

## GREENING OF THE KUDAWA WATHURANA ACCESS ROAD<sup>1</sup>

**Background.** The Sinharaja is one of Sri Lanka's last remaining rain forests. An access of 1.6 Km provides entry to the core conservation zone. This road was originally built several decades ago (in the 1970s) to facilitate transport of timber logs when commercial logging was allowed inside Sinharaja. In 2018, the road was rehabilitated by the Forest Department in order to promote Nature Based Tourism. The works included:

- i) Widening the road back to its original 13 feet width
- ii) Paving the entire road surface with pavement stone
- iii) Installing concrete side drains

These works were deemed inadequate for such sensitive site and the work was halted when physical progress was almost at 70% in April 2019. This review addresses the proposed works for completing the works.

**Minimizing project footprint.** The main decisions for minimizing the impact of roads through forest areas are the selection of the alignment and the width of the road. In this case, these two decisions have already been made. For the level of pedestrian traffic that is expected along this trail (3000 tourists per month), a 4 – 5 ft would have been sufficient. It seems that maintenance vehicles could use a different road and there was no immediate need for a 13 ft wide access road. Even a reduction to 8 ft with occasional wider passing areas can accommodate the pedestrian traffic and still support some occasional service vehicles. Also, the decision to build concrete side drains does not provide a natural look to the road in such a sensitive spot.

Although the reduction of the width of the road and the destruction of concrete drains would be desirable from an ecological point of view, these actions are deemed both socially and politically unfeasible at this moment. Therefore, it is recommended that the road be completed as designed especially the surface materials. Since the source of materials are outside the sensitive areas the completion of the road does not represent a major concern.

However, the completion of the road still offers opportunities greening actions. Some of these opportunities are discussed below.<sup>2</sup>

**Habitat fragmentation.** Although the width of the road and the expected level of traffic would not represent a barrier to fauna movement across the road, the type and depth of the concrete drains would obstruct the movement of small animals (lizards, amphibian, crawling insects) and most probably become traps. Small animals will not have the ability to get out of the ditch and be drowned or starve.

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<sup>1</sup> Juan D. Quintero, Environmental Engineering Consultant.

<sup>2</sup> Recommendations and schematics were taken from:

Keller, Gordon; LOW-VOLUME ROADS ENGINEERING Best Management Practices Field Guide, USDA, Forest Service, July 2003.

Keller, Gordon; Stabilization and Rehabilitation Measures for Low-Volume Forest Roads, USDA, Forest Service, 2011.

Pakistan: Field Manual on Slope Stabilization, UNDP, 2008

Quintero, Juan D.; A Guide to Good Practice for Environmentally Friendly Roads, TNC Latin American Conservation Council, 2015.

### Side drains become barrier to small fauna movement.



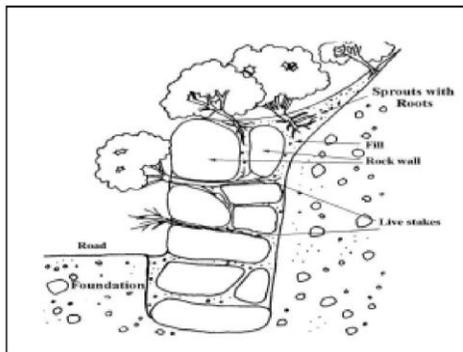
Although based on the pictures provided it would be difficult to find options to minimize this impact it is recommended that some measure to minimize this impact, design engineers can be requested to provide alternative solutions. Compacted shoulders, wooden planks could be used to provide passage to animals in some sections of the road.

Another fragmentation issue could be arboreal animals. If these types of animals exist in this forest, it is recommended that specialists identify preferred routes. If the road does not allow for connectivity at the canopy level, then some aerial crossings can be installed in key sections of the road.

**Erosion control and Slope stabilization.** The proposed engineering measures are sound and will provide this protection along the road. However, it is encouraged that **Biotechnical Erosion Control** be used instead of only structural measures. Biotechnical Erosion Control consists of a combination of vegetative and structural measures used to prevent erosion or stabilize slopes and stream banks. The term “biotechnical” describes several methods of establishing vegetative cover by embedding a combination of live, dormant, and/or decaying plant material in a structure-like manner or in conjunction with riprap or physical structures such as cribs or gabions.

These measures would provide a more “nature based” look to the road. Some of the measures that could be used in this road include:

### A Wall with Live Stakes Constructed with Rock or Gabions and Vegetation



Other alternatives include:

- Vegetated soft gabions
- Vegetated concrete crib walls

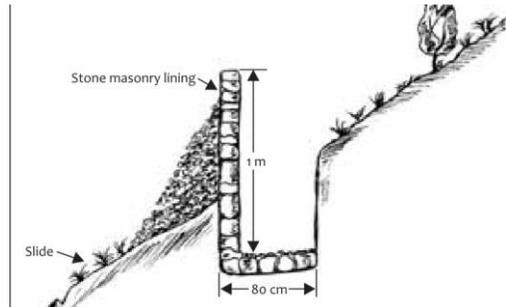
- Vegetated wooden crib walls

### Concrete and Wooden Crib Walls



The proposed cut off drains at the top of the slopes are adequate. The cutoff drains are essential for preventing the additional runoff from the up slope to enter into the face of the slope.

### Cutoff Drain



Terracing is proposed in some high cuts like the one at 200 – 250 m from the entrance. Care should be taken to minimize the affectation of additional forest from this terracing. Vegetated concrete or wooden crib walls is recommended at this site and other high cuts. Vegetated gabions in the smaller cuts. Cut off drain is also needed.

### Bioengineering is recommended for all slopes

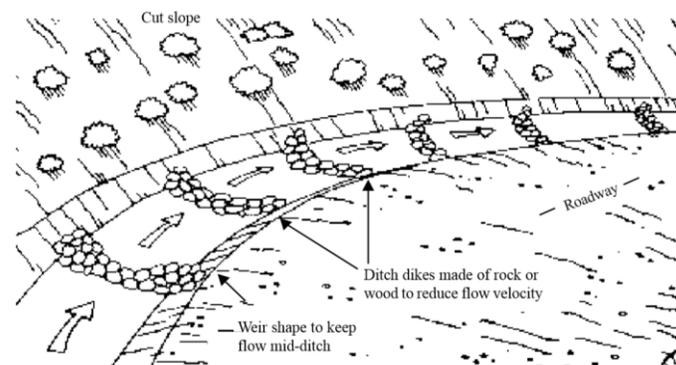


In areas without any ditch construction, an effort must be made for the ditches to be made to look more “natural, with perhaps a “V construction and armored with a turf reinforcing mat and grass (rather than concrete). In addition, it is recommended to look for opportunities for more frequent lead-offs (depending on road grades).

The outlet of pipes and ditches are ideally located in a stable, nonerosive soil area or in a well-vegetated or rocky area. The accelerated velocity of water leaving a roadway can cause severe erosion or gulying if discharged directly onto erosive soils. The pipes and drain outlet area can be stabilized, and the energy of the water dissipated, by discharging the water onto 1-2 cubic meters of a graded rock riprap.

Ditches in steep grades in erosive soils, and with flow velocities over one meter per second may require armoring or the use of small ditch dike or dam structures placed in the ditch to slow down the velocity of water. The proposed rubble masonry drain, with cascading bottom is also adequate for this purpose.

### Ditch armoring



**Signage.** The road is located inside a sensitive site. Visitors must follow strict Code of Conduct while using the road. It is recommended that visible signs at the ticketing point be placed to provide such a Code of Conduct to all visitors:

- Prohibitions to stray outside the road alignment
- No hunting, feeding animals
- No littering or dumping trash along the road
- No domestic animals allowed
- No hunting
- No smoking

These signs must be in local language. If foreign tourists are also expected, the signs must be also in English.

**Illegal logging and hunting.** The opening of roads through forested areas increase the probability of illegal logging and poaching. It seems that control of illegal activities around this road is adequate. However, if there is any indication that these activities are occurring, then some additional physical control at the entry point is recommend. Simple wooden posts at the entrance with a clearance just to let maintenance vehicles pass would prevent larger vehicles or trucks from entering the road.