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OttoLink- A Tool for Recording PHEV Performance Data

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Persen Technologies Inc. (PERSENTECH)

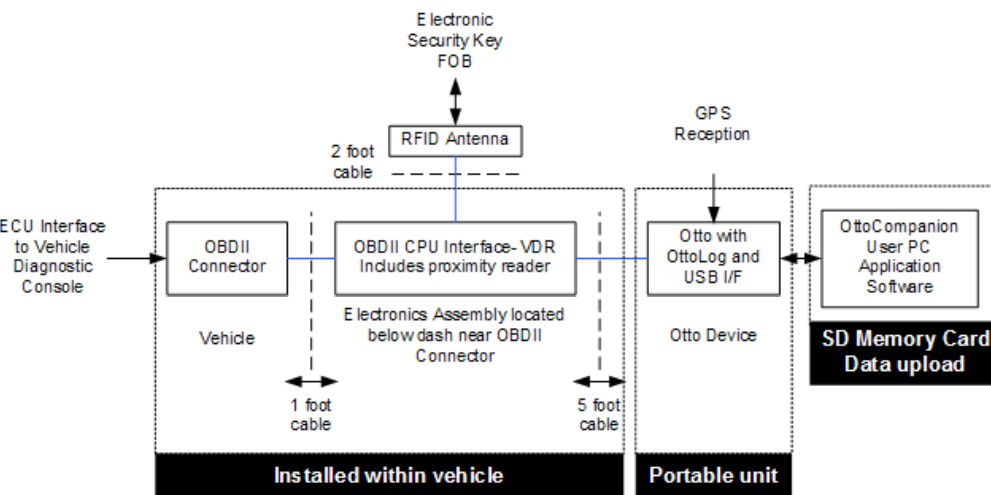
- Established in December 2003
 - Technology and product developments in the Location-Based Services (LBS) market for automotive OEM and after-market devices
- Corporate capabilities
 - GPS-based solutions for data acquisition
 - Hardware design and firmware development
 - PCB layout
 - Supply chain and project management
 - Application software development
 - Satellite system engineering





- A low-cost and easy-to-deploy data acquisition system comprised of three main elements:

- (1) OttoLink™ On Board Diagnostic (OBDII) vehicle monitoring device,
- (2) Otto-Driving Companion® (Otto) GPS-based road safety device, and
- (3) OttoID™ driver identification device.







**Otto-Driving
Companion GPS
device**

**Ottolink driver
Identification
system (receiver
plus keychain FOB)**

**Ottolink OBDII
vehicle diagnostic
device**

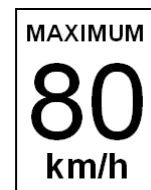
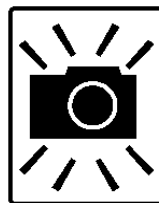


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- OttoLink is the main data acquisition device with connections to the vehicle's OBDII console interface, Otto and Otto-ID sensors
 - OttoLink™ records the performance of the battery, electrical system, and gasoline engine parameters, driving behaviour according to speed limit and other community-specific location-based information, and a unique identifier code that can be associated with a specific driver



- A Portable GPS device the size of a pocket calculator
 - Integrated antenna to receive GPS signals
 - Integrated digital map
 - Integrated speaker and four colored lights
- Otto's intelligence
 - Knows Posted Speed Limits
 - Knows your community
 - Crosswalks, School Zones, Playgrounds, Red Light Camera Intersections, Hazardous Intersections, Deer Crossings



- OBDII systems monitor all components and emission control devices that could affect emission levels
- Regulations require that the system illuminate a Malfunction Indicator Light (MIL) when a malfunction occurs that could cause emissions to exceed a level equal to 1.5 times the emissions standard that the vehicle was certified for
- OBDII system does not have a sensor in the tailpipe that turns on the MIL when the emissions are high.
 - OBDII system monitors components individually and turns on the MIL when any one component is malfunctioning
- OBDII has standard gasoline engine parameters and hybrid-specific, and modified hybrid (PHEV)-specific data channels that can be monitored

OttoLink Configuration

Driving conditions | Air / fuel mixture | Emission control | Diagnostics

Environment

- 0F - Intake air temperature
- 33 - Barometric pressure
- 46 - Ambient air temperature
- 2F - Fuel level input

Driver

- 49,4A,4B - /
- 11,45,47,48
- 1E - Auxiliary
- 1F - Time since
- 0D - Vehicle

Engine

OttoLink Configuration

Driving conditions | Air / fuel mixture | Emission control | Diagnostics

Exhaust Gas Recirculation (EGR)

- 2C - Commanded EGR
- 2D - EGR Error

Evaporative system

- 32 - Evap system vapor pressure
- 2E - Commanded evaporative purge

Catalytic converter and secondary air injection

- 3C,3D,3E,3F - Catalyst temperature
- 12 - Commanded secondary air status

OK

Cancel

OttoLink Configuration

Driving conditions | Air / fuel mixture | Emission control | Diagnostics

Air

- 4C - Commanded throttle actuator control
- 0B - Intake manifold pressure
- 10 - Air flow rate from mass air flow sensor

Fuel

- 0A,22,23 - Fuel rail pressure
- 03 - Fuel system status
- 44 - Command equivalence ratio
- 06,08 - Short term fuel trim
- 07,09 - Long term fuel trim

OttoLink Configuration

Driving conditions | Air / fuel mixture | Emission control | Diagnostics

Onboard monitoring

- 01 - Monitor status since DTCs cleared
- 41 - Monitor status this drive cycle

Malfunction Indicator Lamp (MIL)

- 21 - Distance travelled while MIL is activated
- 4D - Minutes run by engine while MIL activated

Diagnostic Trouble Codes (DTC)

- 30 - Number of warm-ups since DTCs cleared
- 31 - Distance since DTCs cleared
- 4E - Time since DTCs cleared

Miscellaneous

- 42 - Control module voltage
- 1C - OBD requirements to which vehicle is designed

OK

Cancel





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Toyota PRIUS Hybrid Parameters			
Channel	Bytes	Description	Units
022	0 1	Lateral acceleration 1	Raw
022	2 3	Lateral acceleration 2	Raw
023	0 1	Forward acceleration 1	Raw
025	2 3	Forward acceleration 2	Raw
025	0 1	Steering position	Raw
030	4	Brake pedal pressure	percent
03B	0 1	Electric motor current	DC Amperes
03B	2 3	Electric motor voltage	DC Volts
0B1	0 1	Front right wheel rotation	Raw
0B1	2 3	Front left wheel rotation	Raw
0B3	0 1	Rear right wheel rotation	Raw
0B3	2 3	Rear left wheel rotation	Raw
3C8	2	RPM	count
3CA	2	Speed	km/h
3CB	0	Toyota battery max discharge	Amperes
3CB	1	Toyota battery max charge	Amperes
3CB	2 3	Toyota battery state of charge	Percent
3CB	4	Toyota battery maximum temperature	Degrees C
3CB	5	Toyota battery minimum temperature	Degrees C
3CD	0 1	Toyota fault code	Hex
3CD	2 3	Toyota battery voltage	DC Volts
52C	1	Engine Coolant temperature	Degrees C
540	1	Shift lever	Item
5A4	1	Gas gauge	raw units
5B6	2	Open doors	Item

33 Other channels on CAN bus currently unknown

Majority of channels related to Toyota Prius specific data

Some channels associated with external battery technology

Location-based information example

Record	Date	Time	Latitude	Longitude	Speed	Speed Limit	Point of Interest
index	DD/MM/YY	GMT	Degrees	Degrees	km/h	km/h	Mark
1282	01/10/07	15:12:39	49.796377	-97.13595	28.2	50	
1283	01/10/07	15:12:40	49.796308	-97.135958	26.7	50	
1284	01/10/07	15:12:41	49.79624	-97.13595	26.7	50	
1285	01/10/07	15:12:42	49.79617	-97.135935	26.7	50	
1286	01/10/07	15:12:43	49.796102	-97.135913	28.2	50	
1287	01/10/07	15:12:44	49.796033	-97.135882	28.2	50	
1288	01/10/07	15:12:45	49.795957	-97.135852	28.9	50	
1289	01/10/07	15:12:46	49.795888	-97.135822	28.9	50	
1290	01/10/07	15:12:47	49.79582	-97.135798	28.9	50	
1291	01/10/07	15:12:48	49.795743	-97.135775	29.6	50	
1292	01/10/07	15:12:49	49.795675	-97.13576	29.6	50	
1293	01/10/07	15:12:50	49.795598	-97.135752	30.4	50	

PRIUS CAN-bus information example

Record	Channel 3CB byte 4	Channel 3CB byte 5	Channel 3CB bytes 2 3	Channel 3CD bytes 0 1	Channel 3CD bytes 2 3	Channel 3CF bytes 0 1 2 3
	Toyota battery maximum temperature	Toyota battery minimum temperature	Toyota battery state of charge	Toyota fault code	Toyota battery voltage	Unknown
index	Degrees C	Degrees C	Percent	Hex	DC Volts	Hex
1282	12	10	62.5	0X0000	239	0X10090B04
1283	12	10	62.5	0X0000	238	0X10090B04
1284	12	10	62.5	0X0000	244	0X10090B04
1285	12	10	62.5	0X0000	245	0X10090B04
1286	12	10	62.5	0X0000	246	0X10090B04
1287	12	10	62.5	0X0000	247	0X10090B04
1288	12	10	62.5	0X0000	248	0X10090B04
1289	12	10	62.5	0X0000	247	0X10080B04
1290	12	10	62.5	0X0000	248	0X10080B04
1291	12	10	63	0X0000	247	0X10090B04
1292	12	10	63	0X0000	248	0X10090B04
1293	12	10	63	0X0000	249	0X10090B04

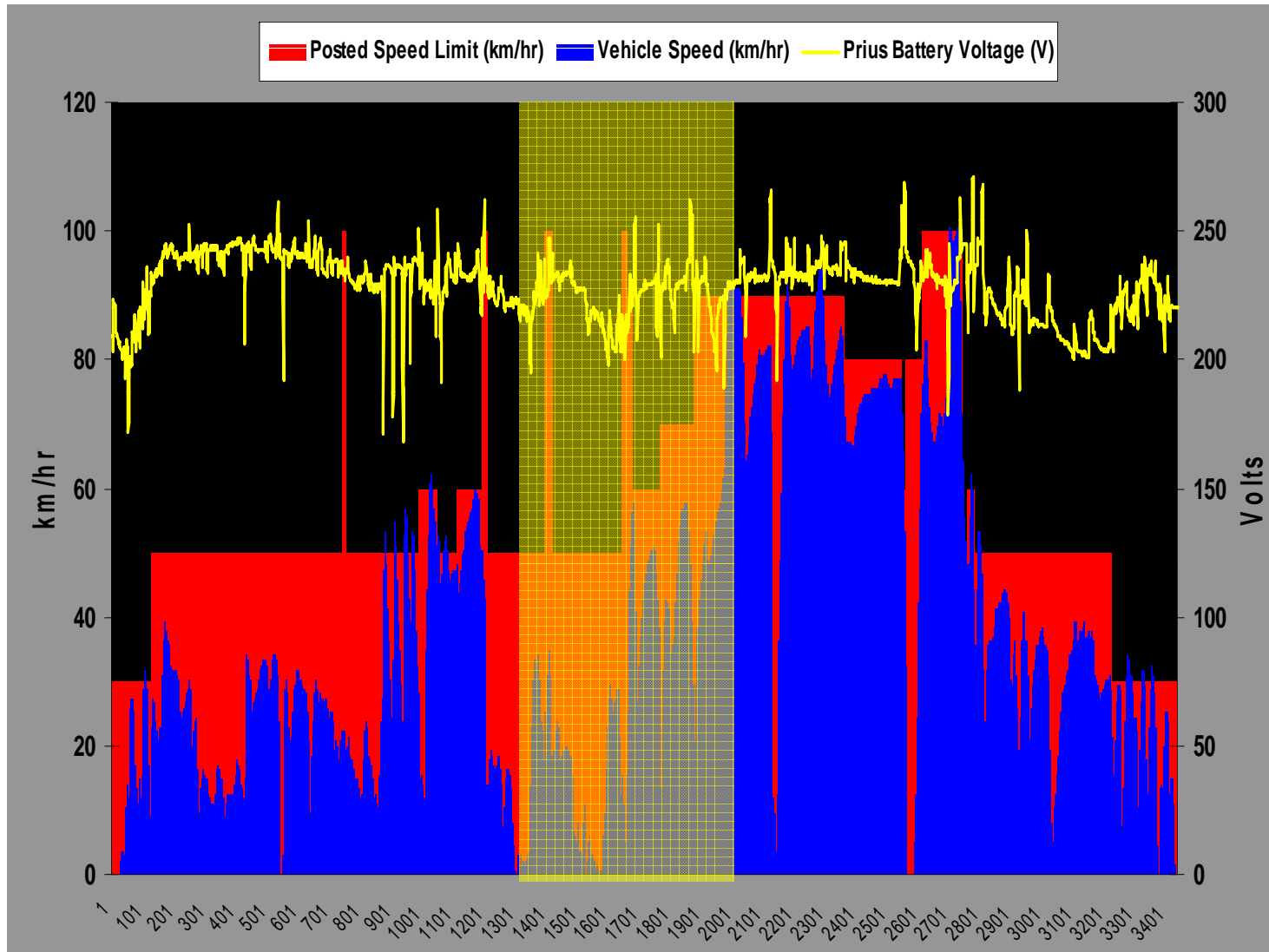


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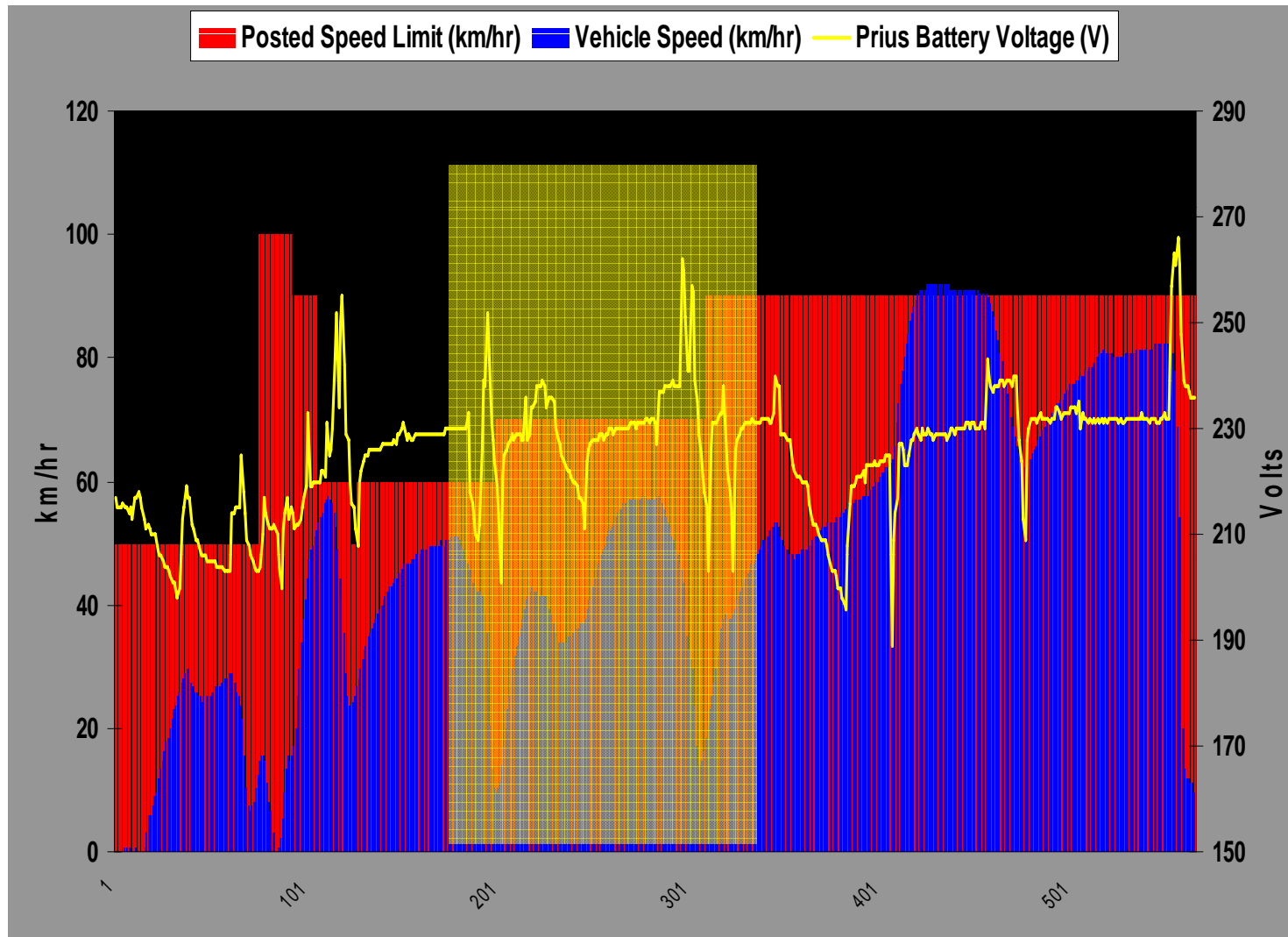
PRIUS SAEJ1979 Gasoline Engine information example

Record	SAE J1979 service 1 parameter 03	SAE J1979 service 1 parameter 04	SAE J1979 service 1 parameter 05	SAE J1979 service 1 parameter 06	SAE J1979 service 1 parameter 07	SAE J1979 service 1 parameter 10
	Fuel system status	Calculated engine load	Engine coolant temperature	Short term fuel trim	Long term fuel trim	Mass air flow
index	bitmap	percent	degrees C	percent	percent	g/s
1282	0X0200	16.1	64	-3.1		
1283					-3.9	3.1
1284	0X0200					
1285		38	64	-3.1	-3.1	6.8
1286						
1287	0X0200	38.4	64	0	-3.1	
1288						7.1
1289	0X0200	41.2	64	-0.8		
1290					-3.1	7.6
1291						
1292	0X0200	43.1	64	-0.8	-3.1	7.9
1293						

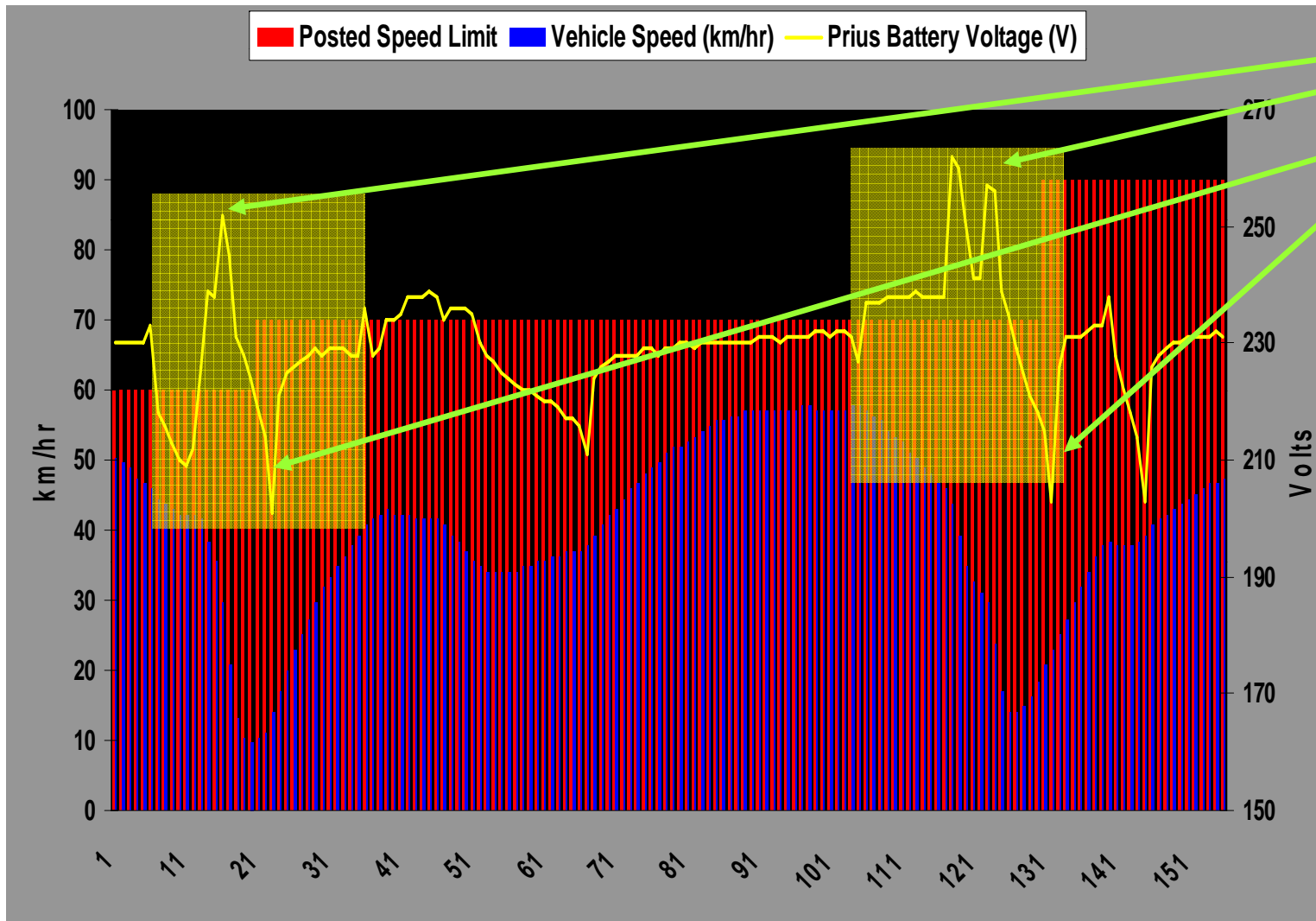
Driving behaviour example: Prius battery voltage & braking



Driving behaviour example: Prius battery voltage & braking

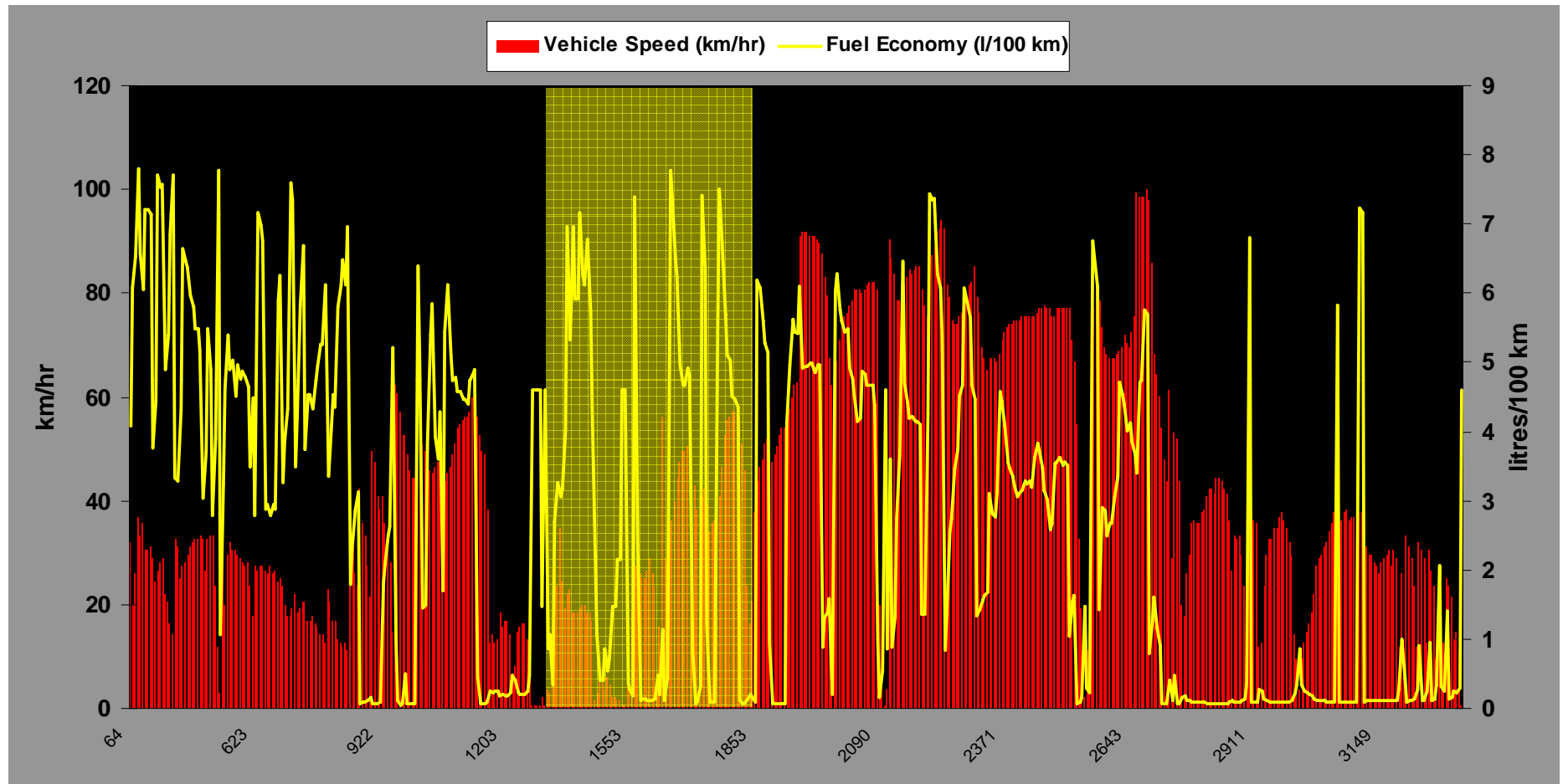


Driving behaviour example: Prius battery voltage & braking

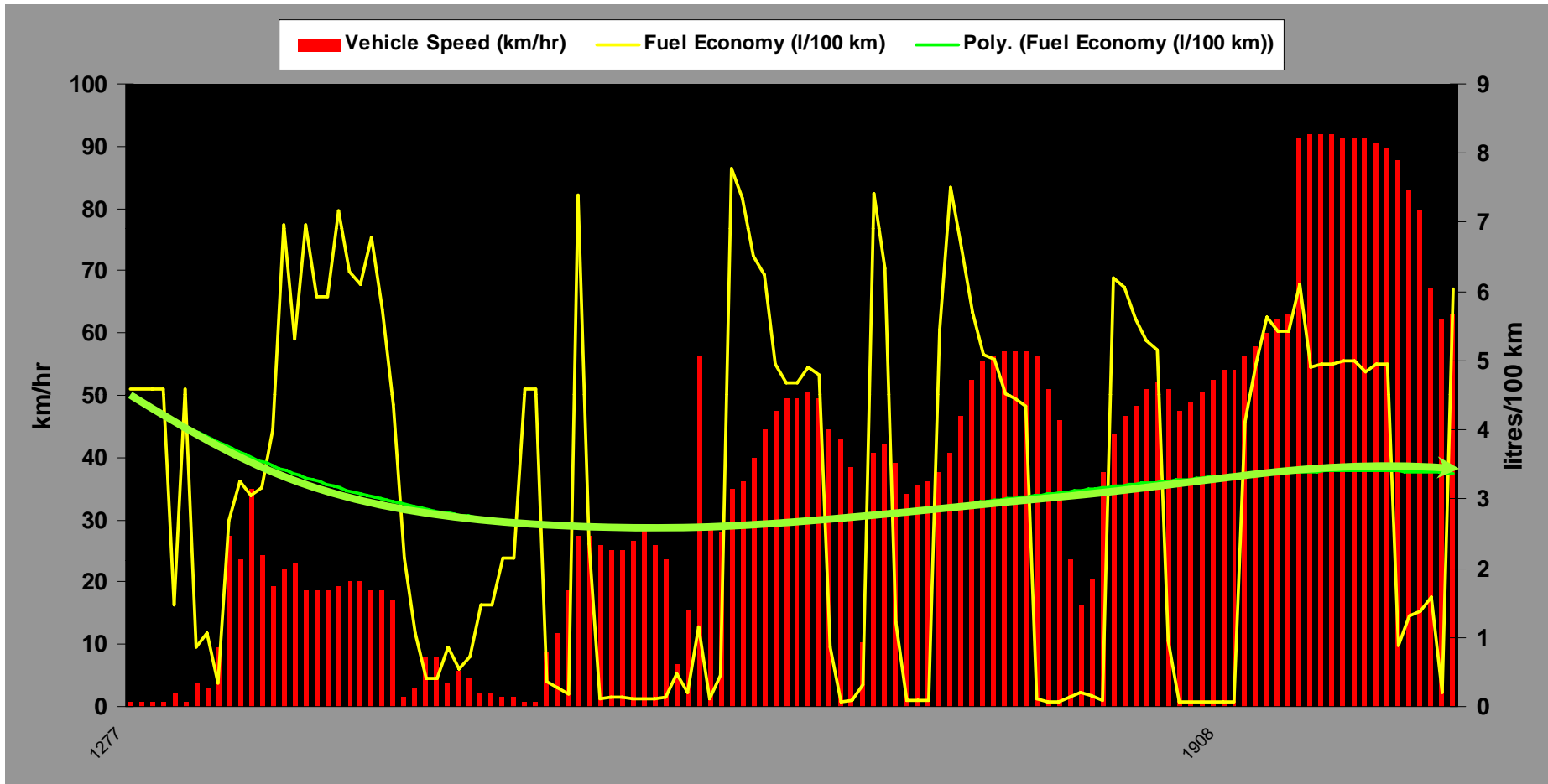


- **Emissions** → Grams of pollutant emitted per unit distance x **vehicle activity** per day
- Fuel consumption → leads to the emission of CO, CO₂ and THC (Total Hydro Carbons) using the carbon balance equation
- Fuel consumption → dependent on idling, acceleration, deceleration, cruise speed
- **Vehicle activity** → influenced by **driving behaviour**
- **Driving behaviour** → influences **Emissions**

Driving behaviour example: Emissions & fuel economy



Driving behaviour example: Emissions & fuel economy

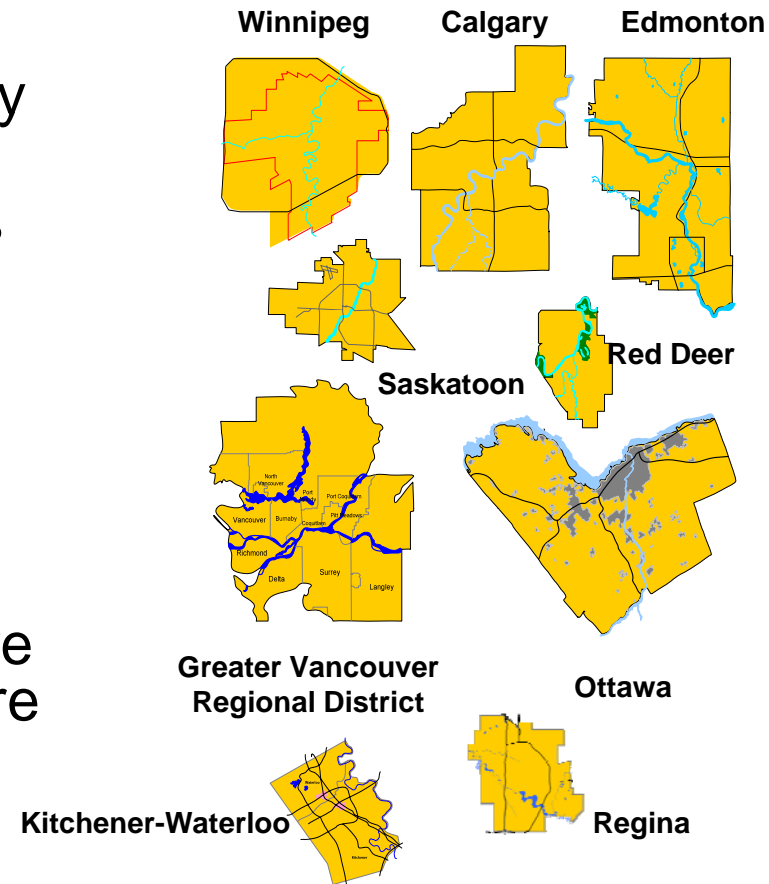


Fuel Economy trend data = 3.5 l/100 km

CO₂e emissions estimate for this portion of the trip = **692.8 grams**

OttoLog- Driving behaviour data collection and reporting

- Otto records where you drove, how fast you were going, and can calculate fuel costs for each trip based on fuel economy inputs
- Otto's data can be exported to numerous formats and trip information can be viewed on GoogleEarth®
- Otto's Road Safety mode requires a coverage map that includes all the community safety alerts and the posted speed limits
- The OttoLog functionality does not require a coverage map and operates everywhere where GPS coverage exists



myLogs



Welcome to the myLogs portion of the website.

Using this website, you can upload, view and analyse trails recorded with your Otto Driving Companion.

Currently Viewing

Filename:	Otto1005-Sept28.ipl
Recorded with Otto:	01005
Trips:	130
Distance (km):	1162.25
Duration (h:m:s):	34:27:41
Data Points:	121455

[Upload New Log](#)



[View Reports Generated from My Log](#)

Choose this option to view reports generated from the log you have uploaded.



[View Where I Drove on a Map](#)

Choose this option to see where you drove on a 3D map using Google Earth.



[Export Log in Another Format](#)

Your log can be exported and saved to a number of different formats so that it can be viewed and processed in third party applications.



[Upload a New Log for Viewing](#)

Upload a log to the website so it can be viewed and analysed. The log can either be one that was previously saved on your PC in OttoLog IPL format, or one that is currently stored on your Otto Driving Companion.



Report Statistics

Total Distance: 1162.25 km
 Total Duration: 34:27:41
 Total Idle Time: 08:49:57
 Total Unlocked Time: 00:23:41

Report Parameters

Log Start: 9/11/2007 9:59:00 AM
 Log End: 9/26/2007 4:03:19 PM
 Otto Serial Number: 1005
 Logfile Name: Otto1005-Sept28.jpl
 Timezone: (GMT-05:00)

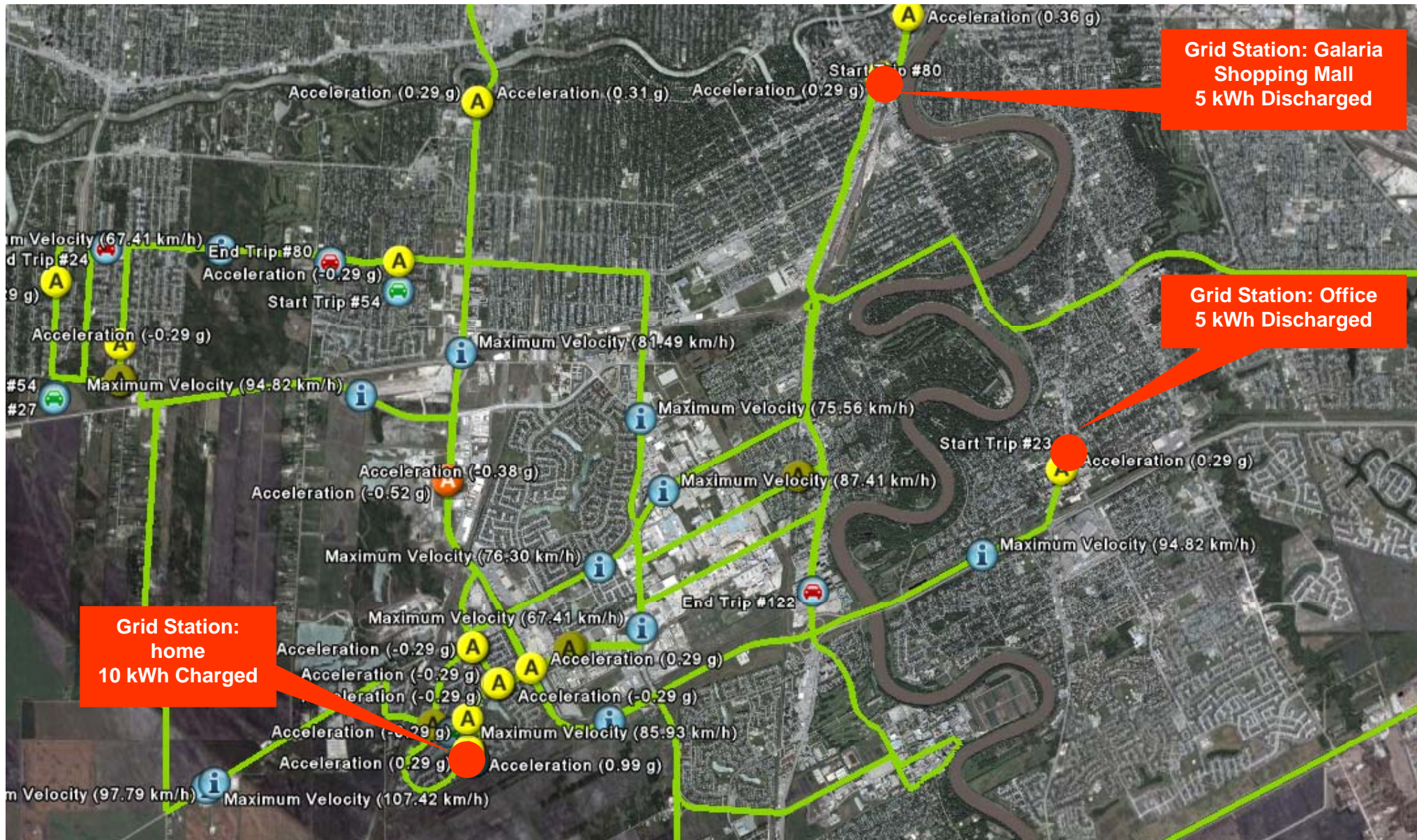
Overall Trip Summary

Trip	Trip Start	Trip End	Duration (h:m:s)	Distance (km)	Idle (h:m:s)	Unlocked (h:m:s)	Avg Speed (km/h)	Max Speed (km/h)
<u>1</u>	9/11/2007 9:59:00 AM	9/11/2007 9:59:12 AM	00:00:12	0.00	00:00:08	00:00:04	0.00	0.00
<u>2</u>	9/11/2007 3:40:54 PM	9/11/2007 4:04:12 PM	00:23:18	13.06	00:03:46	00:00:18	38.18	91.12
<u>3</u>	9/11/2007 4:17:38 PM	9/11/2007 4:21:31 PM	00:03:53	2.05	00:00:21	00:00:00	34.13	54.08
<u>4</u>	9/11/2007 5:47:41 PM	9/11/2007 5:52:53 PM	00:05:12	2.08	00:01:09	00:00:04	30.35	54.82
<u>5</u>	9/12/2007 8:12:24 AM	9/12/2007 8:59:36 AM	00:47:12	21.37	00:09:15	00:00:25	33.35	85.93
<u>6</u>	9/12/2007 9:00:59 AM	9/12/2007 9:05:25 AM	00:04:26	1.62	00:01:31	00:00:26	27.76	61.49
<u>7</u>	9/12/2007 6:23:59 PM	9/12/2007 6:39:11 PM	00:15:12	10.80	00:02:09	00:00:02	49.16	85.19
<u>8</u>	9/12/2007 7:18:29 PM	9/12/2007 7:27:16 PM	00:08:47	7.38	00:00:16	00:00:00	51.51	84.45
<u>9</u>	9/12/2007 7:40:49 PM	9/12/2007 7:50:49 PM	00:10:00	8.37	00:00:42	00:00:00	53.38	98.53
<u>10</u>	9/13/2007 8:12:52 AM	9/13/2007 8:56:00 AM	00:43:08	21.74	00:07:18	00:00:16	35.28	84.45
<u>11</u>	9/13/2007 8:57:15 AM	9/13/2007 9:02:02 AM	00:04:47	1.43	00:01:19	00:00:32	25.97	54.82
<u>12</u>	9/13/2007 5:55:05 PM	9/13/2007 6:00:00 PM	00:00:55	1.00	00:00:10	00:00:00	15.17	67.41
<u>13</u>	9/13/2007 6:00:00 PM	9/13/2007 6:00:00 PM	00:00:00	0.00	00:00:00	00:00:00	0.00	68.89

Classification	Duration	Distance	Percent of Total
Peak Transit Hours (6 AM-9 AM, 4 PM-7 PM)	14:32:15	443.99 km	42.18 %
Off-Peak Transit Hours (9 AM-4 PM)	06:18:50	253.57 km	18.32 %
Night Driving	04:31:33	219.37 km	13.13 %
Weekend Driving	09:05:03	245.31 km	26.36 %

- Other input data channels can be integrated with the OttoLink device
 - Current transformers and voltage sensors to monitor charge/discharge to grid
 - Retro-fitted or re-fitted PHEV vehicles with additional battery voltage and current sensors
 - Other environmental or vehicle safety sensors
- Location-specific opportunistic charging stations can be mapped into the OttoLink driver monitoring system to provide charging-discharging statistics

OttoLink- A Tool for Recording PHEV Performance Data



Thank You!

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