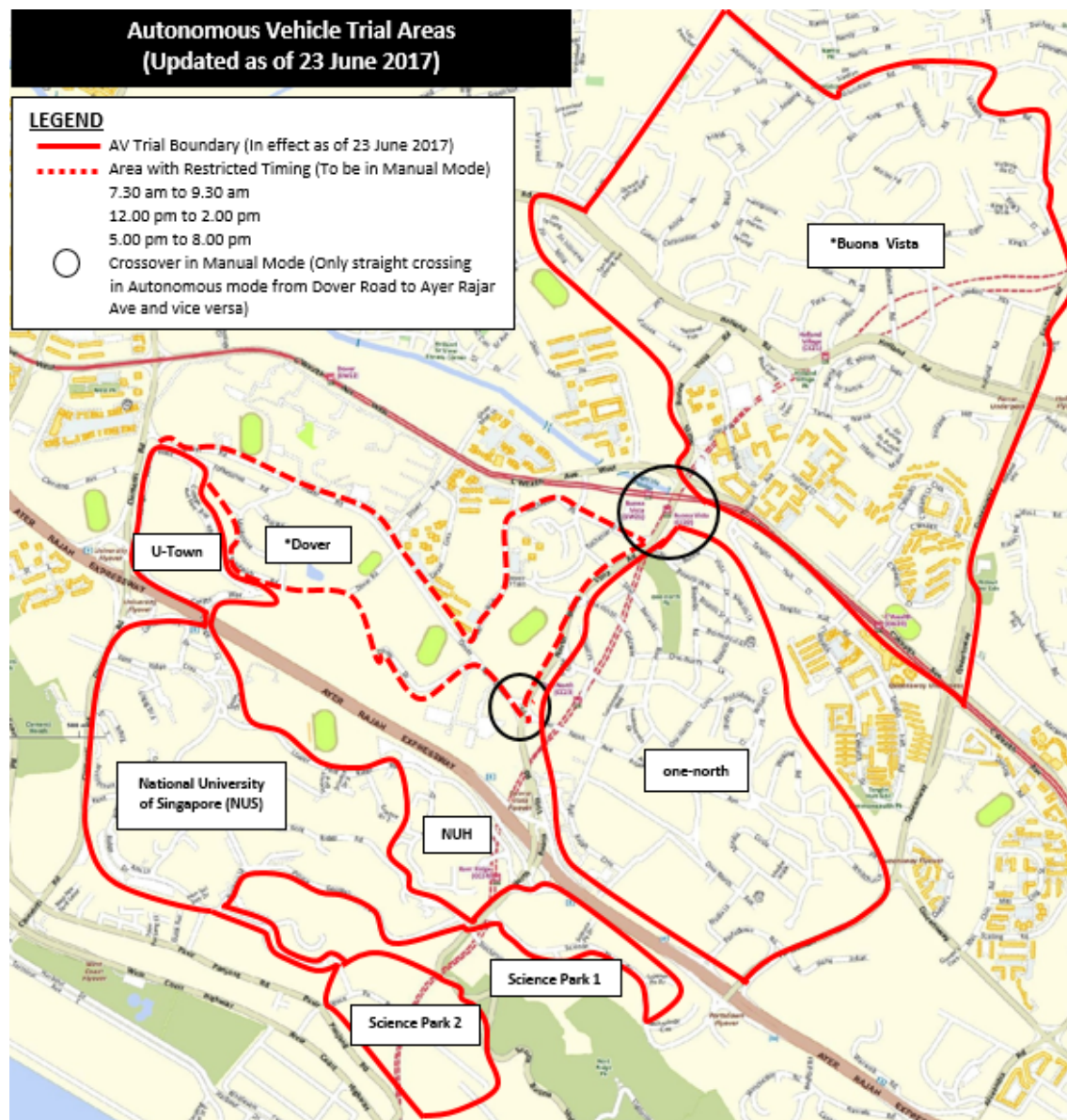


AUTONOMOUS VEHICLES (AV) TEST BED AND CENTRE OF EXCELLENCE FOR TESTING AND RESEARCH FOR AVS-NANYANG TECHNOLOGICAL UNIVERSITY (NTU) (CETRAN)

1. one-north AV Test Site

- 1.1. one-north was the first test-site identified and designated for AV testing in collaboration with JTC. Since January 2015, a 6-km long network of test routes connecting Biopolis, Fusionopolis and Mediapolis was identified for AV on-road testing. This was doubled to 12-km in September 2016, whereby AV trial participants can conduct further on-road testing in one-north, given their progressive capabilities.
- 1.2. Since 23 June 2017, the AV testbed had been expanded to neighbouring areas such as the National University of Singapore (NUS), Singapore Science Park 1 and 2, Dover and Buona Vista. These areas present a larger testbed, and will add another 55km to the existing AV trial routes, allowing AV trial participants to experience more on-road scenarios which will help accelerate technology development. See below for a map of the expanded testbed.



2. Existing Infrastructure in one-north to Support AV Trials

2.1. Be-SAFE – Beacon System for AV Trials

- 2.1.1. LTA has implemented a Vehicle-to-Infrastructure (V2I) cooperative system leveraging dedicated short range communication (DSRC) beacons at designated locations in one-north. The aim is to assess the potential of V2I technologies as an enabler to AVs such as through providing position augmentation and relevant traffic information.
- 2.1.2. DSRC beacons are currently in place at ten road junctions in one-north. The beacons enhance the AV's way-finding ability by broadcasting information such as Traffic Light Signal, Position Augmentation information as well as traffic conditions in the vicinity such as the location of nearby roadworks and/or traffic incidents.

2.2. J-Eyes CCTV @ one-north

- 2.2.1. A network of CCTVs has been implemented at 20 locations as of July 2016. This allows LTA to monitor and study the behaviour and on-the-ground challenges of AVs at critical locations such as traffic junctions and road bends. Video footages from the CCTV cameras also serve as an independent source of evidence during investigation should an incident occur.

2.3. Centre of Excellence for Testing & Research of AVs-NTU (CETTRAN) Test Circuit

- 2.3.1. On 1 August 2016, LTA and JTC, in partnership with NTU launched CETTRAN to build up technical capabilities and knowledge in the testing and certification of AVs. On 22 Nov 2017, the CETTRAN AV Test Centre was launched to support CETTRAN's testing and certification activities. The Test Centre has a test circuit customized to AV testing requirements and Singapore's road settings, traffic rules, and traffic behaviour so as to provide a simulated environment that will facilitate the testing of AVs in a real-world environment
- 2.3.2. Common traffic schemes and infrastructure such as bus stops, taxi stands, filter lanes, traffic junctions, zebra crossings, traffic lights and signs and road markings will be incorporated into the CETTRAN Test Circuit to closely replicate real-world road conditions. In addition, there are CCTVs to monitor the test circuit activities and beacons will also be implemented to facilitate testing.
- 2.3.3. This will be complemented by a computer-simulated testing environment that CETTRAN will be experimenting with to perform simulation-based testing specific to AVs.

