

Significant Road Safety Deficiencies in the Southern Lantau Road Network

Road Safety Commentary

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This article draws attention to interested parties two significant road safety deficiencies with potential for catastrophic consequences. These are namely ineffective Arrester Beds (Escape Lane) on Tung Chung Road and lack of safety barriers along the dam of the Shek Pik Reservoir. Rectification is imminently needed and certainly a prerequisite for any increase of bus and coach traffic. In addition, existing roads in the southern Lantau road network are narrow and steep, generating concerns for head-on collisions and roadside crashes. The safety and comfort of pedestrians would be major concerns where highway traffic interacts with village communities and country park visitors. Other potential safety concerns include vehicle interactions with cyclists and cows. All these issues need to be identified, addressed and satisfactorily resolved through a comprehensive Road Safety Review. This article does not cover the broader environmental and social consequences of opening up the road network.

Roadside Safety Risk

Crashes involving vehicles leaving the road have the potential for severe and catastrophic consequences. Roadside safety concerns the probability and consequences of vehicles leaving the road. The key to improving roadside safety includes adequate road and traffic provisions, effective control of driving standard as well as measures to prevent vehicles from severe impacts or rolling off dangerous side slopes in case they do leave the road. Brake failure is a particular risk of hilly roads on continuous long steep grades.

The following table illustrates some of the historic crashes with severe casualties or potential severe consequences in the road network.

Date	Location	Happenings
22nd July 1973	Keung Shan Road	Bus rolled down steep side slope of hilly section (40 casualties of which 17 are fatalities)
23 August 1992	Keung Shan Road	Bus overturned on side slope of Shek Pik Reservoir (22 casualties of which 8 are serious)
26th January 2003	Keung Shan Road	Bus overturned on side slope of hilly section (10 casualties of which 8 are serious)
24 April 2005	Keung Shan Road	Bus possibly with brake failure collided with taxi in front at temporary traffic light and overran into side slope
5 April 2015	Tung Chung Road	Bus with brake failure overran roundabout onto side road at bottom of long steep grade on Tung Chung Road southbound
13 May 2015	Tung Chung Road	Dumper truck with brake failure rolled over at bottom of long steep grade on Tung Chung Road southbound

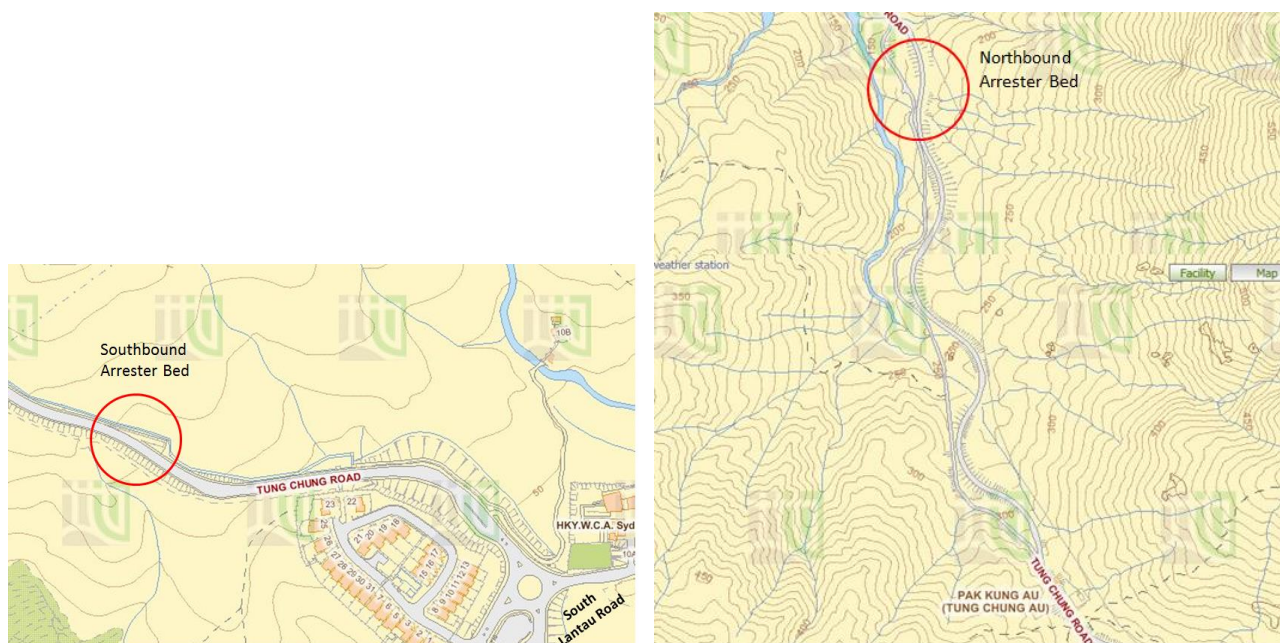
Safety Problem 1 - Arrester Beds on Tung Chung Road

Tung Chung Road is constructed on continuous long steep grades at both sides of the mountain pass of Pak Kung Au with an altitude of 330mPD. At present, two-way daily bus and coach traffic is estimated to be 350 and 500 for weekdays and holidays respectively. Brake failure among heavy vehicles is a particular risk as demonstrated by two potentially catastrophic crashes in April and May 2015 respectively.

There are two arrester beds at either side of Tung Chung Road. Their purpose is to enable an out-of-control vehicle with brake failure to slow down and stop safely. Rapid deceleration of such vehicles is achieved through frictional resistance of the gravel bed and preferably aided by an uphill profile. The end of the arrester bed also has to be specially designed with energy absorbing and containment measures.

The arrester beds on Tung Chung Road measure only 14m and 15m in length whereas a proper facility would be 70m to 130m long, depending on the precise design parameters. Furthermore, the arrester beds do not consist of any proper treatments at the end. Signing and delineation are crucial to reassure and guide drivers under panic condition but the adequacy of these provisions is doubtful. In fact, a heavy vehicle or bus with brake failure is likely to overrun these arrester beds. The scenario of a fully loaded bus with brake failure attempting to use the facility at full speed could be catastrophic.

It will be necessary to review the suitability of the location of these arrester beds and to reconstruct them to meet specific technical requirements. In the interim, these arrester beds should be closed off while alternative control measures are formulated to reduce the risk of brake failures.



Location of Arrester Bed for Southbound Traffic (left) and Northbound Traffic (right) (source of map: Lands Department)



Layout and Dimensions of Arrester Bed for Southbound Traffic (left) and Northbound Traffic (right) (source of map: Lands Department)



General View of the Arrester Bed for Southbound Traffic: Out-of-control vehicle is likely to overrun the facility and launched airborne into the forest



General View of the Arrester Bed for Northbound Traffic: Out-of-control vehicle is likely to overrun the facility and roll down the side slope back onto the road

Safety Problem 2 - Shek Pik Reservoir Dam

A 700m long section of Keung Shan Road lies along the crest of the dam of Shek Pik Reservoir. The northern roadside is guarded by a continuous stone wall but the southward roadside is guarded by a railing without the containment capability of a safety barrier. The dam is more than 50m in height and the southern side slope has an initial gradient of 1 : 2.275 (23.7 °) followed by 1 : 2.78 and then 1 : 3. Over the side slope there are three berms with drainage channels. The bottom of the slope is a massive toe wall.

From the roadside safety point of view, side slope gradient of 1: 3 and steeper will not permit an errant vehicle to regain control. The vehicle could readily roll over and may continue to fall off the slope. The intermediate berms and bottom toe wall could further aggravate the damage and casualties.

At present, two-way daily bus and coach traffic on the dam is estimated to be 320 and 400 for weekdays and holidays respectively. There is always the possibility of vehicles leaving the road due to speeding, inattention, fatigue driving, loss of control, skidding, tyre burst, sudden illness or the result of a primary collision. A catastrophic scenario is that a bus breaks through the railing and starts to roll over the side slope at speed. This would result in mass fatalities and casualties.

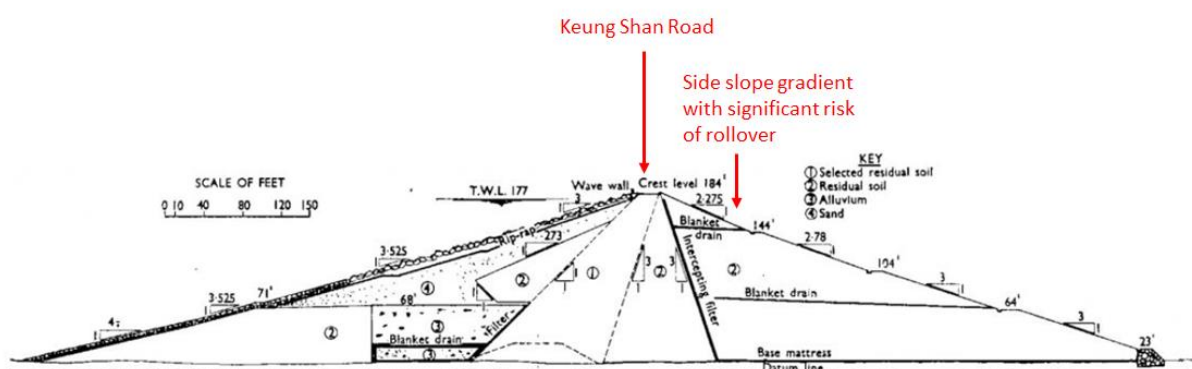
To rectify the problem, a continuous Thrie-beam safety barrier or equivalent should be installed along the entire length of the southern roadside of the dam.



Site Location (source of map: Lands Department)



Steep Side Slope of the Dam without a Proper Safety Barrier



Cross-section of Shek Pik Reservoir (courtesy: Indhkh Group and Tymon Mellor; Government's archive)

Conclusion

This article illustrates two significant road safety deficiencies in the restricted road network on Lantau Island which are already considered unacceptable for today's traffic. The risk will further escalate if more traffic including coaches and buses is permitted. It is therefore critically important to investigate and rectify such deficiencies as a matter of urgency. In fact, there would be many other safety deficiencies and issues in the road network which warrant a thorough Road Safety Review and upgrading works prior to accepting any increase of traffic.