TOYOTA

Toyota Motor North America, Inc.

Vehicle Safety & Compliance
Liaison Office
Mail Stop: W4-2D
6565 Headquarters Drive
Plano, TX 75024

March 4, 2020

RECALL 20V-012

AMENDED DEFECT INFORMATION REPORT

1. Vehicle Manufacturer Name:

Toyota Motor Corporation ["TMC"]
1, Toyota-cho, Toyota-city, Aichi-pref., 471-8571, Japan

Toyota Motor Manufacturing, Kentucky, Inc. ["TMMK"]
1001 Cherry Blossom Way, Georgetown, KY, 40324

Toyota Motor Manufacturing, Indiana, Inc. ["TMMI"]
4000 Tulip Tree Drive, Princeton, IN 47670-4000

Toyota Motor Manufacturing Canada Inc. ["TMMC"]
1055 Fountain Street North, Cambridge, Ontario, Canada N3H 5K2

Toyota Motor Manufacturing Mississippi, Inc. ["TMMMS"]
1200 Magnolia Way, Blue Springs, MS 38828

Toyota Motor Manufacturing, Texas, Inc. ["TMMTX"]
1 Lone Star Pass, San Antonio, Texas 78264

Toyota Motor Manufacturing de Baja California, S. de R. L. de C.V. ["TMMBC"]
Carretera Tijuana Tecate Kilometro 143 y 144
Tijuana, Baja California C. P. 22550

Affiliated U.S. Sales Company

Toyota Motor North America, Inc. ["TMNA"]
6565 Headquarters Drive, Plano, TX 75024

Manufacturer of Fuel Pump Assembly:

DENSO CORPORATION
1-1, Showa-cho, Kariya-city, Aichi-pref., 448-8661, Japan
Phone: +81-566-25-5511

DENSO International America, Inc.
24777 Denso Drive, Southfield, Michigan 48086 U.S.A.
Phone: +1-248-350-7500

Country of Origin: Japan and U.S.A.

2. Identification of Involved Vehicles:

Make/ Car Line	Model Year	Manufacturer	Production Period
Toyota/4Runner	2014-2015	TMC	September 2, 2013 through February 19, 2015
Toyota/Avalon	2018-2019	TMMK	April 2, 2018 through February 11, 2019
Toyota/Camry	2018-2019	TMMK	November 20, 2017 through February 14, 2019
Toyota/Corolla	2018-2019	TMMC, TMMMS	October 19, 2017 through February 8, 2019
Toyota/FJ Cruiser	2014	TMC	September 2, 2013 through August 7, 2014
Toyota/Highlander	2018-2019	TMMI	November 8, 2017 through July 3, 2019
Toyota/Land Cruiser	2014-2015	TMC	September 2, 2013 through March 11, 2015
Toyota/Sequoia	2018-2019	TMMI	April 2, 2018 through March 18, 2019
Toyota/Sienna	2017-2019	TMMI	November 8, 2017 through February 11, 2019
Toyota/Tacoma	2018-2019	TMMBC/TMMTX	November 7, 2017 through February 19, 2019
Toyota/Tundra	2018-2019	TMMTX	April 2, 2018 through February 6, 2019

Lexus/ES350	2018-2019	TMC/TMMK	April 2, 2018 through May 6, 2019
Lexus/GS300	2018-2019	TMC	October 13, 2017 through December 6, 2017 September 18, 2018 through January 18, 2019
Lexus/GS350	2013-2014 2018-2019	TMC	September 2, 2013 through July 29, 2014 October 3, 2017 through January 31, 2019
Lexus/GX460	2014-2015	TMC	September 2, 2013 through February 19, 2015
Lexus/IS-F	2014	TMC	September 10, 2013 through July 24, 2014
Lexus/IS200t	2017	TMC	October 2, 2017
Lexus/IS300	2018-2019	TMC	October 2, 2017 through January 31, 2019
Lexus/IS350	2014-2015 2018-2019	TMC	September 2, 2013 through February 21, 2015 October 2, 2017 through November 30, 2018
Lexus/LC500	2018-2019	TMC	October 6, 2017 through January 31, 2019

Lexus/LC500h (Hybrid)	2018-2019	TMC	October 6, 2017 through January 28, 2019
Lexus/LS460	2013-2015	TMC	September 2, 2013 through February 23, 2015
Lexus/LS500	2018-2019	TMC	October 30, 2017 through January 31, 2019
Lexus/LS500h (Hybrid)	2018-2019	TMC	October 7, 2017 through January 30, 2019
Lexus/LX570	2014-2015	TMC	September 2, 2013 through March 11, 2015
Lexus/NX200t	2015	TMC	October 20, 2014 through June 2, 2015
Lexus/RC300	2018-2019	TMC	November 27, 2017 through January 31, 2019
Lexus/RC200t	2017	TMC	September 14, 2017 through November 28, 2017
Lexus/RC350	2015 2018-2019	TMC	April 15, 2014 through February 23, 2015 November 27, 2017 through January 31, 2019
Lexus/RX350	2017-2019	TMC/TMMC	October 2, 2017 through July 25, 2019
Lexus/RX350L	2018-2019	TMC/TMMC	December 4, 2017 through May 8, 2019

NOTE: (1) Although the involved vehicles are within the above production period, not all vehicles in this range were sold in the U.S.

(2) Based on Toyota's current understanding of the condition, this recall applies to certain vehicles with specific fuel pumps supplied by Denso, containing impellers produced during specific periods under specific circumstances. These vehicles contain fuel pumps that were produced with impellers of lower density and contain either (1) a pump impeller of a type with lower surface strength or (2) a pump impeller that was exposed to production solvent drying for longer periods of time. Vehicles with fuel pumps that were not produced under the aforementioned conditions are not included at this time.

(3) Some hybrid models are equipped with the aforementioned fuel pumps. However, with the exception of LS500h and LC500h, if the condition occurs, these vehicles will enter a fail-safe driving mode, resulting in illumination of warning lights and reduced motive power in which the vehicle can still be driven for certain distances. This does not present an unreasonable risk to safety. Toyota intends to conduct a customer satisfaction campaign for these vehicles in the future.

Applicability	Part Number	Part Name	Component Description
MY2014-2015 Toyota/4Runner	23220-31430	23220- : Pump Assy, Fuel w/Filter 23221- : Pump Assy, Fuel	Fuel Pump Assembly
MY2018-2019 Toyota/Avalon	23220-0P180 23221-31130		
MY2018-2019 Toyota/Camry	23221-31130		
MY2018-2019 Toyota/Corolla	23220-0T201		
MY2014 Toyota/FJ Cruiser	23220-31430		
MY2018-2019 Toyota/Highlander	23221-31130		

MY2014-2015 Toyota/Land Cruiser	23220-50271	23220- : Pump Assy, Fuel w/Filter 23221- : Pump Assy, Fuel	Fuel Pump Assembly
MY2018-2019 Toyota/Sequoia	23220-0S011		
MY2017-2019 Toyota/Sienna	23221-31130		
MY2018-2019 Toyota/Tacoma	23220-0C301 23221-31130		

MY2018-2019 Toyota/Tundra	23220-0S011		
MY2018-2019 Lexus/ES	23220-0P180 23221-31130		
MY2013-2015 MY2018-2019 Lexus/GS	23220-38041 23221-31130		
MY2014-2015 Lexus/GX	23220-31430		
MY2014-2015 MY2017-2019 Lexus/IS	23220-38041 23221-31130		
MY2017-2019 Lexus/LC/LC Hybrid	23221-31130		
MY2013-2015 MY2017-2019 Lexus/LS/LS Hybrid	23220-38030 23220-38050 23221-31130		
MY2014-2015 Lexus/LX	23220-50271		
MY2015 Lexus/NX	23221-36030		
MY2015 MY2017-2019 Lexus/RC	23220-38041 23221-31130		
MY2017-2019 Lexus/RX	23221-31130		

3. Total Number of Vehicles Potentially Involved:

Toyota 4Runner	:	112,524
Toyota Avalon	:	20,739
Toyota Camry	:	19,291
Toyota Corolla	:	364,656
Toyota FJ Cruiser	:	17,156
Toyota Highlander	:	375,851
Toyota Land Cruiser	:	4,519
Toyota Sequoia	:	11,056
Toyota Sienna	:	111,515
Toyota Tacoma	:	323,917
Toyota Tundra	:	71,797
Lexus ES350	:	40,312
Lexus GS300	:	17
Lexus GS350	:	29,501
Lexus GX460	:	34,417
Lexus IS200t	:	2
Lexus IS-F	:	87
Lexus IS300	:	26,760
Lexus IS350	:	16,365
Lexus LC500	:	1,820
Lexus LC500h Hybrid	:	45
Lexus LS500	:	11,786
Lexus LS460	:	13,582
Lexus LS500h Hybrid	:	498
Lexus LX570	:	6,852
Lexus NX200t	:	27,140
Lexus RC300	:	1,999
Lexus RC350	:	9,201
Lexus RC200t	:	157
Lexus RX350L	:	29,103
Lexus RX350	:	135,304
Total	:	1,817,969

4. Percentage of Vehicles Estimated to Actually Contain the Defect:

Unknown. Toyota is unable to provide an estimate of the percentage of vehicles to actually contain the defect. Whether the issue in each case will lead to a vehicle stall while driving at higher speeds depends on many variables, such as the specific production condition of fuel pump impeller and vehicle operating conditions.

5. Description of Problem:

The subject vehicles are equipped with a low-pressure fuel pump, located in the fuel tank, that supplies fuel pressure to the fuel injection system. These fuel pumps may include impellers which have been manufactured with lower density. If these impellers are also (1) of a type

with lower surface strength or (2) of a different type but were exposed to production solvent drying for longer periods of time, higher levels of surface cracking may occur. In this condition, excessive fuel absorption may occur, resulting in increased impeller deformation. In some cases, the impeller may deform to a point that creates sufficient interference with the fuel pump body to cause the fuel pump to become inoperative. An inoperative fuel pump due to these conditions could result in illumination of check engine and master warning indicators, rough engine running, engine no start and/or vehicle stall while driving at low speed. However, in rare instances, vehicle stall could occur while driving at higher speeds, increasing the risk of a crash.

6. Chronology of Principal Events:

June 2019 – August 2019

In early June 2019, Toyota observed an increase in field reports related to the low pressure fuel pumps produced by the supplier. These reports indicated that customers alleged rough engine running, engine no start, and/or loss of motive power while driving at low speed (less than 20 mph) and occurred more commonly in areas of the southern U.S. with hotter climates.

In mid-June, Toyota began an investigation, including the recovery of failed parts from the field. The supplier began inspection and analysis of the recovered parts and identified impeller deformation inside the fuel pump assembly due to more fuel absorption into the impeller material, with signs of binding/interference between the pump impeller and the pump casing/cover. A further analysis of failed impellers was conducted, and it was confirmed that the failed impellers had a lower density. Generally, impellers with lower density are more susceptible to fuel absorption.

As part of ongoing parts analysis, an additional observation was made of cracking to the impeller surface. To understand the relationship between surface cracks and pump failure, Toyota began an investigation to identify factors potentially contributing to cracking.

September 2019 – December 2019

As part of the investigation, Toyota hypothesized that solvent used during the manufacturing process was a factor in fuel pump impeller cracking and began duplication testing. During the testing, cracks occurred on the surface of the impellers as the solvent dried over time. However, the duplication test could not match impeller crack that was observed in the parts recovered from the field.

Toyota also conducted vehicle testing to understand potential failure modes of incidents identified in the field. Starting with a review of operation parameters to support duplication, recovered failed parts were installed in a Toyota fleet vehicle. After confirming that no DTC was initially present, the vehicle was parked for a period of time and then started; low fuel pressure was detected. Shortly thereafter, the check engine light and master warning were displayed. The vehicle was then driven until a rough running condition/loss of power became noticeable, and vehicle speed was gradually reduced until low speed engine stall occurred. The vehicle returned to normal operation immediately after restarting it.

This evaluation suggested that this issue occurs at lower speeds, but Toyota continued to investigate whether this condition could lead to a loss of motive power at higher speeds. As

part of this investigation, a manual review of available freeze frame data from all field incidents was done. Based on a detailed analysis of these data, three alleged cases were identified where loss of motive power occurred at higher speed (>20mph).

January 9, 2020

While continuing its investigation into the cause of impeller swelling, Toyota could not rule out the possibility of loss of motive power at higher speeds in the subject vehicles. Therefore, the decision was made to conduct a voluntary safety recall campaign.

January 13, 2020

Toyota filed a Part 573 report.

January – mid February 2020

As observed in Toyota's earlier study of low density impellers combined with drying solvent, cracks could not be duplicated to a level observed in the recovered parts. Thus, it was concluded that these conditions alone could not create impeller swelling and deformation which could result in sufficient impeller interference with the fuel pump body, causing the pump to become inoperative.

Toyota continued investigating whether there were other factors that could create cracks similar to those in the field recovered parts. One factor considered was the potential for longer lead times and temperature variation during fuel pump transit to the vehicle assembly plant during which the fuel pump would be exposed to drying solvent. Replication testing was done again with low density impellers, but with longer duration of dry solvent exposure and also temperature cycling. As a result, cracking was observed and appeared similar to the level of cracking as the recovered parts from the field.

However, Toyota observed that some field cases involved impellers that had low density with similar cracks to other field cases, but experienced shorter lead times to the vehicle assembly plant (i.e., were not exposed to drying solvent for longer periods of time during production in the same manner as the pumps investigated above). Thus, Toyota investigated a second factor, which was the surface strength of different pump impeller types. Analyses were performed on impeller samples from the pump types that may have been produced with lower density material. These analyses identified that the surface strength was low on one particular type. Impellers of this type, produced with the lower density material, can experience higher levels of surface cracking even when exposed to shorter durations of solvent drying.

Based on the above activities, Toyota concluded that pumps produced with impellers of lower density that also contain either (1) a pump impeller of a type with lower surface strength or (2) a pump impeller that was exposed to production solvent drying for longer periods of time could experience the impeller cracking at a level that could lead to excessive fuel absorption and increased impeller deformation. If impeller deformation results in sufficient interference with the fuel pump body, the fuel pump may become inoperative.

In parallel with the aforementioned investigation (beginning in mid-January), Toyota began an investigation to confirm that a fail-safe driving mode would occur in hybrid vehicles if this condition occurs. The testing involved inducing an inoperative fuel pump condition on test vehicles. During testing it was observed that the LS500h and LC500h could potentially

experience a ready off condition instead of entering a fail-safe driving mode under specific testing circumstances.

Additional analysis was conducted on the hybrid system design. This analysis compared design differences between hybrid systems used in the models being tested above. Further refinements to the test methods were developed to understand if the initial testing reflected what could occur in the field if one of these hybrid models experienced this fuel pump condition. Using the refined test methods, additional testing was done to cover all the hybrid models that may be equipped with a subject fuel pump.

Based on these results, it was determined that all hybrid vehicles equipped with the subject fuel pump, except LS500h/LC500h, would enter a fail-safe driving mode if this fuel pump condition occurs. However, because the LS500h and LC500h vehicles use a hybrid system of a unique design that may use more electricity from the battery and use the engine less than earlier designs, there is a possibility that, under certain driving conditions, these vehicles may have a hybrid battery state of charge that would not allow the vehicle to enter a fail-safe driving mode if this fuel pump condition occurs. Thus, it was determined that these models should be included in the recall population.

February 27, 2020

Based on the new information explained above, Toyota decided to amend recall 20V-012.

As of March 4, 2020, based on a diligent review of records, Toyota's best engineering judgment is that there are 81 Toyota Field Technical Reports and 3,225 warranty claims that have been received from U.S. sources that relate to the fuel pump failure investigated in this chronology and which were considered in the decision to submit this report.

7. Description of Corrective Repair Action:

All known owners of the affected Toyota and Lexus vehicles will be notified by first class mail to return their vehicles to a Toyota or Lexus dealer. Dealers will replace the fuel pump assembly with an improved one.

Reimbursement Plan for pre-notification remedies

The owner letter will instruct vehicle owners who have paid to have this condition remedied prior to this campaign to seek reimbursement pursuant to Toyota's General Reimbursement Plan.

8. Recall Schedule:

Owners of vehicles currently included in the recall, that were not included in the original recall population on January 13, 2020, will be notified by May 3, 2020. Owners of the vehicles that were originally covered by this recall (as filed on January 13) and are still covered by this recall, as amended, will be notified by March 13, 2020.

9. Distributor/Dealer Notification Schedule:

Notifications to distributors/dealers were sent on March 3, 2020. Copies of dealer communications will be submitted as they are issued.

10. Manufacturer's Campaign Number:

	Interim	Final
Toyota:	20TB02	20TA02
Lexus:	20LB01	20LA01