LKK Auto Consultants Pte Ltd
Company Registration No. 199607198R
51 UBI AVE 1, #01-25 PAYA UBI INDUSTRIAL PARK, SINGAPORE 408933 TEL : (065) 62563561 FAX : (065) 67414108

Your Ref: S8M00A51 14 March 2018
Our Ref : CS/ASM18004432/N

M/s AXA Insurance Pte Ltd
8 Shenton Way #24-01
AXA Tower
Singapore 068811
(Motor Claims Department)

TECHNICAL INVESTIGATION REPORT OF FIRE INCIDENT INVOLVING THE MOTOR VEHICLE YM 9113J ON 6 FEBRUARY 2018

1. We refer to your letter dated 7 March 2018 and the instructions therein.

2. Our analysis, comments and opinions with respect to the cause of fire to the Motor Vehicle YM 9113J (herein referred to as **"Insured Vehicle"**) are set out below.

Inspection of the Motor Vehicle

3. The Insured Vehicle was physically inspected on 13 March 2018 at the premises of Veolia ES Singapore Ind. Pte. Ltd. (herein referred to as **"Veolia"**) located at 23 Pandan Avenue, Singapore 609389.

4. A static inspection was carried out to the Insured Vehicle where the following general information was recorded:-

Vehicle Registration No.	: YM 9113J
Make / Model	: ISUZU FTR34P
Chassis No	: JALFTR34P87000023
Year of Registration	: September 2008
Mileage	: N.A (wiring affected)

5. The Insured Vehicle was noted to have sustained fire damage that was confined to its centre portion. The fire damage was observed to be most severe at its left centre portion. The exterior body of the Insured Vehicle was relatively unaffected by the fire except for the centre portion. The rear of the interior compartment was affected as a result of the fire. See photos 1 – 7 below.

Photo 1 shows the front view of the Insured Vehicle at the time of our inspection. The fire damage to the Insured Vehicle was confined to its centre portion. The exterior body of the Insured Vehicle was relatively unaffected by the fire except for the centre portion.

Photo 2 shows the right side of the Insured Vehicle at the time of our inspection. The exterior body of the Insured Vehicle was relatively unaffected by the fire except for the centre portion. The fire damage to the Insured Vehicle was confined to its centre portion (circled).

Photo 3 shows the left side of the Insured Vehicle at the time of our inspection. The exterior body of the Insured Vehicle was relatively unaffected by the fire except for the centre portion. The fire damage to the Insured Vehicle was confined to its centre portion. The fire damage was observed to be most severe at its left centre portion (circled).

Photo 4 shows the rear portion of the Insured Vehicle at the time of our inspection. The fire damage to the Insured Vehicle was confined to its centre portion. The rear portion was observed to have been unaffected by the fire.

Photo 5 shows the main engine compartment of the Insured Vehicle which is situated beneath the front cabin at the time of our inspection. The main engine compartment of the Insured Vehicle was relatively unaffected by the fire.

Photo 6 shows the interior compartment of the Insured Vehicle at the time of inspection. The rear portion of the interior compartment was significantly affected by the fire (circled).

Photo 7 shows a closer view of the rear portion of the interior compartment which was significantly affected by the fire.

6. At the time of inspection of the Insured Vehicle, we did not find any additionally fitted electronic and/or electrical component(s) on the Insured Vehicle. There also appears to be no modification(s) fitted on the Insured Vehicle.

Investigation and Technical Analysis

7. The Insured Vehicle has 2 engines. The main engine is situated beneath the front cabin. The sub engine is situated at the centre portion of the Insured Vehicle. The function of the sub engine is to power the movement of the Insured Vehicle's mechanical components. The mechanical components basically consist of a rotary brush on each side as well as a linear centre brush to sweep waste to a position and a high pressure fan in the suction system which creates a vacuum in the suction cup to draw the waste into a bin located at the rear portion of the Insured Vehicle.

8. For this particular case, the fire appears to have originated from the left centre portion of the Insured Vehicle, which houses the sub engine (herein referred to as **"sub engine compartment"**). This can be determined from the burn pattern and the high heat intensity burn marks (whitish burn marks) found on the left portion of the Insured Vehicle's sub engine compartment and also the rust that had developed at the areas around the sub engine compartment.

9. The whitish burn marks are a result of exposure to prolonged heat intensity. Rust would normally start to develop around these areas soon after a fire as prolonged exposure to high heat intensity usually causes steel/metal material body parts to be exposed to natural environmental condition. Hence the rust that had developed around the sub engine compartment of the Insured Vehicle is an indication that the fire to the Insured Vehicle had originated from the sub engine.

10. Under normal operational conditions, the sub engine compartment of the Insured Vehicle can be raised to reveal the sub engine via an external control panel which is located at the right centre portion of the Insured Vehicle. However due to the fire which had affected the electrical system of the Insured Vehicle, we were unable to gain access to the sub engine to access the degree of fire damage. See photos 8 & 10 below.

Photo 8 shows the sub engine compartment of the Insured Vehicle where the burn pattern and whitish burn marks were found (circled). Such whitish burn marks are a result of exposure to prolonged heat intensity, which had caused the steel/metal material of the sub engine compartment to be exposed to natural environmental condition. Hence the rust that had developed around the sub engine compartment of the Insured Vehicle is an indication that the fire to the Insured Vehicle had originated from the sub engine.

Photo 9 shows the right portion of the sub engine compartment which was badly burnt as a result of the fire (circled). Under normal operational conditions, the sub engine compartment of the Insured Vehicle can be raised to reveal the sub engine via an external control panel which is located at the right centre portion of the Insured Vehicle (arrowed).

Photo 10 shows a closer view of the external control panel which is used to raise the sub engine compartment of the Insured Vehicle to reveal the sub engine under normal operational conditions. However due to the fire affecting the electrical system of the Insured Vehicle, we were unable to gain access to the sub engine to access the degree of fire damage.

11. Upon closer examination around the areas in closest proximity to the sub engine which was where the fire to the Insured Vehicle had likely started, we had found several stretches of burnt wiring with greenish residue. These wirings were original factory fitted wirings below the sub engine compartment. We also found traces of greenish residue on several stretches of burnt wiring leading from the battery of the Insured Vehicle. The presence of greenish residue indicates internal heating of copper wires, a sign of an electrical short circuit occurring. The greenish residue is normally left behind from oxidation as a result of chemical reaction involving the copper wires. These physical evidences would appear to suggest that the cause of fire to the Insured Vehicle could have possibly been due to electrical in nature. See photos 11 - 17 below.

Photo 11 shows upon closer examination around the areas in closest proximity to the sub engine which was where the fire to the Insured Vehicle had likely started, we had found several stretches of burnt wiring with greenish residue. These wirings were original factory fitted wirings below the sub engine compartment (arrowed). We also found traces of greenish residue on several stretches of burnt wiring leading from the battery of the Insured Vehicle (circled). The presence of such greenish residue suggests occurrence of an electrical short circuit.

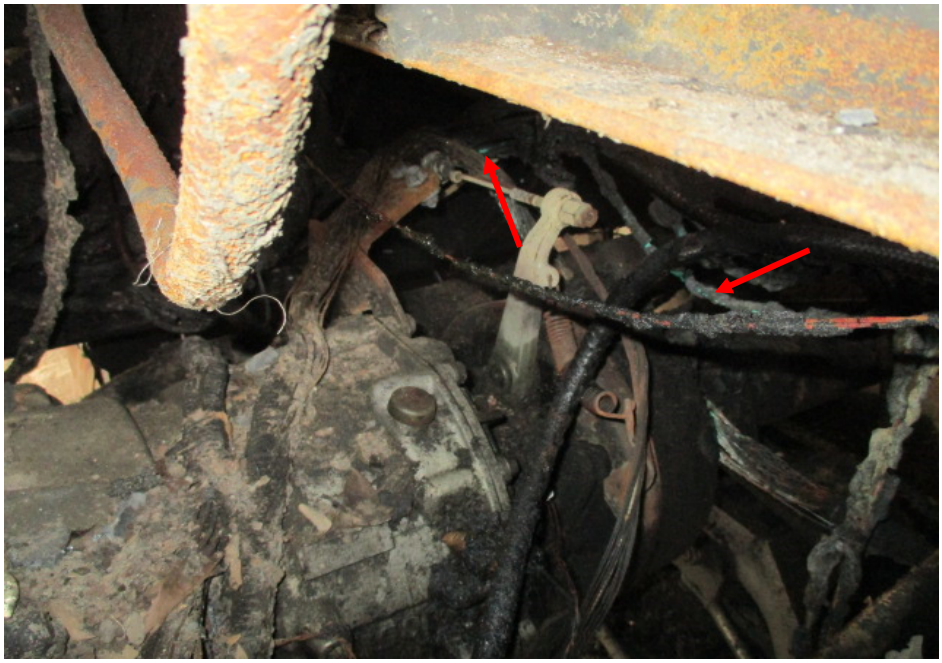

Photo 12 shows several original factory fitted wirings below the sub engine compartment with greenish residue (arrowed). The presence of such greenish residue suggests occurrence of an electrical short circuit.

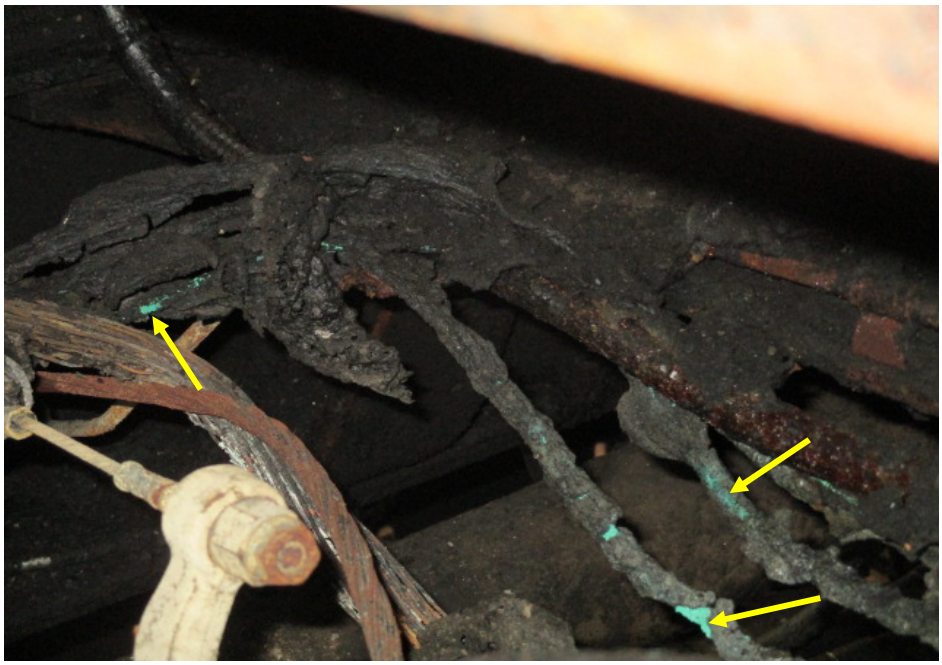

Photo 13 shows a close up view of the greenish residue found on some of the burnt wirings below the sub engine compartment of the Insured Vehicle (circled). The presence of such greenish residue suggests occurrence of an electrical short circuit.

Photo 14 shows the several stretches of burnt wirings leading from the battery (circled) of the Insured Vehicle which had traces of greenish residue (arrowed). The presence of such greenish residue suggests occurrence of an electrical short circuit.

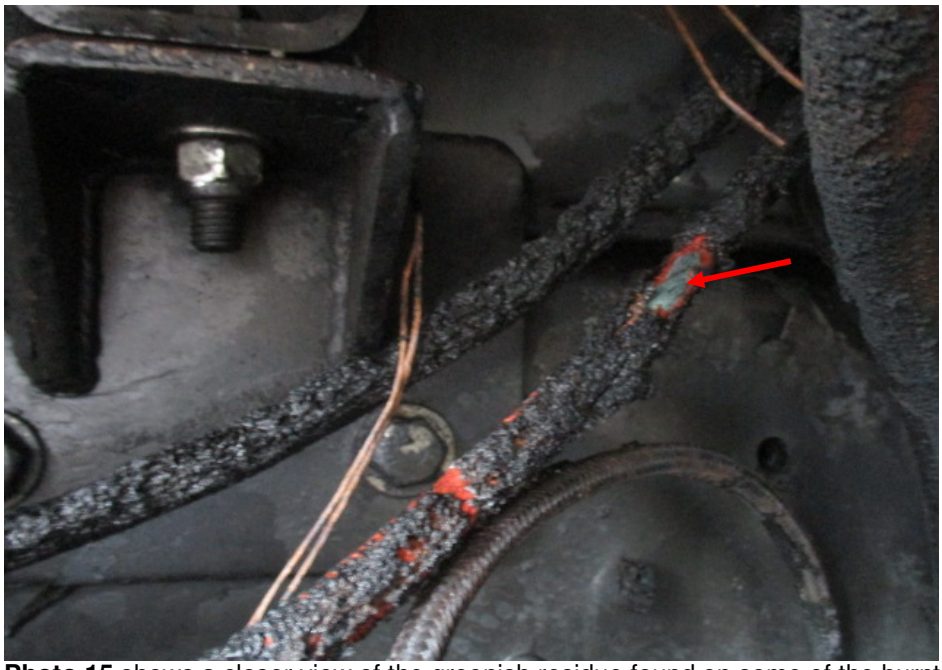

Photo 15 shows a closer view of the greenish residue found on some of the burnt wirings leading from the battery of the Insured Vehicle (arrowed). The presence of such greenish residue suggests occurrence of an electrical short circuit.

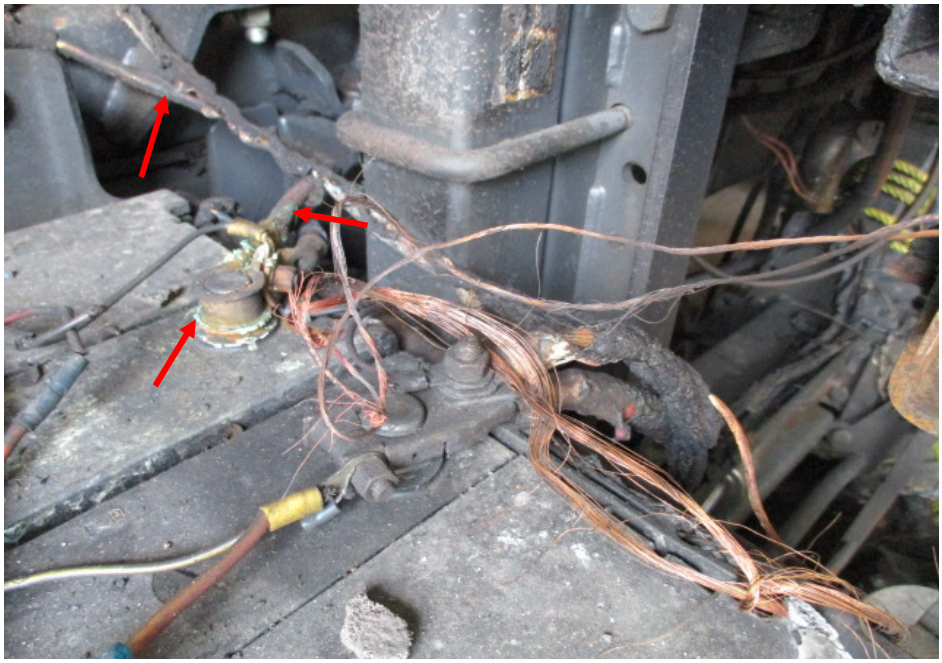

Photo 16 shows a closer view of the greenish residue found on some of the burnt wirings leading from the battery of the Insured Vehicle (arrowed). The presence of such greenish residue suggests occurrence of an electrical short circuit.

Photo 17 shows a close up view of the greenish residue found on some of the burnt wirings leading from the battery of the Insured Vehicle (arrowed). The presence of such greenish residue suggests occurrence of an electrical short circuit.

12. From the Police Report No. D/20180207/2019, Singapore Accident Statement and Veolia Preliminary Accident/Incident Report which were made by Mr Khairil Rezwan bin Roslan (herein referred to as **"Mr Khairil"**), we note that the fire to the Insured Vehicle had started at a time when he was driving the Insured Vehicle and waiting at a traffic junction. Mr Khairil was first alerted of the fire by another motorist.

13. We managed to speak to Mr Khairil on 13 March 2018 where we were able to gather further information pertaining to the incident as well as to the history of the Insured Vehicle.

14. According to Mr Khairil, on 6 February 2018, he drove the Insured Vehicle from Veolia along with his trainee, Mr Masran at approximately 0700 hours. He travelled along the West Coast flyover towards Cantonment Close which was the 1st scheduled cleaning location. At 1020 hours he proceeded along Cantonment Road from Cantonment Close to the next location at Eu Tong Sen Street. Mr Khairil was waiting at the traffic junction of Cantonment Road and Neil Road on the 1st lane. Suddenly he heard the sound of a car horn. He looked to his left and saw a lorry driver alerting him by pointing to the left portion of the Insured Vehicle. Mr Khairil alighted and went to check. He saw flames emitting from the left centre portion. He tried to raise the sub engine compartment via the external control panel but he could not raise it fully. He then quickly grabbed the fire extinguisher from the rear of the driver cabin, attempting to put out the fire. He was unable to extinguish the fire and immediately called the SCDF. Meanwhile Mr Masran was calling their team leader, Mr Jahis and reporting the incident to him.

15. Police were first to respond to the incident. They instructed both Mr Khairil and Mr Masran to move to the left side of the road. Police officers re-directed traffic while waiting for the SCDF. 2 fire bikes arrived in 10 minutes, cut the wires connected to the battery of the Insured Vehicle and attempted to put out the fire with foam extinguishers till the pumper arrived 5 minutes later. Firefighters took approximately 1 hour to extinguish the fire. Police and SCDF took down their statements and Mr Khairil assisted SCDF in their preliminary investigations.

16. The tow truck arrived at the incident location 20 minutes after the incident was reported to Mr Jahis. Mr Khairil was allowed to tow the Insured Vehicle after SCDF completed their preliminary investigations which took about an hour. The Insured Vehicle was towed to ComfortDelgro Engineering (herein referred to as **"Comfort"**) located at 45 Pandan Road.

17. Mr Khairil made the Preliminary Accident/Incident Report at Veolia later that day. He lodged a police Clementi Neighbourhood Police Centre on 7 February 2018 at 1138 hours and proceeded to make an insurance report at Comfort at 1455 hours.

18. Mr Khairil mentioned that he is not the only driver of the Insured Vehicle. Drivers at Veolia are rotated to cover different jobs which require them to drive various vehicles. To the best of his recollection, there has not been any major mechanical problem and/or electrical problem with the Insured Vehicle whenever he was driving it.

19. With regards to the history of the Insured Vehicle, we were able to gather from Mr Myint Hlaing (herein referred to as **"Mr Myint"**) who is the executive engineer of Veolia that the Insured Vehicle was purchased new 9 years ago.

20. Pertaining to the maintenance aspect, Mr Myint informed us that the Insured Vehicle was sent for periodical servicing every 3 months. The vehicle servicing is done at Veolia's in-house workshop.

21. Mr Khairil mentioned that there were neither warning lights displayed nor was there an abnormal rise in temperature throughout the period the Insured Vehicle was driven.

22. During the course of our investigations, we were able to obtain from Mr Myint the latest servicing and repair records of the Insured Vehicle. The last servicing before the incident was done on 24 November 2017 which had included the replacement of engine oil and oil filter. The other components were either adjusted or cleaned as per Veolia's Prevent Maintenance/ Inspect Report. Furthermore on 24 January 2018, the hydraulic fluid and battery water were topped up. The air filter was checked and the fan belt/tensioner was replaced. See invoices 1 & 2 below.

[illegible] ENVIRONMENTAL SERVICES

SERVICE AND REPAIR REPORT

Name	Kay	Date	24 . 1 . 2018	WO No.	34741
Location	Pandan	Zone			MW1
Type	DULEVO / 6000 / ... / OTHER				
Vehicle No.	YM 4113	Time-In	17 . 30	Service-type	Schedule/Break-Down/Wear-tear
Odometer/RH		Time-Out	19 . 00		

Feed Back- alternator monitoring inspection

Repaired / Checked / Replaced / Adjusted

Service and Repair for general

						Tyre Replacement	
Engine oil/2T	Top Up/R	Oil Filter	R	Clutch	R/RR/A	Front Right	R/RR
Hydraulic oil	Top Up/R	Fuel Filter	R	Brake (service/parking)	R/RR/A	Front Left	R/RR
Gear oil	Top Up/R	Air Filter	R/C	Fan Belt/Tensioner	R/A	Rear Right	R/RR
Break fluid	Top Up/R	Hydraulic Filter	R	Fuel pump/AC pump	R/RR/A	Rear Left	R/RR
oil	Top Up/R	Horn/Mirror	R/RR	Fuel injector/Pipe	R/RR	Rear End Right	R/RR
Coolant/Adblue	Top Up/R	Fuses/Bulbs	R	Leaf spring	R	Rear End Left	R/RR
Battery water	Top Up/R	Arrow/Beacon light	R/RR	Ball Joint/Tie rod/Kin Pin	R/A	A/C system	RR
Greasing	R	Power window	R	Wheel nut/stud	R	Brush L/R/C/F	R/RR
Water separator	R	Wiper	R/A	Body Dented	RR		

Hydraulic System (Body Discharge/Transmission/Suction/Sweeping/Lifting/Packing)

Pump	R/RR	Valve	R/RR	Cylinder	R/RR	Hose	R/RR
Motor	R/RR	Solenoid coil	R/RR	Coupling/PTO	RR/R/A	Seal	R/RR

Pneumatic System (Nozzel/Center brush/Flap/PTO/Vacuum)

Air tank	DRAIN	Valve	R/RR	Actuator	R/RR	Hoses	R/RR
Lubricator	R/RR	Solenoid coil	R/RR	Cylinder	R/RR	Seal	R/RR

Water Sprinkler / Jetting System

Pump	R/RR	Valve	R/RR	Nozzel	R/RR	Hoses	R/RR
Coupling/PTO	R/RR	Belt	R	Lubricator	R/RR	Tank	R/RR/C

Starting/Charging and Electrical System

Battery/ Clip	R/RR	Starter/Alternator	R/RR	Fuel solenoid	R/RR	Wiring/switches	R/RR

Suction System				Conveyor System			
Nozzle/Rubber	R/RR	Truck/Castor	R	Blade/Housing	R/RR	Belt/Roller	R/RR

Tri-scooter / Motorbike / Tricycle

Acc/Choke Cables	R/A	Brake/Clutch	R/A	Wiring /switches/plug	R/RR	Frame/Drive Hub	R/RR

Transmission Linkages				Other Repair			
Throttle/For-Rev cal	R/A	Stop cable	R/A	Fabrication	DONE	Hot work	DONE

Remark:	Part Uses
- replace Castle wheel!	1-
	2- Castle wheel 2pcs
	3-

Mechanic- Sani

* Please tick as action done.

VEOLIA ENVIRONMENTAL SERVICES
7 Tuas Avenue 10 Singapore 639131
Tel: +65 68610008 Fax: +65 68615886
www.veolia-es.sg

VESS-OP-MW-01-F-03

Invoice 1 shows the last repairs done to the Insured Vehicle on 24 January 2018 at the Veolia in-house workshop (arrowed) which included the topping up of hydraulic fluid and battery water. The air filter was checked and the fan belt/tensioner was replaced.

VEOLIA ENVIRONMENTAL SERVICES

JOHNSTON 600 SWEEPER

Prevent Maintenance / Inspection Report

Vehicle No : SJM 9113

Type of Service : SVC

Mileage : 76249 (2Eng)

Engine Hour :

WO No : 34177

Date : 24-11-17

Time In : 0045

Time Out : 0215

	Description	A/C	R	RR	T/U	Remarks
1	Replace engine oil and filter		/			engine oil 9L
2	Replace fuel filter		/			
3	Check Air filter and clean housing	/				CME
4	Check fan drive - V belt, pulley and belt tension condition					CME
5	Check cooling system- radiator, hoses, pump and connections					CME
6	Clean radiator fin and check coolent level					CME
7	Check Engine - fuel pump,injectors,fuel line and mounting					CME
8	Check torgue convertor and impeller gear oil level					CME
9	Check brush plate, brush arm,motor, cylinder					CME
10	Check L&R suction nozzle assembly, cylinders and linkages					CME
11	Check centerbrush, cylinders, hoses and attachment					CME
12	Check Impeller fan, housing and control flap					CME
13	Check hopper, intake duct and sealing					CME
14	Check water sprinkler system-water pump, hoses and spray nozzles.					CME
15	Check Hyd. System- pump ,motor and hoses.					CME
16	Check Electrical system- safety switch and wire					CME
17	Drain air reservior and lubricator					CME
18	Greasing on all grease nipples, linkages and attachment					CME OK
19	Repair / replace and top up as necessary for above checklist.					OK
20	Run Engine and conduct all functional check.					OK

(# Note: Any found unusuals and abnormals are required to report to Engineer.)

ABB
A/C : ADJUST OR CLEAN
R : REPLACED
RR : RSPAIRED
T/U : TOP UP

Remarks :

Follow Up Action Require : Nil

Attended By : Sim / Myint

Check By :

VEOLIA ENVIRONMENTAL SERVICES
7 Tuas Avenue 10 Singapore 639131
Tel.: +65 68610888 Fax: +65 68615320
www.veolia-es.sg

VESS-OP-MN-01-F-04

Invoice 2 shows the last servicing package done on the Insured Vehicle on 24 November 2017 at the Veolia in- house workshop (arrowed) which included the replacement of engine oil and oil filer. The other components were either adjusted or cleaned as per Veolia's Prevent Maintenance/ Inspect Report.

23. To the best of Mr Myint's recollection, there has not been any major mechanical problem and/or electrical problem with the Insured Vehicle. He also informed us that ever since the Insured Vehicle was purchased, there has not been any modification(s) and/or additional electrical or electronic component(s) fitted to the Insured Vehicle.

Site Inspection

24. With the information gathered, we visited the incident location on 14 March 2018 taking the reports made by Mr Khairil and the information that we had gathered from him as references.

25. Firstly, we note that the incident had occurred at the traffic junction of Cantonment Road and Neil Road along the 1st lane.

26. There is a traffic camera affixed near the traffic lights at the left side of the traffic junction. However we were unable to view or obtain the footage for security reasons.

27. At the time of visit, we observed burn marks and/or burnt residual remains on the ground where the Insured Vehicle was positioned. Apart from the burn marks on the ground, we did not observe any other damaged or newly replaced government property at the time of our visit to the incident location. No further information could be gathered during our site inspection other than the observation that the area where the Insured Vehicle was positioned when the incident occurred was not a secluded location. See photos 18 - 21 below.

Photo 18 shows the traffic junction of Cantonment Road and Neil Road (arrowed) where the incident occurred along the 1st lane. There is a traffic camera affixed near the traffic lights at the left side of the traffic junction (circled).

Photo 19 shows a closer view of the traffic camera affixed near the traffic lights at the left side of the traffic junction (circled). However we were unable to view or obtain the footage for security reasons.

Photo 20 shows the burnt marks and/or burnt residual remains on the ground where the Insured Vehicle was positioned at the time of incident (circled). No further information could be gathered during our site inspection other than the observation that the area where the Insured Vehicle was positioned when the incident occurred was not a secluded location.

Photo 21 shows a closer view of the burnt marks and/or burnt residual remains on the ground where the Insured Vehicle was positioned at the time of incident (circled). Apart from the burn marks on the ground, we did not observe any other damaged or newly replaced government property at the time of our visit to the incident location.

Incident Scene Photographs

28. We were able to obtain photographs from Ms Myint taken by Mr Khairil at the incident location. The photographs were taken during the fire and after the fire to the Insured Vehicle were extinguished.

29. In general, the information that could be gathered from these photographs had corresponded to the events that were related to us by Ms Khairil. Our close examination of these photographs also showed no unusual foreign material(s) and/or object(s) found on the ground in the immediate area where the Insured Vehicle was positioned. See photos 22 – 25 below.

Photo 22 shows the left centre portion of the Insured Vehicle engulfed in flames before the arrival of the SCDF. In general, the information gathered from this photograph had corresponded to Ms Khairil's statement, which is the fire started from the left portion of the sub engine and that he tried to raise the sub engine compartment but it could not be raised fully (circled).

Photo 23 shows the SCDF attending to the fire.

Photo 24 shows firefighters ensuring that the fire was completely extinguished.

Photo 25 shows the Insured Vehicle after the fire was extinguished. In general, the information gathered from this photograph had corresponded to Ms Khairil's statement, which is the incident had occurred at the traffic junction of Cantonment Road (circled) and Neil Road along the 1st lane as well as police officers were present at the scene to re- direct traffic (arrowed).

30. Given the circumstances of the incident as reported, the possibility of the cause of fire to the Insured Vehicle being due to the sub engine overheating would seem unlikely as Mr Khairil had mentioned to us there were no indications of abnormally high temperatures on the Insured Vehicle when he was driving before the incident occurred.

31. The possibility of the fire being due to external factors (foreign material(s) stuck on hot surfaces, arson and sabotage amongst others) would also seem unlikely as the fire was confined to the centre portion, with no visible exterior damage to other parts of the Insured Vehicle. The location of where the Insured Vehicle was positioned was also observed to be not at a secluded location.

32. The possibility of the fire being due to electrical in nature would then seem more likely given that engine overheating and external factors would both seem unlikely. The fire being due to electrical nature is also supported by the condition of the wirings that were found beneath the sub engine compartment as well as the wirings leading from the battery of the Insured Vehicle, which was earlier discussed in paragraph 11 above.

33. Our checks with both local and international bodies and associations had revealed that at the time of writing this report, there was a manufacturer recall on 21 January 2009 for the insufficient Storage Management System of Materials (Zinc & Nylon) resulting in zinc oxidation becoming advanced and distended. However the fault was rectified on 25 March 2009. See search result from LTA below.

Enquiry on Vehicle Recall - Vehicle Specific

* ONLY INFORMATION ON VEHICLE RECALLS SUBMITTED FROM 9 APRIL 2007 IS AVAILABLE

Vehicle Owner Particulars	
Owner ID Type:	Company
Owner ID:	3108N
Vehicle Details	
Vehicle Registration number:	YM9113J
Make:	ISUZU
Vehicle Model:	FTR34P
Engine No.:	6HK1466043
Chassis No.:	JALFTR34P87000023
Recall Details	
1 Recall No.:	R2009030015
Manufacturer Recall Date:	21 Jan 2009
Estimated Completion Year of Recall:	2009
Brief Description (As Provided by Motor Dealer):	The insufficient Storage Management System of Materials (Zinc & Nylon) and Zinc Oxidation becomes advanced and distended.
Date Rectified:	25 Mar 2009
For more details, contact TRIANGLE AUTO PTE LTD	
Hotline Information:	Winnie Tan at 68614800

OK

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Land Transport Authority
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Conclusion

34. Having investigated and technically analysed the damages of burnt nature to the Insured Vehicle, we are of the view that the cause of fire to the Insured Vehicle was of electrical in nature. For this particular case, the fire had originated from the wirings from the sub engine of the Insured Vehicle. The wirings were original factory fitted wirings of the Insured Vehicle.

35. We did not find any evidence which had suggested that the cause of fire to the Insured Vehicle was due to poor maintenance and/or recurring electrical problem.

36. There were no modification(s) or additional electronic and/or electrical component(s) fitted on the Insured Vehicle at the time of our inspection of the Insured Vehicle.

37. Our investigations had also revealed that at the time of writing this report, there is no manufacturer recall of electrical nature to similar make and model vehicle as the Insured Vehicle that may possibly be related to this incident.

38. SCDF was activated to attend to the fire incident and a fire report pertaining to their findings will likely be forth coming. We have applied for this fire report and will forward a copy of the report once it is made available to us.

Muhd Nazril
Technical Investigator

Ang Bryan Tani
AMSOE, AMIRTE, AFF SAE, M.MATAI, AFF.Inst.AEA
Senior Technical Investigator
Technical Investigation & Reconstructionist (SAE-A)