SEACAP 21/004
Practitioner Training

Theme 4

Slope and Roadside Inspections and Assessments

Routine Inspections

- Three times a year; before, during and after the wet season
- Emergency inspections when problems first reported

SLOPE HAZARD INVENTORY

Road	Location (km)	Type of hazard					Date of inspection		
		Above road		Below Road					
		Slope	Wall	Slope	Wall	Culvert			
13N	65+350	5x10C							
	65+380					1P			
	65+430/450			20x30F					
	65+600/615				4x15M				
	65+650/670		20x3G						
	65+650/670	20x30C							

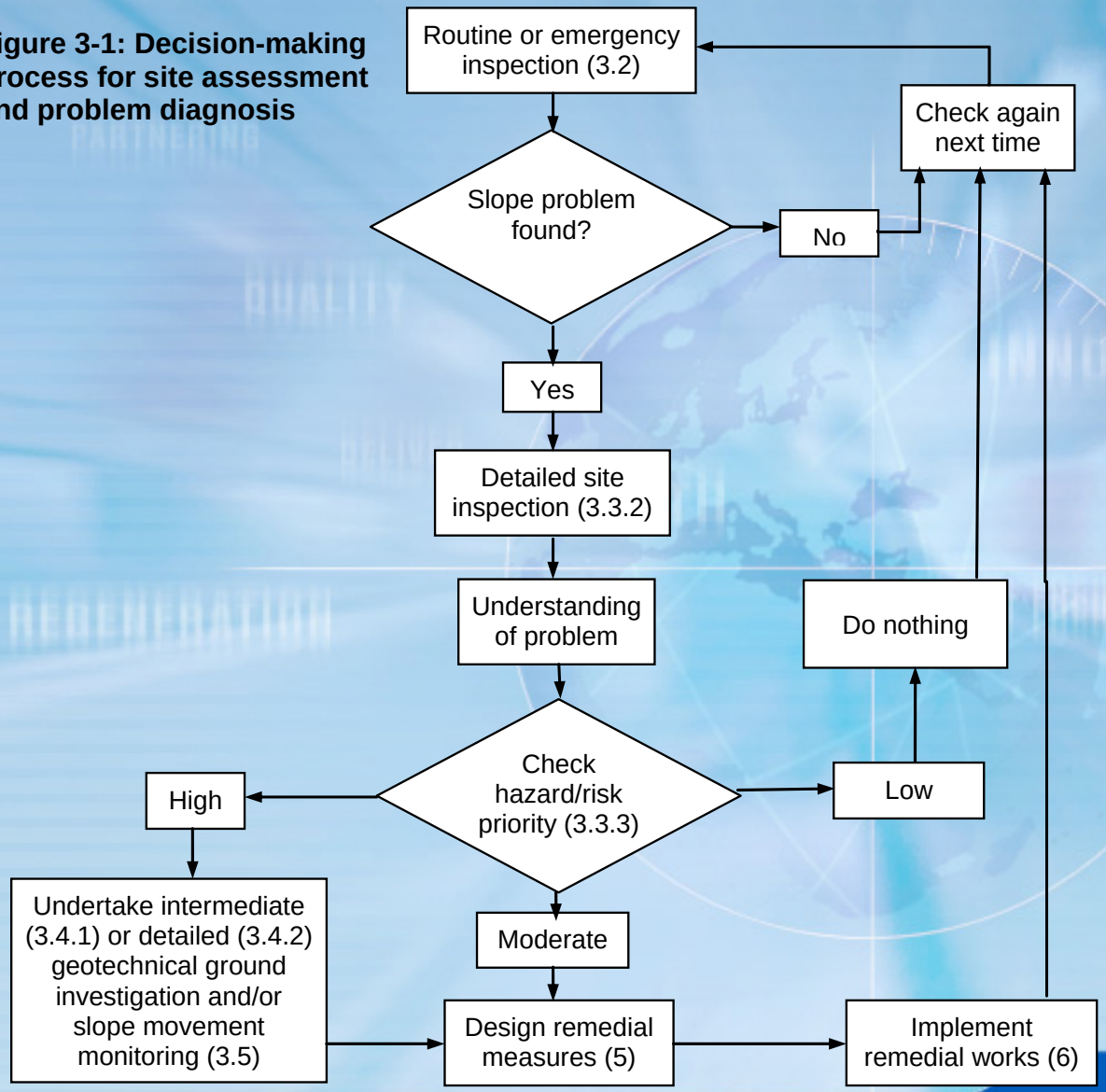
Slope	5 x 10 = width and height of hazard in metres C = cut slope F = fill slope N = natural ground
Wall	6 x 15 = height and length in metres M = masonry G = gabion C = concrete
Culvert	1 = culvert diameter or width in metres P = pipe B = box

Detailed Inspections

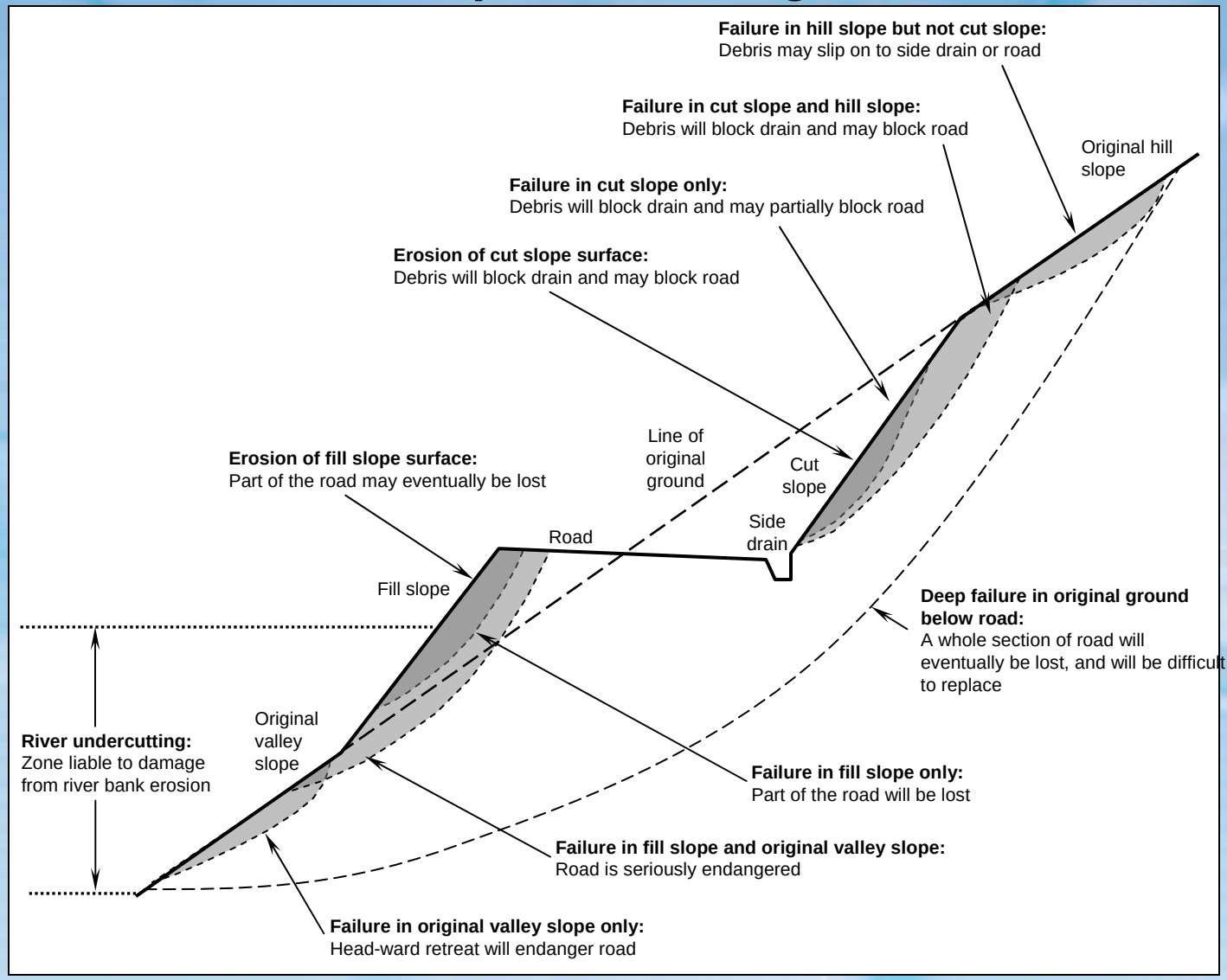
- Use of SMM figure 3-1
- Detailed inspection procedure

Slope Manual Fig 3-1

Figure 3-1: Decision-making process for site assessment and problem diagnosis



Slope Manual Fig 2-2



Slope Manual Fig 3-2: Above Road

Problem	Common evidence	Likely consequences
Above the road		
Erosion of the cut slope surface	• Debris present in roadside drains. • Gullies have formed in the cut slope. • Signs of damage to the vegetation.	• Debris *will* block drains and adjacent carriageway and *may* damage the road surface. • Loss of mass on the cut slope *may* undermine the hill slope above and cause a failure.
Failure in cut slope only	• A cone of debris blocking the drain and extending on to the carriageway. • A landslide scar on the cut slope.	• Debris *will* block drains and *may* damage the road surface. • Water from the blocked drains *may* flow across the road and cause erosion down slope. • Traffic *will* be disrupted on at least one side of the road. • Loss of mass on the cut slope *may* undermine the hill slope above and cause a larger failure.
Failure in hill slope but above the cut slope	• Debris on or above the cut slope, possibly extending down as far as the side drain and road. • A landslide scar on the hill slope above the cut slope.	• Debris *may* block the side drain or cause damage and disruption to the road. • The cut slope *will* be surcharged by the additional weight of debris from above, and *may* fail as a result.
Failure in cut slope and hill slope	• Debris on the cut slope, probably extending into the side drain and road. • A landslide with the upper part of its scar on the hill slope and the lower part on the cut slope. • Entire failure of the slope above the road	• Debris *will* block drains and *may* damage the road surface. • Water from the blocked drains *may* flow across the road and cause erosion on the lower side. • Traffic *will* be disrupted on at least one side of the road. • The failure *may* block the road entirely.

Slope Manual Fig 3-2b: Below Road

Problem	Common evidence	Likely consequences
Below the road		
Erosion of the fill slope surface	• Gullies have formed in the fill slope. • Signs of damage to the vegetation.	• If untreated, the erosion *may* cause a failure of the fill slope
Failure in fill slope only	• Tension cracks on the valley side of the road. • A landslide scar in the fill slope.	• The road *may* be partly or wholly cut off. • Traffic *may* be disrupted on at least one side of the road.
Failure in fill slope and original valley slope	• Tension cracks on the valley side of the road. • A landslide scar in the fill slope extending into the original ground beneath. • Evidence that the slope below and either side of the fill slope is moving (e.g. scars, tension cracks)	• Loss of mass on the slope *will* undermine the fill slope above and *may* cause a larger failure.
Failure in original valley slope but not in fill slope	• A landslide scar in the original hillside beneath the fill slope.	• Loss of mass on the slope *may* undermine the hill slope above and cause a larger failure.
Deep failure in the original ground underneath the road	• Indication that the entire road and possibly the slope above is failing	• The road *will* be damaged and *may* be partly or wholly cut. • Traffic *will* be disrupted.
Loss of support from below by river erosion	• Obvious active or periodic river scour.	• Loss of mass on the slope *may* undermine the hill slope above and cause a larger failure.

Erosion of cut slope surface

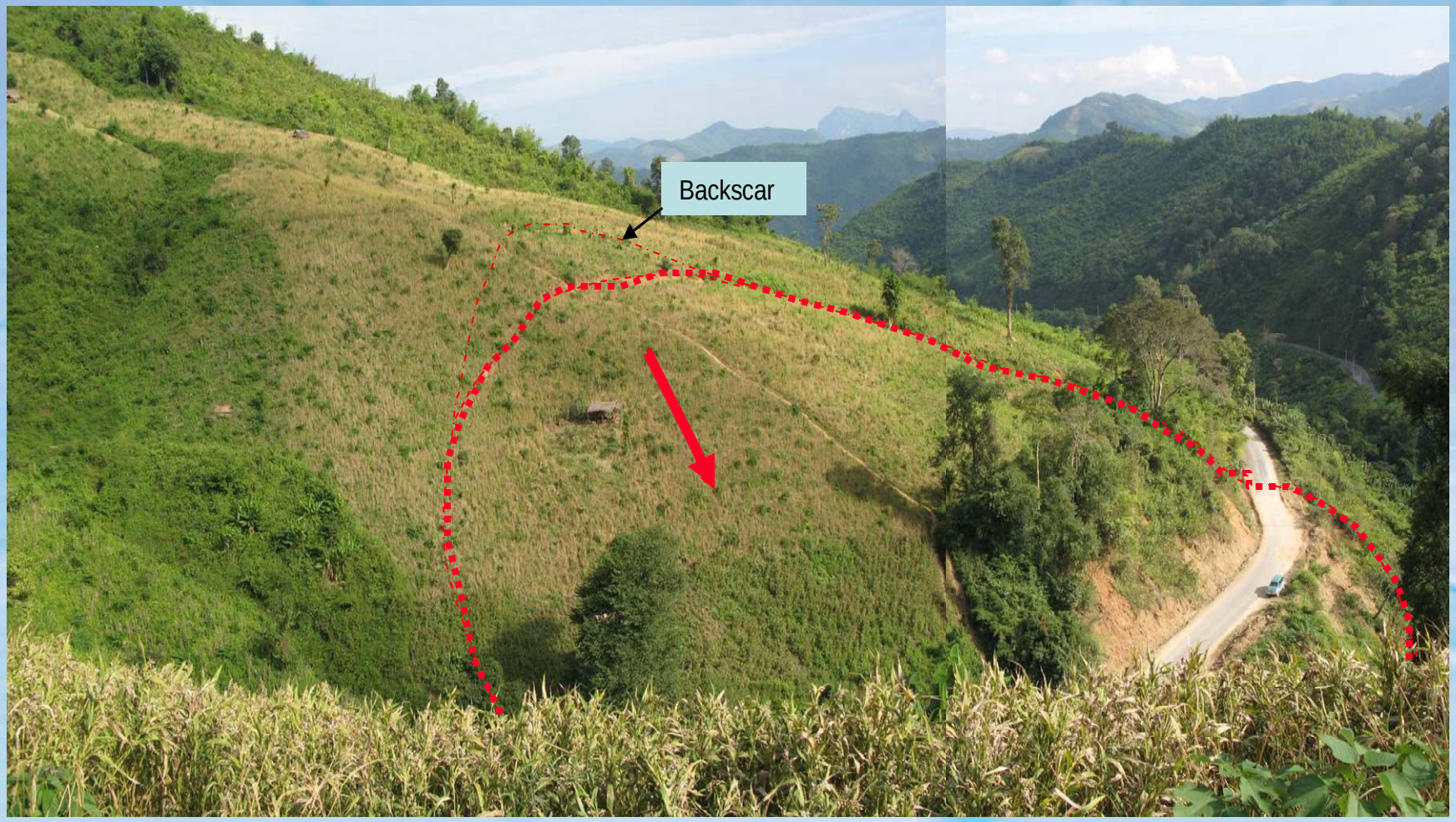
Failure in cut slope only

Erosion of the fill slope surface

Failure in the fill slope only

Failure in the fill slope and original valley slope

Deep failure in original ground underneath road



LANDSLIDE REPORT

Location (road and km):

Date of report: | Reporter's name:

Situation		Material		Blockage		Failure	
Above road		Rock		Whole road		Whole road	
Below road		Debris		Part of road		Part of road	
Through road		Soil		Side drain only		Side drain only	

Geometry of slipped area		Topography	
Length (perpendicular to road) m		Original slope angle	
Width (parallel to road) m		Failure angle	
Depth (estimated) m			
Estimated volume (L x W x D) m^3		Associated retaining wall	

Sketch of failure/additional notes:

Probable cause of failure:

Consequences if nothing done:

LANDSLIDE REPORT

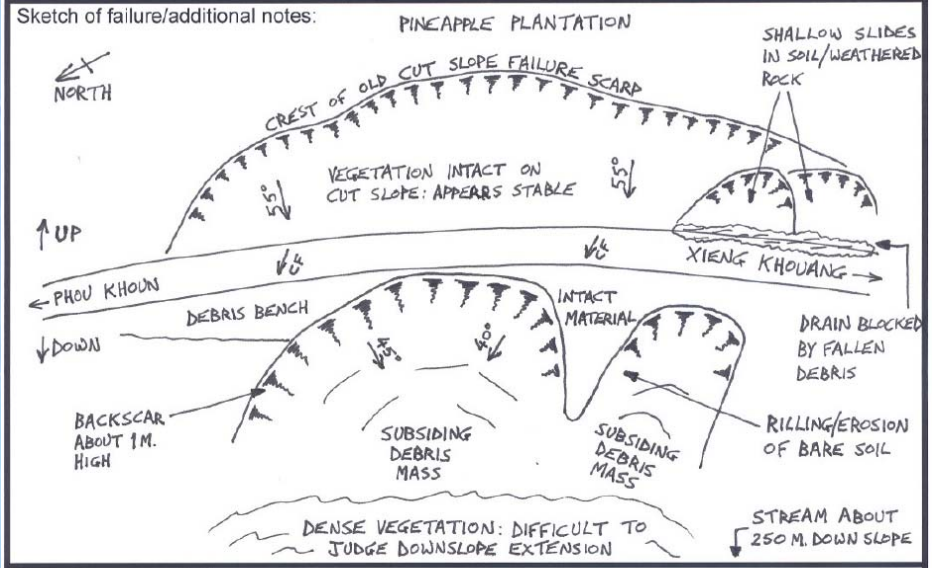
Location (road and km): NATIONAL ROAD 7, KM 6.1

Date of report: 11 OCT. 2006 | Reporter's name: A. FALANG

Situation		Material		Blockage		Failure	
Above road	✓	Rock		Whole road		Whole road	
Below road	✓	Debris		Part of road	✓	Part of road	✓
Through road		Soil	✓	Side drain only		Side drain only	

Geometry of slipped area		Topography		
Length (m perpendicular to road)	40M	Original slope angle		35°
Width (m parallel to road)	50M	Failure angle	BELOW	40-45°
Depth (m estimated)	1-3M	" "	ABOVE	55°
Estimated volume (L x W x D)	3,000M^3	Associated retaining wall		NONE

Sketch of failure/additional notes:



Probable cause of failure:

SMALL SLIDES IN CUT SLOPE SEEM TO HAVE OCCURRED DUE TO CULTIVATION AND RUNOFF FROM PLANTATION IMMEDIATELY ABOVE. THESE BLOCKED THE SIDE DRAIN. OVERFLOW FROM DRAIN RAN ACROSS ROAD AND SATURATED STEEP DEBRIS SLOPE BELOW, CAUSING IT TO SLUMP DOWN. WATER ALSO SCOURED EDGE OF ROAD.

Consequences if nothing done:

1. DEBRIS WILL CONTINUE TO SLUMP DOWN ON LOWER SIDE, LEAVING A HIGHER AND HIGHER BACKSCAR. 2. WATER WILL GO ON SCOURING THE EDGE OF THE ROAD SO THAT THE BACKSCAR EATS BACK INTO THE ROAD. 3. THE CUT SLOPE WILL KEEP FAILING SO THAT THE SIDE DRAIN IS CONSTANTLY GETTING BLOCKED.

WALL REPORT

Location (road and km):

Date of report: | Reporter's name:

Situation		Type		Nature of distress		Distress due to:	
Above road		Mortared masonry		Cracking		Sliding	
Below road		Composite masonry		Tilting		Overturning	
		Gabion		Bulging		Sinking	
		Other (name)				Slope failure	

Geometry			Shape			
Affected length (parallel to road)	m			Sloping	Vert	Horiz
Total length	m		Front face			
Width at base	m		Back face			
Height	m		Base			

Sketch of failure/additional notes:

Probable cause of failure:

Consequences if nothing done:

WALL REPORT

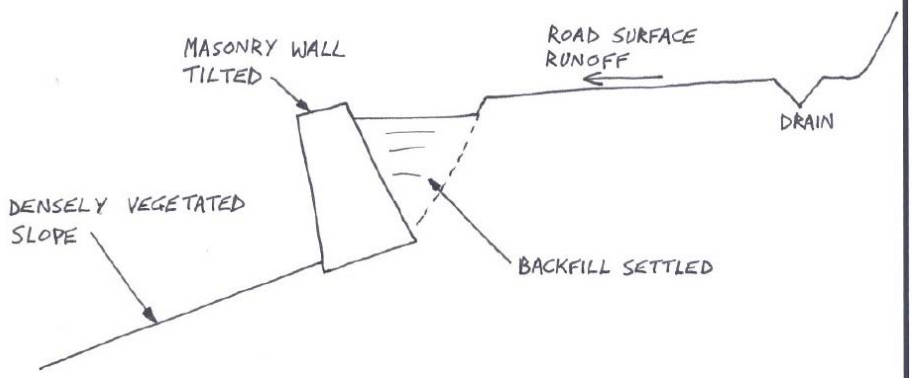
Location (road and km): ROAD 13 NORTH, KM. 326.9

Date of report: 11 OCT. 2006 | Reporter's name: A. FALANG

Situation		Type		Nature of distress		Distress due to:	
Above road		Mortared masonry	✓	Cracking		Sliding	
Below road	✓	Composite masonry		Tilting	✓	Overturning	✓
		Gabion		Bulging		Sinking	
		Other (name)				Slope failure	

Geometry		Shape			
Affected length (parallel to road)	3 M		Sloping	Vert	Horiz
Total length	10 M	Front face	✓		
Width at base (ESTIMATED)	2 M	Back face		✓	
Height	3 M	Base	NOT	KNOWN	

Sketch of failure/additional notes:



Probable cause of failure:

1. SURFACE RUNOFF FROM ROAD ENTERING BACKFILL BEHIND WALL AND CAUSING INCREASED LOAD ON TO WALL. 2. FOUNDATION OF WALL PROBABLY SOFTENED BY IN-FLOW OF WATER. 3. POSSIBILITY OF MOVEMENT IN SLOPE BELOW, BUT CURRENTLY OBSCURED BY THICK VEGETATION.

Consequences if nothing done:

1. WALL LIKELY TO CONTINUE TO TILT AND MAY COLLAPSE. 2. FILL BEHIND WALL WILL CONTINUE TO SINK. THIS IS CREATING A BACK SCARP THAT WILL EVENTUALLY REACH INTO THE ROAD.