.6331	0.0081	0.4078	0.1606	0.0192
0.0202	8.9237	0.0747	224.3058	0.0104	0.4587	0.1813	0.0209
0.0204	9.0347	0.0385	225.8916	0.0025	0.2248	0.0859	0.0079
0.0165	8.1448	0.0290	208.1444	0.0020	0.1969	0.0751	0.0069
0.0202	8.9510	0.0378	224.2598	0.0025	0.2224	0.0849	0.0078
0.0202	8.9237	0.0747	224.3058	0.0104	0.4587	0.1813	0.0209
0.0164	8.1165	0.0530	208.6331	0.0081	0.4078	0.1606	0.0192
0.0199	8.8441	0.0728	222.7685	0.0102	0.4538	0.1793	0.0207
0.0202	8.9510	0.0378	224.2598	0.0025	0.2224	0.0849	0.0078
0.0164	8.1448	0.0290	208.1444	0.0020	0.1969	0.0751	0.0069
0.0199	8.8715	0.0371	222.7236	0.0024	0.2200	0.0840	0.0077
0.0212	10.5991	0.1070	258.6160	0.0148	0.5491	0.2179	0.0243
0.0212	10.5991	0.1070	258.6160	0.0148	0.5491	0.2179	0.0243
0.0212	10.5991	0.1070	258.6160	0.0148	0.5491	0.2179	0.0243
0.0212	10.6225	0.0496	258.5402	0.0035	0.2664	0.1020	0.0093
0.0212	10.6225	0.0496	258.5402	0.0035	0.2664	0.1020	0.0093
0.0212	10.6225	0.0496	258.5402	0.0035	0.2664	0.1020	0.0093

		Petrol LCVs						
PM B&T g/km	FC l/100km	CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km
0.0204	8.4014	2.4090	220.1199	0.0656	0.1106	0.0038	0.0012	0.0320
0.0165	7.7962	1.2376	187.0871	0.0461	0.1040	0.0036	0.0011	0.0259
0.0202	8.3398	2.3356	217.3081	0.0649	0.1103	0.0038	0.0012	0.0316
0.0204	8.3996	1.1114	188.8177	0.0112	0.0467	0.0011	0.0008	0.0320
0.0165	7.7947	0.9220	164.0796	0.0099	0.0413	0.0010	0.0009	0.0259
0.0202	8.3380	1.0996	186.6078	0.0112	0.0463	0.0011	0.0008	0.0316
0.0202	8.3398	2.3356	217.3081	0.0649	0.1103	0.0038	0.0012	0.0316
0.0164	7.7962	1.2376	187.0871	0.0461	0.1040	0.0036	0.0011	0.0258
0.0199	8.2818	2.2626	214.6020	0.0642	0.1098	0.0038	0.0012	0.0312
0.0202	8.3380	1.0996	186.6078	0.0112	0.0463	0.0011	0.0008	0.0316
0.0164	7.7947	0.9220	164.0796	0.0099	0.0413	0.0010	0.0009	0.0258
0.0199	8.2801	1.0884	184.4961	0.0112	0.0459	0.0011	0.0008	0.0312
0.0212	9.6344	3.3128	268.0443	0.0725	0.1178	0.0041	0.0010	0.0332
0.0212	9.6344	3.3128	268.0443	0.0725	0.1178	0.0041	0.0010	0.0332
0.0212	9.6344	3.3128	268.0443	0.0725	0.1178	0.0041	0.0010	0.0332
0.0212	9.6315	1.3153	228.8436	0.0115	0.0533	0.0012	0.0006	0.0332
0.0212	9.6315	1.3153	228.8436	0.0115	0.0533	0.0012	0.0006	0.0332
0.0212	9.6315	1.3153	228.8436	0.0115	0.0533	0.0012	0.0006	0.0332

	Diesel LCVs							
FC l/100km	CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km
9.2553	0.0683	232.1038	0.0138	0.7804	0.2633	0.0144	0.0320	8.6356
7.8855	0.0586	217.3548	0.0121	0.7547	0.2538	0.0132	0.0259	8.1280
9.1352	0.0671	230.5901	0.0137	0.7772	0.2622	0.0142	0.0316	8.5785
8.0169	0.0250	232.2150	0.0035	0.3945	0.1296	0.0058	0.0320	8.6384
6.9844	0.0215	218.9364	0.0030	0.3842	0.1255	0.0053	0.0259	8.2030
7.9225	0.0246	230.8797	0.0034	0.3931	0.1291	0.0058	0.0316	8.5880
9.1352	0.0671	230.5901	0.0137	0.7772	0.2622	0.0142	0.0316	8.5785
7.8855	0.0586	217.3548	0.0121	0.7547	0.2538	0.0132	0.0258	8.1280
9.0196	0.0659	229.1776	0.0135	0.7742	0.2611	0.0140	0.0312	8.5252
7.9225	0.0246	230.8797	0.0034	0.3931	0.1291	0.0058	0.0316	8.5880
6.9844	0.0215	218.9364	0.0030	0.3842	0.1255	0.0053	0.0258	8.2030
7.8324	0.0242	229.6402	0.0034	0.3918	0.1286	0.0057	0.0312	8.5413
11.3019	0.0916	263.5486	0.0160	0.8444	0.2858	0.0187	0.0332	9.8221
11.3019	0.0916	263.5486	0.0160	0.8444	0.2858	0.0187	0.0332	9.8221
11.3019	0.0916	263.5486	0.0160	0.8444	0.2858	0.0187	0.0332	9.8221
9.7262	0.0336	261.2433	0.0040	0.4235	0.1400	0.0074	0.0332	9.7337
9.7262	0.0336	261.2433	0.0040	0.4235	0.1400	0.0074	0.0332	9.7337
9.7262	0.0336	261.2433	0.0040	0.4235	0.1400	0.0074	0.0332	9.7337

Hybrid (cars and LCVs)							
CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km
0.0410	90.6522	0.0008	0.0102	0.0003	0.0013	0.0204	3.8458
0.0289	90.4917	0.0006	0.0140	0.0004	0.0008	0.0165	3.8588
0.0399	90.5504	0.0008	0.0105	0.0003	0.0013	0.0202	3.8414
0.0410	90.6522	0.0008	0.0102	0.0003	0.0013	0.0204	3.8458
0.0289	90.4917	0.0006	0.0140	0.0004	0.0008	0.0165	3.8588
0.0399	90.5504	0.0008	0.0105	0.0003	0.0013	0.0202	3.8414
0.0399	90.5504	0.0008	0.0105	0.0003	0.0013	0.0202	3.8414
0.0289	90.4917	0.0006	0.0140	0.0004	0.0008	0.0164	3.8588
0.0389	90.4661	0.0008	0.0108	0.0003	0.0013	0.0199	3.8378
0.0399	90.5504	0.0008	0.0105	0.0003	0.0013	0.0202	3.8414
0.0289	90.4917	0.0006	0.0140	0.0004	0.0008	0.0164	3.8588
0.0389	90.4661	0.0008	0.0108	0.0003	0.0013	0.0199	3.8378
0.0624	93.5646	0.0011	0.0057	0.0002	0.0013	0.0212	3.9701
0.0624	93.5646	0.0011	0.0057	0.0002	0.0013	0.0212	3.9701
0.0624	93.5646	0.0011	0.0057	0.0002	0.0013	0.0212	3.9701
0.0624	93.5646	0.0011	0.0057	0.0002	0.0013	0.0212	3.9701
0.0624	93.5646	0.0011	0.0057	0.0002	0.0013	0.0212	3.9701
0.0624	93.5646	0.0011	0.0057	0.0002	0.0013	0.0212	3.9701

Plug in hybrid (cars and LCVs)							
CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km
0.0197	43.5131	0.0004	0.0049	0.0001	0.0006	0.0204	1.8460
0.0139	43.4360	0.0003	0.0067	0.0002	0.0004	0.0165	1.8522
0.0192	43.4642	0.0004	0.0050	0.0002	0.0006	0.0202	1.8439
0.0197	43.5131	0.0004	0.0049	0.0001	0.0006	0.0204	1.8460
0.0139	43.4360	0.0003	0.0067	0.0002	0.0004	0.0165	1.8522
0.0192	43.4642	0.0004	0.0050	0.0002	0.0006	0.0202	1.8439
0.0192	43.4642	0.0004	0.0050	0.0002	0.0006	0.0202	1.8439
0.0139	43.4360	0.0003	0.0067	0.0002	0.0004	0.0164	1.8522
0.0187	43.4237	0.0004	0.0052	0.0002	0.0006	0.0199	1.8422
0.0192	43.4642	0.0004	0.0050	0.0002	0.0006	0.0202	1.8439
0.0139	43.4360	0.0003	0.0067	0.0002	0.0004	0.0164	1.8522
0.0187	43.4237	0.0004	0.0052	0.0002	0.0006	0.0199	1.8422
0.0299	44.9110	0.0005	0.0027	0.0001	0.0006	0.0212	1.9057
0.0299	44.9110	0.0005	0.0027	0.0001	0.0006	0.0212	1.9057
0.0299	44.9110	0.0005	0.0027	0.0001	0.0006	0.0212	1.9057
0.0299	44.9110	0.0005	0.0027	0.0001	0.0006	0.0212	1.9057
0.0299	44.9110	0.0005	0.0027	0.0001	0.0006	0.0212	1.9057
0.0299	44.9110	0.0005	0.0027	0.0001	0.0006	0.0212	1.9057

Electric (cars and LCVs)							
CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0204	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0165	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0202	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0204	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0165	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0202	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0202	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0164	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0199	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0202	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0164	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0199	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0212	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0212	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0212	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0212	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0212	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0212	0.0000

HCV Rigid 3.5-7.5t							
CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km
0.3285	276.0704	0.0289	1.1063	0.1204	0.0347	0.0320	10.2453
0.3061	271.6951	0.0233	0.8376	0.0934	0.0310	0.0259	10.0544
0.3260	274.9363	0.0284	1.0825	0.1179	0.0344	0.0316	10.2025
0.1858	278.0258	0.0143	0.5374	0.0558	0.0141	0.0320	10.2957
0.1692	272.6186	0.0119	0.3571	0.0377	0.0125	0.0259	10.0733
0.1842	276.9130	0.0141	0.5218	0.0542	0.0140	0.0316	10.2537
0.3260	274.9363	0.0284	1.0825	0.1179	0.0344	0.0316	10.2025
0.3061	271.6951	0.0233	0.8376	0.0934	0.0310	0.0258	10.0544
0.3237	273.9285	0.0280	1.0596	0.1156	0.0340	0.0312	10.1645
0.1842	276.9130	0.0141	0.5218	0.0542	0.0140	0.0316	10.2537
0.1692	272.6186	0.0119	0.3571	0.0377	0.0125	0.0258	10.0733
0.1827	275.9130	0.0139	0.5068	0.0527	0.0138	0.0312	10.2160
0.3896	304.8863	0.0370	1.5386	0.1647	0.0411	0.0332	11.3326
0.3896	304.8863	0.0370	1.5386	0.1647	0.0411	0.0332	11.3326
0.3896	304.8863	0.0370	1.5386	0.1647	0.0411	0.0332	11.3326
0.2204	305.3035	0.0179	0.8149	0.0837	0.0166	0.0332	11.3249
0.2204	305.3035	0.0179	0.8149	0.0837	0.0166	0.0332	11.3249
0.2204	305.3035	0.0179	0.8149	0.0837	0.0166	0.0332	11.3249

HCV Rigid 7.5-10t							
CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km
0.6184	419.8451	0.0566	2.0244	0.2199	0.0626	0.0320	15.6732
0.5496	393.3805	0.0453	1.5179	0.1684	0.0550	0.0259	14.6488
0.6119	416.9352	0.0556	1.9807	0.2154	0.0619	0.0316	15.5634
0.3157	419.2237	0.0227	0.9359	0.0973	0.0227	0.0320	15.6249
0.2757	391.2445	0.0187	0.6373	0.0673	0.0197	0.0259	14.5496
0.3122	416.2302	0.0224	0.9105	0.0947	0.0224	0.0316	15.5120
0.6119	416.9352	0.0556	1.9807	0.2154	0.0619	0.0316	15.5634
0.5496	393.3805	0.0453	1.5179	0.1684	0.0550	0.0258	14.6488
0.6058	414.2101	0.0547	1.9388	0.2111	0.0612	0.0312	15.4605
0.3122	416.2302	0.0224	0.9105	0.0947	0.0224	0.0316	15.5120
0.2757	391.2445	0.0187	0.6373	0.0673	0.0197	0.0258	14.5496
0.3088	413.4182	0.0220	0.8861	0.0923	0.0222	0.0312	15.4059
0.7548	480.5222	0.0741	2.8081	0.3006	0.0769	0.0332	17.9626
0.7548	480.5222	0.0741	2.8081	0.3006	0.0769	0.0332	17.9626
0.7548	480.5222	0.0741	2.8081	0.3006	0.0769	0.0332	17.9626
0.3843	480.3552	0.0288	1.3848	0.1426	0.0276	0.0332	17.9315
0.3843	480.3552	0.0288	1.3848	0.1426	0.0276	0.0332	17.9315
0.3843	480.3552	0.0288	1.3848	0.1426	0.0276	0.0332	17.9315

HCV Rigid 10-20t							
CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km
0.7130	554.2367	0.0705	2.6793	0.2840	0.0655	0.0785	20.5537
0.6113	504.0562	0.0567	1.9910	0.2135	0.0562	0.0626	18.5989
0.7038	549.5272	0.0693	2.6233	0.2783	0.0646	0.0775	20.3760
0.3257	552.3063	0.0327	1.1283	0.1160	0.0230	0.0785	20.4386
0.2737	502.6478	0.0269	0.7953	0.0825	0.0195	0.0626	18.5240
0.3211	547.7128	0.0321	1.1009	0.1133	0.0227	0.0775	20.2653
0.7038	549.5272	0.0693	2.6233	0.2783	0.0646	0.0775	20.3760
0.6113	504.0562	0.0567	1.9910	0.2135	0.0562	0.0623	18.5989
0.6950	545.0513	0.0682	2.5692	0.2727	0.0638	0.0763	20.2071
0.3211	547.7128	0.0321	1.1009	0.1133	0.0227	0.0775	20.2653
0.2737	502.6478	0.0269	0.7953	0.0825	0.0195	0.0623	18.5240
0.3166	543.3460	0.0317	1.0744	0.1106	0.0224	0.0763	20.1005
0.8963	648.0253	0.0932	3.6511	0.3842	0.0825	0.0817	24.0924
0.8963	648.0253	0.0932	3.6511	0.3842	0.0825	0.0817	24.0924
0.8963	648.0253	0.0932	3.6511	0.3842	0.0825	0.0817	24.0924
0.4152	643.9700	0.0423	1.6137	0.1651	0.0289	0.0817	23.8972
0.4152	643.9700	0.0423	1.6137	0.1651	0.0289	0.0817	23.8972
0.4152	643.9700	0.0423	1.6137	0.1651	0.0289	0.0817	23.8972

HCV Rigid 20-25t							
CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km
0.8811	698.3144	0.0838	3.0063	0.3241	0.0852	0.0877	25.9887
0.7611	622.0061	0.0667	2.2349	0.2444	0.0726	0.0708	23.0507
0.8701	691.4059	0.0823	2.9406	0.3173	0.0840	0.0866	25.7281
0.3559	697.1117	0.0393	1.0782	0.1135	0.0252	0.0877	25.8976
0.3031	620.7165	0.0320	0.7594	0.0811	0.0212	0.0708	22.9781
0.3513	690.2642	0.0387	1.0510	0.1108	0.0249	0.0866	25.6393
0.8701	691.4059	0.0823	2.9406	0.3173	0.0840	0.0866	25.7281
0.7611	622.0061	0.0667	2.2349	0.2444	0.0726	0.0704	23.0507
0.8596	684.8139	0.0809	2.8774	0.3107	0.0829	0.0853	25.4794
0.3513	690.2642	0.0387	1.0510	0.1108	0.0249	0.0866	25.6393
0.3031	620.7165	0.0320	0.7594	0.0811	0.0212	0.0704	22.9781
0.3468	683.7287	0.0380	1.0248	0.1081	0.0245	0.0853	25.3927
1.0984	831.4098	0.1118	4.1888	0.4469	0.1087	0.0911	31.0106
1.0984	831.4098	0.1118	4.1888	0.4469	0.1087	0.0911	31.0106
1.0984	831.4098	0.1118	4.1888	0.4469	0.1087	0.0911	31.0106
0.4436	828.9727	0.0515	1.5735	0.1641	0.0319	0.0911	30.8729
0.4436	828.9727	0.0515	1.5735	0.1641	0.0319	0.0911	30.8729
0.4436	828.9727	0.0515	1.5735	0.1641	0.0319	0.0911	30.8729

HCV Rigid 25-30t							
CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km
0.8503	743.6184	0.0685	2.7704	0.2938	0.0745	0.0969	27.6882
0.7234	664.7030	0.0552	1.9964	0.2146	0.0634	0.0790	24.6486
0.8390	736.5476	0.0673	2.7057	0.2872	0.0735	0.0957	27.4215
0.3923	745.0203	0.0410	1.0832	0.1119	0.0261	0.0969	27.7013
0.3275	665.6057	0.0334	0.7524	0.0784	0.0220	0.0790	24.6672
0.3868	737.9645	0.0404	1.0554	0.1091	0.0258	0.0957	27.4351
0.8390	736.5476	0.0673	2.7057	0.2872	0.0735	0.0957	27.4215
0.7234	664.7030	0.0552	1.9964	0.2146	0.0634	0.0786	24.6486
0.8283	729.7889	0.0662	2.6434	0.2808	0.0726	0.0944	27.1664
0.3868	737.9645	0.0404	1.0554	0.1091	0.0258	0.0957	27.4351
0.3275	665.6057	0.0334	0.7524	0.0784	0.0220	0.0786	24.6672
0.3814	731.2201	0.0397	1.0285	0.1063	0.0254	0.0944	27.1806
1.0663	877.6260	0.0899	3.9163	0.4118	0.0931	0.1004	32.7445
1.0663	877.6260	0.0899	3.9163	0.4118	0.0931	0.1004	32.7445
1.0663	877.6260	0.0899	3.9163	0.4118	0.0931	0.1004	32.7445
0.4943	878.8549	0.0533	1.5820	0.1624	0.0328	0.1004	32.7510
0.4943	878.8549	0.0533	1.5820	0.1624	0.0328	0.1004	32.7510
0.4943	878.8549	0.0533	1.5820	0.1624	0.0328	0.1004	32.7510

HCV Rigid >30t								
CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km	CO g/km
0.8693	849.9438	0.0606	2.4255	0.2561	0.0650	0.1060	31.4904	0.8047
0.7490	755.9158	0.0487	1.7255	0.1846	0.0553	0.0871	27.8504	0.6954
0.8586	841.4878	0.0595	2.3653	0.2500	0.0642	0.1048	31.1713	0.7947
0.3618	851.2991	0.0455	0.8774	0.0902	0.0244	0.1060	31.4829	0.4174
0.3072	756.4649	0.0369	0.6000	0.0622	0.0204	0.0871	27.8532	0.3538
0.3570	842.8641	0.0448	0.8535	0.0878	0.0240	0.1048	31.1647	0.4118
0.8586	841.4878	0.0595	2.3653	0.2500	0.0642	0.1048	31.1713	0.7947
0.7490	755.9158	0.0487	1.7255	0.1846	0.0553	0.0868	27.8504	0.6954
0.8484	833.4030	0.0585	2.3075	0.2441	0.0633	0.1034	30.8663	0.7851
0.3570	842.8641	0.0448	0.8535	0.0878	0.0240	0.1048	31.1647	0.4118
0.3072	756.4649	0.0369	0.6000	0.0622	0.0204	0.0868	27.8532	0.3538
0.3525	834.7997	0.0441	0.8306	0.0854	0.0237	0.1034	30.8604	0.4065
1.0755	1010.0856	0.0801	3.5285	0.3690	0.0816	0.1098	37.5327	1.0063
1.0755	1010.0856	0.0801	3.5285	0.3690	0.0816	0.1098	37.5327	1.0063
1.0755	1010.0856	0.0801	3.5285	0.3690	0.0816	0.1098	37.5327	1.0063
0.4525	1011.2059	0.0598	1.3168	0.1345	0.0309	0.1098	37.5164	0.5233
0.4525	1011.2059	0.0598	1.3168	0.1345	0.0309	0.1098	37.5164	0.5233
0.4525	1011.2059	0.0598	1.3168	0.1345	0.0309	0.1098	37.5164	0.5233

HCV Articulated 14-20t							
CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km	CO g/km
543.7598	0.0783	3.0076	0.3301	0.0865	0.0969	20.1916	0.8755
489.8879	0.0629	2.2986	0.2558	0.0755	0.0790	18.0996	0.7499
538.7987	0.0770	2.9472	0.3237	0.0854	0.0957	20.0044	0.8639
543.3615	0.0304	1.3689	0.1469	0.0300	0.0969	20.1246	0.3958
489.9284	0.0250	0.9915	0.1081	0.0257	0.0790	18.0598	0.3318
538.4881	0.0300	1.3369	0.1436	0.0296	0.0957	19.9407	0.3901
538.7987	0.0770	2.9472	0.3237	0.0854	0.0957	20.0044	0.8639
489.8879	0.0629	2.2986	0.2558	0.0755	0.0786	18.0996	0.7499
534.0708	0.0757	2.8892	0.3177	0.0844	0.0944	19.8260	0.8528
538.4881	0.0300	1.3369	0.1436	0.0296	0.0957	19.9407	0.3901
489.9284	0.0250	0.9915	0.1081	0.0257	0.0786	18.0598	0.3318
533.8417	0.0295	1.3061	0.1405	0.0292	0.0944	19.7654	0.3847
640.1514	0.1033	4.0922	0.4444	0.1091	0.1004	23.8285	1.1061
640.1514	0.1033	4.0922	0.4444	0.1091	0.1004	23.8285	1.1061
640.1514	0.1033	4.0922	0.4444	0.1091	0.1004	23.8285	1.1061
638.0313	0.0395	1.9437	0.2061	0.0373	0.1004	23.6966	0.5039
638.0313	0.0395	1.9437	0.2061	0.0373	0.1004	23.6966	0.5039
638.0313	0.0395	1.9437	0.2061	0.0373	0.1004	23.6966	0.5039

HCV Articulated 20-28t							
CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km	CO g/km
705.1663	0.0704	2.8301	0.3067	0.0821	0.1060	26.2561	0.8898
628.3232	0.0566	2.0979	0.2305	0.0707	0.0871	23.2977	0.7564
698.3001	0.0692	2.7675	0.3002	0.0810	0.1048	25.9970	0.8775
705.0538	0.0360	1.1068	0.1172	0.0275	0.1060	26.2078	0.3969
628.3653	0.0294	0.7917	0.0850	0.0231	0.0871	23.2748	0.3308
698.2411	0.0354	1.0797	0.1145	0.0271	0.1048	25.9507	0.3911
698.3001	0.0692	2.7675	0.3002	0.0810	0.1048	25.9970	0.8775
628.3232	0.0566	2.0979	0.2305	0.0707	0.0868	23.2977	0.7564
691.7339	0.0681	2.7075	0.2940	0.0800	0.1034	25.7493	0.8659
698.2411	0.0354	1.0797	0.1145	0.0271	0.1048	25.9507	0.3911
628.3653	0.0294	0.7917	0.0850	0.0231	0.0868	23.2748	0.3308
691.7274	0.0349	1.0538	0.1118	0.0267	0.1034	25.7049	0.3855
834.8556	0.0928	3.9625	0.4247	0.1039	0.1098	31.1494	1.1303
834.8556	0.0928	3.9625	0.4247	0.1039	0.1098	31.1494	1.1303
834.8556	0.0928	3.9625	0.4247	0.1039	0.1098	31.1494	1.1303
833.9917	0.0467	1.6009	0.1678	0.0347	0.1098	31.0727	0.5072
833.9917	0.0467	1.6009	0.1678	0.0347	0.1098	31.0727	0.5072
833.9917	0.0467	1.6009	0.1678	0.0347	0.1098	31.0727	0.5072

HCV Articulated 28-34t								
CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km	CO g/km	CO2-e g/km
753.8932	0.0713	2.8242	0.3075	0.0858	0.1060	27.9133	1.0516	870.1613
670.4802	0.0576	2.0966	0.2314	0.0735	0.0871	24.6738	0.9024	763.9688
746.3783	0.0701	2.7618	0.3009	0.0847	0.1048	27.6298	1.0378	860.7089
755.3617	0.0366	1.0829	0.1152	0.0284	0.1060	27.8971	0.4369	869.6060
671.3977	0.0300	0.7803	0.0841	0.0238	0.0871	24.6690	0.3692	763.9307
747.9044	0.0360	1.0568	0.1126	0.0280	0.1048	27.6157	0.4310	860.2600
746.3783	0.0701	2.7618	0.3009	0.0847	0.1048	27.6298	1.0378	860.7089
670.4802	0.0576	2.0966	0.2314	0.0735	0.0868	24.6738	0.9024	763.9688
739.1916	0.0690	2.7019	0.2947	0.0836	0.1034	27.3586	1.0247	851.6570
747.9044	0.0360	1.0568	0.1126	0.0280	0.1048	27.6157	0.4310	860.2600
671.3977	0.0300	0.7803	0.0841	0.0238	0.0868	24.6690	0.3692	763.9307
740.7676	0.0355	1.0318	0.1100	0.0276	0.1034	27.3464	0.4253	851.3150
895.5572	0.0937	3.9623	0.4263	0.1084	0.1098	33.2585	1.3247	1046.4788
895.5572	0.0937	3.9623	0.4263	0.1084	0.1098	33.2585	1.3247	1046.4788
895.5572	0.0937	3.9623	0.4263	0.1084	0.1098	33.2585	1.3247	1046.4788
895.1219	0.0475	1.5627	0.1645	0.0358	0.1098	33.1704	0.5482	1044.7814
895.1219	0.0475	1.5627	0.1645	0.0358	0.1098	33.1704	0.5482	1044.7814
895.1219	0.0475	1.5627	0.1645	0.0358	0.1098	33.1704	0.5482	1044.7814

HCV Articulated 34-40t								
VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km	CO g/km	CO2-e g/km	VOC g/km
0.0896	3.2731	0.3575	0.1035	0.1152	32.2548	1.0612	970.6192	0.0802
0.0709	2.4475	0.2710	0.0876	0.0953	28.1485	0.9115	852.6101	0.0640
0.0879	3.2021	0.3501	0.1020	0.1139	31.8981	1.0474	960.1327	0.0788
0.0445	1.1767	0.1265	0.0313	0.1152	32.1529	0.4350	971.2856	0.0470
0.0359	0.8422	0.0920	0.0261	0.0953	28.1056	0.3679	853.0348	0.0380
0.0438	1.1478	0.1236	0.0308	0.1139	31.8003	0.4292	960.8724	0.0462
0.0879	3.2021	0.3501	0.1020	0.1139	31.8981	1.0474	960.1327	0.0788
0.0709	2.4475	0.2710	0.0876	0.0949	28.1485	0.9115	852.6101	0.0640
0.0864	3.1340	0.3430	0.1006	0.1124	31.5566	1.0344	950.0913	0.0775
0.0438	1.1478	0.1236	0.0308	0.1139	31.8003	0.4292	960.8724	0.0462
0.0359	0.8422	0.0920	0.0261	0.0949	28.1056	0.3679	853.0348	0.0380
0.0431	1.1202	0.1207	0.0304	0.1124	31.4628	0.4235	950.9013	0.0454
0.1199	4.5746	0.4937	0.1324	0.1192	38.9074	1.3401	1166.2537	0.1066
0.1199	4.5746	0.4937	0.1324	0.1192	38.9074	1.3401	1166.2537	0.1066
0.1199	4.5746	0.4937	0.1324	0.1192	38.9074	1.3401	1166.2537	0.1066
0.0588	1.7075	0.1812	0.0399	0.1192	38.7625	0.5457	1165.6811	0.0617
0.0588	1.7075	0.1812	0.0399	0.1192	38.7625	0.5457	1165.6811	0.0617
0.0588	1.7075	0.1812	0.0399	0.1192	38.7625	0.5457	1165.6811	0.0617

HCV Articulated 40-50t						
NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km	CO g/km	CO2-e g/km
2.9741	0.3229	0.0959	0.1244	36.0262	1.2298	1172.2340
2.1923	0.2414	0.0809	0.1035	31.4728	1.0414	1026.1389
2.9065	0.3159	0.0945	0.1230	35.6306	1.2127	1159.2994
1.0598	0.1125	0.0309	0.1244	35.9800	0.4988	1175.5920
0.7549	0.0813	0.0258	0.1035	31.4605	0.4148	1029.1092
1.0333	0.1098	0.0305	0.1230	35.5871	0.4915	1162.7551
2.9065	0.3159	0.0945	0.1230	35.6306	1.2127	1159.2994
2.1923	0.2414	0.0809	0.1031	31.4728	1.0414	1026.1389
2.8418	0.3091	0.0932	0.1215	35.2517	1.1965	1146.9136
1.0333	0.1098	0.0305	0.1230	35.5871	0.4915	1162.7551
0.7549	0.0813	0.0258	0.1031	31.4605	0.4148	1029.1092
1.0080	0.1072	0.0301	0.1215	35.2109	0.4845	1150.4578
4.2241	0.4530	0.1218	0.1286	43.4077	1.5723	1413.1414
4.2241	0.4530	0.1218	0.1286	43.4077	1.5723	1413.1414
4.2241	0.4530	0.1218	0.1286	43.4077	1.5723	1413.1414
1.5510	0.1629	0.0394	0.1286	43.3148	0.6353	1413.9421
1.5510	0.1629	0.0394	0.1286	43.3148	0.6353	1413.9421
1.5510	0.1629	0.0394	0.1286	43.3148	0.6353	1413.9421

HCV Articulated >50t								
VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km	CO g/km	CO2-e g/km	VOC g/km
0.0881	3.1764	0.3448	0.1027	0.1336	43.6240	0.0000	0.0000	0.0000
0.0705	2.3442	0.2579	0.0867	0.1117	38.0099	0.0000	0.0000	0.0000
0.0866	3.1044	0.3373	0.1012	0.1321	43.1360	0.0000	0.0000	0.0000
0.0558	1.1251	0.1190	0.0347	0.1336	43.6786	0.0000	0.0000	0.0000
0.0451	0.8087	0.0865	0.0289	0.1117	38.0941	0.0000	0.0000	0.0000
0.0549	1.0976	0.1162	0.0342	0.1321	43.1942	0.0000	0.0000	0.0000
0.0866	3.1044	0.3373	0.1012	0.1321	43.1360	0.0000	0.0000	0.0000
0.0705	2.3442	0.2579	0.0867	0.1113	38.0099	0.0000	0.0000	0.0000
0.0851	3.0354	0.3301	0.0998	0.1305	42.6686	0.0000	0.0000	0.0000
0.0549	1.0976	0.1162	0.0342	0.1321	43.1942	0.0000	0.0000	0.0000
0.0451	0.8087	0.0865	0.0289	0.1113	38.0941	0.0000	0.0000	0.0000
0.0540	1.0713	0.1135	0.0337	0.1305	42.7302	0.0000	0.0000	0.0000
0.1168	4.5149	0.4840	0.1322	0.1379	52.7137	0.0000	0.0000	0.0000
0.1168	4.5149	0.4840	0.1322	0.1379	52.7137	0.0000	0.0000	0.0000
0.1168	4.5149	0.4840	0.1322	0.1379	52.7137	0.0000	0.0000	0.0000
0.0733	1.6372	0.1714	0.0442	0.1379	52.6718	0.0000	0.0000	0.0000
0.0733	1.6372	0.1714	0.0442	0.1379	52.6718	0.0000	0.0000	0.0000
0.0733	1.6372	0.1714	0.0442	0.1379	52.6718	0.0000	0.0000	0.0000

HCV Electric								Buses Ur
NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km	CO g/km	CO2-e g/km	VOC g/km	NOx g/km
0.0000	0.0000	0.0000	0.0584	0.0000	0.6809	526.2121	0.0413	1.8462
0.0000	0.0000	0.0000	0.0467	0.0000	0.5618	473.6514	0.0354	1.3780
0.0000	0.0000	0.0000	0.0577	0.0000	0.6700	521.9785	0.0407	1.8039
0.0000	0.0000	0.0000	0.0589	0.0000	0.3328	524.6139	0.0246	0.8843
0.0000	0.0000	0.0000	0.0471	0.0000	0.2765	471.1388	0.0211	0.6398
0.0000	0.0000	0.0000	0.0581	0.0000	0.3274	520.3480	0.0242	0.8623
0.0000	0.0000	0.0000	0.0577	0.0000	0.6700	521.9785	0.0407	1.8039
0.0000	0.0000	0.0000	0.0465	0.0000	0.5618	473.6514	0.0354	1.3780
0.0000	0.0000	0.0000	0.0568	0.0000	0.6596	517.9828	0.0402	1.7635
0.0000	0.0000	0.0000	0.0581	0.0000	0.3274	520.3480	0.0242	0.8623
0.0000	0.0000	0.0000	0.0468	0.0000	0.2765	471.1388	0.0211	0.6398
0.0000	0.0000	0.0000	0.0572	0.0000	0.3224	516.3245	0.0239	0.8413
0.0000	0.0000	0.0000	0.0608	0.0000	0.8993	609.4308	0.0530	2.6292
0.0000	0.0000	0.0000	0.0608	0.0000	0.8993	609.4308	0.0530	2.6292
0.0000	0.0000	0.0000	0.0608	0.0000	0.8993	609.4308	0.0530	2.6292
0.0000	0.0000	0.0000	0.0612	0.0000	0.4398	608.0928	0.0318	1.2894
0.0000	0.0000	0.0000	0.0612	0.0000	0.4398	608.0928	0.0318	1.2894
0.0000	0.0000	0.0000	0.0612	0.0000	0.4398	608.0928	0.0318	1.2894

ban <15t				Buses Urban 15-18t				
NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km	CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km
0.1934	0.0475	0.0320	19.4468	0.9277	696.7930	0.0686	2.7966	0.3068
0.1451	0.0424	0.0259	17.8663	0.7515	610.5429	0.0553	2.0787	0.2308
0.1890	0.0470	0.0316	19.2871	0.9120	690.0098	0.0674	2.7321	0.3000
0.0897	0.0213	0.0320	19.3499	0.4553	695.0353	0.0328	1.1836	0.1245
0.0651	0.0188	0.0259	17.7743	0.3685	607.4873	0.0269	0.8448	0.0898
0.0875	0.0210	0.0316	19.1890	0.4477	688.2689	0.0322	1.1534	0.1215
0.1890	0.0470	0.0316	19.2871	0.9120	690.0098	0.0674	2.7321	0.3000
0.1451	0.0424	0.0258	17.8663	0.7515	610.5429	0.0553	2.0787	0.2308
0.1849	0.0464	0.0312	19.1363	0.8970	683.5078	0.0662	2.6704	0.2935
0.0875	0.0210	0.0316	19.1890	0.4477	688.2689	0.0322	1.1534	0.1215
0.0651	0.0188	0.0258	17.7743	0.3685	607.4873	0.0269	0.8448	0.0898
0.0854	0.0208	0.0312	19.0372	0.4404	681.7822	0.0317	1.1245	0.1185
0.2739	0.0586	0.0332	22.5868	1.2350	818.8273	0.0920	3.9919	0.4331
0.2739	0.0586	0.0332	22.5868	1.2350	818.8273	0.0920	3.9919	0.4331
0.2739	0.0586	0.0332	22.5868	1.2350	818.8273	0.0920	3.9919	0.4331
0.1305	0.0266	0.0332	22.4997	0.6019	816.0814	0.0426	1.7367	0.1811
0.1305	0.0266	0.0332	22.4997	0.6019	816.0814	0.0426	1.7367	0.1811
0.1305	0.0266	0.0332	22.4997	0.6019	816.0814	0.0426	1.7367	0.1811

			Buses Coach <=18t					
PM2.5 E g/km	PM B&T g/km	FC l/100km	CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km
0.0816	0.0785	25.9070	1.1467	772.4133	0.0944	3.9128	0.4207	0.1025
0.0696	0.0626	23.0165	0.9089	667.6346	0.0733	2.8423	0.3091	0.0838
0.0805	0.0775	25.6511	1.1255	763.1104	0.0926	3.8200	0.4110	0.1009
0.0298	0.0785	25.7859	0.5950	778.2904	0.0479	1.8046	0.1873	0.0394
0.0255	0.0626	22.9125	0.4680	674.4042	0.0381	1.2647	0.1323	0.0323
0.0293	0.0775	25.5305	0.5838	769.1428	0.0470	1.7583	0.1826	0.0387
0.0805	0.0775	25.6511	1.1255	763.1104	0.0926	3.8200	0.4110	0.1009
0.0696	0.0623	23.0165	0.9089	667.6346	0.0733	2.8423	0.3091	0.0838
0.0794	0.0763	25.4058	1.1053	754.2045	0.0908	3.7311	0.4017	0.0994
0.0293	0.0775	25.5305	0.5838	769.1428	0.0470	1.7583	0.1826	0.0387
0.0255	0.0623	22.9125	0.4680	674.4042	0.0381	1.2647	0.1323	0.0323
0.0289	0.0763	25.2858	0.5730	760.3849	0.0462	1.7139	0.1780	0.0382
0.1021	0.0817	30.5115	1.5634	945.4300	0.1283	5.6335	0.6013	0.1324
0.1021	0.0817	30.5115	1.5634	945.4300	0.1283	5.6335	0.6013	0.1324
0.1021	0.0817	30.5115	1.5634	945.4300	0.1283	5.6335	0.6013	0.1324
0.0377	0.0817	30.3531	0.8141	948.7423	0.0640	2.6480	0.2734	0.0509
0.0377	0.0817	30.3531	0.8141	948.7423	0.0640	2.6480	0.2734	0.0509
0.0377	0.0817	30.3531	0.8141	948.7423	0.0640	2.6480	0.2734	0.0509

		Buses Electric						
PM B&T g/km	FC l/100km	CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km
0.0785	28.7983	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0320
0.0626	24.7829	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0259
0.0775	28.4473	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0316
0.0785	28.9732	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0320
0.0626	25.0119	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0259
0.0775	28.6281	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0316
0.0775	28.4473	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0316
0.0623	24.7829	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0258
0.0763	28.1113	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0312
0.0775	28.6281	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0316
0.0623	25.0119	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0258
0.0763	28.2977	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0312
0.0817	35.3264	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0332
0.0817	35.3264	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0332
0.0817	35.3264	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0332
0.0817	35.4046	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0332
0.0817	35.4046	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0332
0.0817	35.4046	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0332

	Light vehicles fleet average emission factors							
FC l/100km	CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km
0.0000	0.4248	191.4291	0.0163	0.2193	0.0617	0.0050	0.0228	7.8166
0.0000	0.4170	174.9364	0.0144	0.2041	0.0582	0.0044	0.0185	7.1573
0.0000	0.4269	189.8744	0.0162	0.2179	0.0613	0.0049	0.0226	7.7521
0.0000	0.2041	131.5259	0.0047	0.0887	0.0230	0.0017	0.0224	5.3555
0.0000	0.2042	121.0534	0.0043	0.0829	0.0219	0.0015	0.0181	4.9432
0.0000	0.2050	130.5348	0.0047	0.0882	0.0229	0.0017	0.0221	5.3145
0.0000	0.4269	189.8744	0.0162	0.2179	0.0613	0.0049	0.0226	7.7521
0.0000	0.4170	174.9364	0.0144	0.2041	0.0582	0.0044	0.0184	7.1573
0.0000	0.4291	188.4034	0.0162	0.2169	0.0610	0.0049	0.0222	7.6911
0.0000	0.2050	130.5348	0.0047	0.0882	0.0229	0.0017	0.0221	5.3145
0.0000	0.2042	121.0534	0.0043	0.0829	0.0219	0.0015	0.0180	4.9432
0.0000	0.2060	129.5995	0.0047	0.0877	0.0228	0.0017	0.0218	5.2758
0.0000	0.4065	221.5255	0.0175	0.2440	0.0684	0.0060	0.0237	9.0623
0.0000	0.4065	221.5255	0.0175	0.2440	0.0684	0.0060	0.0237	9.0623
0.0000	0.4065	221.5255	0.0175	0.2440	0.0684	0.0060	0.0237	9.0623
0.0000	0.1960	151.0192	0.0048	0.0981	0.0253	0.0020	0.0233	6.1603
0.0000	0.1960	151.0192	0.0048	0.0981	0.0253	0.0020	0.0233	6.1603
0.0000	0.1960	151.0192	0.0048	0.0981	0.0253	0.0020	0.0233	6.1603

Heavy vehicles fleet average emission factors								
CO g/km	CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km	CO g/km
0.8076	723.9224	0.0633	2.3887	0.2574	0.0716	0.0904	26.8729	0.7767
0.6984	646.9039	0.0507	1.7576	0.1923	0.0611	0.0744	23.8942	0.6311
0.7976	716.8489	0.0622	2.3344	0.2518	0.0706	0.0893	26.6060	0.7635
0.3378	700.0872	0.0357	0.8796	0.0921	0.0238	0.0895	25.9379	0.3516
0.2878	625.1624	0.0291	0.6150	0.0653	0.0201	0.0737	23.0690	0.2860
0.3334	693.3009	0.0352	0.8568	0.0898	0.0235	0.0885	25.6818	0.3456
0.7976	716.8489	0.0622	2.3344	0.2518	0.0706	0.0893	26.6060	0.7635
0.6984	646.9039	0.0507	1.7576	0.1923	0.0611	0.0741	23.8942	0.6311
0.7881	710.1016	0.0612	2.2823	0.2464	0.0697	0.0881	26.3515	0.7510
0.3334	693.3009	0.0352	0.8568	0.0898	0.0235	0.0885	25.6818	0.3456
0.2878	625.1624	0.0291	0.6150	0.0653	0.0201	0.0734	23.0690	0.2860
0.3292	686.8240	0.0346	0.8350	0.0876	0.0232	0.0873	25.4375	0.3400
1.0095	858.9631	0.0837	3.3815	0.3601	0.0901	0.0936	31.9682	1.0349
1.0095	858.9631	0.0837	3.3815	0.3601	0.0901	0.0936	31.9682	1.0349
1.0095	858.9631	0.0837	3.3815	0.3601	0.0901	0.0936	31.9682	1.0349
0.4220	829.3311	0.0466	1.2955	0.1345	0.0299	0.0927	30.8144	0.4673
0.4220	829.3311	0.0466	1.2955	0.1345	0.0299	0.0927	30.8144	0.4673
0.4220	829.3311	0.0466	1.2955	0.1345	0.0299	0.0927	30.8144	0.4673

Buses average emission factors							Processing time
CO2-e g/km	VOC g/km	NOx g/km	NO2 g/km	PM2.5 E g/km	PM B&T g/km	FC l/100km	3.5s/row
579.9212	0.0549	2.3071	0.2486	0.0636	0.0563	21.5233	25/07/21 19:25:16
512.1606	0.0448	1.7102	0.1861	0.0546	0.0450	19.2715	25/07/21 19:25:20
574.4417	0.0539	2.2537	0.2430	0.0627	0.0555	21.3166	25/07/21 19:25:23
530.7707	0.0260	0.9452	0.0980	0.0229	0.0538	19.6581	25/07/21 19:25:27
468.1266	0.0216	0.6757	0.0705	0.0197	0.0430	17.6182	25/07/21 19:25:31
525.7743	0.0256	0.9213	0.0955	0.0225	0.0530	19.4696	25/07/21 19:25:35
574.4417	0.0539	2.2537	0.2430	0.0627	0.0555	21.3166	25/07/21 19:25:38
512.1606	0.0448	1.7102	0.1861	0.0546	0.0448	19.2715	25/07/21 19:25:42
569.2152	0.0530	2.2027	0.2377	0.0619	0.0547	21.1194	25/07/21 19:25:46
525.7743	0.0256	0.9213	0.0955	0.0225	0.0530	19.4696	25/07/21 19:25:50
468.1266	0.0216	0.6757	0.0705	0.0197	0.0428	17.6182	25/07/21 19:25:53
521.0105	0.0252	0.8984	0.0932	0.0222	0.0523	19.2898	25/07/21 19:25:57
681.8852	0.0728	3.2958	0.3520	0.0797	0.0585	25.3705	25/07/21 19:26:01
681.8852	0.0728	3.2958	0.3520	0.0797	0.0585	25.3705	25/07/21 19:26:04
681.8852	0.0728	3.2958	0.3520	0.0797	0.0585	25.3705	25/07/21 19:26:08
623.4943	0.0339	1.3839	0.1426	0.0289	0.0559	23.1566	25/07/21 19:26:12
623.4943	0.0339	1.3839	0.1426	0.0289	0.0559	23.1566	25/07/21 19:26:16
623.4943	0.0339	1.3839	0.1426	0.0289	0.0559	23.1566	25/07/21 19:26:19