LiDAR DECOMMISSIONING REPORT

Pacific region

28/02/2023
FINAL

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PPA

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Quality information and document history

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1. Introduction

3E has been engaged by Pacific Power Association ("the Client") to carry out five LiDAR wind measurement campaigns in the Pacific region. More specifically:

- On the Marshall Islands, with a LiDAR unit WindCube V2.1 - WLS7-1113 from Leosphère, provided by 3E. installed on site 03/08/2020 and decommissioned 14/10/2021.

- In Samoa, with a LiDAR unit WindCube V2.1 - WLS7-1112 from Leosphère provided by 3E. installed on site 25/02/2020 and due to malfunctioning decommissioned on 15/12/2020. The unit was replaced by WLS7-7033 from Leosphère, provided by 3E. installed on site 26/10/2021 and decommissioned 14/02/2023.

- In Tonga, with a LiDAR unit WindCube V2.1 - WLS7-1115 from Leosphère, provided by 3E. installed on site 24/01/2020 and decommissioned 28/02/2023.

- In Tuvalu, with a LiDAR unit WindCube V2.1 - WLS7-1131 from Leosphère, provided by 3E. installed on site 25/02/2020 and decommissioned 01/06/2021.

- On the Solomon Islands, with a LiDAR unit WindCube V2.1 - WLS7-1109 from Leosphère provided by 3E. installed on site 18/02/2020 and due to malfunctioning decommissioned on 01/04/2020. The unit was replaced by WLS7-7017 from Leosphère, provided by 3E. installed on site 19/04/2021 and decommissioned 18/02/2023.

2. Project restrictions

Release windcube V2.1

Covid international travel restrictions

Covid lockdowns

3. Project/Site overview

3.1. Marshall Islands

The table below provides an overview of the site details. An overview of the executed maintenance and site interventions can be found in section 4. At the decommissioning of the LiDAR measurement campaign the site was cleared and returned to its original state.

Installation company	3E	
Site name	Marshall Islands	
Country	Marshall Islands	
Coordinates	Latitude= 7.067532 Longitude= 171.279621	WGS1984 Decimal degrees
Type / Serial number	Leosphère WindCube V2.1	WLS7 – 1113
Alternative coordinates	Easting= 530,880.08 m Northing= 7,812,23.58 m	WGS1984 UTM59N
Brief site description	The monitoring equipment is Installed on the airport near the runaway. There are no conflicting plans for the area.	
Distances	Laser-measured Evaluated on site From aerial map	☐ ☒ ☒
Heights	Laser-measured Evaluated on site From aerial map	☐ ☒ ☒
Installation completion date	03/08/2020	
Decommissioning date	14/10/2021	

3.2. Samoa

The table below provides an overview of the site details. During the campaign the LiDAR unit WLS7 – 1112 broke down and was replaced with WLS – 7033. An overview of the executed maintenance and site interventions can be found in section 4. At the decommissioning of the LiDAR WLS7-7033 the site was cleared and returned to its original state.

Installation company	3E	
Site name	Samoa	
Country	Samoa	
Coordinates	Latitude= -13.937399 Longitude= -171.749627	WGS1984 Decimal degrees
Type / Serial number	Leosphère WindCube V2.1	WLS7 – 1112 & WLS7-7033
Alternative coordinates	Easting= 419,023.28 m Northing= 8,459,069.44 m	WGS1984 UTM2L
Brief site description	The site is located 53 km South-east of Faleolo International Airport, Apia, Samoa. The lidar is located on Mt. LePu'e in 1020 meter above MSL. The Site is surrounded by dense forest.	
Distances	Laser-measured Evaluated on site From aerial map	☐ ☒ ☒
Heights	Laser-measured Evaluated on site From aerial map	☐ ☒ ☒
WLS7 – 1112 Installation date	25/02/2020	
WLS7 – 1112 decommissioning date	15/12/2020	
WLS7-7033 Installation date	26/10/2021	
WLS7-7033 decommissioning date	14/02/2023	

3.3. Tonga

The table below provides an overview of the site details. An overview of the executed maintenance and site interventions can be found in section 4. At the decommissioning of the LiDAR measurement campaign the site was cleared and returned to its original state.

Installation company	3E	
Site name	Keitahi (aka Tu'anekivale)	
Country	Tonga	
Coordinates	Latitude= -18.617179 Longitude= 173.908188	WGS1984 Decimal degrees
Type / Serial number	Leosphère WindCube V2.1	WLS7 – 1113
Alternative coordinates	Easting= 193,114.73 m Northing= 7,939,042.08 m	WGS1984 UTM2K
Brief site description	Site located 7km east of Airport with good elevation and exposure to coastal winds. Site is located on coastal ridge site.	
Distances	Laser-measured Evaluated on site From aerial map	☐ ☒ ☒
Heights	Laser-measured Evaluated on site From aerial map	☐ ☒ ☒
Installation completion date	24/01/2020	
Decommissioning date	28/02/2023	

3.4. Tuvalu

The table below provides an overview of the site details. An overview of the executed maintenance and site interventions can be found in section 4. At the decommissioning of the LiDAR measurement campaign the site was cleared and returned to its original state.

Installation company	3E	
Site name	Tuvalu	
Country	Tuvalu	
Coordinates	Latitude= -8.525098 Longitude= 179.196466	WGS1984 Decimal degrees
Type / Serial number	Leosphère WindCube V2.1	WLS7 – 1131
Alternative coordinates	Easting= 741,785.96 m Northing= 9,056,963.72 m	WGS1984 UTM60L
Brief site description	The monitoring equipment is Installed in front of the Met Office's fenced compound near the runaway of the airport. There are no conflicting plans for the area.	
Distances	Laser-measured Evaluated on site From aerial map	☐ ☒ ☒
Heights	Laser-measured Evaluated on site From aerial map	☐ ☒ ☒
Installation completion date	25/02/2020	
Decommissioning date	01/06/2021	

3.5. Solomon Islands

The table below provides an overview of the site details. During the campaign the LiDAR unit WLS7 – 1109 broke down and was replaced with WLS – 7017. An overview of the executed maintenance and site interventions can be found in section 4. At the decommissioning of the LiDAR WLS7-7017 the site was cleared and returned to its original state.

Installation company	3E	
Site name	Solomon Islands	
Country	Solomon Islands	
Coordinates	Latitude= -9.43773 Longitude= 160.063219	WGS1984 Decimal degrees
Type / Serial number	Leosphère WindCube V2.1	WLS7 – 1109 & WLS7 – 7017
Alternative coordinates	Easting= 616,721.48 m Northing= 8,956,524.79 m	WGS1984 UTM57L
Brief site description	The site is located 3 km south-east of Honiara international airport, Solomon Islands and is located at an existing PV plant. The lidar is 7 meter above MSL. The Site is in an existing PV plant and fenced off. No obstructions noted on site.	
Distances	Laser-measured Evaluated on site From aerial map	☐ ☒ ☒
Heights	Laser-measured Evaluated on site From aerial map	☐ ☒ ☒
Installation completion date	18/02/2020	
WLS7-1109 decommissioning date	01/04/2020	
WLS7-7017 Installation date	19/04/2021	
WLS7-7017 decommissioning date	18/02/2023	

4. Site maps

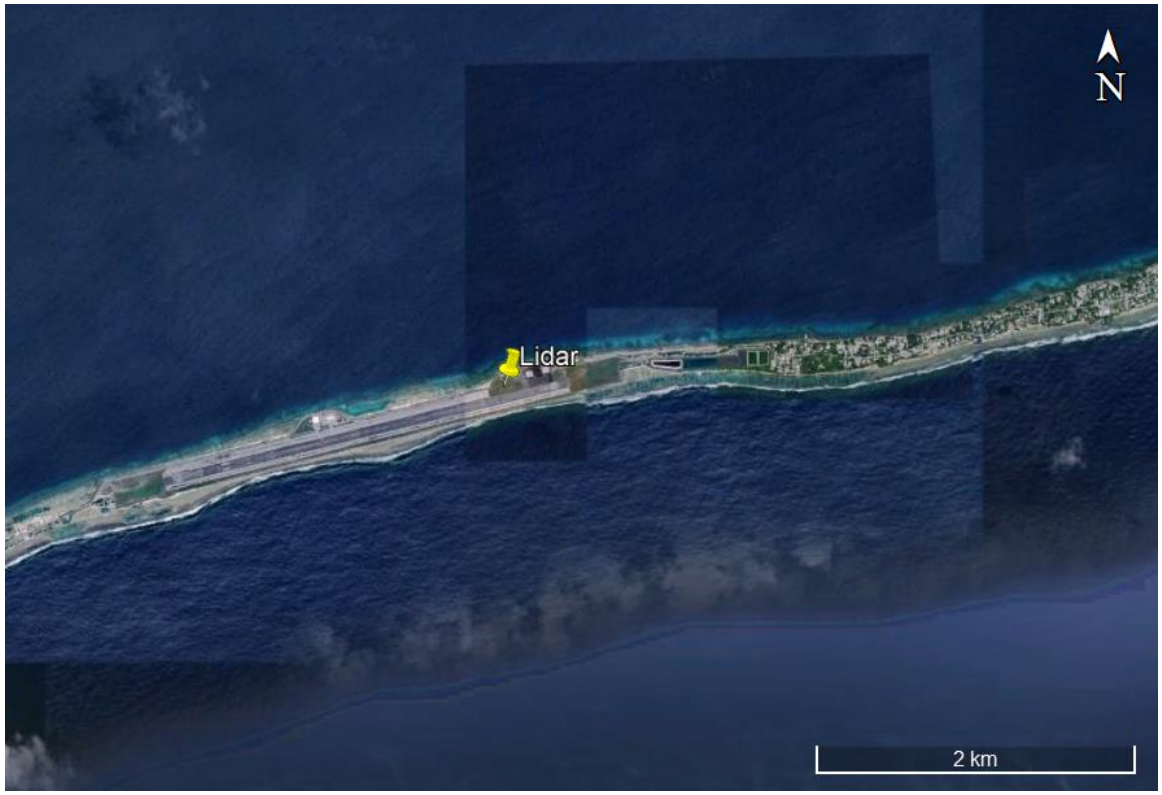

Figure 1: Site map LiDAR measurement campaign Marshall Islands (Google Earth)

Figure 2: Site map LiDAR measurement campaign Samoa (Google Earth)

Figure 2: Site map LiDAR measurement campaign Tonga (Google Earth)

Figure 3: Site map LiDAR measurement campaign Tuvalu (Google Earth)

Figure 4: Site map LiDAR measurement campaign Solomon Islands (Google Earth)

5. Maintenance interventions

5.1. Marshall Islands

5.1.1. 19/01/2021

On 01/01/2021, most likely due to local weather conditions the LiDAR was slightly tilted outside of it's operational limits of 1° on tilt and roll direction. The average availability dropped significantly as a result. A site visit was executed on 19/01/2021 to relevel the LiDAR WLS7-1113.

5.2. Samoa

5.2.1. 22/04/2020

The power supply system used is based on a PV array combined with charge controller, inverter, and connection to the LiDAR. A site visit was executed on 22/04/2020 to investigate the malfunctioning power supply system of the installation. The origin was found the linked to the inverter used. After resetting the system, the LiDAR was able to restart measurements.

5.2.2. 14/06/2020

On 05/05/2020 the power supply system malfunctioned again. A site visit was executed on 14/06/2020 to redesign the power supply system and everything expect the solar array was replaced.

5.2.3. 15/12/2020

On 01/07/2020 the Laser chain of the LiDAR broke down. The LiDAR unit WLS7-1112 was decommissioned and shipped back to Leopshere's factory for further investigation.

5.2.4. 26/10/2021

A replacement unit WLS7-7033 was shipped to Samoa and installed on 26/10/2021.

5.2.5. 08/02/2022

Power supply system broke down and required repair. Due to a landslide the site was not accessible until 19/09/2022. On which day a team went on-site to resolve the issue.

5.3. Tonga

5.3.1. 24/01/2020

Issues with the power supply system during the installation.

5.3.2. 02/15/2021

Covid pv system installed, return lidar to main islands repais &installation

5.4. Tuvalu

5.4.1. 25/02/2020

The installation was executed on the 25th of February 2020. The LiDAR only started operating from 29/02/2020 due to issues with the power supply.

5.4.2. 23/10/2020

On the 23rd of October 2020 issues with the power system occurred. The LiDAR measured on and of until 09/01/2021 when the focal point was available to resolve the system malfunctioning.

5.5. Solomon Islands

5.5.1. 01/04/2020

On 29/02/2020 the laser chain of LiDAR WLS7-1109 broke down. A site visit was executed on 01/04/2020 and the unit was decommissioned.

5.5.2. 19/04/2021

A replacement unit WLS7-7017 was shipped to the Solomon Islands and installed on 19/04/2021.

5.5.3. 27/09/2022

The laser chain broke down again on 07/11/2021. After which a Leosphere technician came on-site to replace the laser chain. LiDAR WLS7-7017 was repaired on 27/09/2022 and again fully operational.

6. Conclusion

3E has been engaged by Pacific Power Association ("the Client") to carry out five LiDAR wind measurement campaigns in the Pacific region.

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- In Tonga, with a LiDAR unit WindCube V2.1 - WLS7-1115 from Leosphère, provided by 3E. installed on site 24/01/2020 and decommissioned 28/02/2023.

- In Tuvalu, with a LiDAR unit WindCube V2.1 - WLS7-1131 from Leosphère, provided by 3E. installed on site 25/02/2020 and decommissioned 01/06/2021.

- On the Solomon Islands, with a LiDAR unit WindCube V2.1 - WLS7-1109 from Leosphère provided by 3E. installed on site 18/02/2020 and due to malfunctioning decommissioned on 01/04/2020. The unit was replaced by WLS7-7017 from Leosphère, provided by 3E. installed on site 19/04/2022 and decommissioned 18/02/2023.

At the decommissioning of the five LiDAR measurement campaigns the sites were cleared and returned to its original state.

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