

Code no.	Sat_	N	4	5	_	1			
Region Office									
Maintenance Unit									

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	35° 39' 37.3"							
	Longitude	71° 45' 58.9"							
Road name					Km				

Date	2018/12/4								
Inspector	Yasir, Sajid, Shafique, Basharat								

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope, overhang, water catchment slope	3 or more correspondences
		2 correspondences	✓
Geological conditions	Soil	eroded toe of slope, overhang, water catchment slope	1 correspondences
		no correspondence	
	Rock	susceptible to erosion less strength with water	marked
		a little marked	
		None	✓
Structure	Rock	high density of cracks and a weak layers susceptible to erosion, fast weathering	marked
			a little marked
			✓
	Structure	dip slope of bedding plane / Joint Planes	marked
			a little marked
			✓
Surface condition	Topsoil, detached rock and unsteady rock	debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	It corresponds.
			None
			✓
	Spring water	marked	
		a little marked	
		None	✓
Profile	Surface condition	Topsoil, detached rock and unsteady rock	instability
			a little unstable
			✓
	Height (H), dip (i)	Spring water	notable spring water
			seepage
			none
Anomaly	Surface condition	Surface condition	bare land with minor vegetation
			intermediate (bare•grass•tree)
			mainly structure, mainly tree
	Height (H), dip (i)	Height (H), dip (i)	H ≥ 50m
			30 ≤ H < 50m
			15 ≤ H < 30m
Anomaly	Height (H), dip (i)		H < 15m
			i ≥ 70°
			45° ≤ i < 70°
	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure		i < 45°
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	2 or more correspondences • clarity	✓
		certain • unclarity	
		none	

### [Countermeasure]

Type of countermeasures	
No Counter Measure for rock fall. Retaining wall for N-45	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	
There is no countermeasure, or there is not effective even if countermeasures are not performed.	✓

### [Disaster type]

Rock fall	✓
Slope failure	

### [Main check object]

Cut slope	✓
Natural slope	

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

L= 140 m, W= 95 m, D= 0-0.5 m
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### [Evaluation Rank]

Risk	Scale of disaster		
	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

### [Description]

This cut slope is generated during excavation for N-45. Marble and quartzite is exposed in this section which is jointed and cracked with a risk of over hang blocks. Clayey material is found on both sides of the rock fall. Drainage is also found on the right side of the rock fall..
--

Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

Influence on the traffic when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure

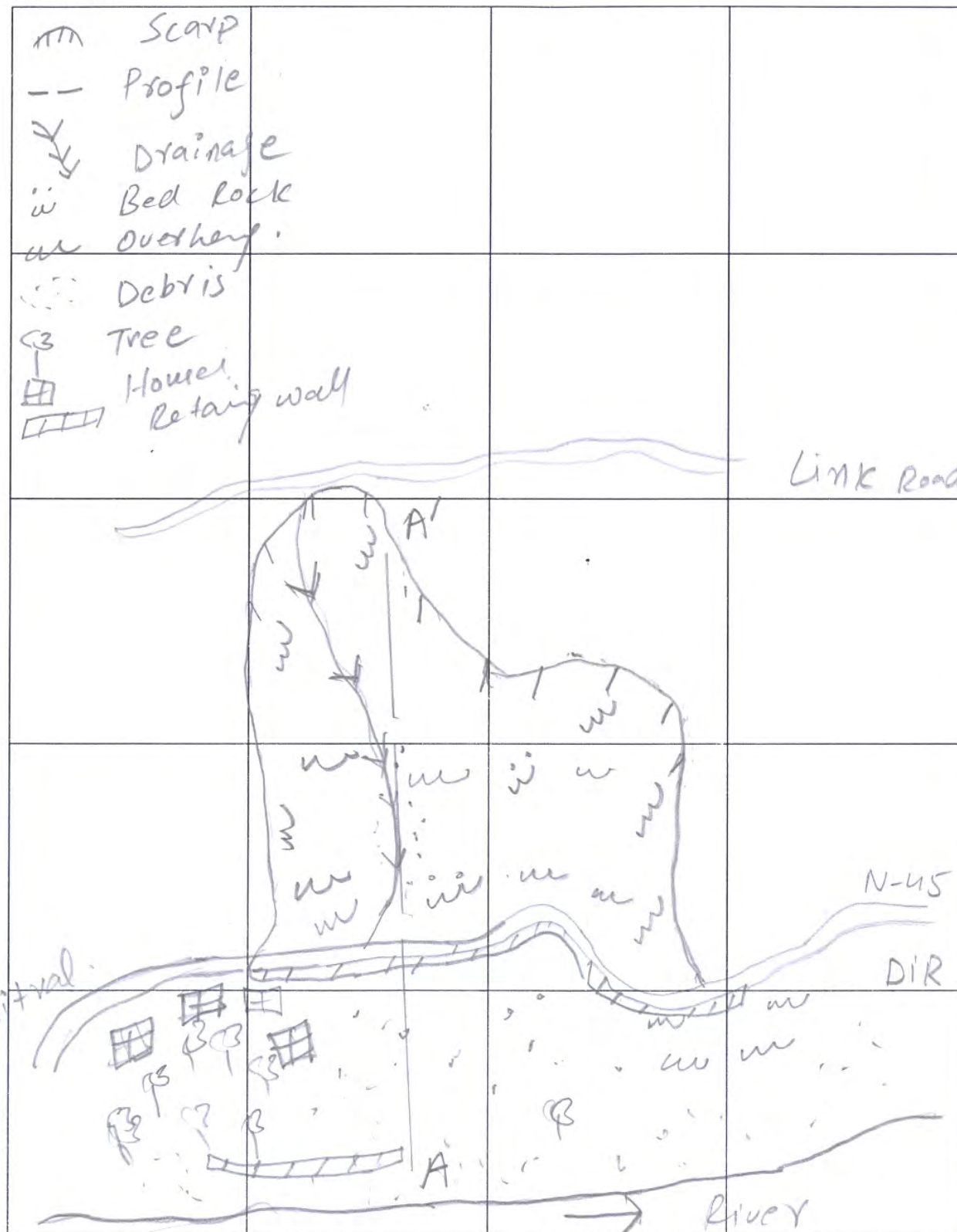
Code no.	N - 4 5
Region Office	
Maintenance Unit	

### Sketch sheet

Coordinates	Latitude	35° 39' 37.3"
	Longitude	71° 45' 58.9"
Road name	N-45	Km 1

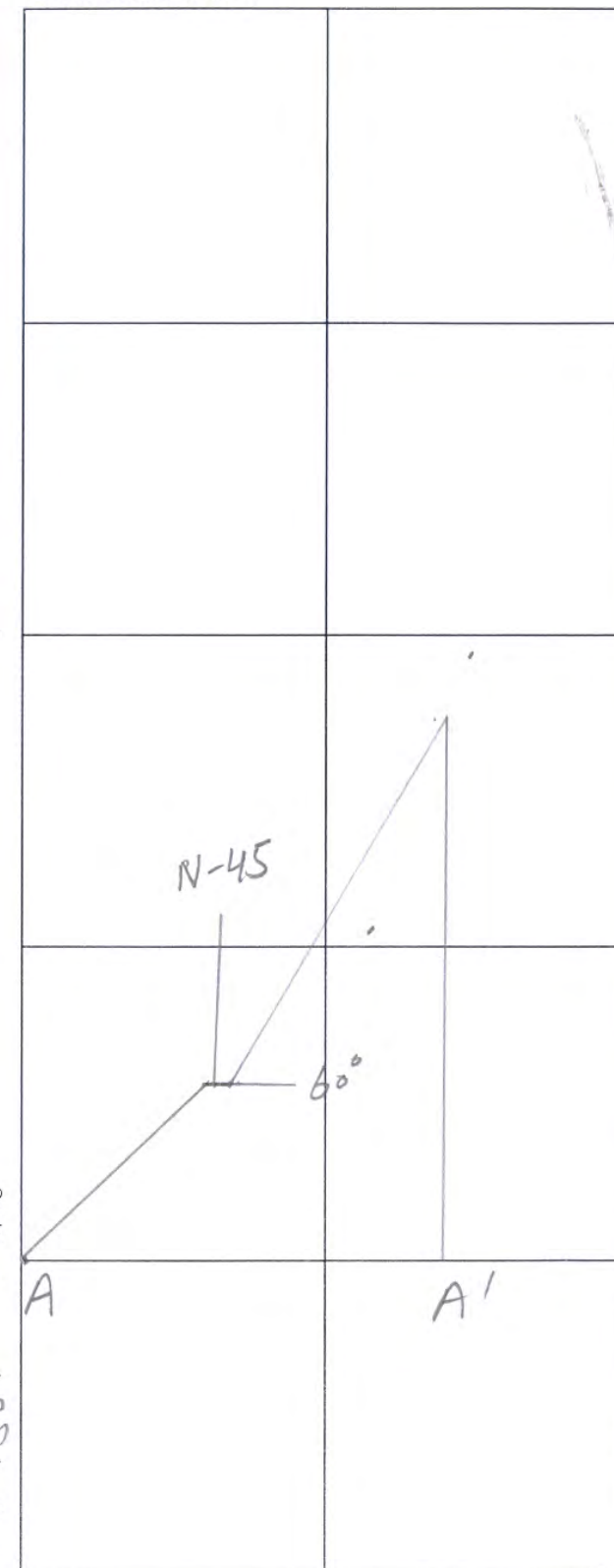
Date	12/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Scale: (50) m

Cross sectional view



Scale: (70) m

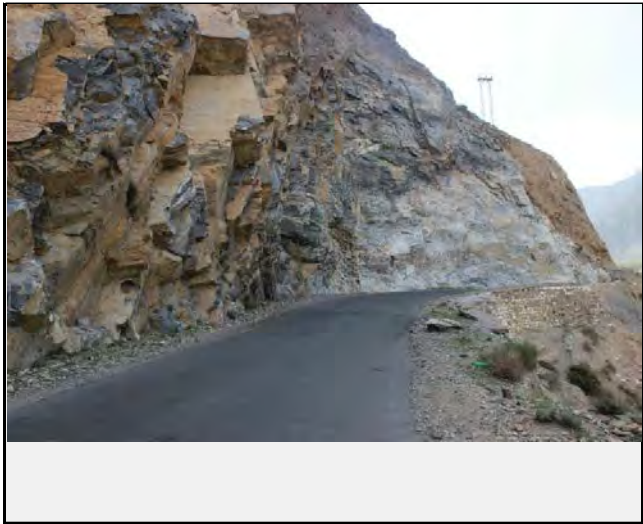


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Region Office							
Maintenance Unit							

Photo sheet

Coordinates	Latitude	35° 39' 37.3"							
	Longitude	71° 45' 58.9"							
Road name					Km				

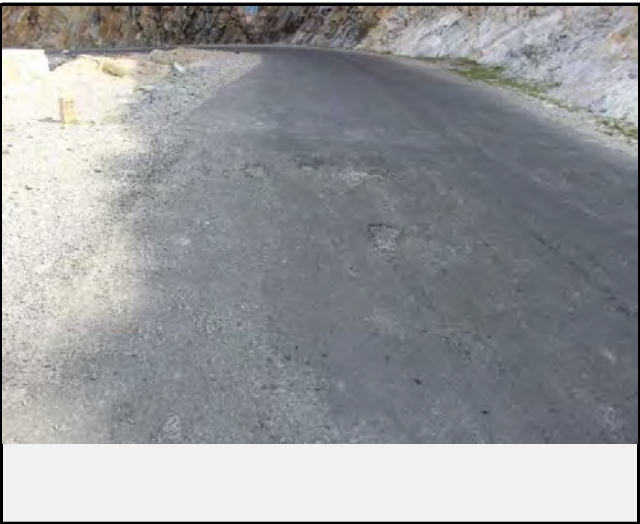
Date	2018/12/4
Inspector	Yasir, Sajid, Shafique, Basharat



Full view of the landslide



View of landslide on Valley side:



Road condition: Cut slope at the start point



View of the slope failure at the middle point



Existing countermeasures / anomalies: View of retaining wall as counter measure for N-45



View of unconsolidated material with damaged retaining wall.





Code no.	Sat_ N 4 5 _ 2
Region Office	
Maintenance Unit	

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	35° 40' 54.8"
	Longitude	71° 45' 59.6"
Road name		Km

Date	13/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope, overhang, water catchment slope	3 or more correspondences 2 correspondences 1 correspondences no correspondence
			✓
Geological conditions	Soil	susceptible to erosion less strength with water	marked a little marked None
			✓
	Rock	high density of cracks and a weak layers susceptible to erosion, fast weathering	marked a little marked None
			✓
Structure	dip slope of bedding plane / Joint Planes		It corresponds. None
			✓
Surface condition	Topsoil, detached rock and unsteady rock	debris on impermeability bedrock, the upper part is a hard / the toe of slope is weak.	marked a little marked None
			✓
Profile	Height (H), dip (i)	instability	
		a little unstable	✓
		stability	
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	notable spring water	
		seepage	
		none	✓
		bare land with minor vegetation	✓
		intermediate (bare • grass • tree)	
		mainly structure, mainly tree	
		H ≥ 50m	
		30 ≤ H < 50m	✓
		15 ≤ H < 30m	
		H < 15m	
		i ≥ 70°	✓
		45° ≤ i < 70°	
		i < 45°	
		2 or more correspondences • clarity	✓
		certain • unclarity	
		none	

### [Countermeasure]

Type of countermeasures	
No Counter Measure for rock fall. Retaining wall for N-45	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	
There is no countermeasure, or there is not effective even if countermeasures are not performed.	✓

### [Disaster type]

Rock fall	✓
Slope failure	

### [Main check object]

Cut slope	✓
Natural slope	

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	✓

### [Expected size of disaster](width, length, depth, etc.)

L= 50 m, W= 130 m, D= 0 m
---------------------------

### [Evaluation Rank]

Risk	Scale of disaster		
	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

### [Description]

This cut slope is generated during excavation for N-45. Marble is exposed in this section which is cracked and some open cracks are also observed with a risk of over hang blocks. Drainage is also found on the both sides of the rock fall. Highly weathered.
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Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

Influence on the traffic when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure

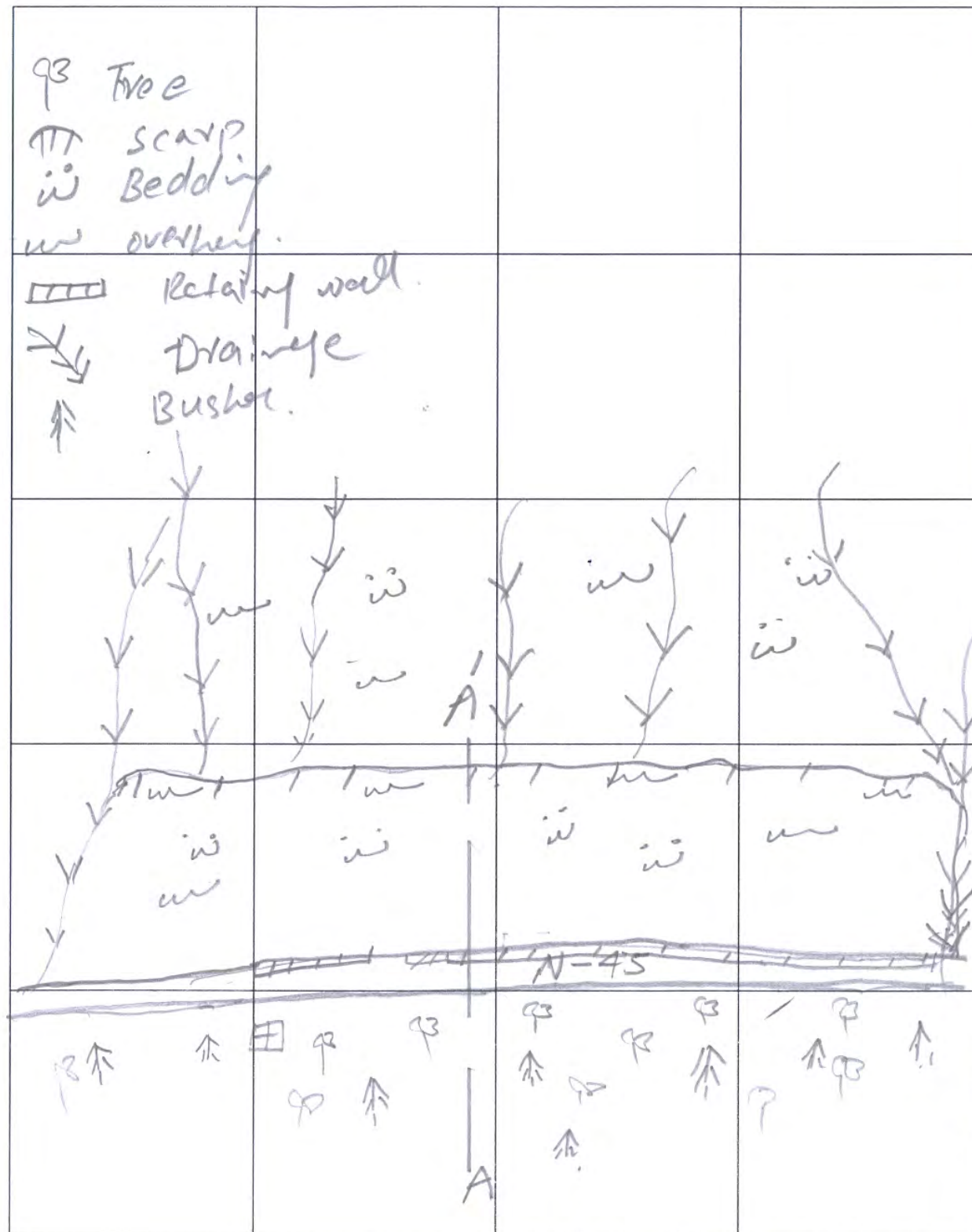
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Region Office	
Maintenance Unit	

### Sketch sheet

Coordinates	Latitude	35° 40' 54.8"
	Longitude	71° 45' 59.6"
Road name	- 45 Km	2

Date	13/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Cross sectional view





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Region Office							
Maintenance Unit							

Photo sheet

Coordinates	Latitude	35° 40' 54.8"							
	Longitude	71° 45' 59.6"							
Road name					Km				

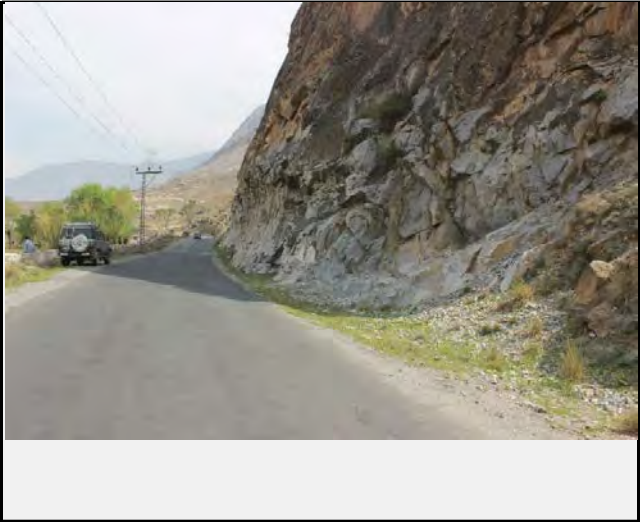
Date	13/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat



Full view of the landslide



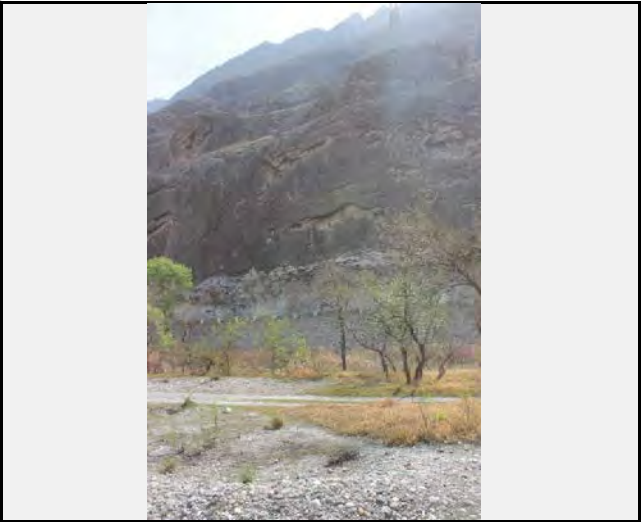
View of landslide on Valley side:



Road condition: Cut slope at the start point



View of the slope failure at the middle point



Existing countermeasures / anomalies:



View of drainage that cuts the slope





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Region Office									
Maintenance Unit									

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	34° 55' 25.6"
	Longitude	72° 50' 10.4"
Road name		Km

Date	14/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences 2 correspondences 1 correspondences no correspondence
			✓
Geological conditions	Soil	susceptible to erosion less strength with water	marked a little marked None
	Rock	high density of cracks and a weak layers susceptible to erosion, fast weathering	marked a little marked None
	Structure	dip slope of bedding plane / Joint Planes	It corresponds. None
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked a little marked None
Surface condition	Topsoil, detached rock and unsteady rock		instability a little unstable stability
	Spring water		notable spring water seepage none
	Surface condition		bare land with minor vegetation intermediate (bare•grass•tree) mainly structure, mainly tree
Profile	Height (H), dip (i)	height	H ≥ 50m
			30 ≤ H < 50m
			15 ≤ H < 30m
			H < 15m
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	dip	i ≥ 70°
			45° ≤ i < 70°
			i < 45°
			2 or more correspondences • clarity certain • unclarity none

### [Countermeasure]

Type of countermeasures	
Small drainage at the toe of the slope failure	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	
There is no countermeasure, or there is not effective even if countermeasures are not performed.	✓

### [Disaster type]

Rock fall	
Slope failure	✓

### [Main check object]

Cut slope	✓
Natural slope	✓

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

L= 322 m, W= 363 m, D= 4-5 m
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### [Evaluation Rank]

Risk	Scale of disaster		
	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

### [Description]

Rounded to sub rounded boulders, gravels, pebbles and cobbles with sandy, silty clayey matrix. About 0.5 to 1m thick sand layers are also observed at different levels along the slope. Few boulders at the top and mid of the slope failure which threaten the road and traffic. This 300 to 400 m wide road section was highly susceptible to erosion. Minor scarps are also observed. 1 feet wide drainage (damaged) is also observed at the toe of slope failure. Gullies are observed at different intervals along the slope failure.
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Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

Influence on the traffic when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure

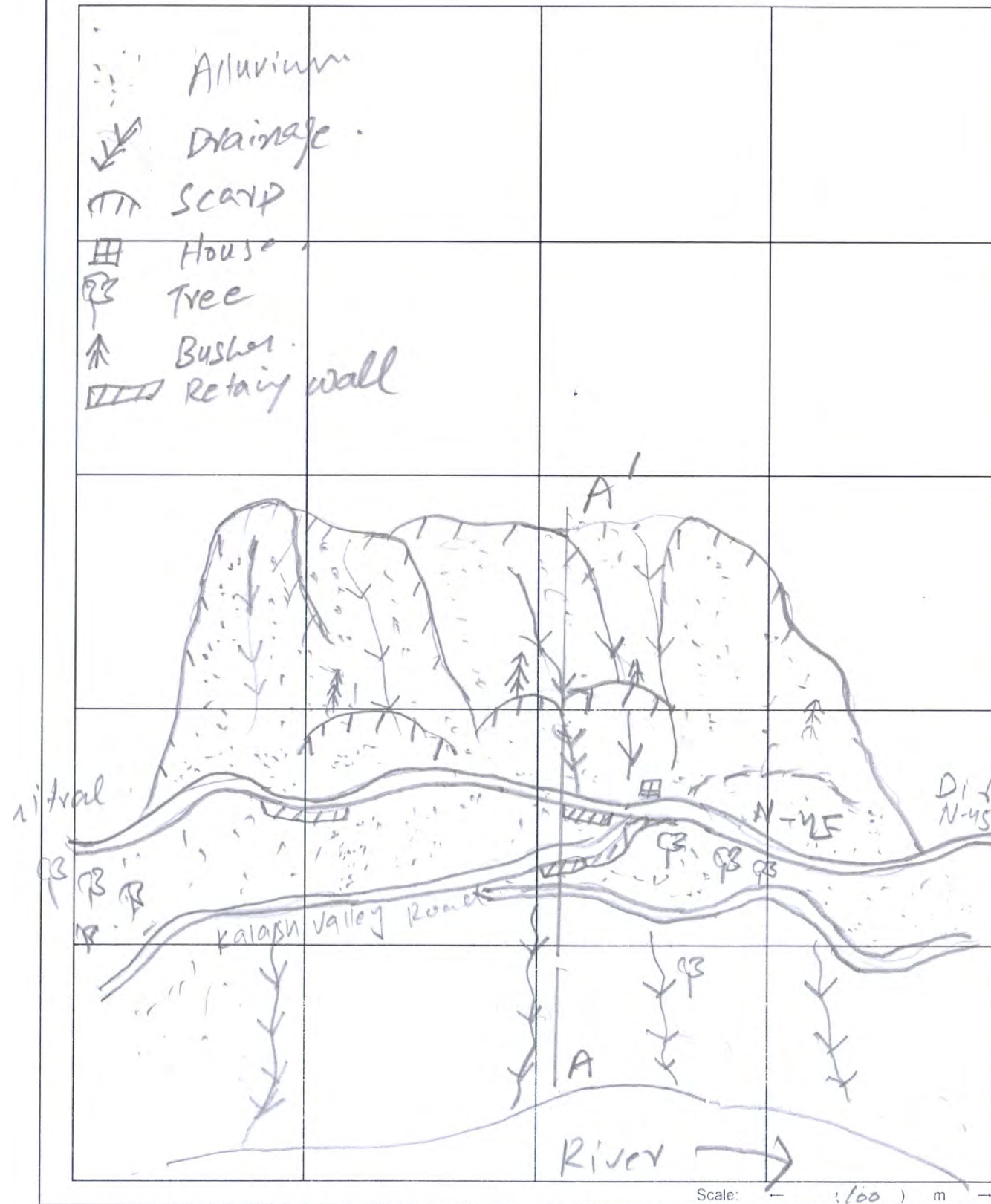
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Maintenance Unit	

### Sketch sheet

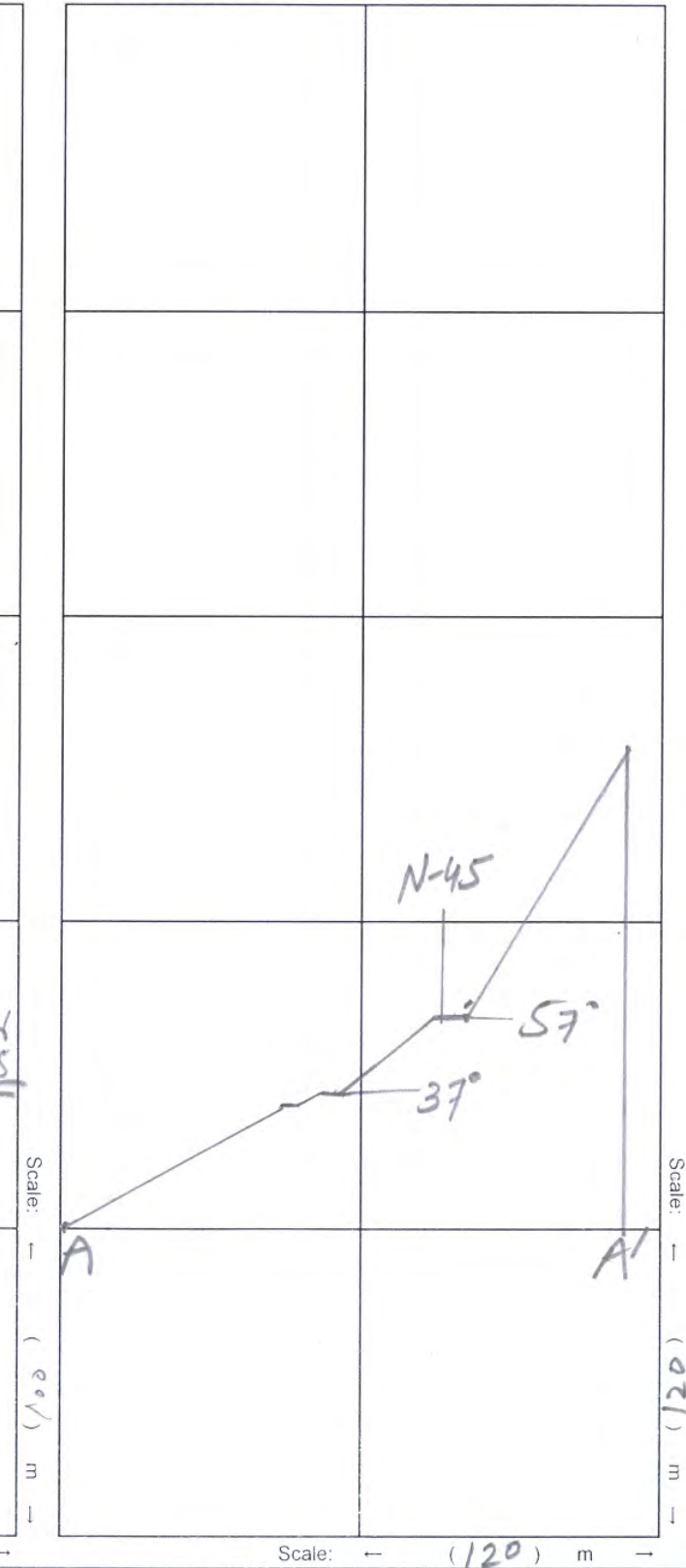
Coordinates	Latitude	34° 55' 25.6"
	Longitude	72° 50' 10.4"
Road name	N-45	Km 3

Date	14/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Cross sectional view



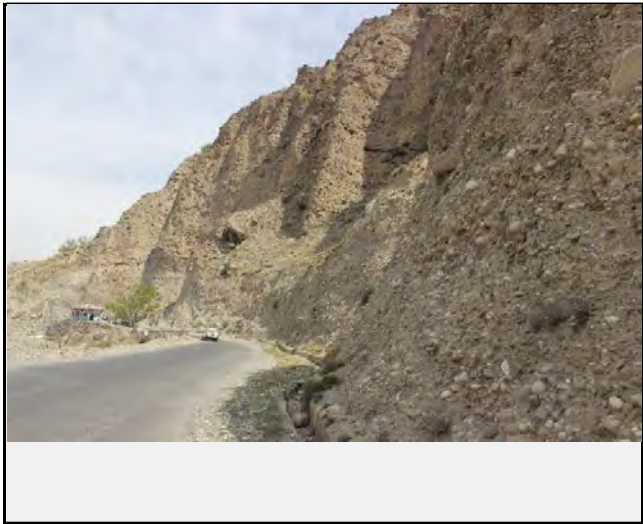


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Maintenance Unit							

Photo sheet

Coordinates	Latitude	34° 55' 25.6"							
	Longitude	72° 50' 10.4"							
Road name					Km				

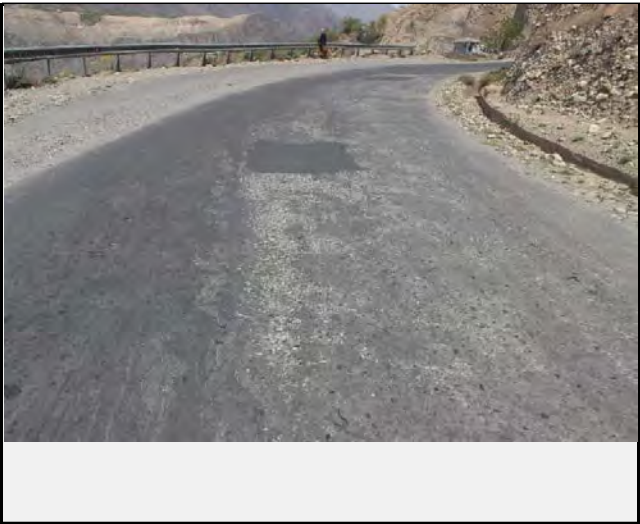
Date	14/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat



Full view of the landslide



View of landslide on Valley side:



Road condition: Cut slope at the start point



View of the slope failure at the middle point with boulder which threaten the road and traffic.



Existing countermeasures / anomalies: View of channel at the toe of Slope Failure



View of sandy layer in the alluvial deposits.



Code no.	Sat_	N	4	5	_	4			
Region Office									
Maintenance Unit									

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	34° 55' 11.2"							
	Longitude	72° 49' 43.9"							
Road name					Km				

Date	15/4/2018								
Inspector	Yasir, Sajid, Shafique, Basharat								

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope, overhang, water catchment slope	3 or more correspondences
		2 correspondences	✓
Geological conditions	Soil	eroded toe of slope, overhang, water catchment slope	1 correspondences
		no correspondence	
	Rock	susceptible to erosion less strength with water	marked
			a little marked
			None
Structure	Rock	high density of cracks and a weak layers susceptible to erosion, fast weathering	marked
			a little marked
			None
	Structure	dip slope of bedding plane / Joint Planes	It corresponds.
			None
			✓
Surface condition	Topsoil, detached rock and unsteady rock	debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked
			a little marked
			None
	Spring water	instability	✓
		a little unstable	
		stability	
Profile	Surface condition	notable spring water	
		seepage	
		none	✓
	Height (H), dip (i)	bare land with minor vegetation	✓
		intermediate (bare•grass•tree)	
		mainly structure, mainly tree	
Anomaly	Height (H), dip (i)	H ≥ 50m	✓
		30 ≤ H < 50m	
		15 ≤ H < 30m	
	dip	H < 15m	
		i ≥ 70°	
		45° ≤ i < 70°	✓
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bonding of tree root, fallen tree, crack, open crack, anomaly of countermeasure	i < 45°	
		2 or more correspondences • clarity	✓
		certain • unclarity	
Anomaly		none	

### [Countermeasure]

Type of countermeasures	
No Counter Measure for slope failure. Culvert at one of the gully drainage.	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

### [Disaster type]

Rock fall	
Slope failure	✓

### [Main check object]

Cut slope	✓
Natural slope	✓

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

L= 309 m, W= 520 m, D= 2-3 m
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### [Evaluation Rank]

Risk	Scale of disaster		
	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

### [Description]

Rounded to sub rounded, angular to sub angular boulders, gravels, pebbles and cobbles with sandy, silty clayey matrix. About 0.5 to 1m thick sand layers are also observed at different levels along the slope. This 300 to 400 m wide road section was highly susceptible to erosion. Gullies are observed at different intervals along the slope failure. Drainage is bounded on both sides of the slope failures. Road is often blocked during rainy seasons due to material overflow on the road.
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Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

Influence on the traffic when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure



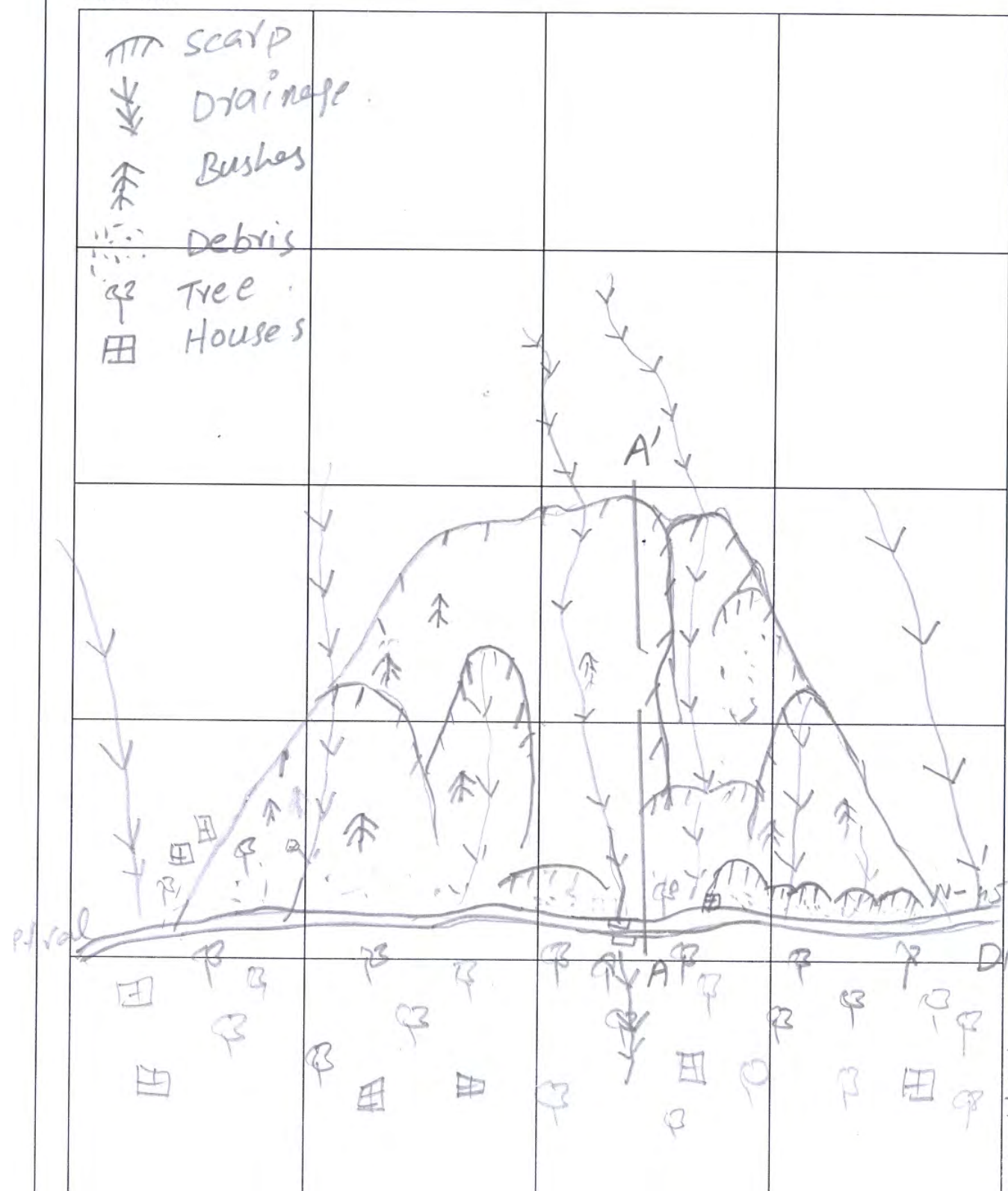
Code no.	N - 4 5 0 4
Region Office	
Maintenance Unit	

### Sketch sheet

Coordinates	Latitude	34° 55' 11.2"
	Longitude	72° 49' 43.9"
Road name	-45	Km 4

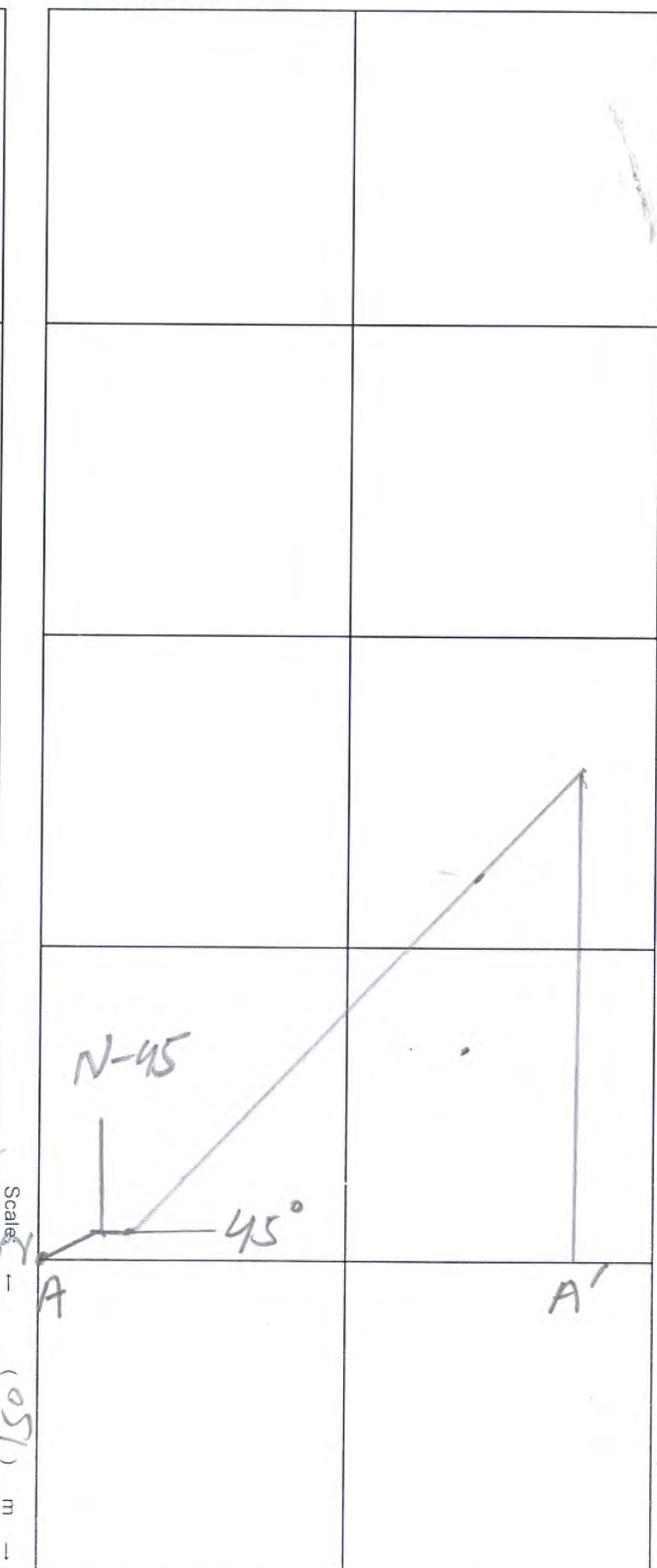
Date	15/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Scale: (150) m

Cross sectional view



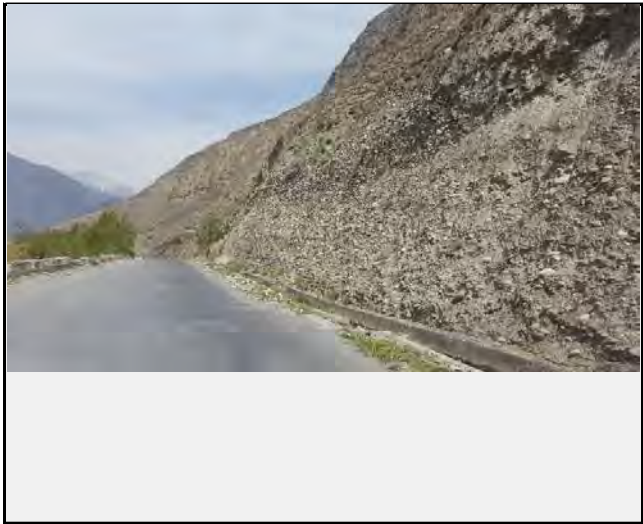
Scale: (150) m

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Maintenance Unit							

Photo sheet

Coordinates	Latitude	34° 55' 11.2"							
	Longitude	72° 49' 43.9"							
Road name					Km				

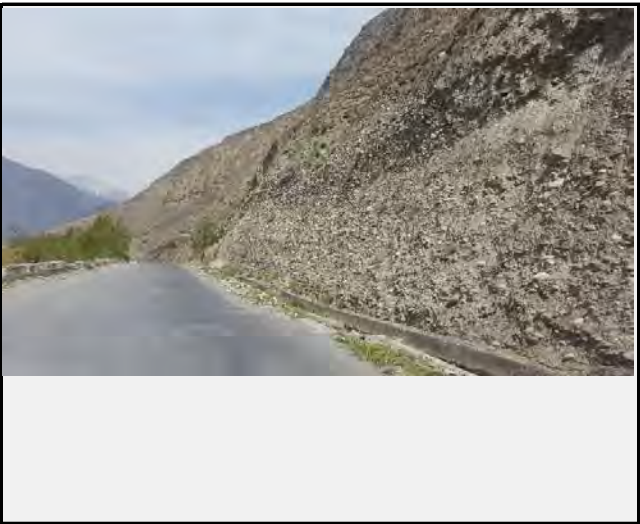
Date	15/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat



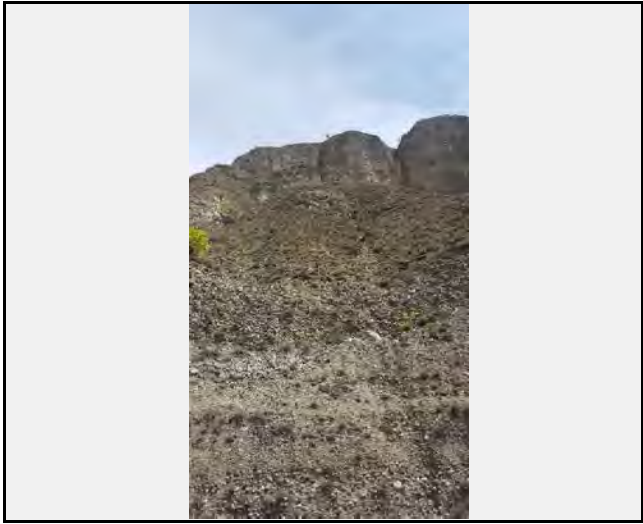
Full view of the landslide



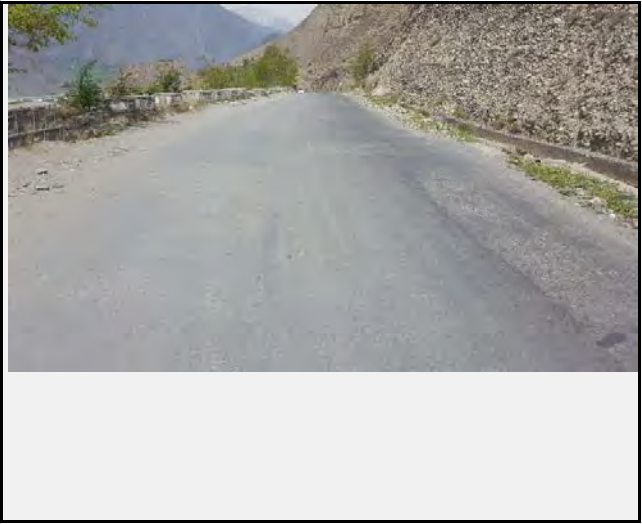
View of landslide on Valley side:



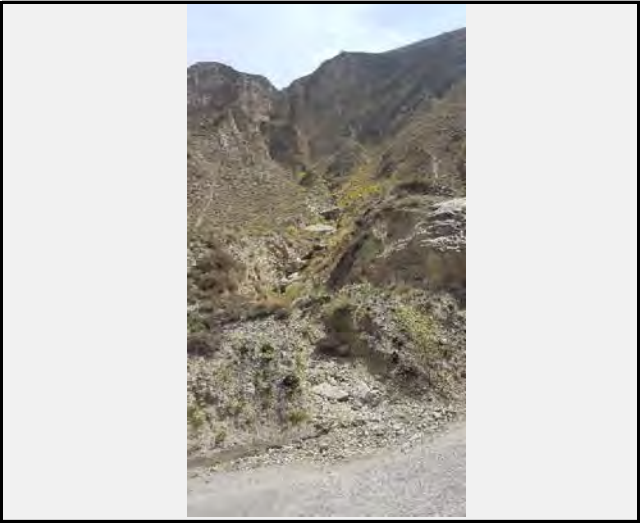
Road condition: Cut slope at the start point



View of the slope failure at the middle point



Existing countermeasures / anomalies: View of water channel at the toe of slope failure and parapit wall as counter measure



View of gully erosion in the middle of slope failure





Code no.	Sat_ N 4 5 _ 5
Region Office	
Maintenance Unit	

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	35° 47' 9.9"
	Longitude	71° 46' 24.7"
Road name		Km

Date	16/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences	✓
		2 correspondences	
Geological conditions	Soil	1 correspondences	
		no correspondence	
	Soil	marked	
		a little marked	✓
	Rock	None	
		marked	✓
Structure	Rock	a little marked	
		None	
	dip slope of bedding plane / Joint Planes	marked	✓
		a little marked	
	debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	None	✓
		marked	
Surface condition	Topsoil, detached rock and unsteady rock	a little marked	✓
		None	
	Spring water	instability	✓
		a little unstable	
	Surface condition	stability	
		notable spring water	
Profile	Height (H), dip (i)	seepage	
		none	✓
	Height (H), dip (i)	bare land with minor vegetation	✓
		intermediate (bare•grass•tree)	
	Height (H), dip (i)	mainly structure, mainly tree	
		Height (H), dip (i)	
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bonding of tree root, fallen tree, crack, open crack, anomaly of countermeasure	H ≥ 50m	✓
		30 ≤ H < 50m	
	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bonding of tree root, fallen tree, crack, open crack, anomaly of countermeasure	15 ≤ H < 30m	
		H < 15m	
	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bonding of tree root, fallen tree, crack, open crack, anomaly of countermeasure	i ≥ 70°	
		45° ≤ i < 70°	
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bonding of tree root, fallen tree, crack, open crack, anomaly of countermeasure	i < 45°	✓
		2 or more correspondences • clarity	
	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bonding of tree root, fallen tree, crack, open crack, anomaly of countermeasure	certain • unclarity	✓
		none	
	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bonding of tree root, fallen tree, crack, open crack, anomaly of countermeasure		

### [Countermeasure]

Type of countermeasures	
Stepped retaining wall at the centre of slope failure.	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

### [Disaster type]

Rock fall	
Slope failure	✓

### [Main check object]

Cut slope	✓
Natural slope	✓

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	✓
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

L= 460 m, W= 275 m, D= 1-2 m
------------------------------

### [Evaluation Rank]

Risk	Scale of disaster		
	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

### [Description]

Schist is exposed along this slope failure. 4-5 m thick alluvial deposit is also observed along the slope failure. Highly fractured rock along the slope failure. Minor scarps are also observed. 1 feet wide drainage (damaged) is also observed at the toe of slope failure. Gullies are observed at different intervals along the slope failure. Water channel for local supplies is also found at the top of the slope failure.

Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

Influence on the traffic when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure

Code no.	N - 4 5
Region Office	
Maintenance Unit	

### Sketch sheet

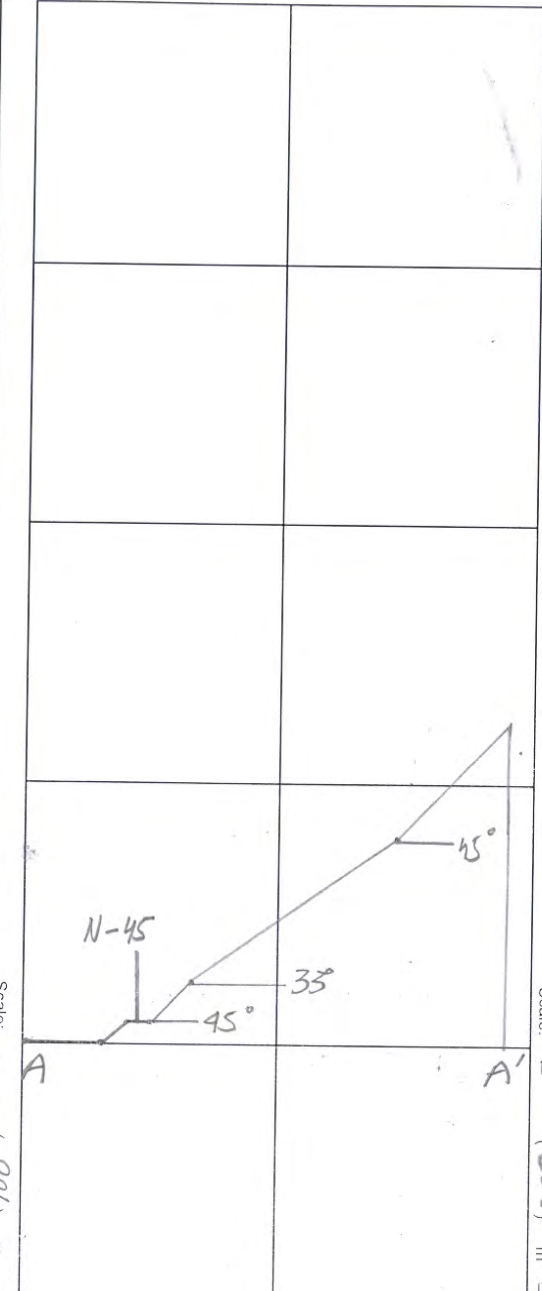
Coordinates	Latitude	35° 47' 9.96"
	Longitude	71° 46' 24.77"
Road Name	N-45	Km 0.5

Date	16/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Cross sectional view



111 Scar P  
 is Bed Rock  
 and overhang  
 Drainage  
 Houses  
 Trees  
 Bushes  
 Retaining wall  
 Link Road  
 Drainage path  
 Bridge  
 Alluvium

River

Scale: (100) m

Scale: (200) m

Code no.	Sat_	N	4	5	_	5	
Region Office							
Maintenance Unit							

Photo sheet

Coordinates	Latitude	35° 47' 9.9"							
	Longitude	71° 46' 24.7"							
Road name					Km				

Date	16/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat



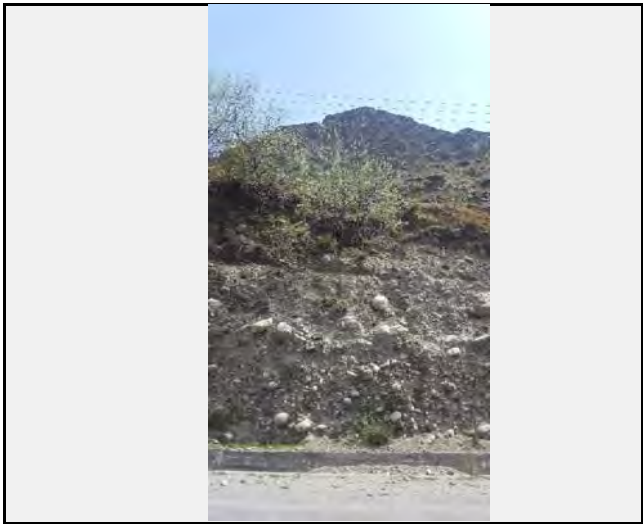
Full view of the landslide



View of landslide on Valley side:



Road condition: Cut slope at the start point



View of the slope failure at the middle point



Existing countermeasures / anomalies: View of Stepped Retaining Wall as counter measure



View of water Supply Scheme passing in the middle of the slope failure





Code no.	N	7	5	-	1	-	1				
Region Office	Muzzafarabad										
Maintenance Unit	Murree										

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude		N 33°49' 23.61"							
	Longitude		E 73°20' 8.36"							
Road name	N	7	5		Km	2	5			

Date	3-Dec-17
Inspector	Makoto Tokuda

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor talus slope, clear convex break of slope, eroded toe of slope, overhang, water catchment slope	3 or more correspondences	
		2 correspondences	✓
		1 correspondences	
		no correspondence	
Geological conditions	Soil	susceptible to erosion	✓
		less strength with water	
		None	
	Rock	high density of cracks and a weak layers,	
		susceptible to erosion,	✓
		fast weathering	
	Structure	dip slope of bedding plane	
		It corresponds.	✓
		None	
		debris on impermeability bedrock,	✓
		the upper part is a hard /the toe of slope is weak.	
		None	
Surface condition	Topsoil, detached rock and unsteady rock	instability	
		a little unstable	✓
		stability	
	Spring water	notable spring waster	
		seepage	✓
		none	
	Surface condition	bare land with minor vegetation	✓
		intermediate (bare・grass・tree)	
		mainly structure, mainly tree	
Profile	Height (H), dip (i)	height	H ≥ 50m
			30 ≤ H < 50m
			15 ≤ H < 30m
			H < 15m
		dip	i ≥ 70°
			45° ≤ i < 70°
			i < 45°
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	2 or more correspondences・clarity	✓
		certain・uncertainty	
		none	

### [Countermeasure]

Type of countermeasures	
Gabion Work, Culvert, Water Channel Works	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

### [Disaster type]

Rock fall	
Slope failure	✓

### [Main check object]

Cut slope	✓
Natural slope	

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	✓
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

10m(L) × 20m(W) × 0.5m(D) = 100m3
-----------------------------------

### [Hazard]

Hazard rank	A: the possibility of collapse/fall is high	
	B: the possibility of collapse/fall is moderate	
	C: the possibility of collapse/fall is low/none	✓

### [Description]

Scarps can be observed at the convex break. Gabion work are preventing the overflow of the debris though is not sufficient. The culvert are filled with the debris and rocks.  
Cleaning of the culvert is advisable.  
The scar of a collapse in the past can be identified but the slope seems stabilized due to its vegetation

Code no.	N	7	5	_	1	_	1				
Region Office	Muzzafarabad										
Maintenance Unit	Murree										

## Evaluation sheet (debris flow)

Coordinates	Latitude		N 33°49' 23.61"										
	Longitude		E 73°20' 8.36"										
Road Name	N	7	5		Km	2	5						

Date	3-Dec-17
Inspector	Makoto Tokuda

### [Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km <sup>2</sup> or more	
		0.15km <sup>2</sup> - 0.50km <sup>2</sup>	
		less than 0.15km <sup>2</sup>	✓
	steepest slope of river bed	40° or more	
		30° - 40°	
		less than 30°	✓
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km <sup>2</sup> or more	
		0.08km <sup>2</sup> - 0.20km <sup>2</sup>	
		less than 0.08km <sup>2</sup>	✓
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km <sup>2</sup> or more	
		0.02km <sup>2</sup> - 20km <sup>2</sup>	
		less than 0.02km <sup>2</sup>	✓
	artificial works that cause negative effects	certain	
		none	✓
	new crack and/or slope failure in stream	certain	
		none	✓
	traces of large slope failure in stream	certain	
		none	✓

### [Road structure]

structure	category of score	Check
River width	10m or more	
	5m - 10m	✓
	3m - 5m	
	less than 3m	
Beam height	less than 1m or	
	No bridge / box culvert	✓
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

### [Potencial disaster mode] Check

Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	✓

### [History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	✓

### [Expected size of disaster] (width, length, depth, etc.)

20(L)*1(W)*2(d) = 40m <sup>3</sup>
------------------------------------

### [Countermeasure]

Type of countermeasure		Check
Gabion works		
Effect of existing countermeasure	none・low	
	moderate	✓
	high	
	enough	

### [Hazard]

Hazard rank:	A: the possibility of debris flow is high	
	B: the possibility of debris flow is moderate	
	C: the possibility of debris flow is low/none	✓

### [Description/comments]

Trace of debris flow was observed at the valley side of the road. Gabion which are installed on the waterway was washed away probably during heavy rain. Reinforcement of the gabion is necessary to stabilize the gradient of river bed.

Code no.	N	7	5	-	1	-	1		
Region Office	Muzaffarabad								
Maintenance Unit	Murree								

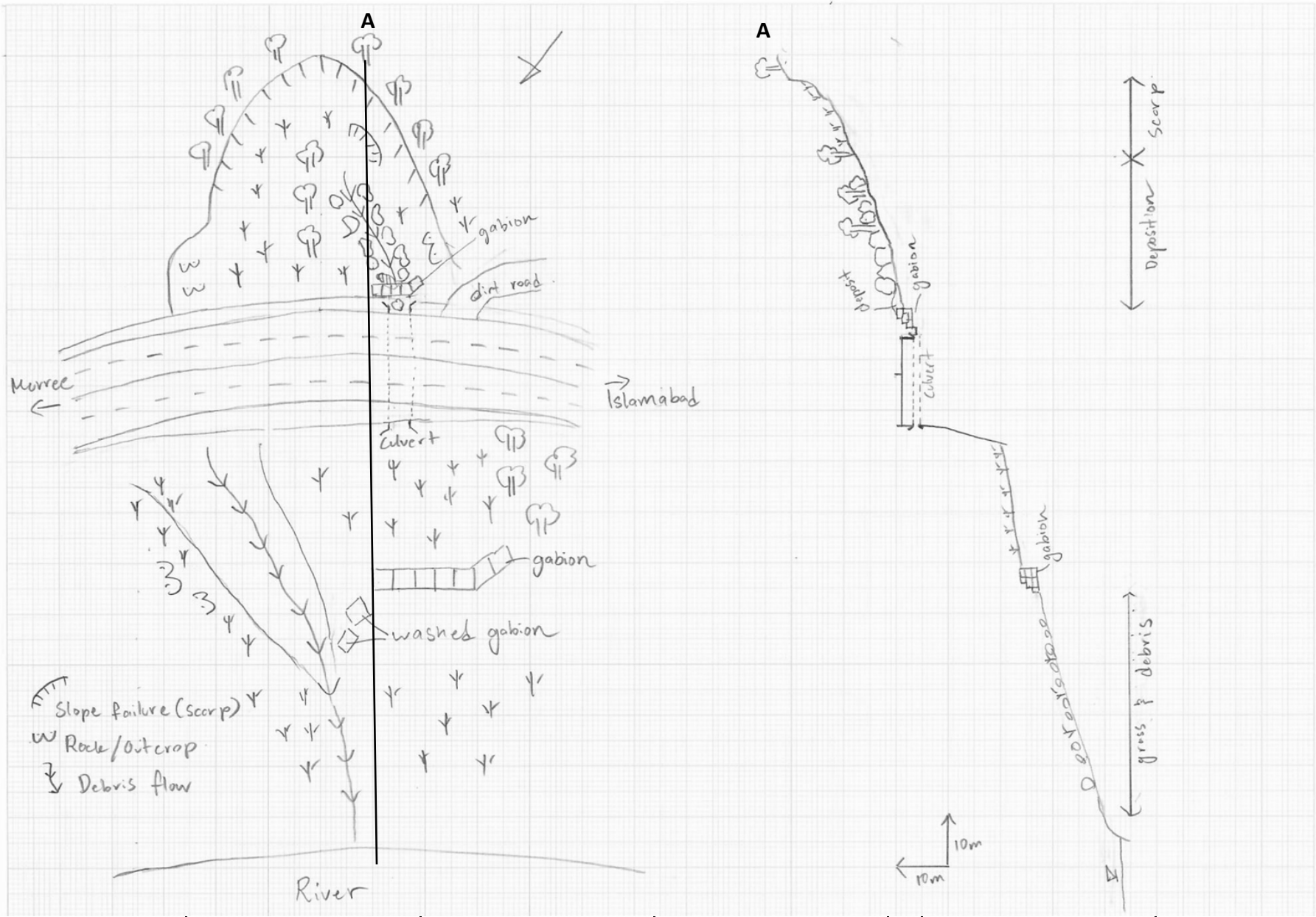
Sketch sheet

Coordinates	Latitude		N 33°49' 23.61"						
	Longitude		E 73°20' 8.36"						
Road Name	N	7	5		Km	2	5		

Date	3-Dec-17
Inspector	Makoto Tokuda

Plane view

Cross sectional view



Scale: ( ) m

Scale: ( ) m

Scale: ( ) m

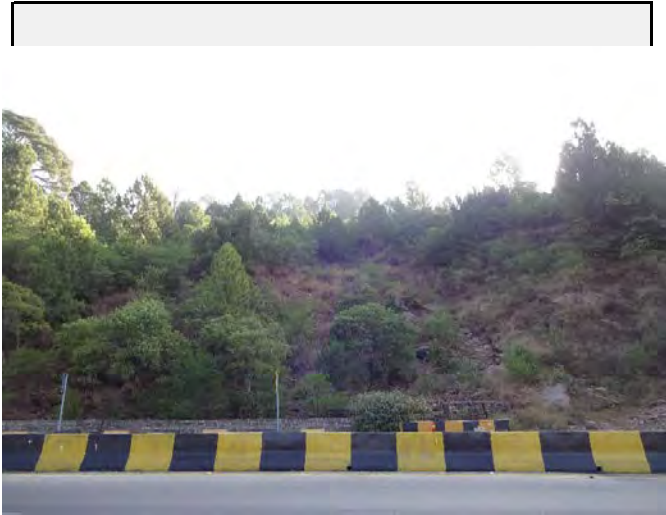


Code no.	N	7	5	_	1	_	1		
Region Office	Muzzafarabad								
Maintenance Unit	Murree								

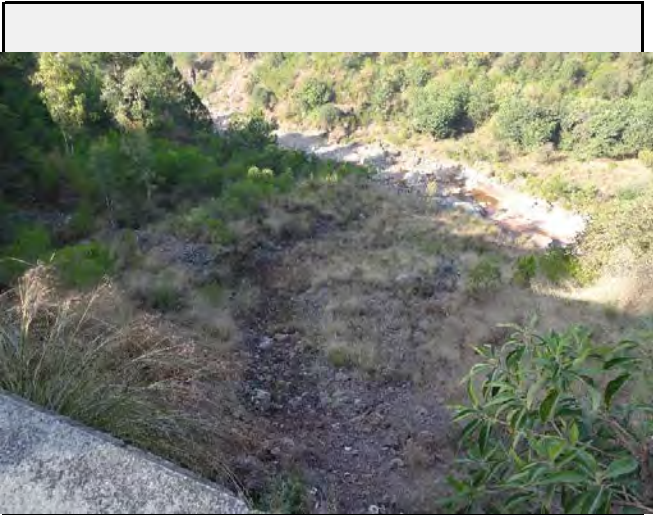
# Photo sheet

Coordinates	Latitude		N 33°49' 23.61"						
	Longitude		E 73°20' 8.36"						
Road Name	N	7	5		Km	2	5		

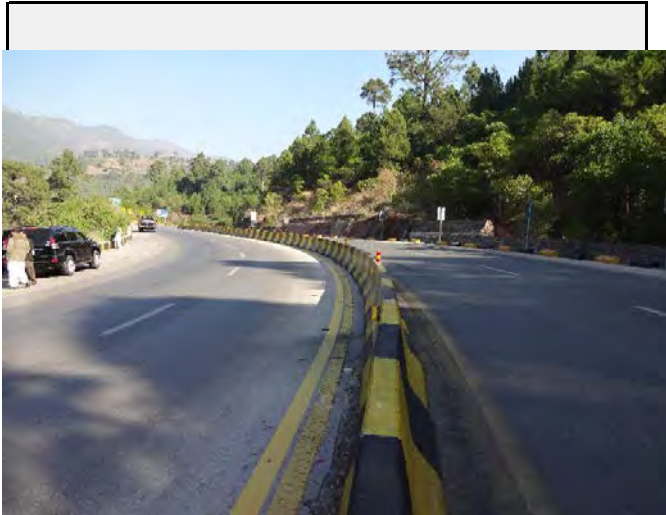
Date	3-Dec-17
Inspector	Makoto Tokuda



Mountain side: Trace of slope failure was observed at the mountain side



Valley side: Trace of debris flow was observed at the valley side.



Road condition: No anomalies was confirmed on the road surface.



Existing countermeasures: Gabion works are undertaken at the toe of the mountain side. However, the debris is deposited on the top of the gabion and may outflow the gabion works in the future.



Existing countermeasures: The culvert is filled with debris and rocks which may block the waterway from the mountain area, resulting the flooding of the road.



Existing countermeasures: Partial of the gabion works in the valley side was washed away by the debris. Reinforcement of the gabion work will be necessary to stabilize gradient of the river bed.

Code no.	N	7	5	_	1	_	2				
Region Office	Muzzafarabad										
Maintenance Unit	Murree										

## Evaluation sheet (debris flow)

Coordinates	Latitude		N 33°49.427'									
	Longitude		E 73°20.164'									
Road Name	N	7	5		Km							

Date	7-Dec-17
Inspector	Makoto Tokuda

### [Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km <sup>2</sup> or more	
		0.15km <sup>2</sup> - 0.50km <sup>2</sup>	
		less than 0.15km <sup>2</sup>	
	steepest slope of river bed	40° or more	
		30° - 40°	
		less than 30°	✓
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km <sup>2</sup> or more	
		0.08km <sup>2</sup> - 0.20km <sup>2</sup>	
		less than 0.08km <sup>2</sup>	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km <sup>2</sup> or more	
		0.02km <sup>2</sup> - 20km <sup>2</sup>	
		less than 0.02km <sup>2</sup>	
	artificial works that cause negative effects	certain	
		none	✓
	new crack and/or slope failure in stream	certain	
		none	✓
	traces of large slope failure in stream	certain	
		none	✓

### [Road structure]

structure	category of score	Check
River width	10m or more	
	5m - 10m	✓
	3m - 5m	
	less than 3m	
Beam height	less than 1m or	
	No bridge / box culvert	✓
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

### [Potencial disaster mode] Check

Damage of bridge/culvert	✓
Outflow of embankment	
Debris flooding on the road	

### [History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	✓

### [Expected size of disaster] (width, length, depth, etc.)

Debris flow is not expected
-----------------------------

### [Countermeasure]

Type of countermeasure		Check
Gabion works, Retaining wall		
Effect of existing countermeasure	none・low	
	moderate	✓
	high	
	enough	

### [Hazard]

Hazard rank:	A: the possibility of debris flow is high	
	B: the possibility of debris flow is moderate	
	C: the possibility of debris flow is low/none	✓

### [Description/comments]

The collapse of the retaining wall was observed at the north side (undercut slope) of the bank near the box culvert. It maybe caused by the poor water drainage which of the back of the retaining wall. However, the box culvert under the road were clear from deposits and has a enough capacity to to drain the debris to the valley side. River training works have been carried out and the catchment area is full of vegetation

Code no.	N	7	5	_	1	_	2		
Region Office	Muzzafarabad								
Maintenance Unit	Murree								

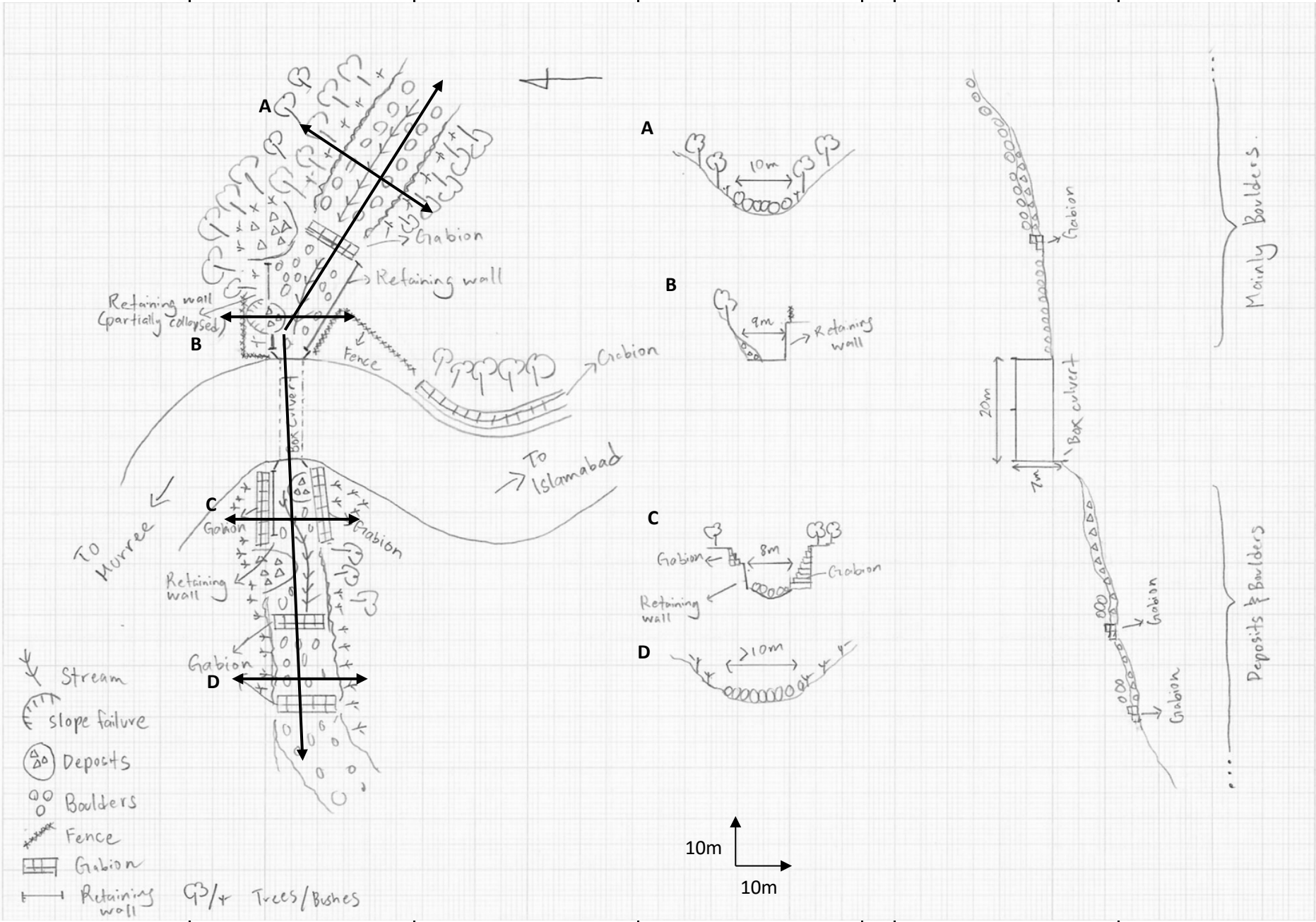
Sketch sheet

Coordinates	Latitude			N 33°49.427'								
	Longitude			E 73°20.164'								
Road Name	N	7	5		Km	0	0	0	0	0	0	

Date	7-Dec-17
Inspector	Makoto Tokuda

Plane view

Cross sectional view



Scale: ( ) m

Scale: ( ) m

Scale: ( ) m

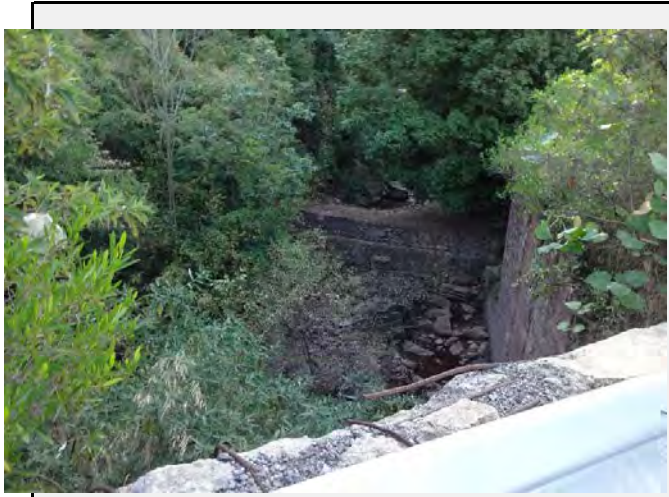


Code no.	N	7	5	_	1	_	2		
Region Office	Muzzafarabad								
Maintenance Unit	Murree								

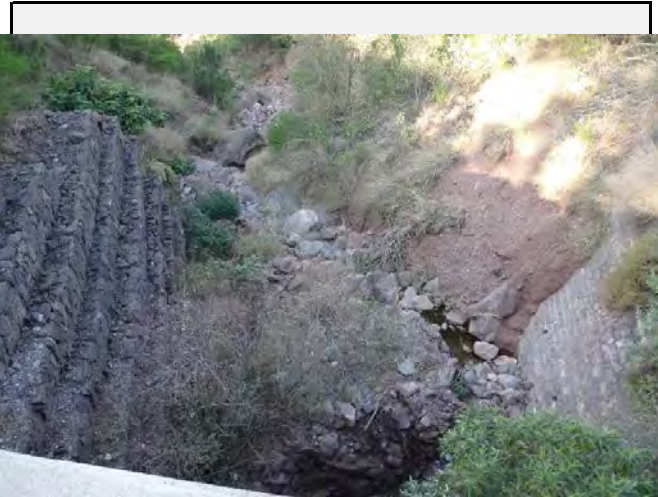
Photo sheet

Coordinates	Latitude		N 33°49.427'						
	Longitude		E 73°20.164'						
Road Name	N	7	5		Km				

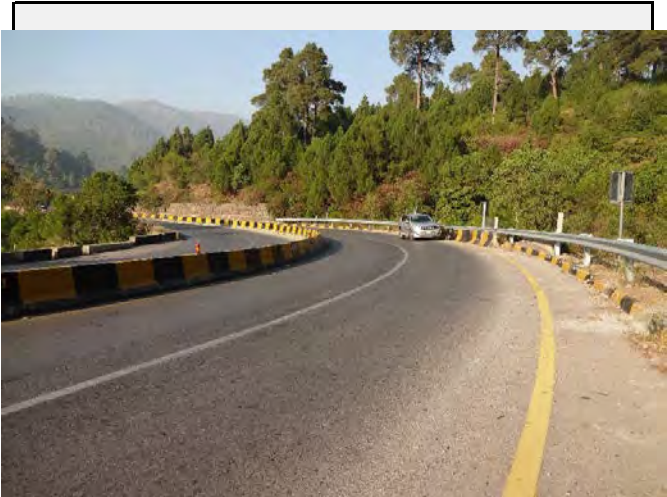
Date	7-Dec-17
Inspector	Makoto Tokuda



Mountain side: Boulders and deposits are mostly observed on mountain side. Gabion are constructed to minimize the gradient of river bed.



Valley side: Retaining wall and gabions are constructed at the both side of the bank on the exit of the box culvert.



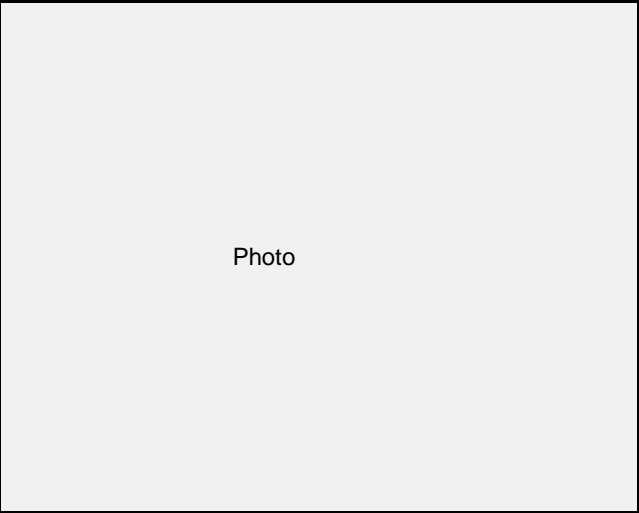
Road condition: No anomalies was observed on the road



Existing countermeasures / anomalies: The box culvert are clear from any debris.



Existing countermeasures / anomalies: Damage on the retaining wall on the north side (undercut slope) on the mountain side.



Existing countermeasures / anomalies:



Code no.	N	7	5	-	2						
Region Office	Muzzafarabad										
Maintenance Unit	Murree										

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude				N 33°50' 38.53"						
	Longitude				E 73°22' 6.91"						
Road name	N	7	5		Km	3	0	+	1	0	0

Date	3-Dec-17
Inspector	Makoto Tokuda

### [Causes]

Item		factor	category of score	Check		
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences			
			2 correspondences			
			1 correspondences	✓		
			no correspondence			
Geological conditions	Soil	susceptible to erosion less strength with water	marked			
			a little marked	✓		
			None			
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked			
			a little marked			
			None	✓		
Structure	dip slope of bedding plane	It corresponds. None	✓			
	debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked a little marked None	✓			
Surface codition	Topsoil, detached rock and unsteady rock	instability a little unstable stability	✓			
		Spring water	notable spring waster seepage none	✓		
			Surface condition	bare land with minor vegetation intermediate (bare•grass•tree) mainly structure, mainly tree	✓	
	Profile			Height (H), dip (i)	height	$H \geq 50m$
		$30 \leq H < 50m$				✓
		$15 \leq H < 30m$				
$H < 15m$						
dip		$i \geq 70^{\circ}$				
		$45^{\circ} \leq i < 70^{\circ}$				
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	$i < 45^{\circ}$	✓			
		2 or more correspondences•clarity		✓		
		certain•unclearly				
		none				

### [Countermeasure]

Type of countermeasures	
Gabion Work, Micro Pile, Channel Work, Retaining wall	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

### [Disaster type]

Rock fall	
Slope failure	✓

### [Main check object]

Cut slope	✓
Natural slope	

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	✓
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

70m(w)*100m(h)*2m(d)=14,000m <sup>3</sup>
---

### [Hazard]

Hazard rank	A: the possibility of collapse/fall is high	
	B: the possibility of collapse/fall is moderate	
	C: the possibility of collapse/fall is low/none	
		✓

### [Description]

The 60m road on the valley side was collapsed in 2016 damaging the houses on the valley. The countermeasure works (Gabion work, Micro pile, Channel work, Retaining wall) is being undertaken after the disaster though the effect is yet unknown. The countermeasures constructed present deficiencies and the embankment may collapse again producing road subsidence.
--



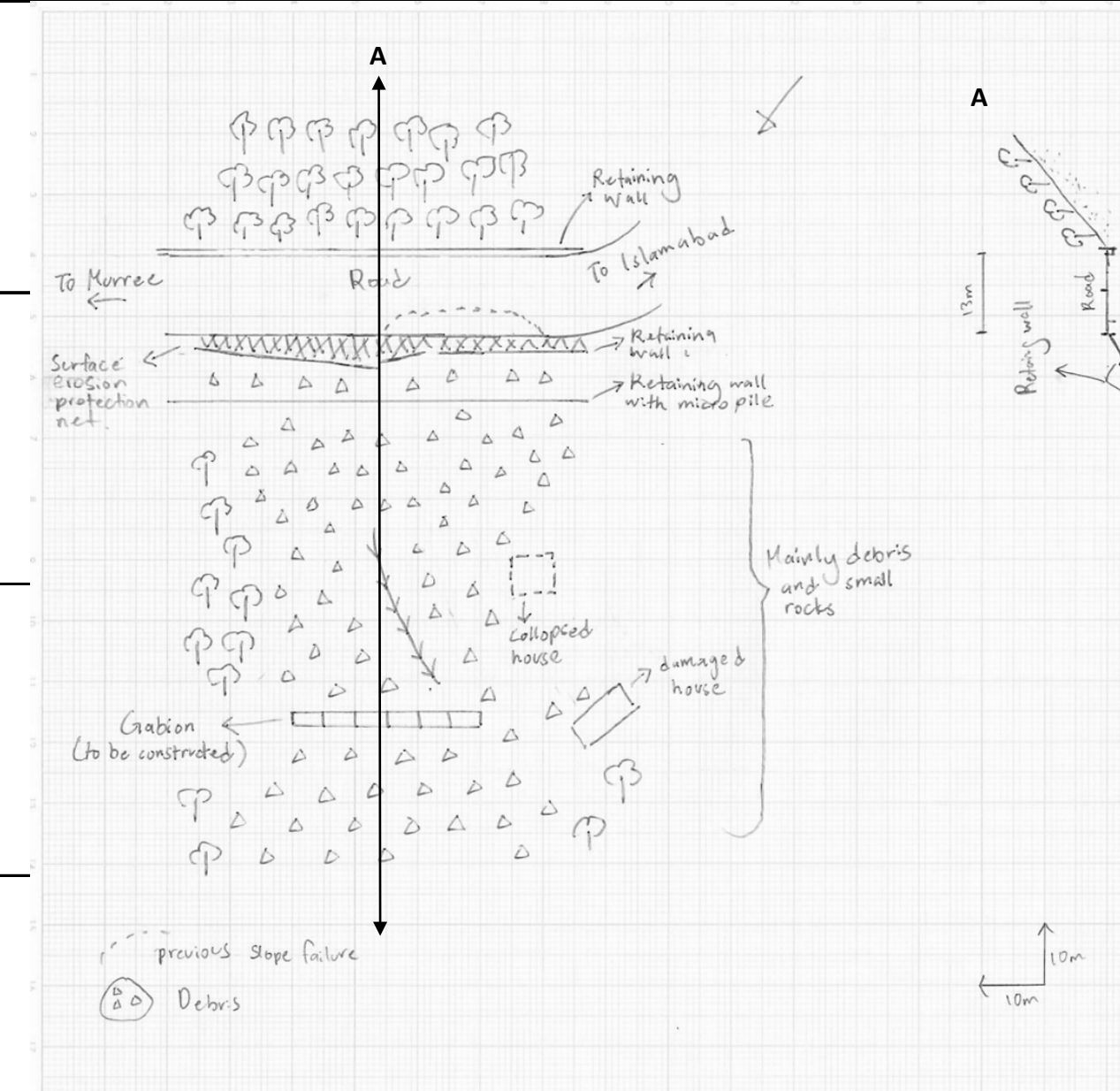
Code no.	N	7	5	_	2				
Region Office	Muzzafarabad								
Maintenance Unit	Murree								

Sketch sheet

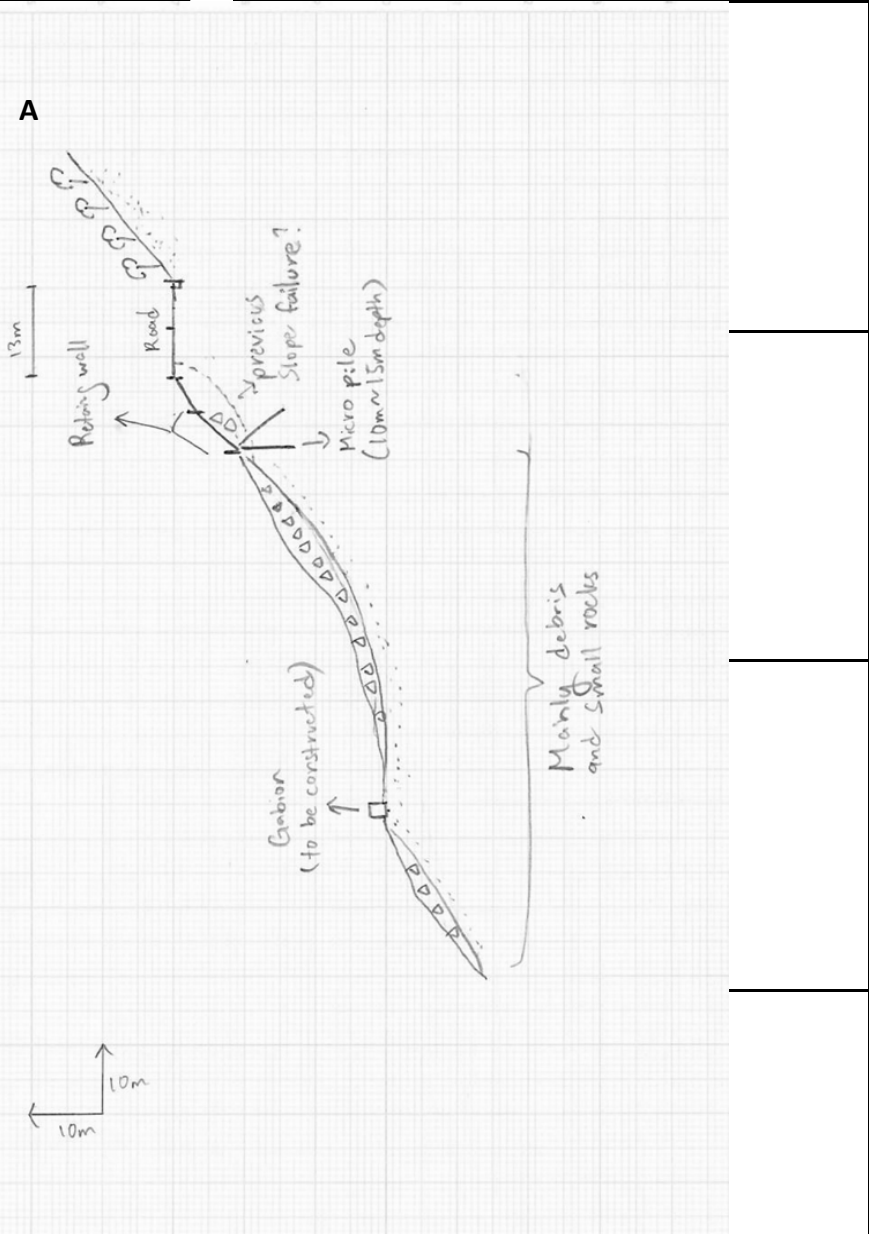
Coordinates	Latitude		N 33°50' 38.53"						
	Longitude		E 73°22' 6.91"						
Road Name	N	7	5		Km	3	0	+	1 0 0

Date	3-Dec-17
Inspector	Makoto Tokuda

Plane view



Cross sectional view



				Scale: ↑ ( ) m ↓

Scale: ← ( ) m →

				Scale: ↑ ( ) m ↓

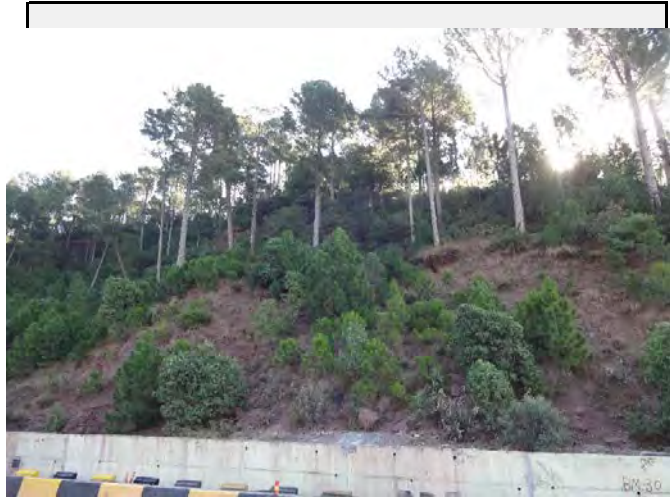
Scale: ← ( ) m →

Code no.	N	7	5	_	2				
Region Office	Muzzafarabad								
Maintenance Unit	Murree								

Photo sheet

Coordinates	Latitude		N 33°50' 38.53"						
	Longitude		E 73°22' 6.91"						
Road Name	N	7	5		Km	3	0	+	1 0 0

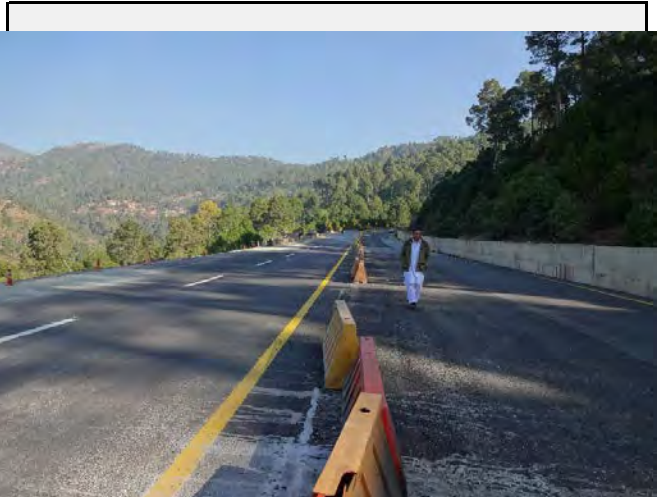
Date	3-Dec-17
Inspector	Makoto Tokuda



Mountain side: No anomalies has been observed in the mountain side.



Valley side: Valley side are covered mostly by the debris and small rocks



Road condition: Road has been repaired after the slope failure occurred in 2016.



Existing countermeasures / anomalies: Surface erosion protection net are installed to minimize the surface erosion.



Existing countermeasures / anomalies: Micro piles are installed at the foundation of the lowest retaining wall (ongoing construction).



Existing countermeasures / anomalies: Retaining walls are constructed at the valley side of the road (ongoing construction).





Code no.	N	7	5	_	3						
Region Office	Muzzafarabad										
Maintenance Unit	Murree										

## Evaluation sheet (debris flow)

Coordinates	Latitude		N 33°53' 29.05"									
	Longitude		E 73°23' 59.28"									
Road Name	N	7	5		Km	4	4					

Date	3-Dec-17
Inspector	Makoto Tokuda

### [Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km <sup>2</sup> or more	✓
		0.15km <sup>2</sup> - 0.50km <sup>2</sup>	
		less than 0.15km <sup>2</sup>	
	steepest slope of river bed	40°or more	
		30° - 40°	
		less than 30°	✓
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km <sup>2</sup> or more	
		0.08km <sup>2</sup> - 0.20km <sup>2</sup>	✓
		less than 0.08km <sup>2</sup>	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km <sup>2</sup> or more	
		0.02km <sup>2</sup> - 20km <sup>2</sup>	✓
		less than 0.02km <sup>2</sup>	
	artificial works that cause negative effects	certain	
		none	✓
	new crack and/or slope failure in stream	certain	
		none	✓
traces of large slope failure in stream	certain	✓	
	none		

### [Road structure]

structure	category of score	Check
River width	10m or more	✓
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or	
	No bridge / box culvert	
	1m - 2m	✓
	2m - 3m	
	3m - 5m	
	5m or more	

### [Potencial disaster mode] Check

Damage of bridge/culvert	✓
Outflow of embankment	
Debris flooding on the road	

### [History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	✓

### [Countermeasure]

Type of countermeasure		Check
None		
Effect of existing countermeasure	none・low	✓
	moderate	
	high	
	enough	

### [Hazard]

Hazard rank:	A: the possibility of debris flow is high	
	B: the possibility of debris flow is moderate	
	C: the possibility of debris flow is low/none	✓

### [Expected size of disaster] (width, length, depth, etc.)

100(L)*2(W)*1(d) = 200m <sup>3</sup>
--------------------------------------

### [Description/comments]

・Continuous water flow along the stream  
 ・Several slope failure are confirmed at the east side of the stream.  
 ・No new trace of the slopes  
 Given the gentle slope and the layout of the bridge debris flow disaster is not expected.



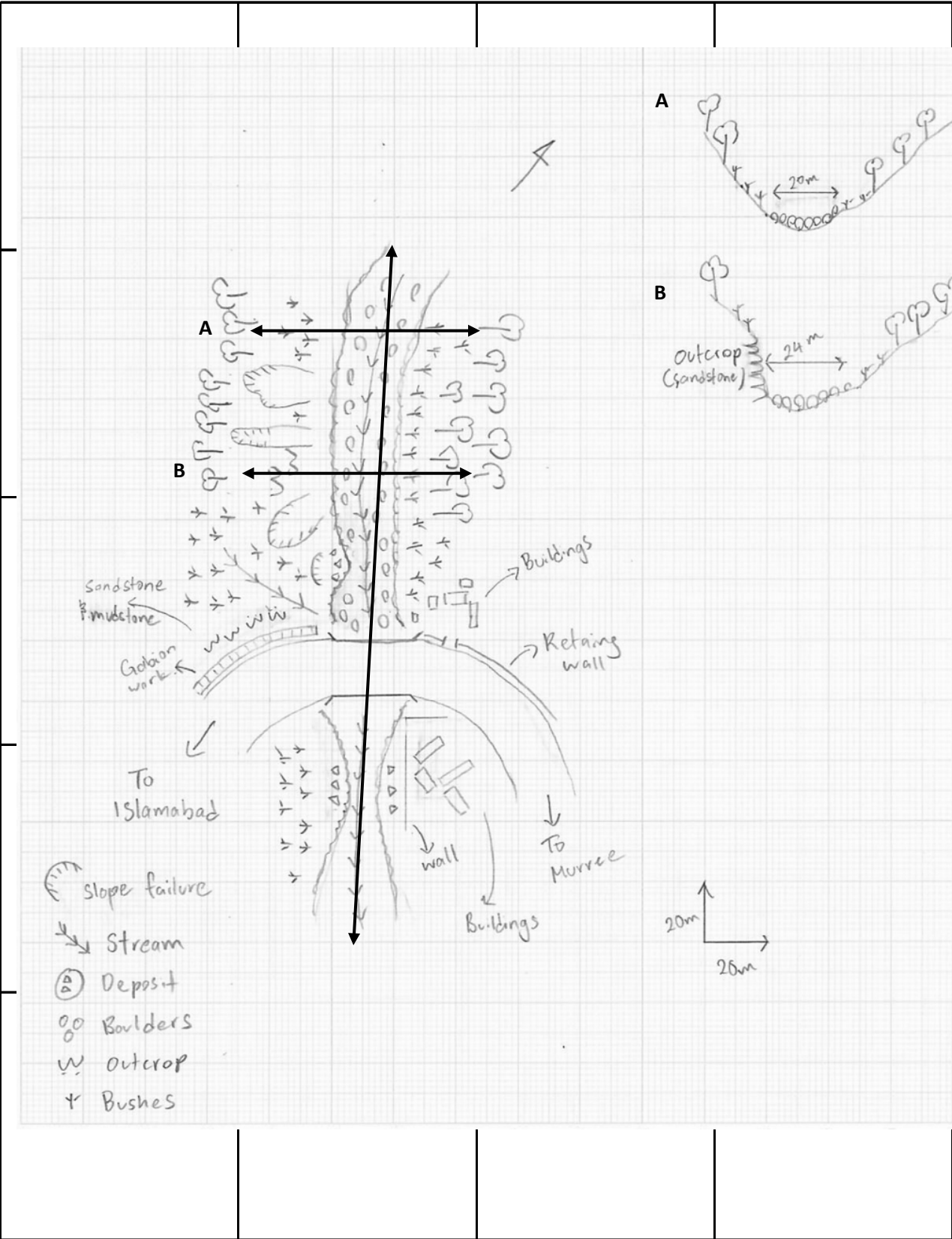
Code no.	N	7	5	_	3				
Region Office	Muzzafarabad								
Maintenance Unit	Murree								

Sketch sheet

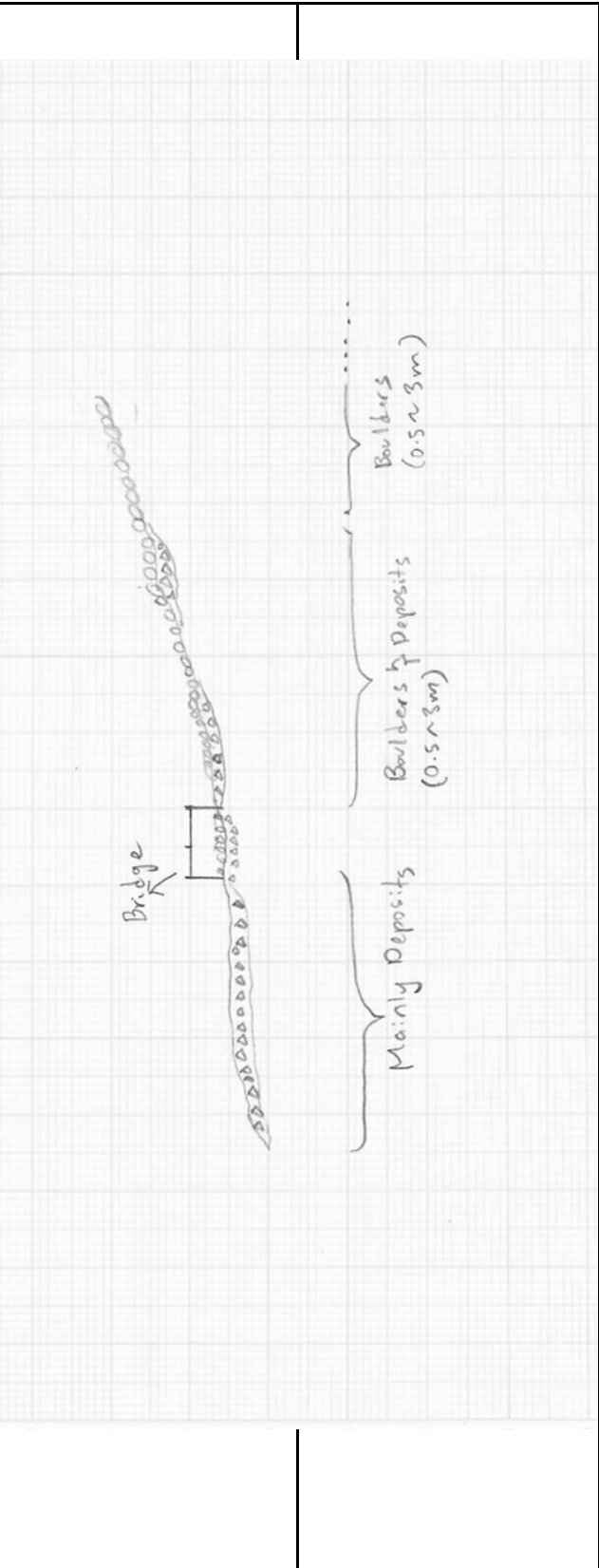
Coordinates	Latitude			N 33°53' 29.05"							
	Longitude			E 73°23' 59.28"							
Road Name	N	7	5		Km	4	4	0	0	0	0

Date	3-Dec-17
Inspector	Makoto Tokuda

Plane view



Cross sectional view



Scale: ← ( ) m →

Scale: ← ( ) m →

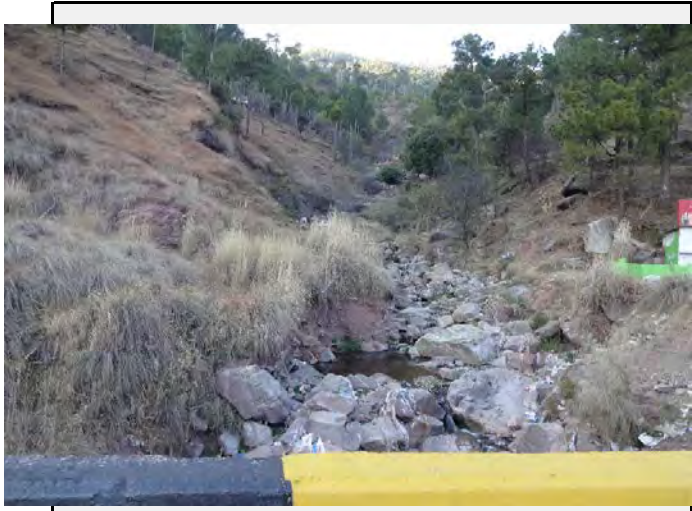
Scale: ← ( ) m →

Code no.	N	7	5	_	3				
Region Office	Muzzafarabad								
Maintenance Unit	Murree								

# Photo sheet

Coordinates	Latitude		N 33°53' 29.05"								
	Longitude		E 73°23' 59.28"								
Road Name	N	7	5		Km	4	4	0	0	0	0

Date	3-Dec-17
Inspector	Makoto Tokuda



Mountain side: Boulders (1~2m) are observed on the river bed on the mountain side.



Valley side: Deposits in the valley side. Erosion on the bank may occurs in future.



Road condition: Some cracks was observed at the joints of the bridge.



Existing countermeasures / anomalies: Dumping of the garbages around the bridge reduce the capacity to drain the debris to the valley side.



Existing countermeasures / anomalies: Several surface collapse can be observed on the west side of the slope on the mountain side.



Existing countermeasures / anomalies: Several surface collapse can be observed on the west side of the slope on the mountain side.





Code no.	N	7	5	_	4						
Region Office	Muzzafarabad										
Maintenance Unit	Murree										

## Evaluation sheet (debris flow)

Coordinates	Latitude			N 33°54' 15.46"							
	Longitude			E 73°24' 50.64"							
Road Name	N	7	5		Km	4	6	+	8	5	0

Date	3-Dec-17
Inspector	Makoto Tokuda

### [Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km <sup>2</sup> or more	✓
		0.15km <sup>2</sup> - 0.50km <sup>2</sup>	
		less than 0.15km <sup>2</sup>	
	steepest slope of river bed	40° or more	
		30° - 40°	✓
		less than 30°	
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km <sup>2</sup> or more	✓
		0.08km <sup>2</sup> - 0.20km <sup>2</sup>	
		less than 0.08km <sup>2</sup>	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km <sup>2</sup> or more	✓
		0.02km <sup>2</sup> - 20km <sup>2</sup>	
		less than 0.02km <sup>2</sup>	
	artificial works that cause negative effects	certain	
		none	✓
	new crack and/or slope failure in stream	certain	✓
		none	
	traces of large slope failure in stream	certain	✓
		none	

### [Road structure]

structure	category of score	Check
River width	10m or more	✓
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or	
	No bridge / box culvert	
	1m - 2m	✓
	2m - 3m	
	3m - 5m	
	5m or more	

### [Potencial disaster mode] Check

Damage of bridge/culvert	✓
Outflow of embankment	
Debris flooding on the road	

### [History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	✓

### [Countermeasure]

Type of countermeasure		Check
Bridge		
Effect of existing countermeasure	none・low	
	moderate	
	high	✓
	enough	

### [Hazard]

Hazard rank:	A: the possibility of debris flow is high	
	B: the possibility of debris flow is moderate	
	C: the possibility of debris flow is low/none	✓

### [Expected size of disaster] (width, length, depth, etc.)

100(L)*2(W)*1(d) = 200m <sup>3</sup>
--------------------------------------

### [Description/comments]

The slope gradient of the stream near the road is gentle and the condition of the vegetation in the catchment area is dense. Big scale debris flow is not expected.

Code no.	N	7	5	_	4				
Region Office	Muzzafarabad								
Maintenance Unit	Murree								

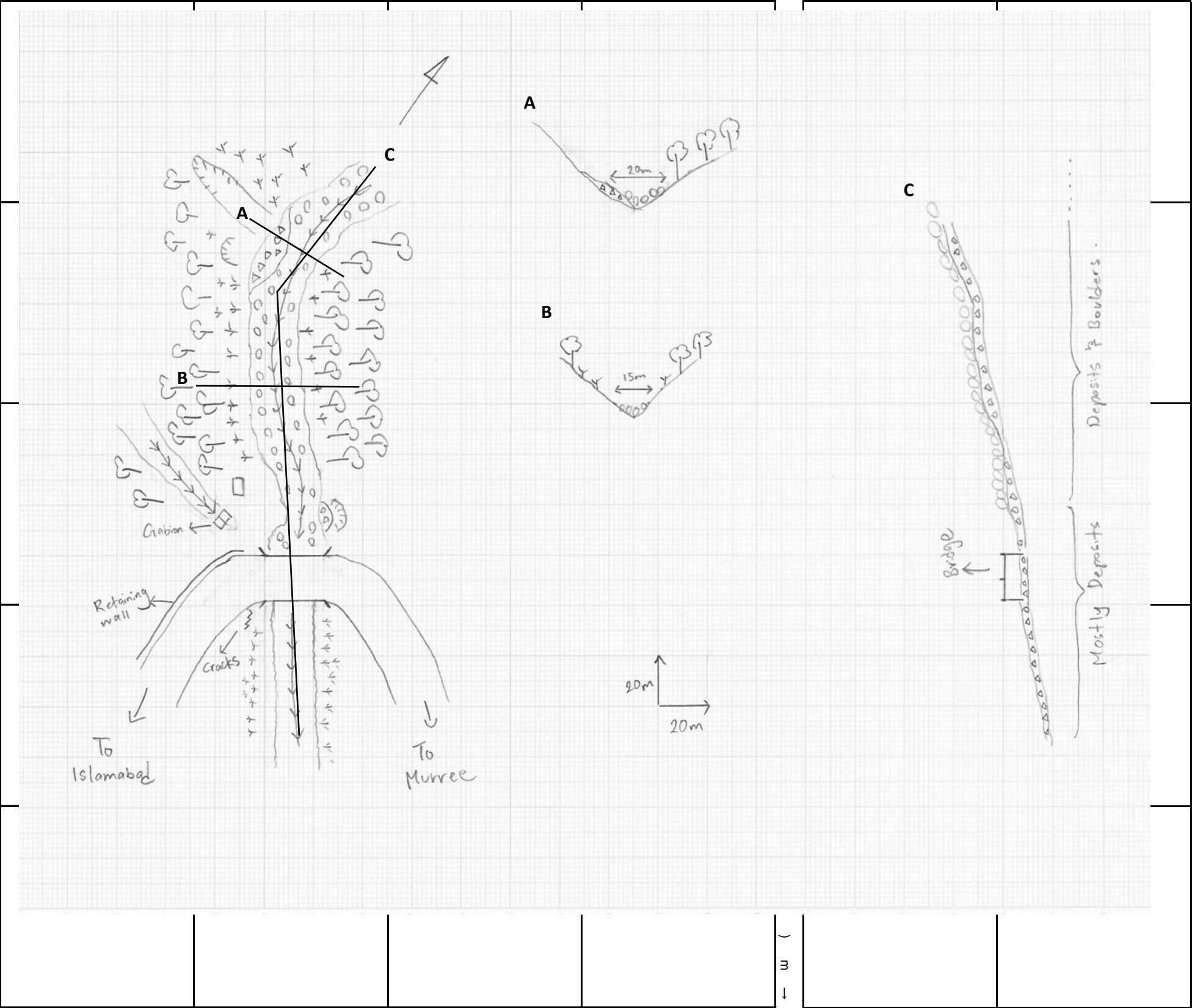
Sketch sheet

Coordinates	Latitude				N 33°54' 15.46"							
	Longitude				E 73°24' 50.64"							
Road Name	N	7	5		Km	4	6	+	8	5	0	

Date	3-Dec-17
Inspector	Makoto Tokuda

Plane view

Cross sectional view



Scale: ← ( ) m →

Scale: ← ( ) m →

Scale: ← ( ) m →

Code no.	N	7	5	_	4				
Region Office	Muzzafarabad								
Maintenance Unit	Murree								

# Photo sheet

Coordinates	Latitude		N 33°54' 15.46"						
	Longitude		E 73°24' 50.64"						
Road Name	N	7	5		Km	4	6	+	8 5 0

Date	3-Dec-17
Inspector	Makoto Tokuda



Mountain side: Stream is filled with boulders (~3m) on the mountain side.



Valley side: Stream is filled with boulders (~2m) on the valley side. There is trace of erosion on the both side of the stream.



Road condition: Small cracks was confirmed at the joint section of the road and bridge.



Existing countermeasures : The height underneath the bridge seems enough to clear the debris to the valley side.



Existing anomalies: Cracks was confirmed on the bank of the valley side. It may collapse in near future due to the erosion.



Others: Another small stream is flowing into this stream. This area is used as a carwash pit for the local people.





Code no.	N	7	5	—	5						
Region Office	Muzzafarabad										
Maintenance Unit	Murree										

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude		33°53'23.94"N							
	Longitude		73°23'59.66"E							
Road name	N	7	5		Km	4	4			

Date	13-Apr-18
Inspector	Wakita

### [Causes]

Item		factor	category of score	Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences	✓
			2 correspondences	
			1 correspondences	
			no correspondence	
Geological conditions	Soil	susceptible to erosion less strength with water	marked	
			a little marked	✓
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	None	
			marked	
			a little marked	✓
	Structure	dip slope of bedding plane	None	
It corresponds.				
None			✓	
Surface condition	Topsoil, detached rock and unsteady rock	debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked	
			a little marked	
			None	✓
	Spring water	Surface condition	instability	
			a little unstable	✓
			stability	
Surface condition	Surface condition	notable spring waster		
		seepage		
		none	✓	
Profile	Height (H), dip (i)	height	bare land with minor vegetation	✓
			intermediate (bare • grass • tree)	
			mainly structure, mainly tree	
			H ≥ 50m	
		30 ≤ H < 50m	✓	
		15 ≤ H < 30m		
dip	H < 15m			
	i ≥ 70°			
	45° ≤ i < 70°	✓		
i < 45°				
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	2 or more correspondences • clarity certain • unclarity none	✓	

### [Countermeasure]

Type of countermeasures	
Retaining wall, gabion wall	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

### [Disaster type]

Rock fall	✓
Slope failure	✓

### [Main check object]

Cut slope	
Natural slope	

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	✓
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

Valley side slope failure: 60m(w)*60m(h)*1.5m(d)=5,400m3 Rock fall max size=2m*1m*1m=2m3
--

### [Hazard]

Hazard rank	A: the possibility of collapse/fall is high	✓
	B: the possibility of collapse/fall is moderate	
	C: the possibility of collapse/fall is low/none	

### [Description]

Mountain side: rock falls occur constantly because the base rock is highly fractured and weathered. The gabion wall is damaged significantly and doesn't avoid rock fall. Valley side: the concrete retaining wall is tilting because the soil it is constructed on is being washed away. Road subsidence is expected if the slope is not treated properly and protected from further erosion. Superficial slope failure may also occur.

Code no.	N	7	5	-	5				
Region Office	Muzzafarabad								
Maintenance Unit	Murree								

Sketch sheet

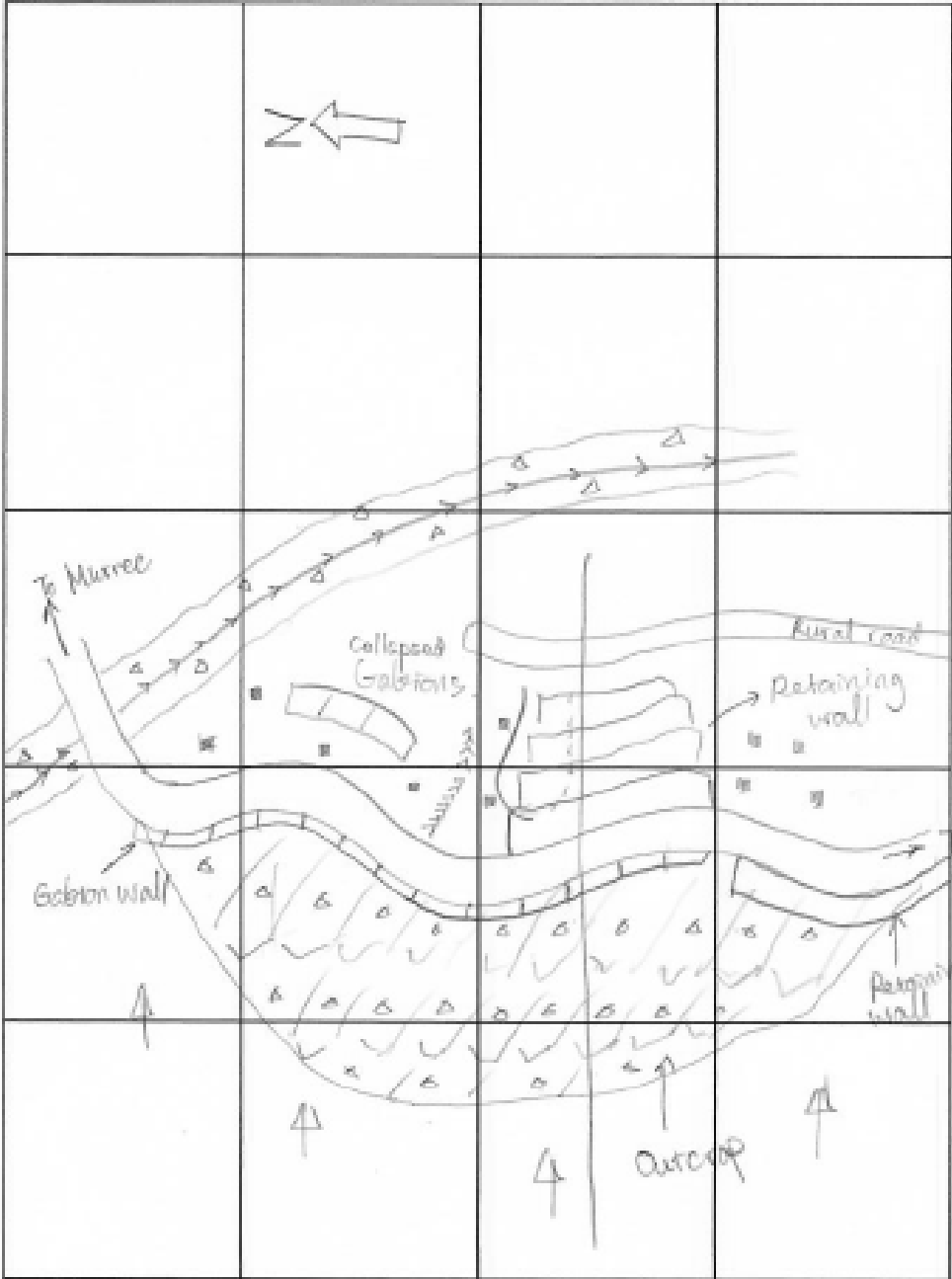
Coordinates	Latitude		33°53'23.94"N							
	Longitude		73°23'59.66"E							
Road Name	N	7	5		Km	4	4			

Date	13-Apr-18
Inspector	Wakita

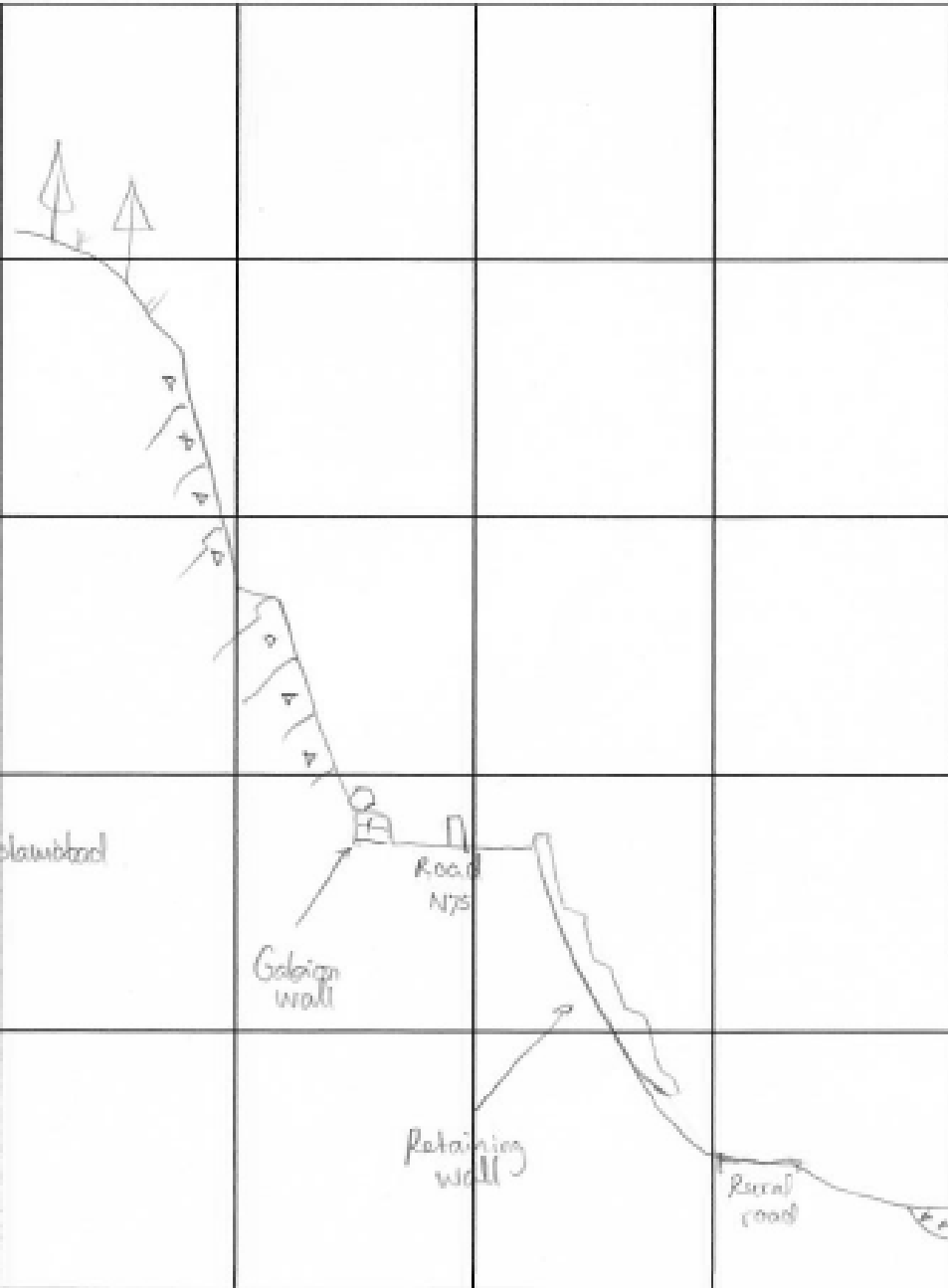
Plane view


Cross sectional view


Plane view



Cross sectional view





Scale: ( ) m

Scale: ( ) m



Code no.	N	7	5	_	5				
Region Office	Muzzafarabad								
Maintenance Unit	Murree								

### Photo sheet

Coordinates	Latitude		33°53'23.94"N						
	Longitude		73°23'59.66"E						
Road Name	N	7	5		Km	4	4		

Date	13-Apr-18
Inspector	Wakita



Overall view of the slope. Rock falls are expected in the mountain side and slope failure in the valley side.



Rock falls of 2m3 have happened in the past reaching the road.



The base rock of the mountain side slope is highly fractured and some layers are highly weathered facilitating rock falls



The gabion wall is damaged in many spots due to past rock falls and is thought not to operate properly as a countermeasure



The retaining wall in the valley side is being damaged because the soil on which it is constructed is being washed away.



Slope failures have collapsed and damaged gabion walls constructed in the valley side as retaining walls for the embankment



Code no.	Sat_	N	7	5	_	7		
Region Office								
Maintenance Unit								

## Evaluation sheet (landslide)

Coordinates	Latitude		33° 53' 34.5"					
	Longitude		73° 24' 38.0"					
Road Name	N	7	5		Km			

Date	2017/12/1
Inspector	Yasir, Sajid, Shafiq, Basharat

### [Main body of landslide]

Mountain side	
Valley side	
Both	√

### [Causes]

		Category	Check
Topographical factor	Result of photo interpretation	exist clearly	√
		exist but partial and not clear	
		exist but not clear	
	Surface anomalies	large and new cracks, steps and subsidence	
		small and old cracks, steps and subsidence	
		slight deformation	√
		no anomalies	
Geological conditions	Geological structure	fault, fracture zone	
		dip slope	
		undip slope/ no characteristic feature	√
	Main rock formation of landslide body	metamorphic rock (schist, quartzite, phyllite etc.)	
		sedimentary rock (sandstone, limestone etc.)	√
		igneous rock (granite etc.)	
		quaternary deposit (colluvial deposit etc.)	
	Hydrological feature	much springs / much seepage	
		little springs /little seepage	√
trace of water			
no water observed			

### [History]

category		Check
Records of Landslide	Existing record (documents or patrimony)	obvious
		slight
		none
	Damage on road facilities and houses	obvious
		slight
		none

### [Countermeasure]

Category	Check	Type of countermeasure
There is no countermeasure		Retaining walls to protect road
Effectiveness of countermeasure	No effect	
	Some effect	
	High effect	

### [Evaluation Rank]

Risk \ Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	②	3	4

Organization responsible for countermeasure works according to the scale of the disaster

Influence on the traffic when potential disaster

-Big: Grant aid

-Great risk: road closed for 2 days or more

-Medium: Major contractor in Pakistan

-Medium risk: road closed for 1 day or less

-Small: Local contractor

-Low risk: no road closure

[Expected size of disaster] (width, length, depth, etc.)

L= 1020 m, W= 650, D, 10-15 m

### [Description]

The landslide N-75-7 along the Murree expressway, is an old landslide with around 3 km<sup>2</sup> area. Lithology of the site is characterized by claystone, siltstone and sandstone of the Miocene Murree Formation. The visible scarp of the landslide indicates this is an old landslide, and has been reactivated many times in the past, consequently, small landslides were also observed within the landslide. The upper part of the slide is stable, however, the toe of the landslide material is active with potential for future landslide. The right side of the slide is reactivated and can be considered as potential threat to the road in future. Although, the retaining walls are already built to protect the road. However, the displacement up to 4 cm has been observed also in the retaining wall.

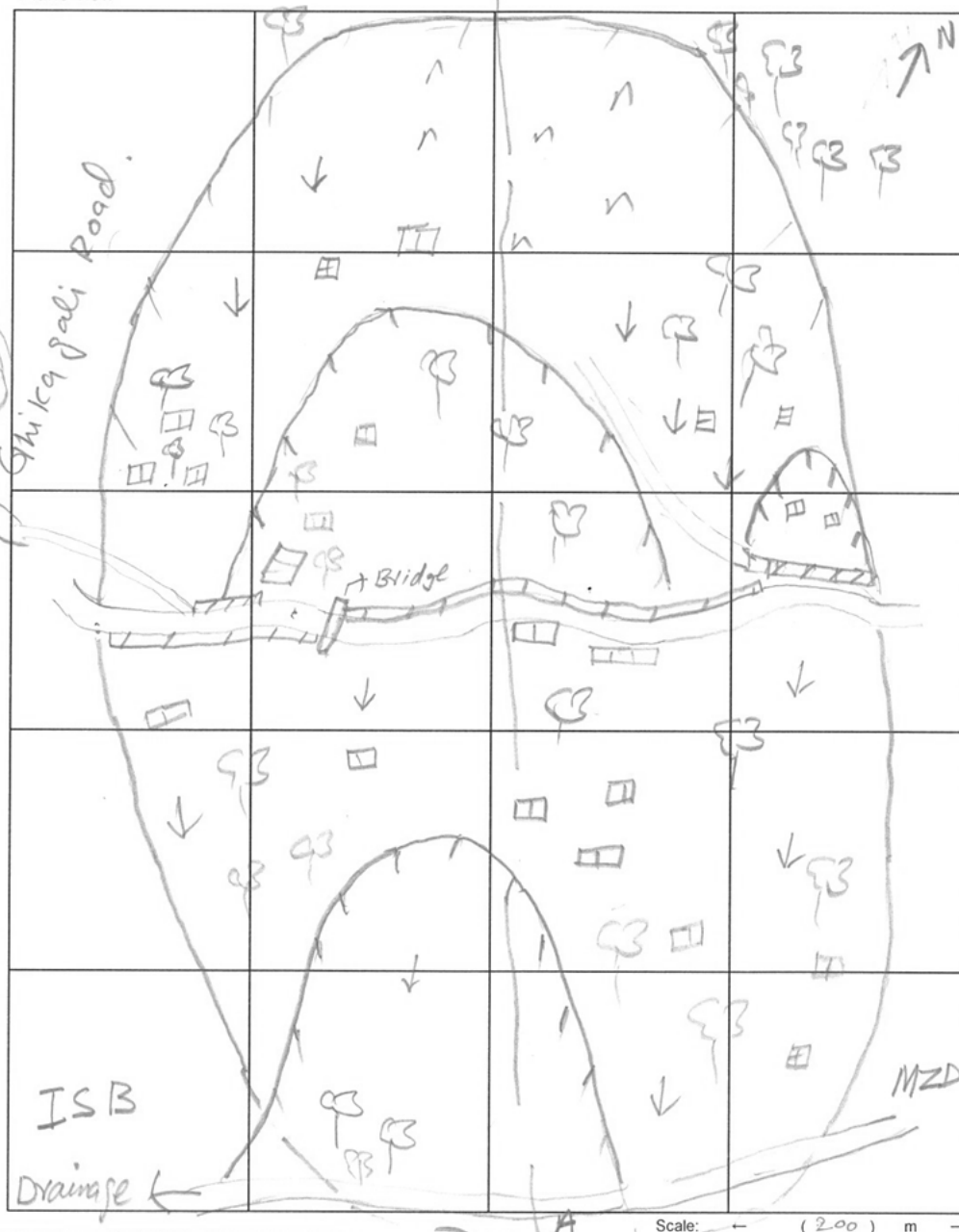
Code no.	
Road name	N 75-7 Km

### Sketch sheet

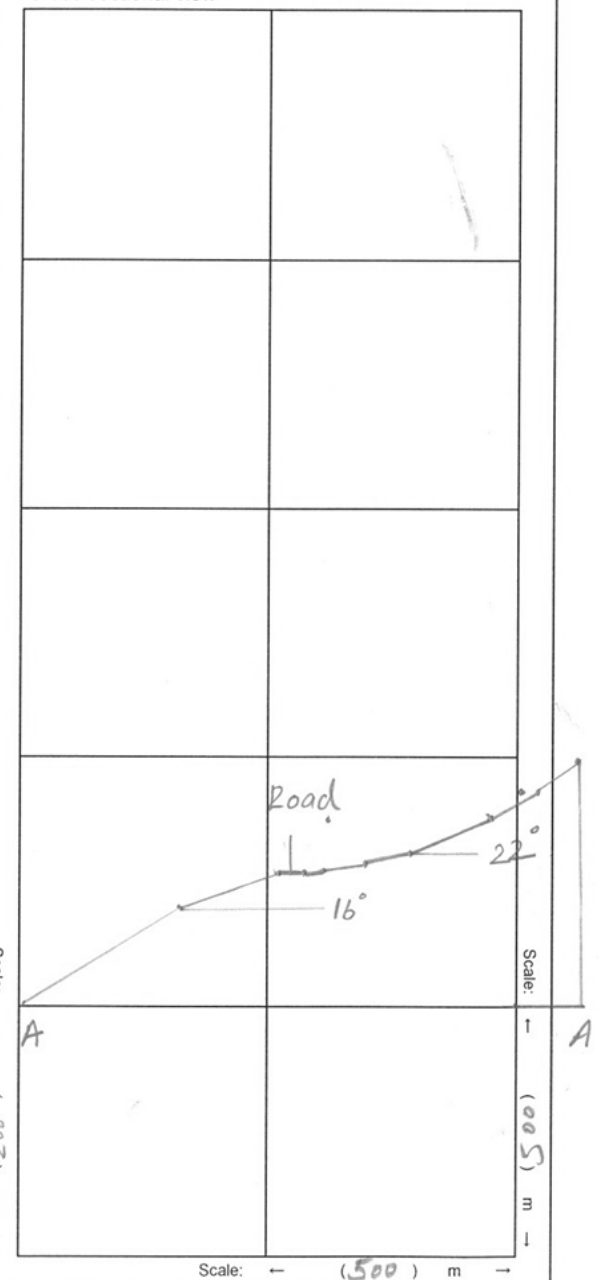
Coordinates	Latitude	33° 53' 34.5"
	Longitude	73° 24' 38.0"

Date	
Inspector	

Plane view



Cross sectional view



- ⊗ Trees
- ↓ Bushes
- ~ Landslide material
- ⌒ Scarp
- ▨ Retain wall
- ▣ Houses
- ≡ Drainage
- Profile



Code no.	Sat_	N	7	5	_	7		
Region Office								
Maintenance Unit								

Photo sheet

Coordinates	Latitude		33° 53' 34.5"					
	Longitude		73° 24' 38.0"					
Road Name	N	_	7	5	Km			

Date	2017/12/1
Inspector	Yasir, Sajid, Shafiq, Basharat



Mountain side view of landslide



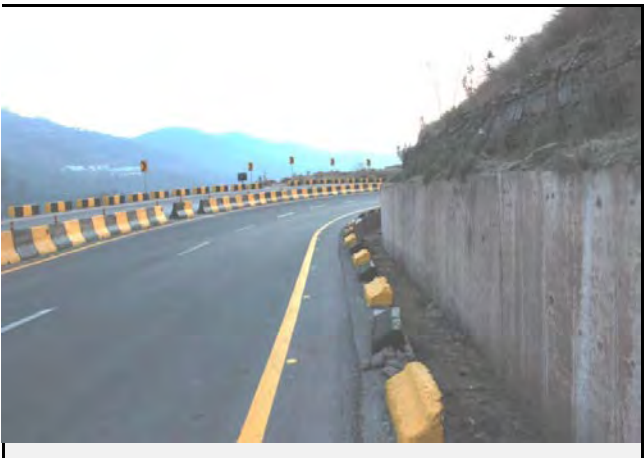
Valley side view of landslide



Road condition: Road is built through the landslide



Existing countermeasures / anomalies: Retaining and gabion walls has been constructed to protect the road



Existing countermeasures / anomalies: Upto 4 cm cracks were observed in the retaining wall



Existing countermeasures / anomalies: Retaining wall has been constructed



Code no.	Sat	_	N	7	5	_	9		
Region Office									
Maintenance Unit									

## Evaluation sheet (debris flow)

Coordinates	Latitude	33° 54' 15.9"							
	Longitude	73° 24' 51"							
Road Name	N	7	5		Km	9			

Date	2017/12/2
Inspector	Yasir, Sajid, Shafiq, Basharat

### [Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km <sup>2</sup> or more	
		0.15km <sup>2</sup> - 0.50km <sup>2</sup>	
		less than 0.15km <sup>2</sup>	√
	steepest slope of river bed	40°or more	
30° - 40°			
less than 30°		√	
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km <sup>2</sup> or more	√
		0.08km <sup>2</sup> - 0.20km <sup>2</sup>	
		less than 0.08km <sup>2</sup>	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km <sup>2</sup> or more	
		0.02km <sup>2</sup> - 20km <sup>2</sup>	
		less than 0.02km <sup>2</sup>	
	artificial works that cause negative effects	certain	
		none	√
	new crack and/or slope failure in stream	certain	√
		none	
traces of large slope failure in stream	certain	√	
	none		

### [Road structure]

structure	category of score	Check
River width	10m or more	√
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or	
	No bridge / box culvert	
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	√

### [History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	√
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

### [Potencial disaster mode] Check

Damage of bridge/culvert	√
Outflow of embankment	
Debris flooding on the road	

### [Expected size of disaster] (width, length, depth, etc.)

L= 1000 m, W=30 m, D= 4 m
---------------------------

### [Countermeasure]

Type of countermeasure	Check
to protect the road. Culvert has also been	
Effect of existing countermeasure	none • low moderate high enough
	√

### [Evaluation Rank]

Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffic when potential disaster

-Great risk: road closed for 2 days or more

-Medium risk: road closed for 1 day or less

-Low risk: no road closure

### [Description/comments]

A seasonal stream crosses the Murree expressway at this location. Stream brings along huge volume of debris every year. During 2007, the debris flow damaged the road completely. Big catchment area with debris fall/rock fall material are present on the upstream. Small landslides were also observed along the stream which contribute in the debris volume and have potential to damage the road in future. Sandstone bed along the left side of the stream is dipping towards the channel. Various sandstone boulders of size more than 2 m<sup>3</sup> have been observed. The bridge and culvert has been damaged in the past due to debris flow. The debris flow is a potential threat to the road and shall be mitigated on high priority.

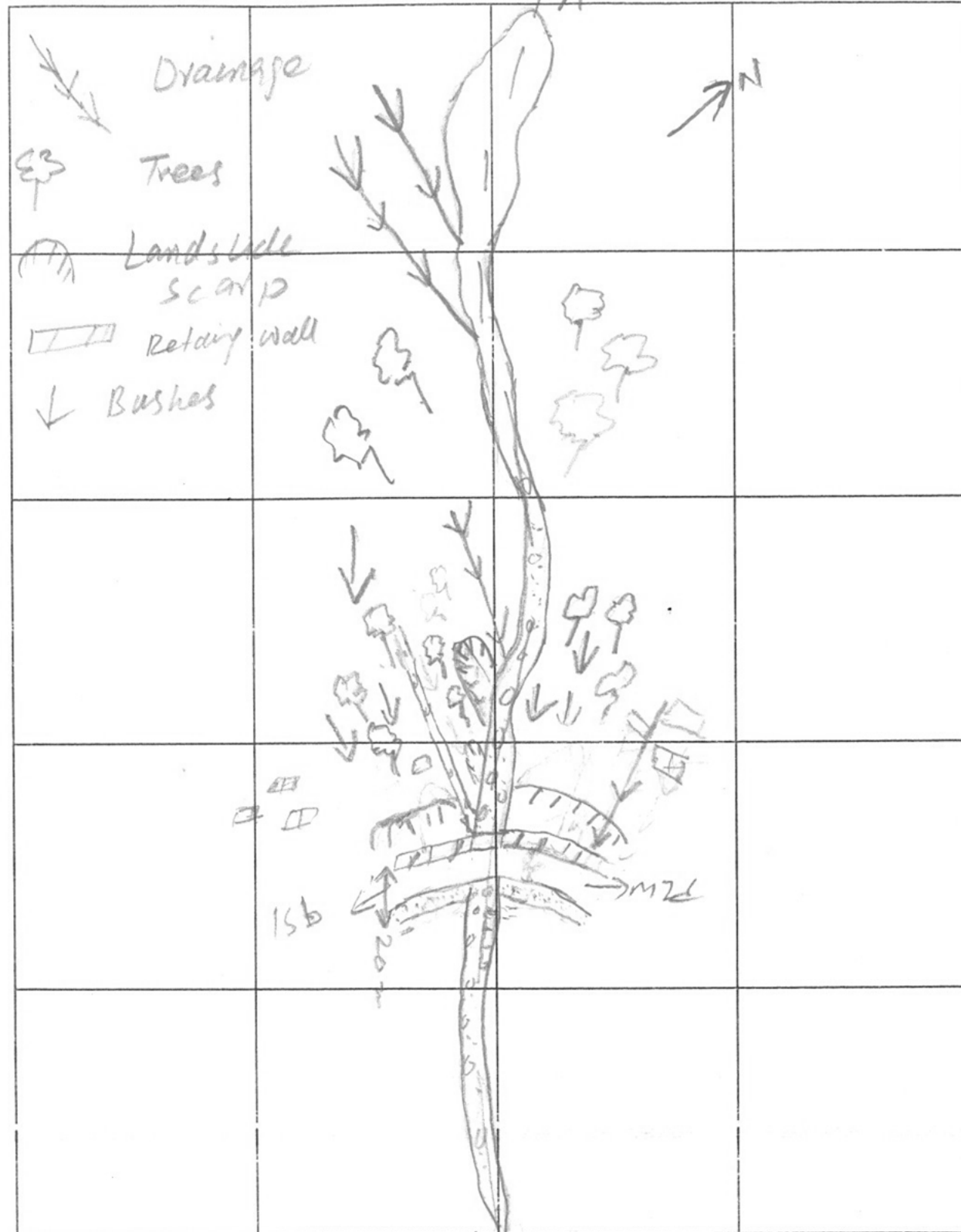
Code no.	
Road name	N 75-9 Km

# Sketch sheet

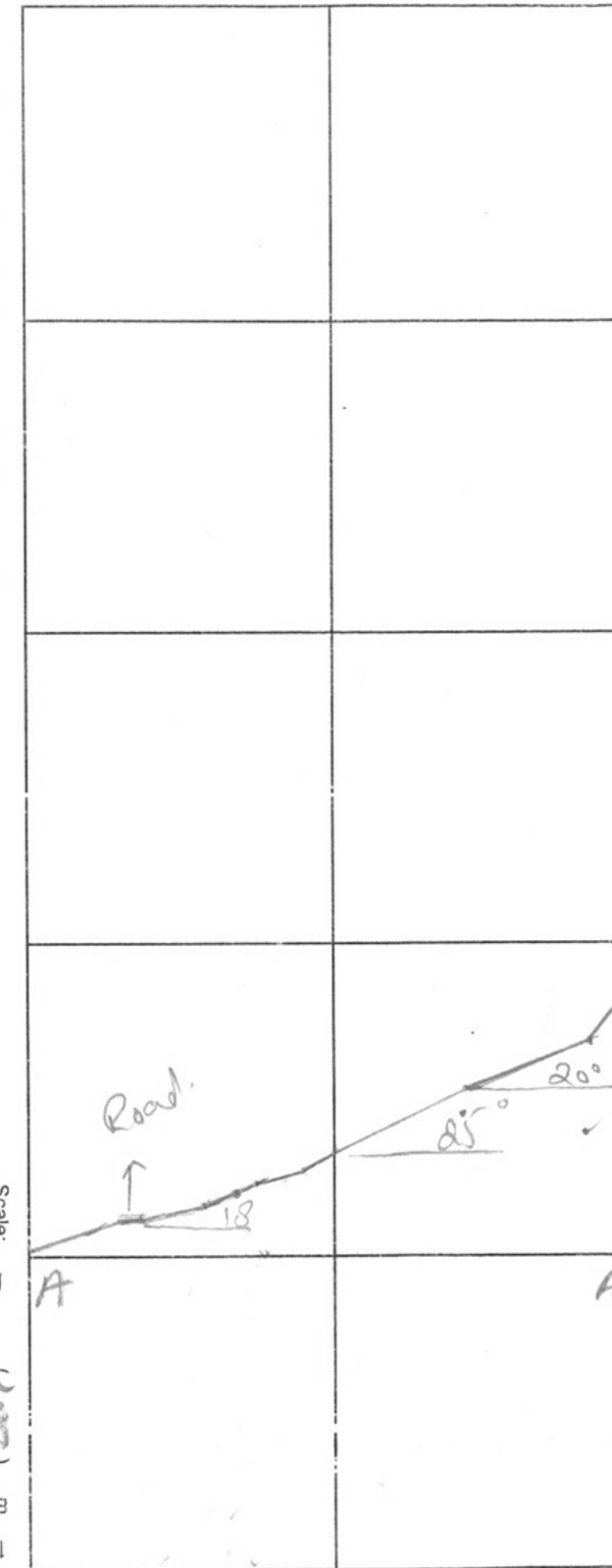
Coordinates	Latitude	33° 59' 15.9"
	Longitude	73° 24' 51"

Date	8/12/17
Inspector	

Plane view



Cross sectional view



Scale: ( ) m

Scale: (500) m

A

200



Code no.	Sat_	N	7	5	_	9		
Region Office								
Maintenance Unit								

Photo sheet

Coordinates	Latitude	33° 54' 15.9"									
	Longitude	73° 24' 51"									
Road Name	N	_	7	5	Km						

Date	2017/12/2
Inspector	Yasir, Sajid, Shafiq, Basharat



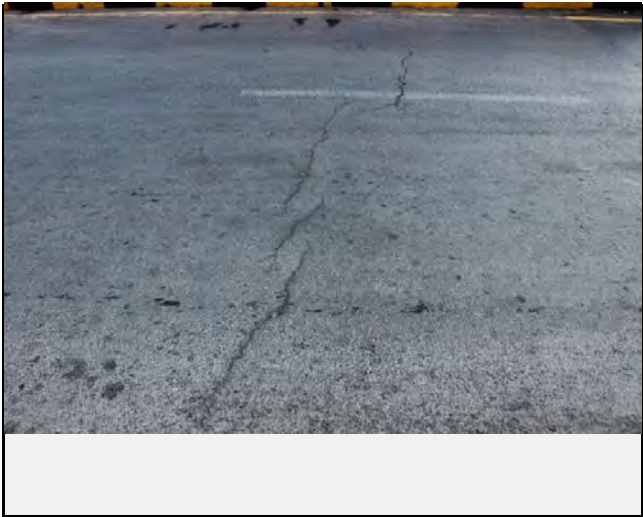
Mountain side view of the debris flow



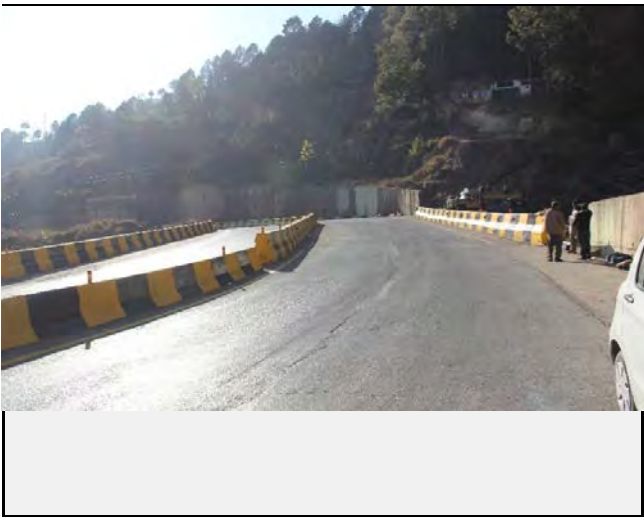
Valley side view of the debris flow



Front view of the debris flow from the road



The crack on road has been observed



Road condition



Existing countermeasures / anomalies: Retaining wall has been constructed at the toe of the slope failure



Code no.	Sat	N	7	5	2	0		
Region Office								
Maintenance Unit								

## Evaluation sheet (debris flow)

Coordinates	Latitude	33° 55' 28.9"						
	Longitude	73° 27' 3.5"						
Road Name	N	7	5	Km	2	0		

Date	2017/12/3
Inspector	Yasir, Sajid, Shafiq, Basharat

### [Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km <sup>2</sup> or more	
		0.15km <sup>2</sup> - 0.50km <sup>2</sup>	
		less than 0.15km <sup>2</sup>	√
Property of slope	steepest slope of river bed	40° or more	
		30° - 40°	√
		less than 30°	
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km <sup>2</sup> or more	
		0.08km <sup>2</sup> - 0.20km <sup>2</sup>	
		less than 0.08km <sup>2</sup>	√
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km <sup>2</sup> or more	
		0.02km <sup>2</sup> - 20km <sup>2</sup>	
		less than 0.02km <sup>2</sup>	√
	artificial works that cause negative effects	certain	
		none	√
	new crack and/or slope failure in stream	certain	√
		none	
	traces of large slope failure in stream	certain	√
		none	

### [Road structure]

structure	category of score	Check
River width	10m or more	√
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or	
	No bridge / box culvert	√
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

### [History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	
There is a history about debris flow though there is no obstacle to traffic.	√
There is no history of debris flow	

### [Potencial disaster mode] Check

Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	√

### [Expected size of disaster] (width, length, depth, etc.)

L= 280 m, W=25 m, D=3-4m

### [Countermeasure]

Type of countermeasure	Check
as made for the outflow of debris material	
Effect of existing countermeasure	<div>none • low</div> <div>moderate</div> <div>high</div> <div>enough</div>

### [Evaluation Rank]

Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor
- Influence on the traffic when potential disaster
- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure

### [Description/comments]

The site is marked by the presence of landslide and debris flow. Geology of the site is characterized by active fault and highly jointed claystone and sandstone. Due to erosion along two gullies debris material has been found in the river bed. Beside, debris flow, there is also a potential landslide. Large open crack on the top indicates its future potential failure. The debris flow and landslide are in dangering the stability of the road. Small retaining walls has been constructed to protect the road. On the upstream small benching were made to minimize erosional affect.

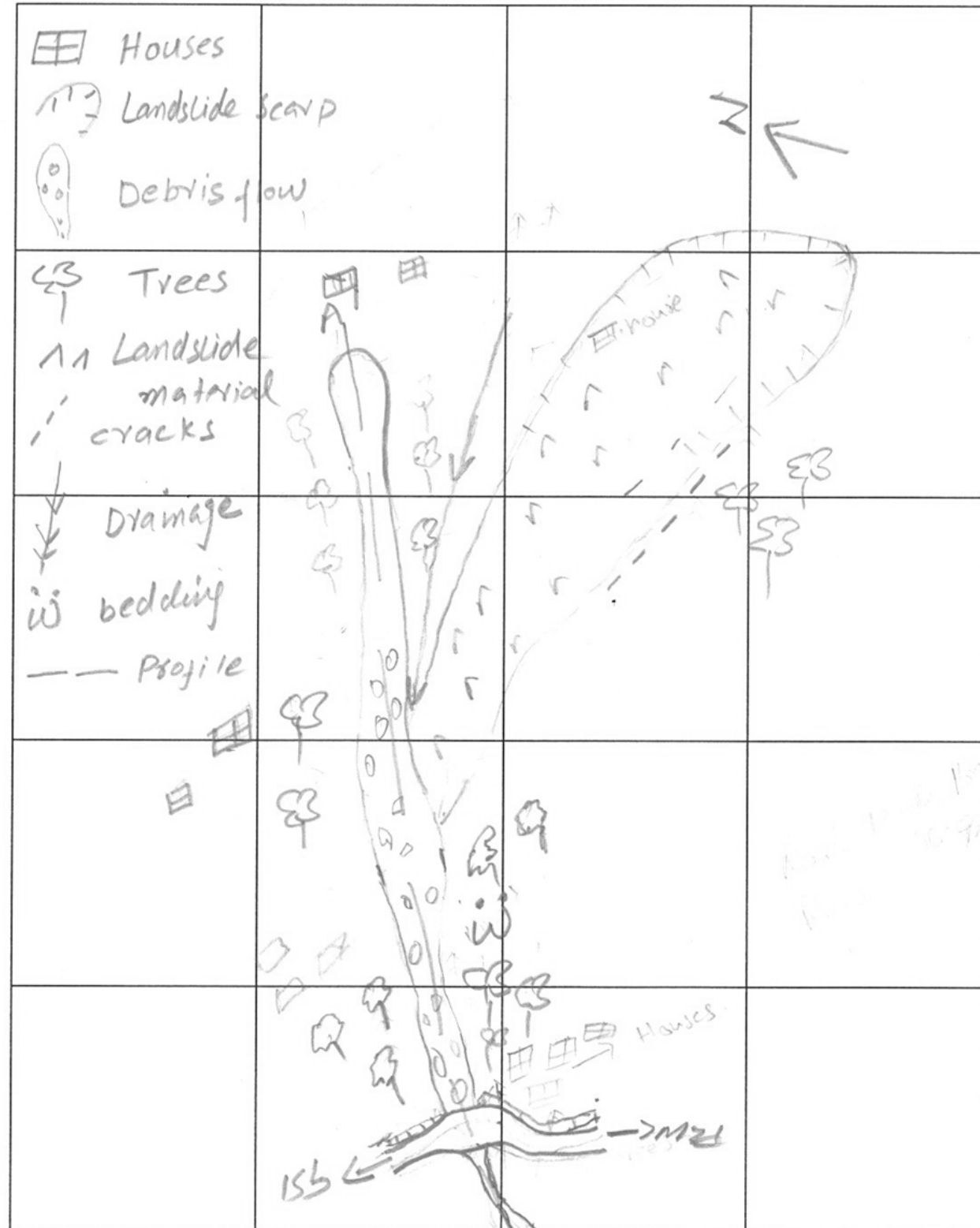
Code no.	20								
Road name	N 75-20	Km							

### Sketch sheet

Coordinates	Latitude	33°55'28.9"
	Longitude	73°29'3.5"

Date	08-12-2017
Inspector	

Plane view



Cross sectional view



Scale: ( 80 ) m

Scale: ( 150 ) m

Height about 120 m

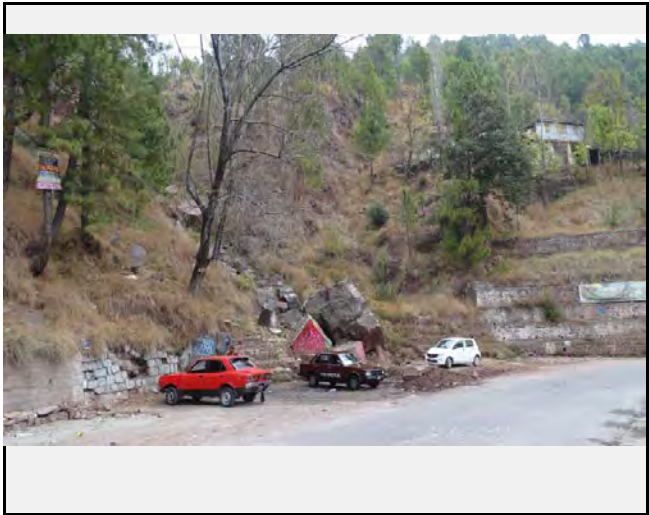


Code no.	Sat_	N	7	5	_	2	0		
Road name	N	-	75						

# Photo sheet

Coordinates	Latitude	33°55' 28.9"
	Longitude	73° 27' 3.5"

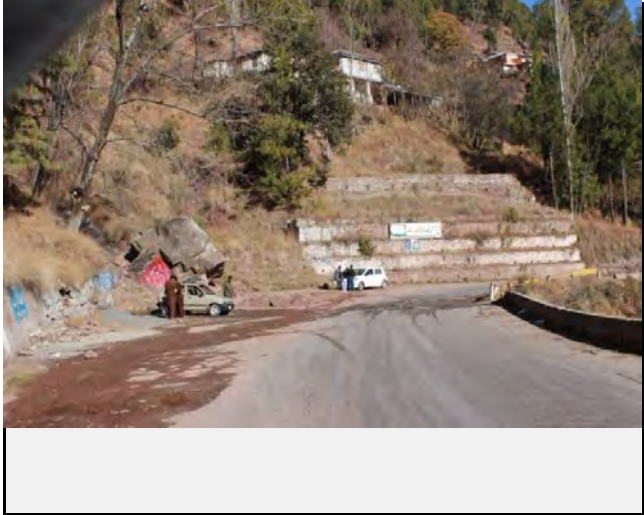
Date	2017/12/3
Inspector	Yasir, Sajid, Shafiq, Basharat



View of debris flow at start point



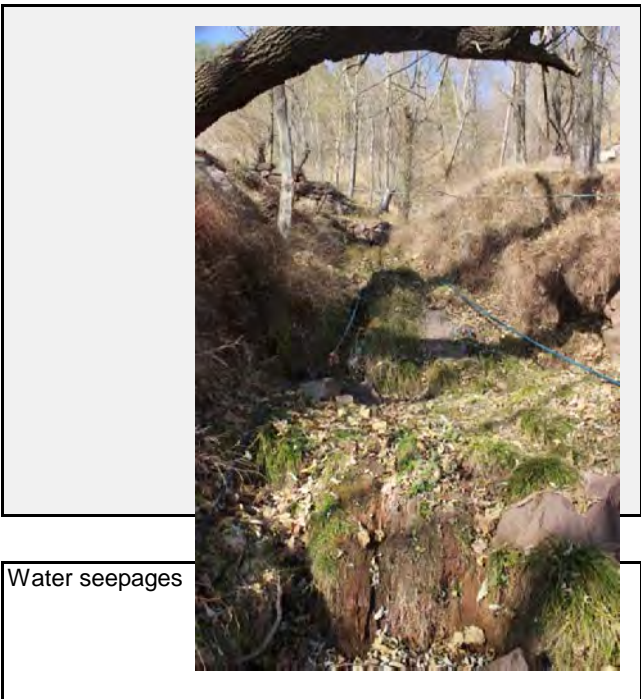
View of debris flow towards valley side



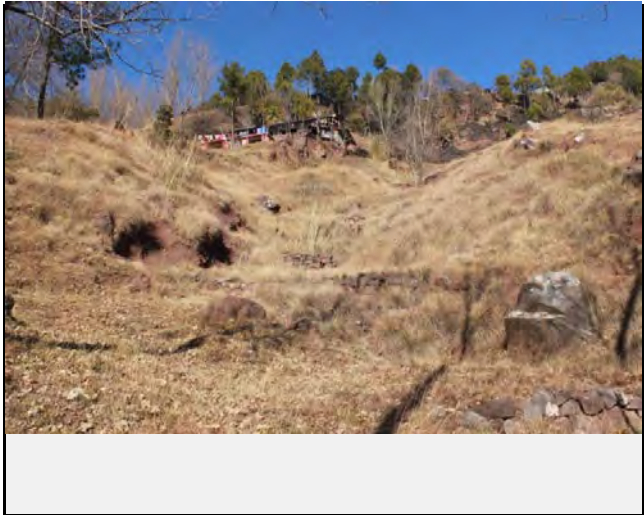
Road condition at location and the retaining wall to protect the road



Future potential landslide. Vegetation and trees on the main body of landslide



Water seepages



Construction of small check dam to control debris flow



Code no.	Sat	_	N	7	5	_	2	8
Region Office								
Maintenance Unit								

## Evaluation sheet (debris flow)

Coordinates	Latitude	33° 59' 16.6"							
	Longitude	73° 29' 2.7"							
Road Name	N	7	5		Km				

Date	2017/12/4
Inspector	Yasir, Sajid, Shafiq, Basharat

### [Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km <sup>2</sup> or more	
		0.15km <sup>2</sup> - 0.50km <sup>2</sup>	
		less than 0.15km <sup>2</sup>	√
	steepest slope of river bed	40°or more	
30° - 40°		√	
less than 30°			
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km <sup>2</sup> or more	√
		0.08km <sup>2</sup> - 0.20km <sup>2</sup>	
		less than 0.08km <sup>2</sup>	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km <sup>2</sup> or more	
		0.02km <sup>2</sup> - 20km <sup>2</sup>	
		less than 0.02km <sup>2</sup>	√
	artificial works that cause negative effects	certain	
		none	√
	new crack and/or slope failure in stream	certain	
		none	√
traces of large slope failure in stream	certain		
	none	√	

### [Road structure]

structure	category of score	Check
River width	10m or more	√
	5m - 10m	
	3m - 5m	
	less than 3m	
Beam height	less than 1m or	
	No bridge / box culvert	
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	√

### [History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	√

### [Potencial disaster mode] Check

Damage of bridge/culvert	√
Outflow of embankment	
Debris flooding on the road	

### [Expected size of disaster] (width, length, depth, etc.)

L= 440 m , W=12 m, D= 2-3 m

### [Countermeasure]

Type of countermeasure		Check
low of the debris. Retaining walls has be		
Effect of existing countermeasure	none•low	
	moderate	√
	high	
	enough	

### [Evaluation Rank]

Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffic when potential disaster

-Great risk: road closed for 2 days or more

-Medium risk: road closed for 1 day or less

-Low risk: no road closure

### [Description/comments]

The site is located on a seasonal stream, where road has very sharp bend. Sides of the upstream are bounded by alternative beds of sandstone and claystone. Some boulders in the stream are of size greater than 3 m<sup>3</sup>. The culvert has been constructed for the debris outflow. Vegetation is also present on both sides of the stream. As a countermeasure benching on upstream side was made which is partially damaged. Downstream side retaining walls are also present. No historic record of debris flow and blockage of road has been found.

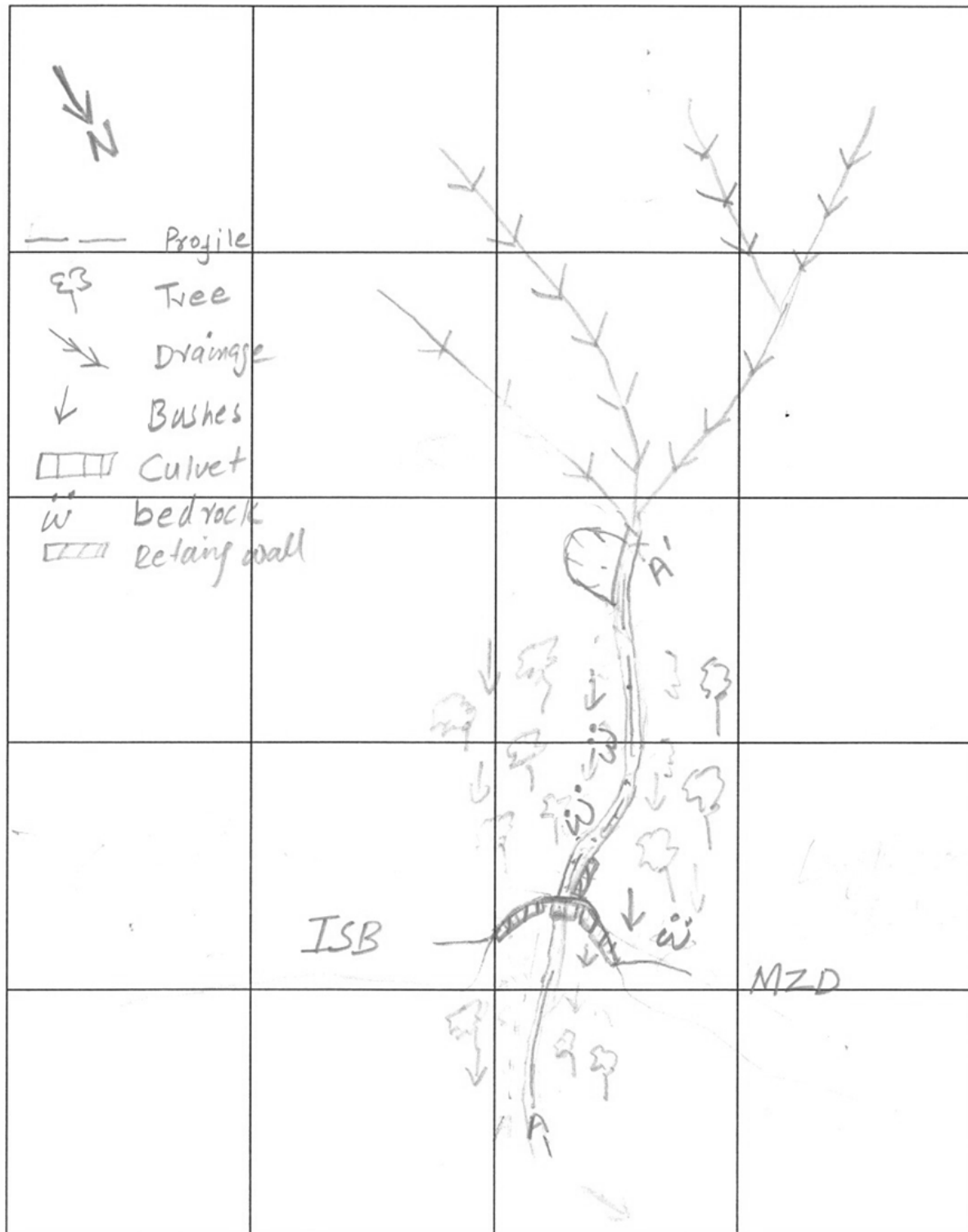
Code no.	
Road name	N-75-28 Km

### Sketch sheet

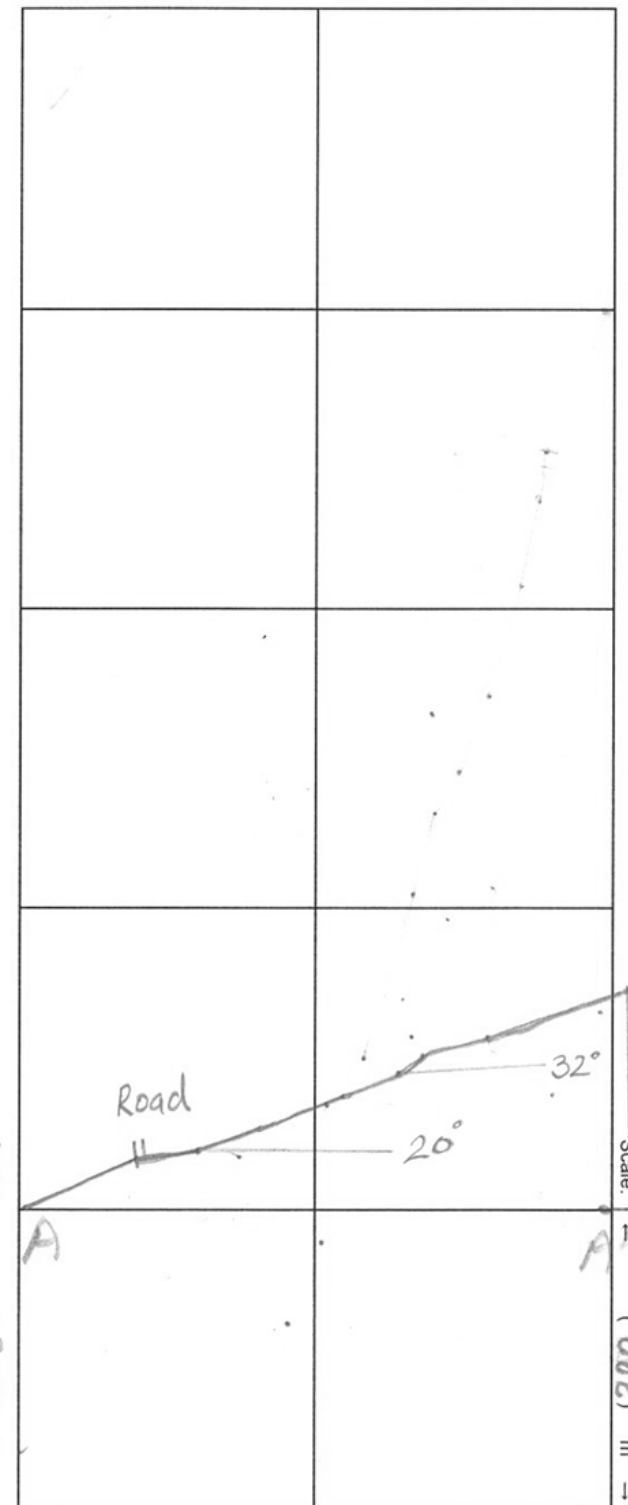
Coordinates	Latitude	33° 59' 16.6"
	Longitude	73° 29' 2.7"

Date	08-12-2017
Inspector	

Plane view



Cross sectional view



Scale: ← (200) m →

Scale: ← (200) m →



Code no.	Sat_	N	7	5	_	2	8	
Region Office								
Maintenance Unit								

Photo sheet

Coordinates	Latitude	33° 59' 16.6"									
	Longitude	73° 29' 2.7"									
Road Name	N	_	7	5	Km						

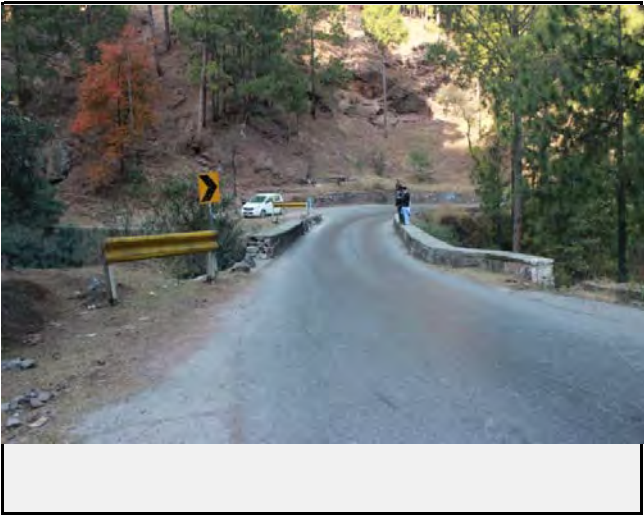
Date	2017/12/4
Inspector	Yasir, Sajid, Shafiq, Basharat



Front view of the debris flow from the road



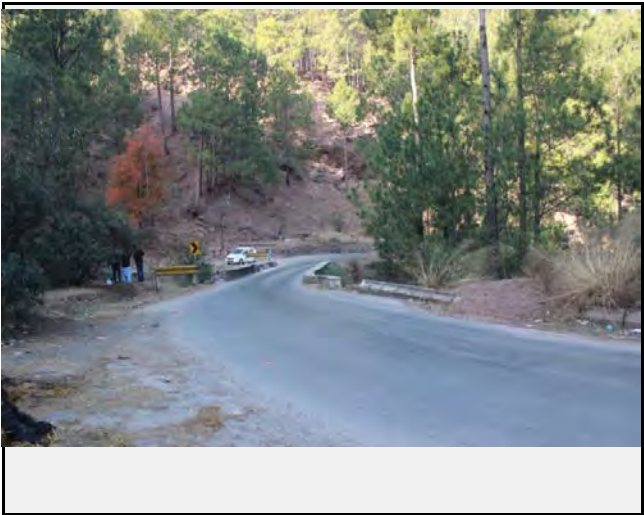
Valley side view of the debris flow



Road condition at the site



Rock bed dipping towards the channel



Culvert has been constructed for the outflow of debris flow



Existing countermeasures / anomalies: Benches has been made on the upstream which are been partially destroyed



Code no.	Sat	_	N	7	5	_	3	3
Region Office								
Maintenance Unit								

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	34° 7' 14.9"					
	Longitude	73° 29' 35.4"					
Road name	N	7	5		Km		

Date	2017/12/5
Inspector	Yasir, Sajid, Shafiq, Basharat

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences	✓
		2 correspondences	
Geological conditions	Soil	1 correspondences	
		no correspondence	
		marked	✓
	Rock	a little marked	
		None	
		marked	✓
	Structure	a little marked	
		None	
Surface condition	dip slope of bedding plane	It corresponds.	
		None	✓
		marked	
	debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	a little marked	✓
		None	
		marked	
Profile	Topsoil, detached rock and unsteady rock	instability	✓
		a little unstable	
		stability	
	Spring water	notable spring waster	
		seepage	✓
		none	
Anomaly	Surface condition	bare land with minor vegetation	
		intermediate (bare•grass•tree)	✓
		mainly structure, mainly tree	
	Height (H), dip (i)	H ≥ 50m	✓
		30 ≤ H < 50m	
		15 ≤ H < 30m	
Anomaly	Height (H), dip (i)	H < 15m	
		i ≥ 70°	
		45° ≤ i < 70°	
	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	i < 45°	✓
		2 or more correspondences • clarity	✓
		certain • unclarity	
Anomaly		none	

### [Countermeasure]

Type of countermeasures	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	✓
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

### [Disaster type]

Rock fall	
Slope failure	✓

### [Main check object]

Cut slope	
Natural slope	✓

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

L= 300 m, W= 220 m, D 5-6 m
-----------------------------

### [Evaluation Rank]

Risk	Scale of disaster		
	Big	Medium	Small
Great risk	①	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

### [Description]

Landslide was initially triggered during 1992 flood. In March 2012, landslide was reactivated during the heavy rainfall. The landslide completely destroyed 200 meter road. The continuity of traffic along this road was disrupted more than one week during March 2012. This section is cut slope consisting of sandstone and shale. The slide is still active. There are large number of open cracks and hanging boulders. As a countermeasure NHA has constructed the shed to protect the road from debris material.

Influence on the traffice when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure

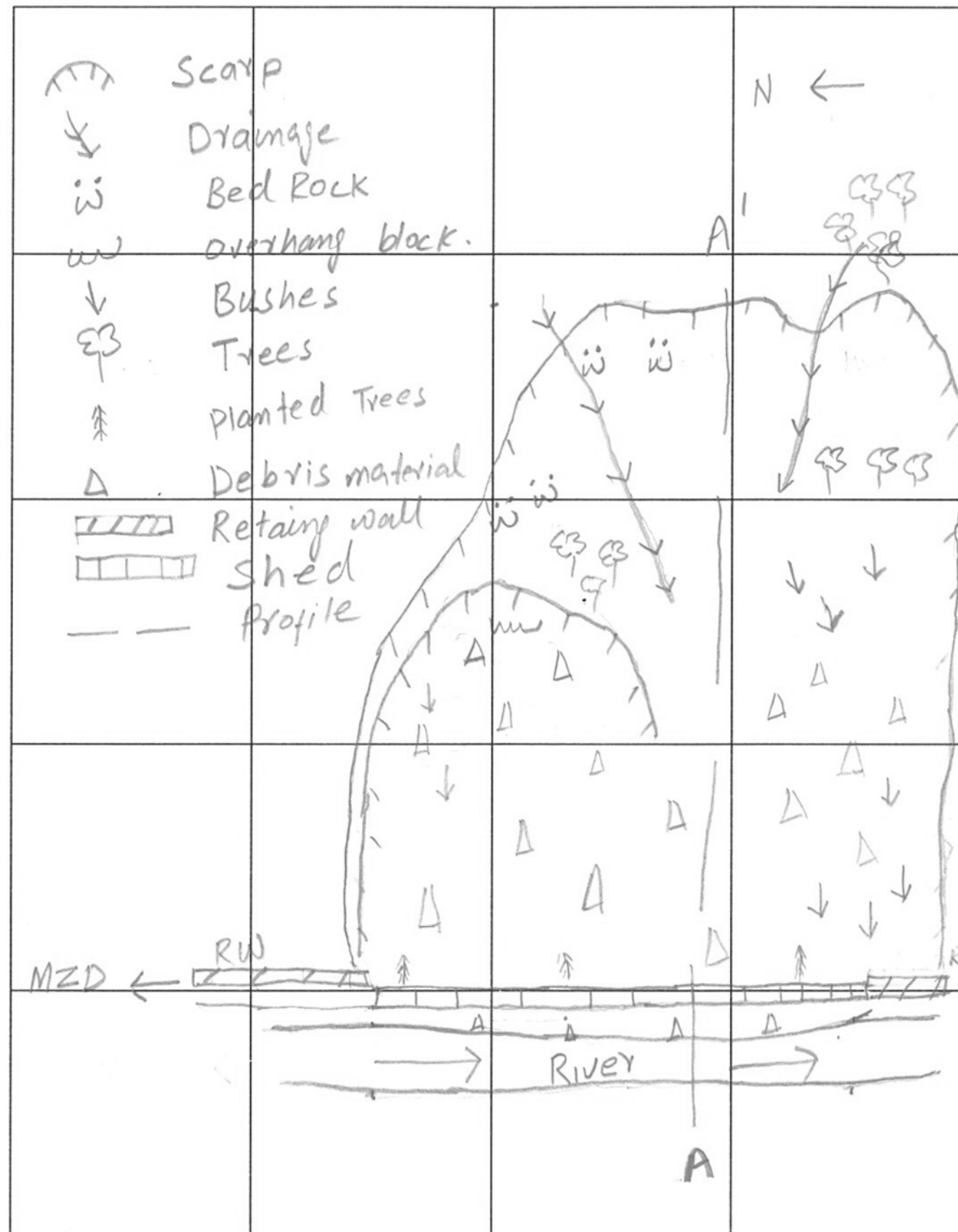
Code no.	
Road name	N-75-33 Km

### Sketch sheet

Coordinates	Latitude	34° 07' 14.9"
	Longitude	73° 29' 35.4"

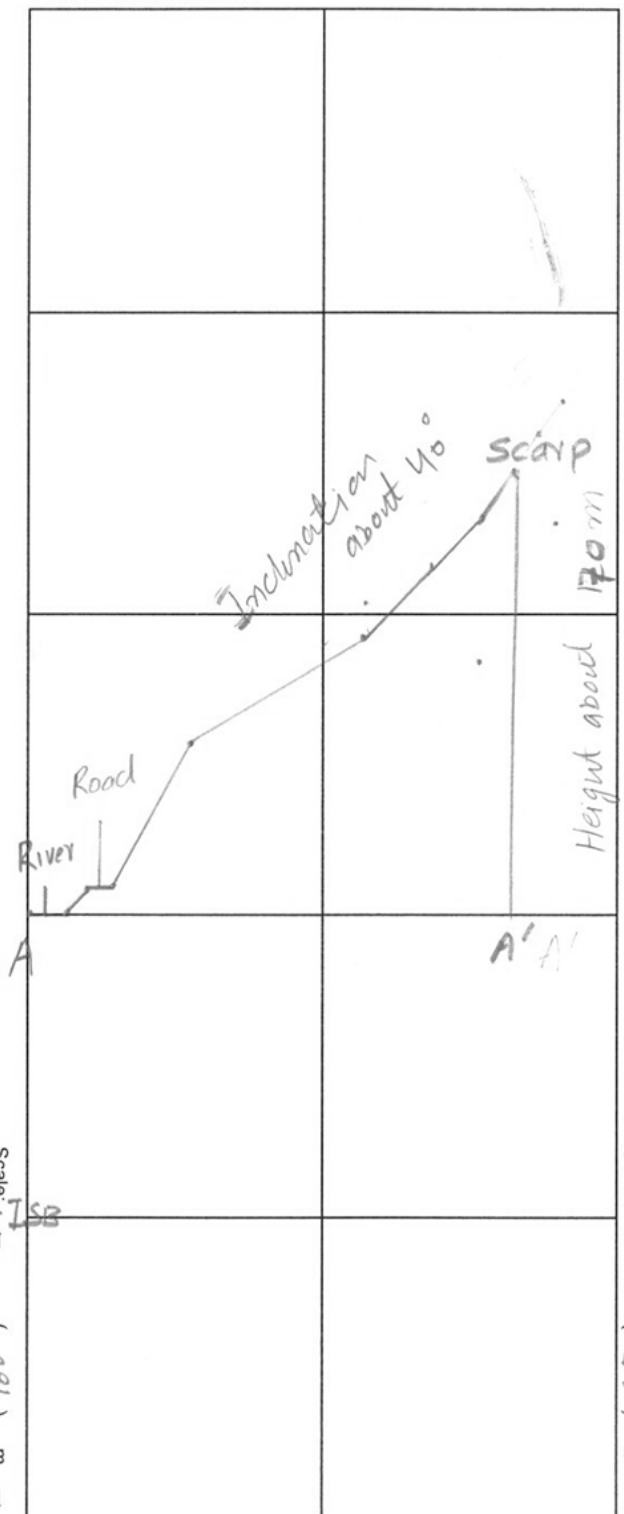
Date	25-11-2017
Inspector	

Plane view



Scale: ← ( 100 ) m →

Cross sectional view



Scale: ← ( 150 ) m →

Scale: ← ( ) m →

Scale: ← ( ) m →



Code no.	Sat_	N	7	5	_	3	3		
Road name	N	7	5				Km		

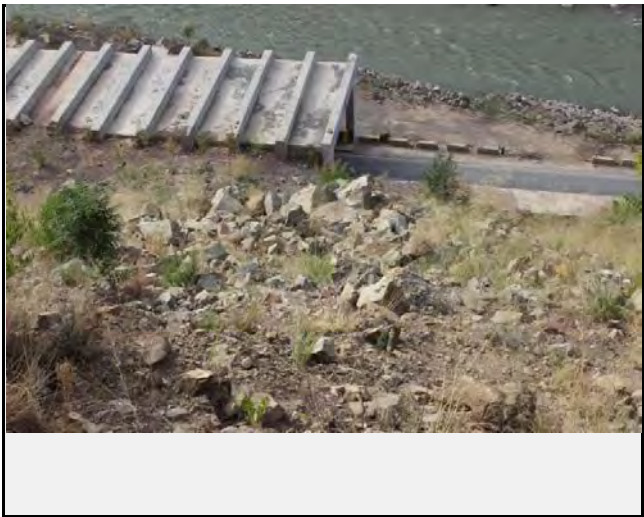
Photo sheet

Coordinates	Latitude	34° 7' 14.9"
	Longitude	73° 29' 35.4"

Date	2017/12/5
Inspector	Yasir, Sajid, Shafiq, Basharat



Full view of the landslide



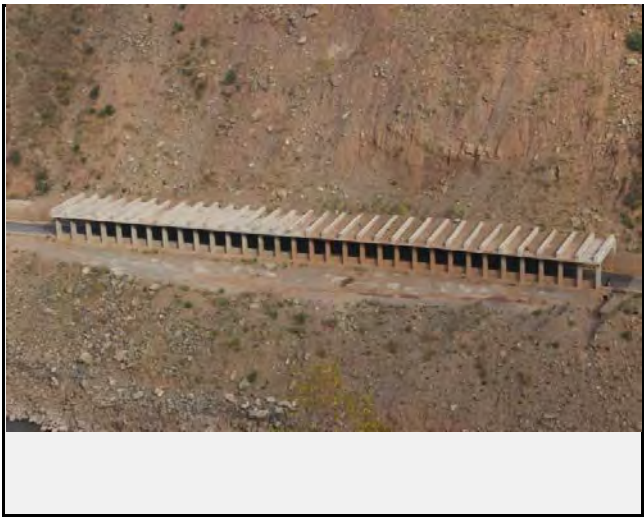
View of landslide on Valley side:



Road condition: Cut slope at the start point



View of the slope failure at the middle point



Existing countermeasures / anomalies: View of shed as counter measure



View of fallen blocks on Shed



Code no.	Sat_ N 9 0 _ 1
Region Office	
Maintenance Unit	

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	34° 52' 59.2"
	Longitude	72° 45' 50.17"
Road name		Km

Date	31/03/2018
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor talus slope, clear convex break of slope, eroded toe of slope , overhang, water catchment slope	3 or more correspondences	✓
		2 correspondences	
Geological conditions	Soil	1 correspondences	
		no correspondence	
	Soil	marked	
		a little marked	✓
	Rock	None	
		marked	✓
Structure	Rock	a little marked	
		None	
	dip slope of bedding plane / Joint Planes	marked	✓
		a little marked	
	debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	None	✓
		marked	
Surface condition	Topsoil, detached rock and unsteady rock	a little marked	
		marked	✓
	Spring water	instability	
		a little unstable	
	Surface condition	stability	✓
		notable spring waster	
Profile	Height (H), dip (i)	seepage	
		none	✓
	Height (H), dip (i)	bare land with minor vegetation	✓
		intermediate (bare•grass•tree)	
	Height (H), dip (i)	mainly structure, mainly tree	
		mainly structure, mainly tree	
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	H ≥ 50m	✓
		30 ≤ H < 50m	
	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	15 ≤ H < 30m	
		H < 15m	
	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	i ≥ 70°	
		45° ≤ i < 70°	✓
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	i < 45°	
		2 or more correspondences • clarity	✓
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	certain • unclarity	
		none	

### [Countermeasure]

Type of countermeasures	
Box Culvert for drainage	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

### [Disaster type]

Rock fall	✓
Slope failure	✓

### [Main check object]

Cut slope	✓
Natural slope	

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

L= 360 m, W= 315 m, D= 1-2 m
------------------------------

### [Evaluation Rank]

Risk	Scale of disaster		
	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

### [Description]

This is a cut slope mainly triggered due to road construction. Active erosion is present leading to water gullies. Eroded talus is present along the road. Detached boulders are present on the slide. Part of the slide is prone to debris flow and also rock fall. Tension cracks are also observed. Two roads passes through the slide. Loose debris is present on the slide. It is disrupting the road traffic mainly during the rainy season. No mitigation measures are present.
--

Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

Influence on the traffic when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure



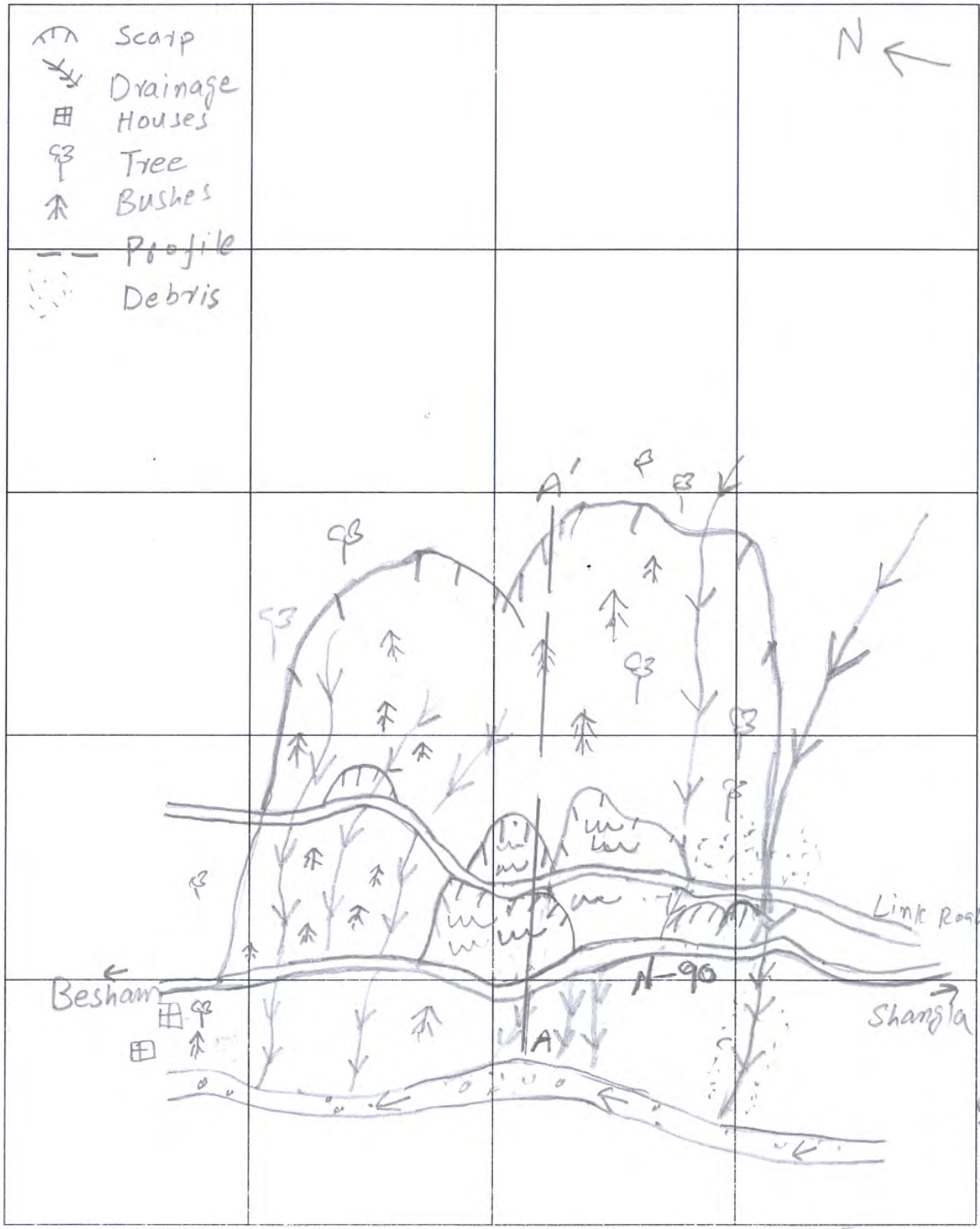
Long. 72° 45' 50.17"

Code no.	N	-	9	0					0	1
Region Office										
Maintenance Unit										

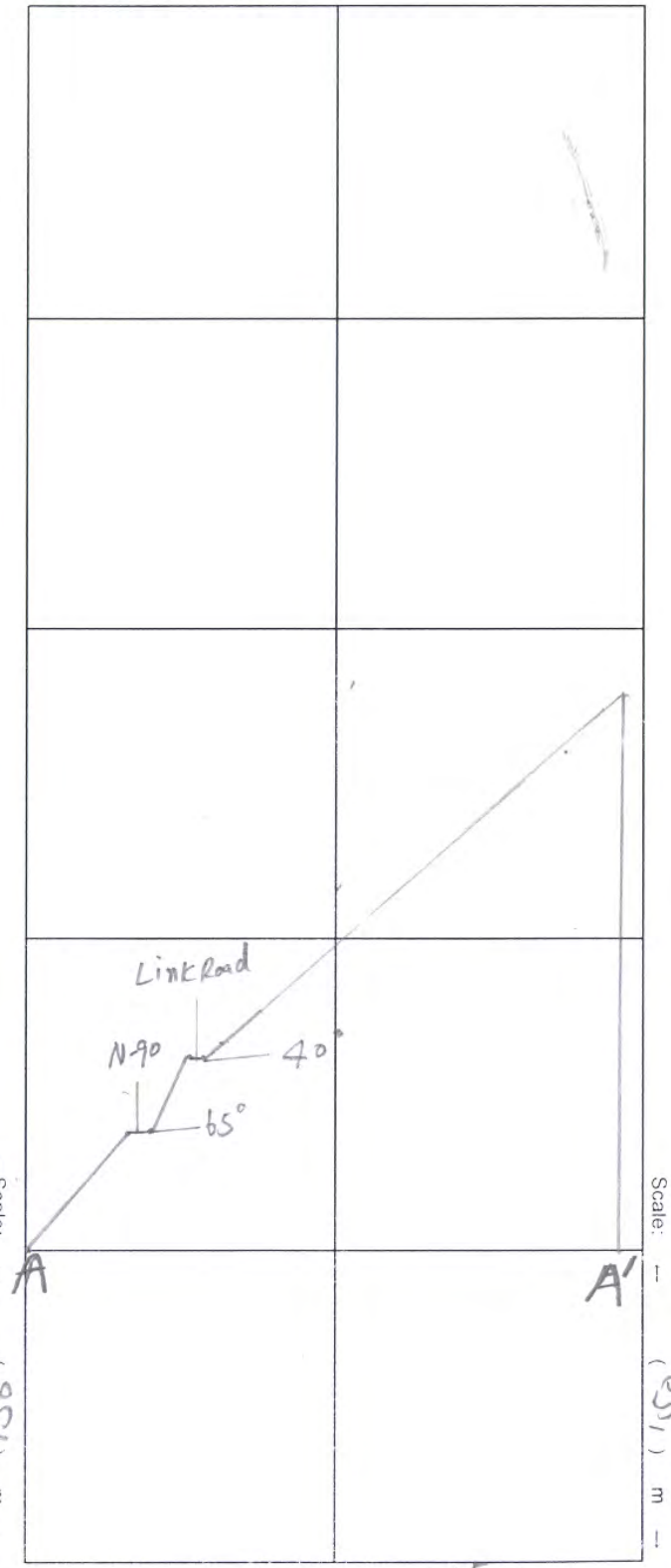
Coordinates		Latitude	34° 52' 59.2"			
		Longitude	72° 45' 50.17"			
Road name		Km		Km		

Date	31/03/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Cross sectional view



Scale: 1:150 m

Scale: 1:150 m

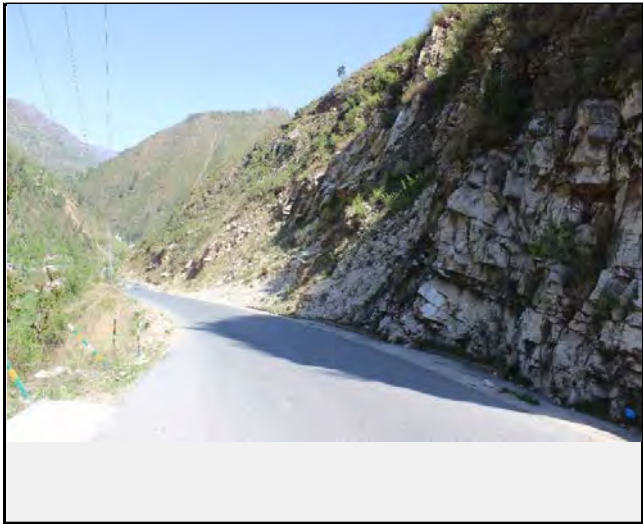


Code no.	Sat_	N	9	0	_	1	
Region Office							
Maintenance Unit							

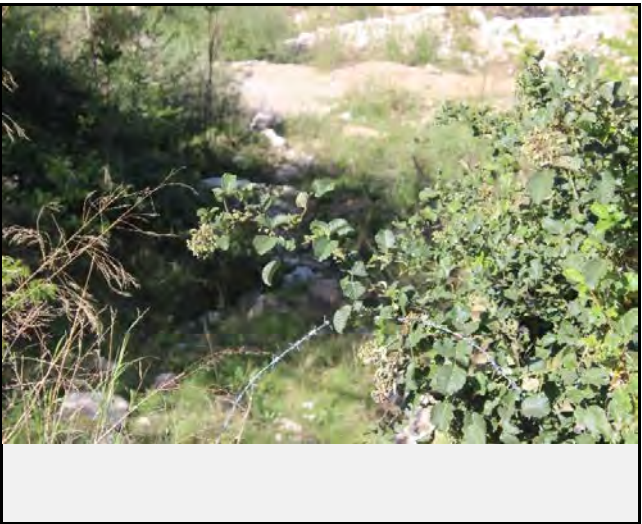
Photo sheet

Coordinates	Latitude	34° 52' 59.2"							
	Longitude	72° 45' 50.17"							
Road name					Km				

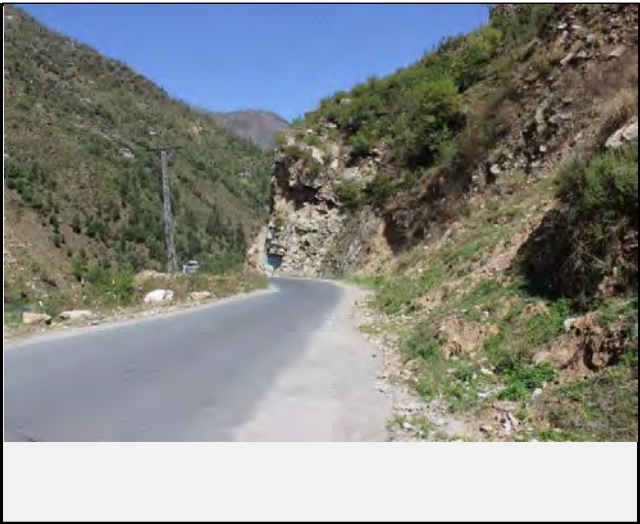
Date	31/03/2018
Inspector	Yasir, Sajid, Shafique, Basharat



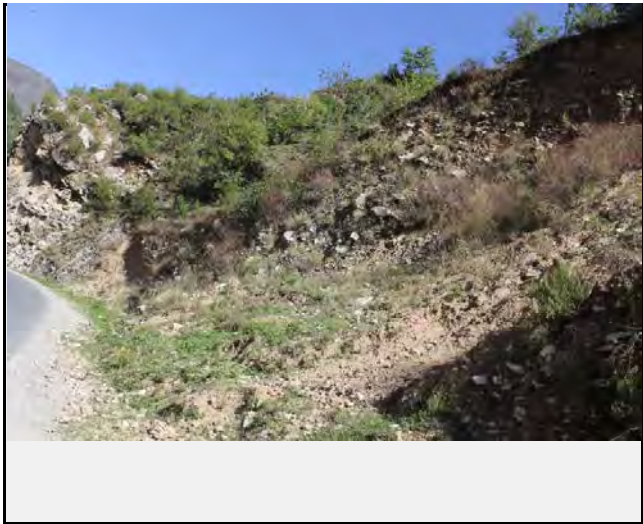
Full view of the landslide



View of landslide on Valley side:



Road condition: Cut slope at the start point



View of the slope failure at the middle point



Existing countermeasures / anomalies: View of shed as counter measure



View of culvert inlet



Code no.	Sat_ N 9 0 _ 2
Region Office	
Maintenance Unit	

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	34° 54' 38.3"
	Longitude	72° 49' 20.7"
Road name		Km

Date	2018/1/4
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope, overhang, water catchment slope	3 or more correspondences
		2 correspondences	✓
Geological conditions	Soil	eroded toe of slope, overhang, water catchment slope	1 correspondences
		no correspondence	
	Rock	susceptible to erosion less strength with water	marked
			a little marked
			None
Structure	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked
			a little marked
			None
	dip slope of bedding plane / Joint Planes		It corresponds.
			None
			✓
Surface condition	debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.		marked
			a little marked
			None
	Topsoil, detached rock and unsteady rock		instability
			a little unstable
			stability
Profile	Spring water		notable spring water
			seepage
			none
	Surface condition		bare land with minor vegetation
			intermediate (bare•grass•tree)
			mainly structure, mainly tree
Anomaly	Height (H), dip (i)		H ≥ 50m
			30 ≤ H < 50m
			15 ≤ H < 30m
	dip		H < 15m
			i ≥ 70°
			45° ≤ i < 70°
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure		i < 45°
			✓
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure		2 or more correspondences • clarity
			certain • unclarity
			none

### [Countermeasure]

Type of countermeasures	
Check dams along gulleys. Retaining wall for N-90	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

### [Disaster type]

Rock fall	
Slope failure	✓

### [Main check object]

Cut slope	✓
Natural slope	

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

L= 300 m, W= 310 m, D= 2-3 m
------------------------------

### [Evaluation Rank]

Risk	Scale of disaster		
	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

### [Description]

A rotation landslide is mainly triggered during the road construction. The slide is mainly active along the road. Active soil erosion is present leading to development of water gullies. The check dams are developed along the gullies to minimize the erosion. Hanging debris is also present on the slide. The slide is obstructing the traffic mainly during the rainfall. Detached and hanging boulders are also present. Bedrock is impermeable. Shrubs and grass is present on the slide. Talus is present mainly with the road. Spring water is present. No counter measures to protect the slide.
---

Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

Influence on the traffice when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure



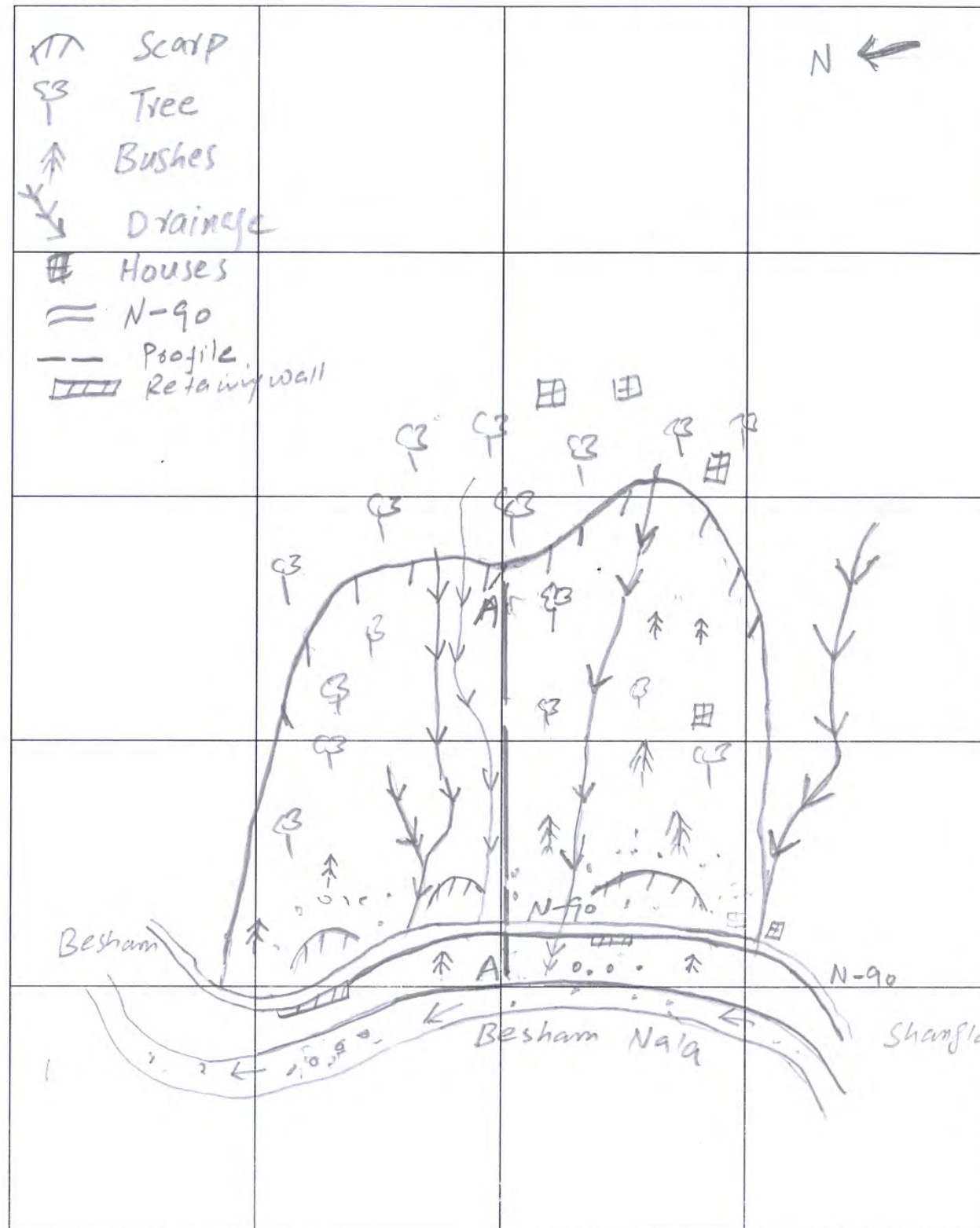
Code no.	N	-	9	0					0	2
Region Office										
Maintenance Unit										

### Sketch sheet

Coordinates	Latitude	34° 54' 38.3"					
	Longitude	72° 49' 20.7"					
Road name			Km		Km	0	2

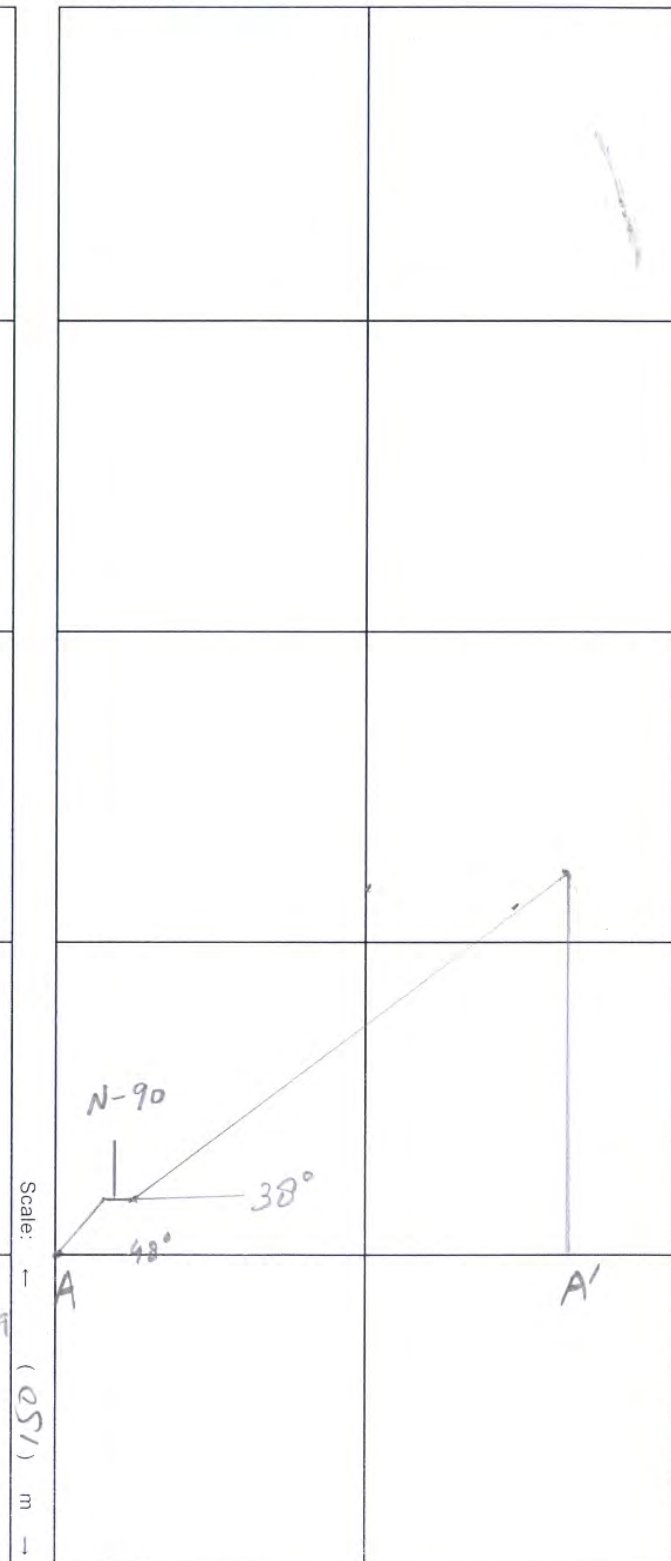
Date	1/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Scale: (150) m

Cross sectional view



Scale: (150) m



Code no.	Sat_	N	9	0	_	2	
Region Office							
Maintenance Unit							

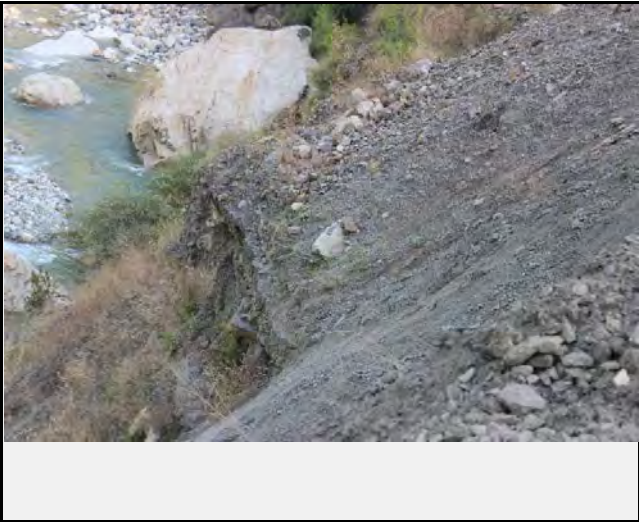
Photo sheet

Coordinates	Latitude	34° 54' 38.3"							
	Longitude	72° 49' 20.7"							
Road name					Km				

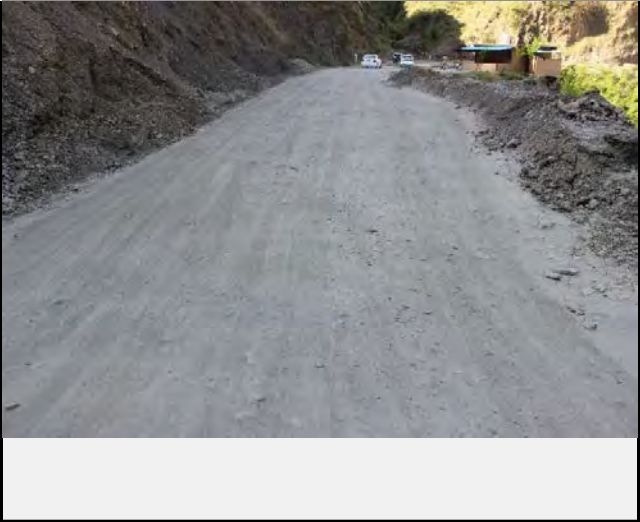
Date	2018/1/4
Inspector	Yasir, Sajid, Shafique, Basharat



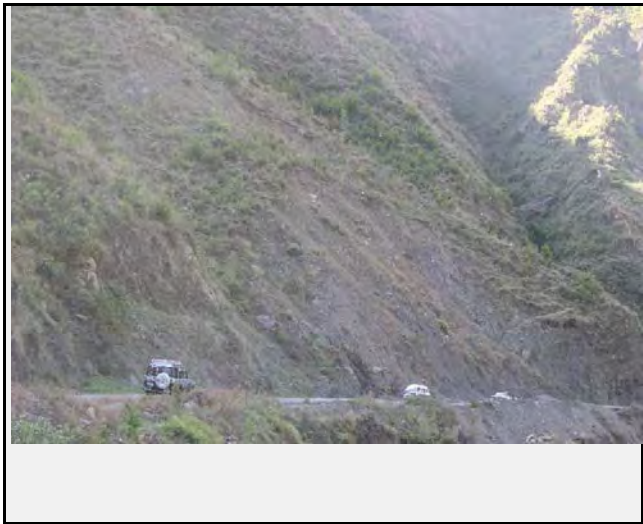
Full view of the landslide



View of landslide on Valley side and existing road damage can be seen



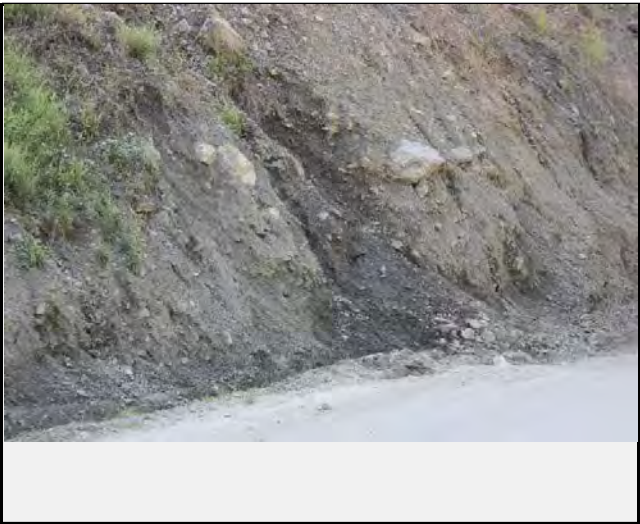
Road condition: Cut slope at the start point



View of the slope failure at the middle point



Existing countermeasures / anomalies: View of check dam as counter measure



View of seepages in the slope failure



Code no.	Sat_ N 9 0 _ 3
Region Office	
Maintenance Unit	

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	34° 55' 25.6"
	Longitude	72° 50' 10.4"
Road name		Km

Date	2018/2/4
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope, overhang, water catchment slope	3 or more correspondences 2 correspondences 1 correspondences no correspondence
			✓
Geological conditions	Soil	susceptible to erosion less strength with water	marked a little marked None
			✓
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked a little marked None
			✓
Structure	dip slope of bedding plane / Joint Planes		It corresponds. None
			✓
	debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked a little marked None	✓  
Surface condition	Topsoil, detached rock and unsteady rock	instability a little unstable stability	✓  
	Spring water	notable spring water seepage none	✓  
	Surface condition	bare land with minor vegetation intermediate (bare•grass•tree) mainly structure, mainly tree	✓  
Profile	Height (H), dip (i)	height	H ≥ 50m 30 ≤ H < 50m 15 ≤ H < 30m H < 15m
		dip	i ≥ 70° 45° ≤ i < 70° i < 45°
			✓  
	Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of contour	2 or more correspondences • clarity certain • unclarity none
			✓  

### [Countermeasure]

Type of countermeasures	
No counter measures. Retaining wall for N-90. Box culvert for drainage	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	
There is no countermeasure, or there is not effective even if countermeasures are not performed.	✓

### [Disaster type]

Rock fall	✓
Slope failure	✓

### [Main check object]

Cut slope	✓
Natural slope	

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

L= 500 m, W= 550 m, D= 0-1 m
------------------------------

### [Evaluation Rank]

Risk	Scale of disaster		
	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

### [Description]

This is a cut slope located on the N90. The landslides is a slope failure triggered due to construction of the road. With the Schist and granite as a bed rock of the slide, part of the slide is also prone to rock fall with detached and hanging boulders. Active soil erosion mainly during the rain, is present on the slide leading to presence of talus is present along the road and gullies on the slide. Spring water is present in the slide. No effective counter measures are present. A culvert is built to drain out the channel water. A retaining wall is built to protect the landslide.
--

Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

Influence on the traffic when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure



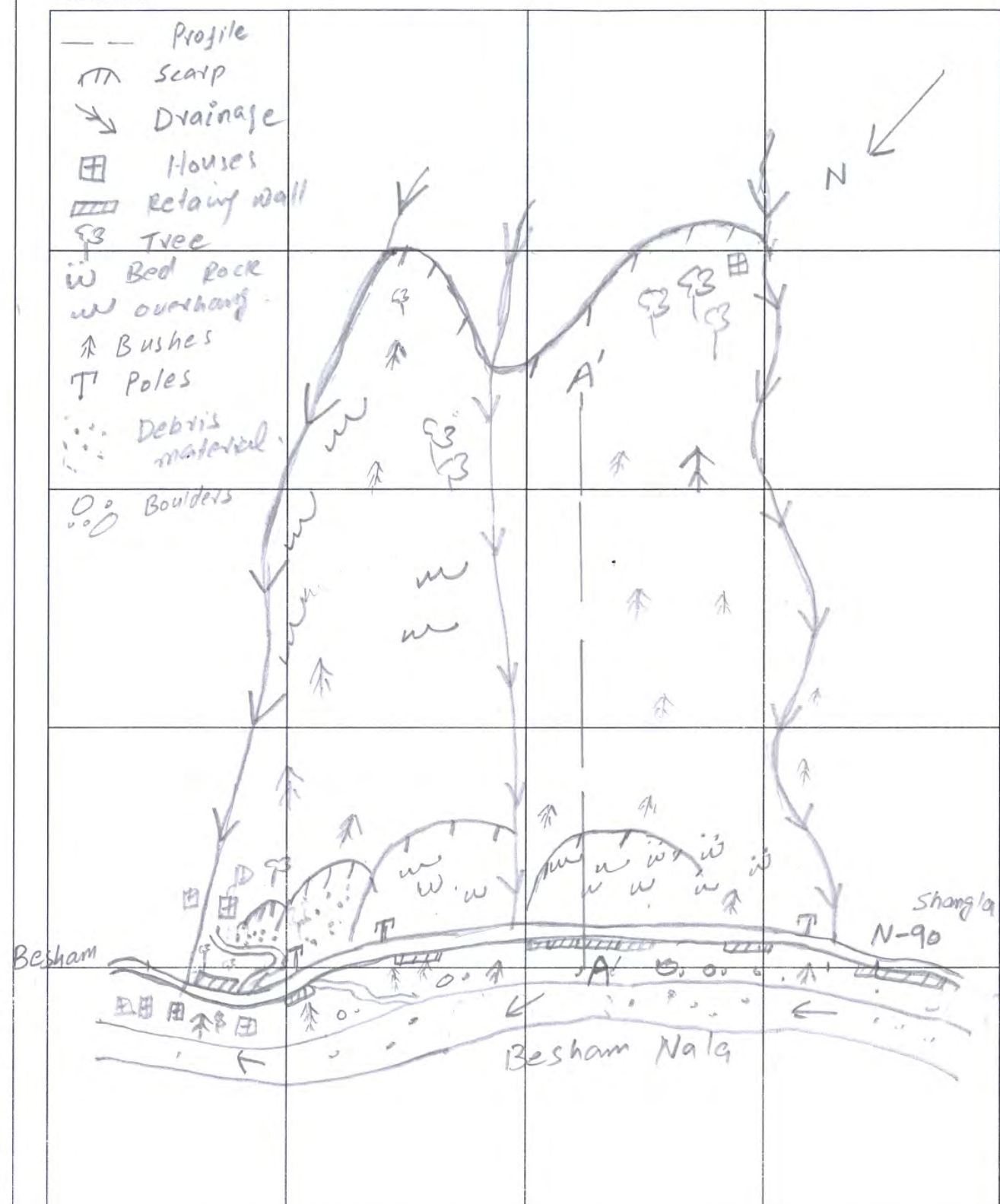
Code no.	N	-	9	0					0	3
Region Office										
Maintenance Unit										

# Sketch sheet

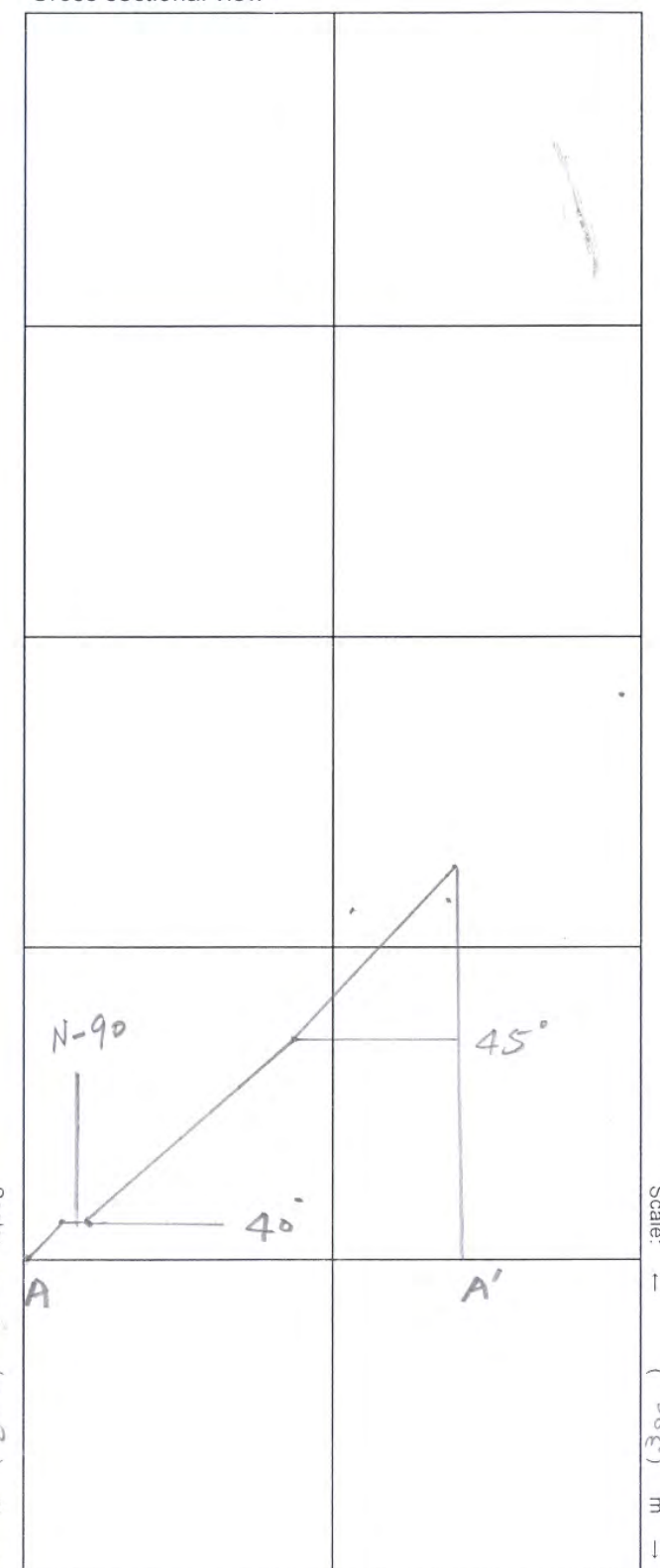
Coordinates	Latitude	34° 55' 25.6"				
	Longitude	72° 50' 10.4"				
Road name				Km		

Date	2/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Cross sectional view



Scale: 1:200 m

Scale: 1:300 m

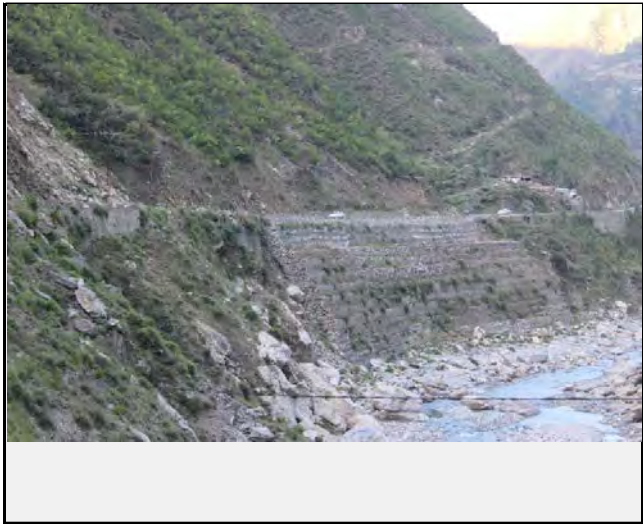


Code no.	Sat_	N	9	0	_	3	
Region Office							
Maintenance Unit							

Photo sheet

Coordinates	Latitude	34° 55' 25.6"							
	Longitude	72° 50' 10.4"							
Road name					Km				

Date	2018/2/4
Inspector	Yasir, Sajid, Shafique, Basharat



Full view of the landslide



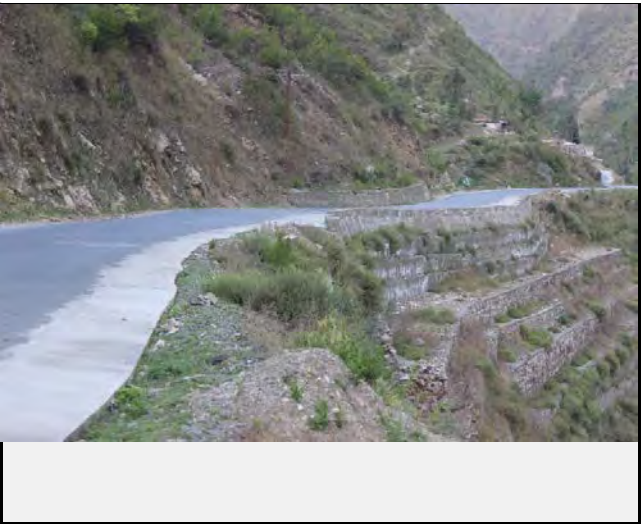
View of landslide on Valley side:



Road condition: Cut slope at the start point



View of the slope failure at the middle point



Existing countermeasures / anomalies: View of Retaining Wall as counter measure



View of drainage that cuts the slope



Code no.	Sat_ N 9 0 _ 4
Region Office	
Maintenance Unit	

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	34° 55' 11.3"
	Longitude	72° 49' 43.8"
Road name		Km

Date	2018/3/4
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope, overhang, water catchment slope	3 or more correspondences
		2 correspondences	
Geological conditions	Soil	1 correspondences	
		no correspondence	
		marked	✓
	Rock	a little marked	
		None	
		marked	✓
	Structure	a little marked	
		None	
Surface condition	dip slope of bedding plane / Joint Planes	It corresponds.	✓
		None	
		marked	
	debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	a little marked	✓
		None	
		marked	
Profile	Topsoil, detached rock and unsteady rock	instability	✓
		a little unstable	
		stability	
	Spring water	notable spring water	✓
		seepage	
		none	
Anomaly	Surface condition	bare land with minor vegetation	✓
		intermediate (bare•grass•tree)	
		mainly structure, mainly tree	
		Height (H), dip (i)	
		height	
		H ≥ 50m	✓
		30 ≤ H < 50m	
		15 ≤ H < 30m	
		H < 15m	
		dip	
		i ≥ 70°	
		45° ≤ i < 70°	
		i < 45°	✓
		Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of contour	2 or more correspondences • clarity
			certain • unclarity
			none

### [Countermeasure]

Type of countermeasures	
No counter measures. Retaining wall for N-90. Box culvert for drainage	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	
There is no countermeasure, or there is not effective even if countermeasures are not performed.	✓

### [Disaster type]

Rock fall	
Slope failure	✓

### [Main check object]

Cut slope	✓
Natural slope	

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

L= 500 m, W= 660 m, D= 1-2 m
------------------------------

### [Evaluation Rank]

Risk	Scale of disaster		
	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

### [Description]

This is an old landslide which is retriggered during the construction of road. Detached boulder are present on the slide. Loose debris on the bedrock are prone to sliding. Active soil erosion on the slide leads to the development of gullies. Shrubs are present on the slide with no trees. No counter measures are present to protect the slide.
--

Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

Influence on the traffic when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure



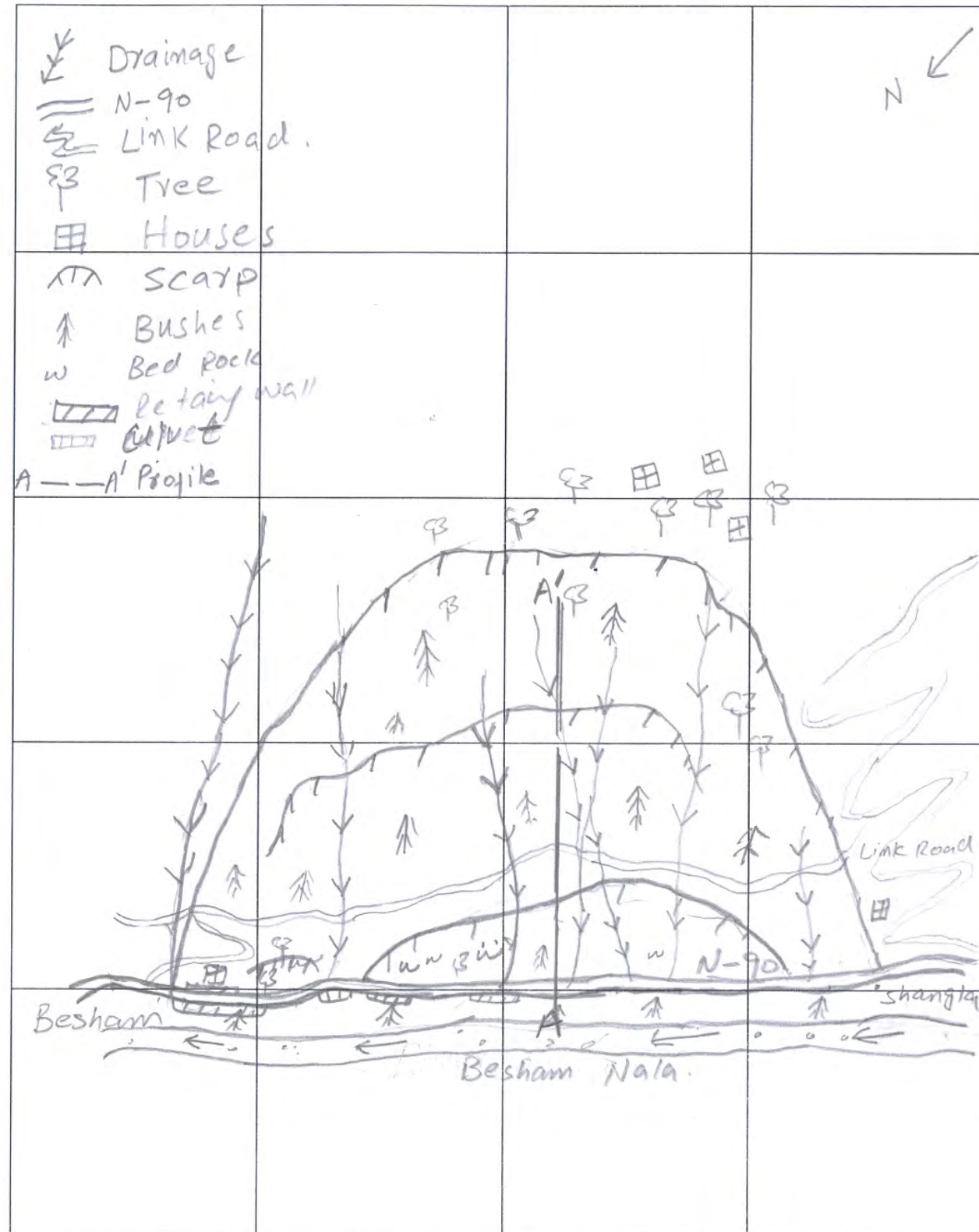
Code no.	N	-	9	0					0	4
Region Office										
Maintenance Unit										

### Sketch sheet

Coordinates	Latitude	34° 55' 11.3"				
	Longitude	72° 49' 43.8"				
Road name						

Date	3/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Cross sectional view



Scale: 1 cm = 250 m

Scale: 1 cm = 250 m

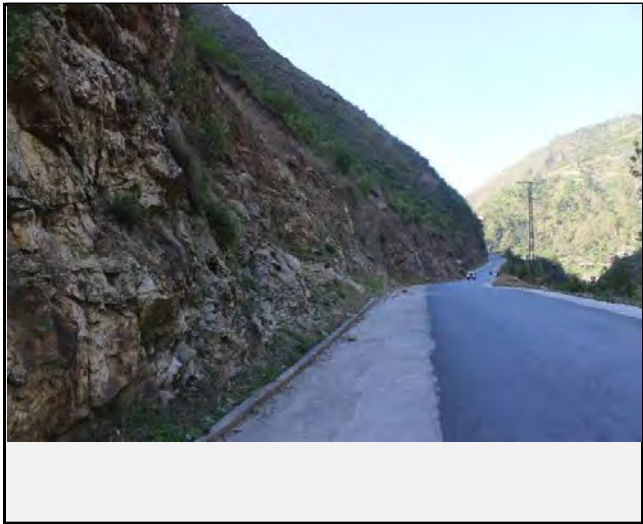


Code no.	Sat_	N	9	0	_	4	
Region Office							
Maintenance Unit							

Photo sheet

Coordinates	Latitude	34° 55' 11.3"							
	Longitude	72° 49' 43.8"							
Road name					Km				

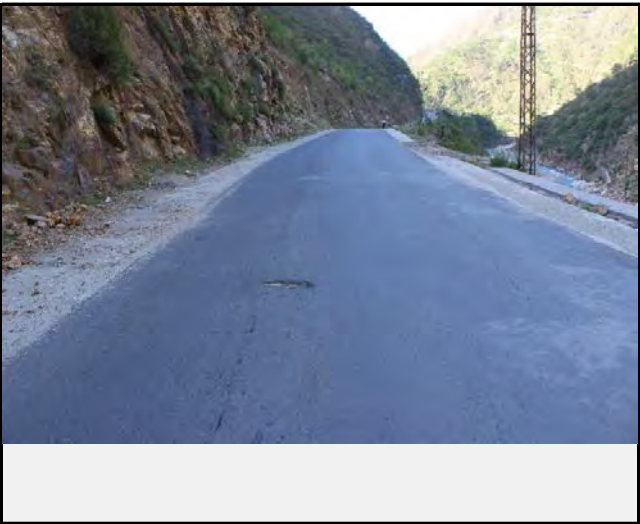
Date	2018/3/4
Inspector	Yasir, Sajid, Shafique, Basharat



Full view of the landslide



View of landslide on Valley side:



Road condition: Cut slope at the start point



View of the slope failure at the middle point



Existing countermeasures / anomalies: View of Retaining wall as counter measure



View of Drainage pipe and damaged retaining wall



Code no.	Sat_	N	9	0	_	5		5
Region Office								
Maintenance Unit								

## Evaluation sheet (debris flow)

Coordinates	Latitude	35° 27' 33.5"						
	Longitude	73° 58' 11.2"						
Road Name					Km			

Date	2018/4/4
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km <sup>2</sup> or more	
		0.15km <sup>2</sup> - 0.50km <sup>2</sup>	√
		less than 0.15km <sup>2</sup>	
	steepest slope of river bed	40°or more	√
		30° - 40°	
		less than 30°	
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km <sup>2</sup> or more	
		0.08km <sup>2</sup> - 0.20km <sup>2</sup>	
		less than 0.08km <sup>2</sup>	
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km <sup>2</sup> or more	
		0.02km <sup>2</sup> - 20km <sup>2</sup>	
		less than 0.02km <sup>2</sup>	√
	artificial works that cause negative effects	certain	√
		none	
	new crack and/or slope failure in stream	certain	√
		none	
	traces of large slope failure in stream	certain	√
		none	

### [Road structure]

structure	category of score	Check
River width	10m or more	
	5m - 10m	
	3m - 5m	
	less than 3m	√
Beam height	less than 1m or	
	No bridge / box culvert	√
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

### [History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	√
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

### [Potencial disaster mode]

	Check
Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	√

### [Expected size of disaster] (width, length, depth, etc.)

L= 420 m, W=60 m, D= 2-3 m
----------------------------

### [Countermeasure]

Type of countermeasure	Check	
Drainage Diversion by Locals		
Effect of existing countermeasure	none • low	√
	moderate	
	high	
	enough	

### [Evaluation Rank]

Risk \ Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffic when potential disaster

-Great risk: road closed for 2 days or more

-Medium risk: road closed for 1 day or less

-Low risk: no road closure

### [Description/comments]

A very active debris flow mainly triggered during the intense monsoon rainfall of 2010 blocking the road for 3 weeks. The debris flow is active mainly during the rainy season blocking the road and obstructing the traffic. A channel is develop to drain the debris flow. Spring water is percolating in the slide debris. Active erosion leads to the development of gullies. Hanging boulders are also present on the slide. Two roads are passes through the slide.



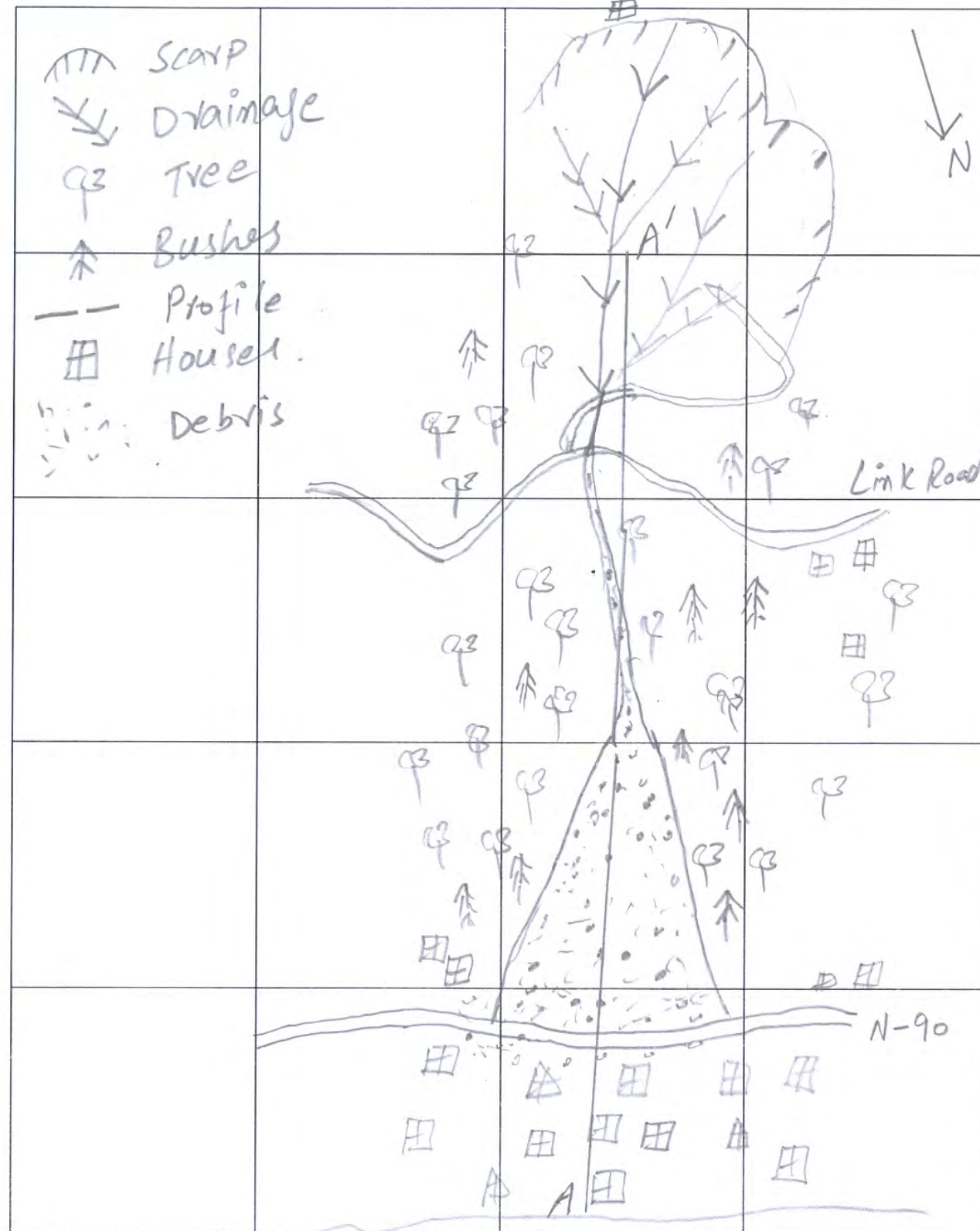
Code no.	N - 9 0 0 5
Region Office	
Maintenance Unit	

### Sketch sheet

Coordinates	Latitude	35° 27' 33.5"
	Longitude	73° 58' 11.2"
Road Name	IN-1	Km 1 Km 0.5

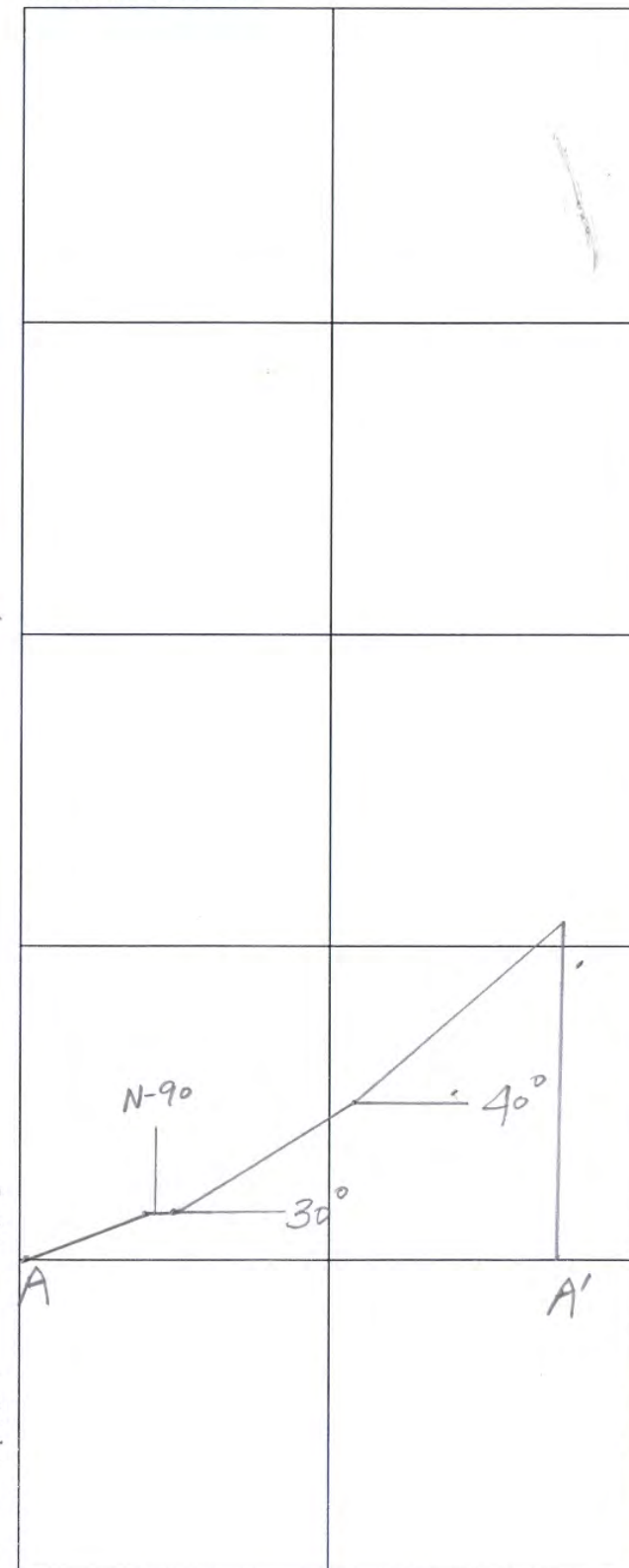
Date	4/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Scale: (100) m

Cross sectional view



Scale: (200) m

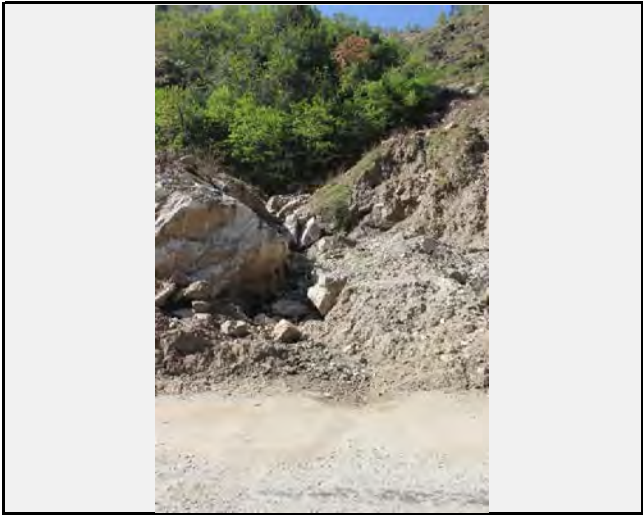


Code no.	Sat_	N	9	0	_	5		
Region Office								
Maintenance Unit								

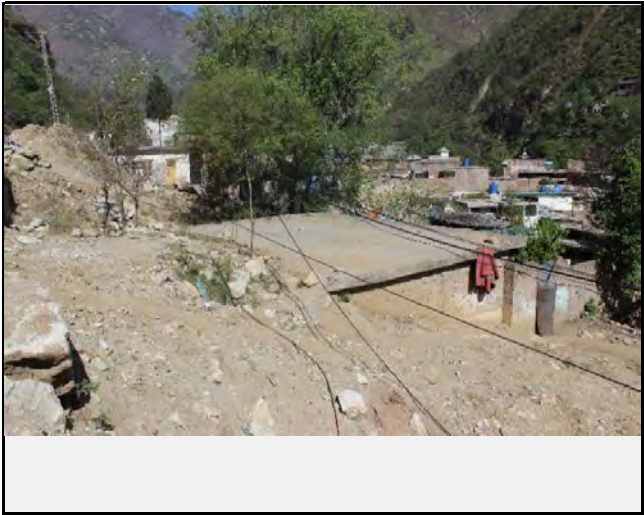
Photo sheet

Coordinates	Latitude	35° 27' 33.5"								
	Longitude	73° 58' 11.2"								
Road Name					Km					

Date	2018/4/4
Inspector	Yasir, Sajid, Shafique, Basharat



Mountain side view of the debris flow



Valley side view of the debris flow



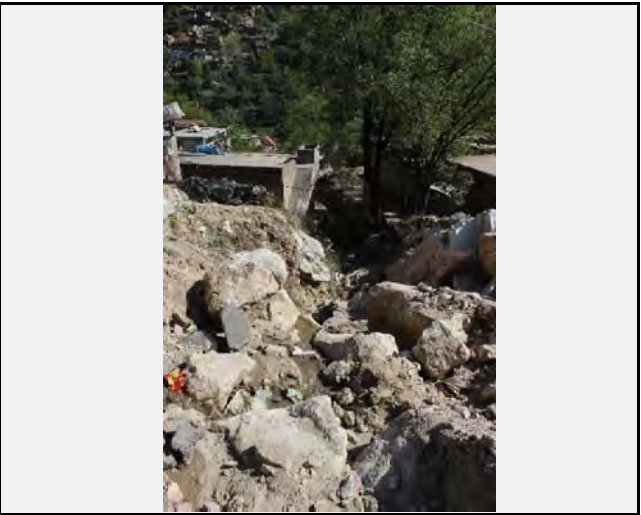
Front view of the debris flow



View of fallen block with the debris flow that can damage the population along the downstream.



Road condition



Existing countermeasures / anomalies: Drainage conversion by the locals to avoid the damages from the debris flow in future.



Code no.	Sat_ N 9 5 _ 1
Region Office	
Maintenance Unit	

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	35° 19' 29.9"
	Longitude	72° 36' 41.9"
Road name		Km

Date	2018/6/4
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope, overhang, water catchment slope	3 or more correspondences 2 correspondences 1 correspondences no correspondence
			✓
Geological conditions	Soil	susceptible to erosion less strength with water	marked a little marked None
	Rock	high density of cracks and a weak layers, susceptible to erosion, fast weathering	marked a little marked None
	Structure	dip slope of bedding plane / Joint Planes	It corresponds. None
		debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	marked a little marked None
Surface condition	Topsoil, detached rock and unsteady rock	instability a little unstable stability	✓
	Spring water	notable spring water seepage none	✓
	Surface condition	bare land with minor vegetation intermediate (bare•grass•tree) mainly structure, mainly tree	✓
Profile	Height (H), dip (i)	height	H ≥ 50m
			30 ≤ H < 50m
			15 ≤ H < 30m
			H < 15m
		dip	i ≥ 70°
			45° ≤ i < 70°
			i < 45°
			✓
Anomaly	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of contour	2 or more correspondences • clarity certain • unclarity none	✓

### [Countermeasure]

Type of countermeasures	
No counter measures	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	
There is no countermeasure, or there is not effective even if countermeasures are not performed.	✓

### [Disaster type]

Rock fall	
Slope failure	✓

### [Main check object]

Cut slope	✓
Natural slope	

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

L= 380 m, W= 620 m, D= 2-3 m
------------------------------

### [Evaluation Rank]

Risk	Scale of disaster		
	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

### [Description]

A deep seated translational landslide. Loose debris of the slide is comprised of boulders, gravels sand and silt. The slide is also prone to debris flow mainly during the rainy season. Active soil erosion on the slide leads to development of gullies on the slide. Around 15 meter of slide scarp is prone to rock fall that often reach to the road. Two road are present in the slide, one the middle of the slide and second at the slide toe. The slide has the potential to damage the road and disrupt the traffic mainly during the rainy season. No countermeasure are constructed to stabilize the slide.
---

Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

Influence on the traffic when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure



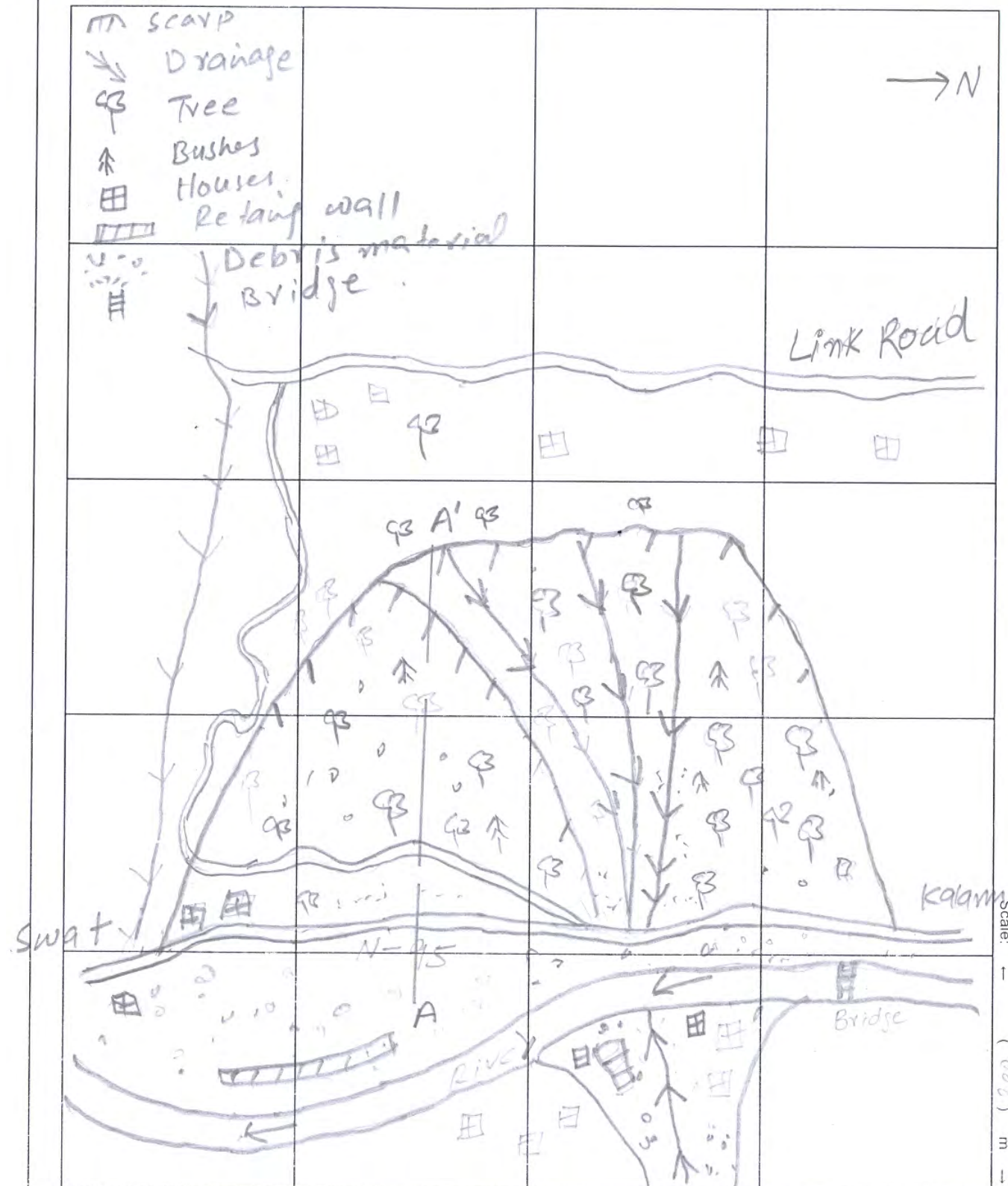
Code no.	N	-	9	5					0	1
Region Office										
Maintenance Unit										

### Sketch sheet

Coordinates	Latitude	35° 19' 29.9"
	Longitude	72° 36' 41.9"
Road name	75	Km 1

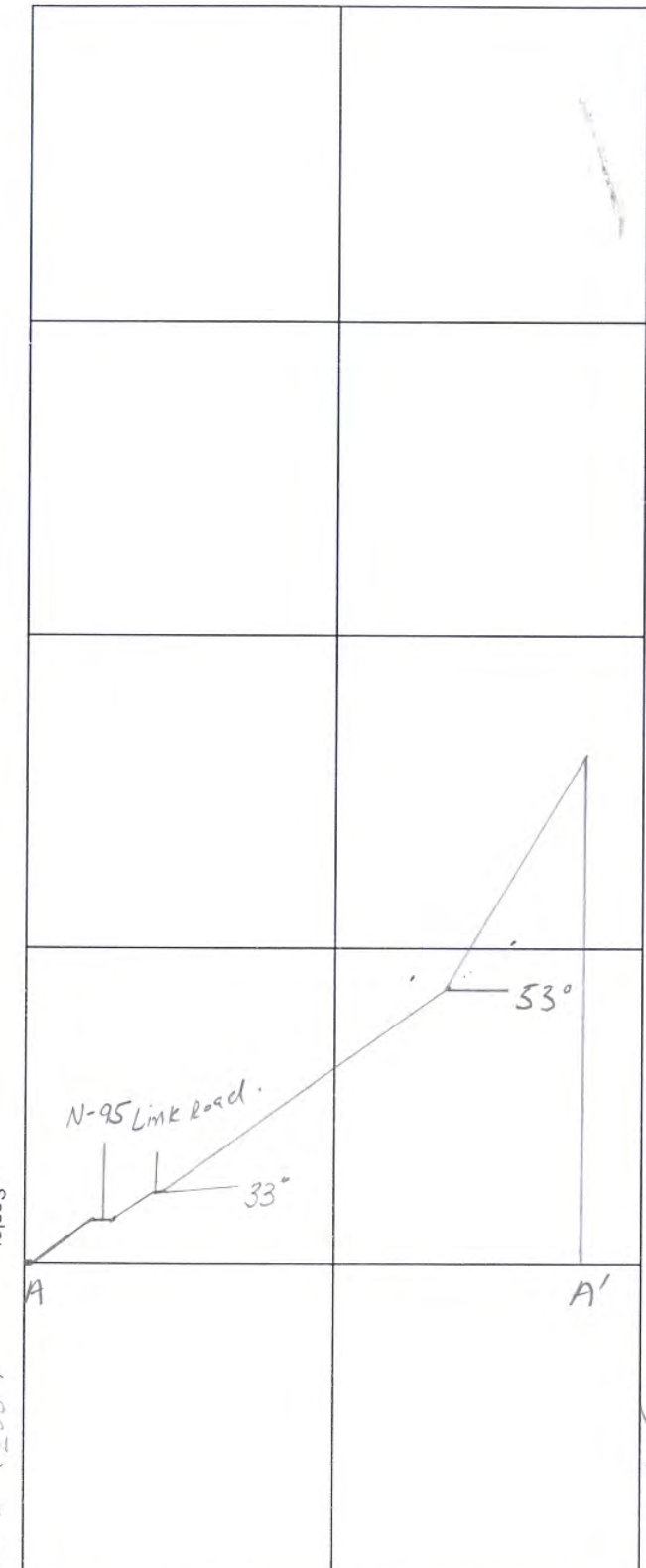
Date	6/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Scale: — (200) m —

Cross sectional view



Scale: — (150) m —

Scale: — (150) m —



Code no.	Sat_	N	9	5	_	1	
Region Office							
Maintenance Unit							

Photo sheet

Coordinates	Latitude	35° 19' 29.9"							
	Longitude	72° 36' 41.9"							
Road name					Km				

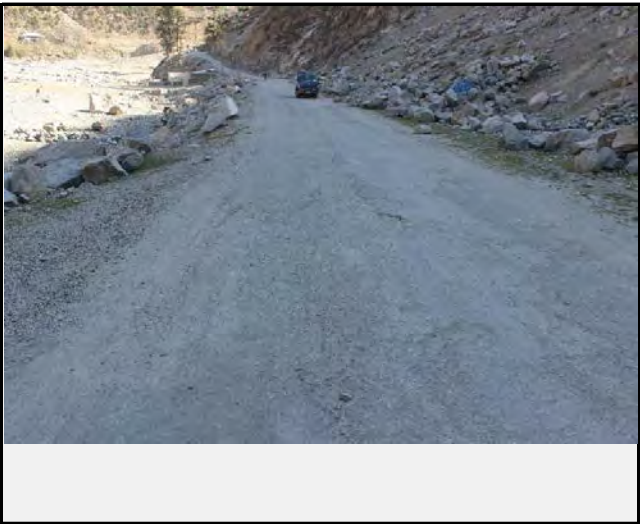
Date	2018/6/4
Inspector	Yasir, Sajid, Shafique, Basharat



Full view of the landslide



View of landslide on Valley side and a river diversion structure built on the toe of the slope failure



Road condition: Cut slope at the start point



View of the slope failure at the left flank



Existing countermeasures / anomalies: View of check dams as counter measure



View of scarp of the slope failure



Code no.	Sat_ N 9 5 _ 2
Region Office	
Maintenance Unit	

## Evaluation sheet (debris flow)

Coordinates	Latitude	35° 20' 18.9"
	Longitude	72° 36' 39.0"
Road Name		Km

Date	2018/7/4
Inspector	Yasir, Sajid, Shafique, Bashara

### [Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km <sup>2</sup> or more 0.15km <sup>2</sup> - 0.50km <sup>2</sup> less than 0.15km <sup>2</sup>	✓
	steepest slope of river bed	40° or more 30° - 40° less than 30°	✓
	area that slope gradient is 30° or more in watershed area	0.20km <sup>2</sup> or more 0.08km <sup>2</sup> - 0.20km <sup>2</sup> less than 0.08km <sup>2</sup>	✓
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km <sup>2</sup> or more 0.02km <sup>2</sup> - 20km <sup>2</sup> less than 0.02km <sup>2</sup>	✓
Property of slope	artificial works that cause negative effects	certain none	✓
	new crack and/or slope failure in stream	certain none	✓
	traces of large slope failure in stream	certain none	✓

### [Road structure]

structure	category of score	Check
River width	10m or more	
	5m - 10m	
	3m - 5m	✓
	less than 3m	
Beam height	less than 1m or No bridge / box culvert	✓
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

### [History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

### [Potencial disaster mode] Check

Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	✓

### [Expected size of disaster] (width, length, depth, etc.)

L= 1900 m, W=140 m, D= 1-2 m
------------------------------

### [Countermeasure]

Type of countermeasure	Check
No Counter Measures	
Effect of existing countermeasure	none • low moderate high enough

### [Evaluation Rank]

Risk \ Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffic when potential disaster

-Great risk: road closed for 2 days or more

-Medium risk: road closed for 1 day or less

-Low risk: no road closure

### [Description/comments]

This is an active debris flow. Channel of the DF is well developed with detached boulders and gravels. The DF is drained by the spring water. Source of the DF is steep scrap with detached and jointed boulders. Eroded talus is present. The slide is mainly triggered during the rainy season. The DF can affect the road and disrupt the traffic. No mitigation measures are constructed to stabilize the slide.



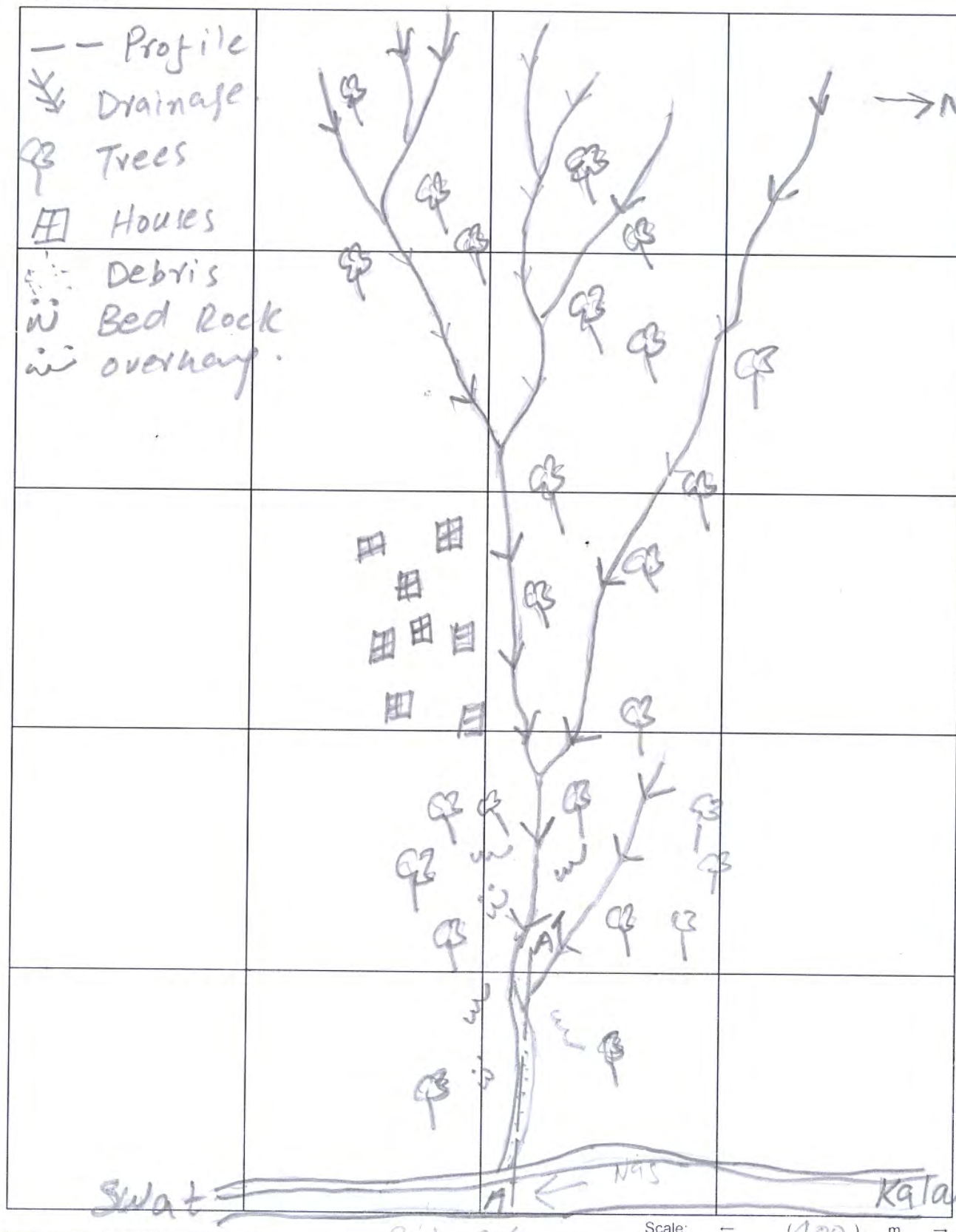
Code no.	N - 9 5 0 2
Region Office	
Maintenance Unit	

### Sketch sheet

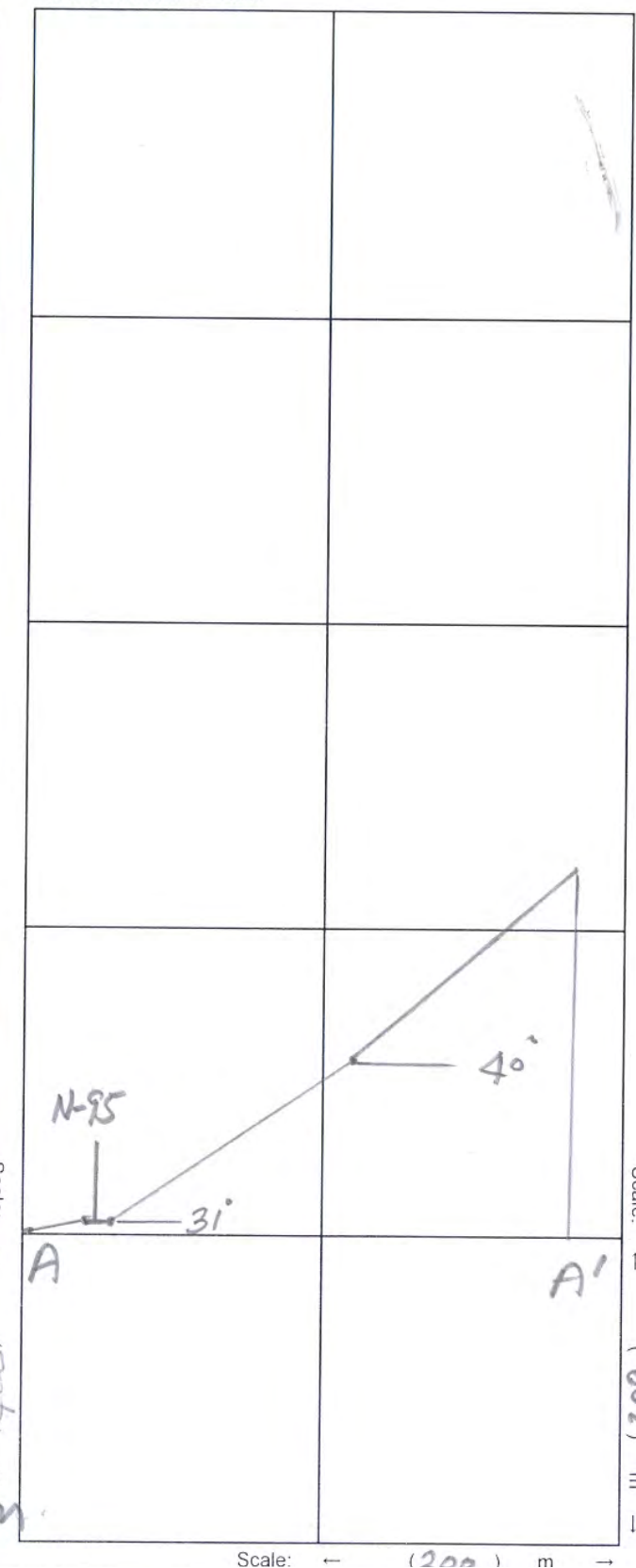
Coordinates	Latitude	35° 20' 18.9"
	Longitude	72° 36' 39.0"
Road Name	N-95	Km 2

Date	7/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Cross sectional view





Code no.	Sat_	N	9	5	_	2		
Region Office								
Maintenance Unit								

Photo sheet

Coordinates	Latitude	35° 20' 18.9"									
	Longitude	72° 36' 39.0"									
Road Name					Km						

Date	2018/7/4
Inspector	Yasir, Sajid, Shafique, Basharat



Mountain side view of the debris flow



Valley side view of the debris flow



Front view of the debris flow



A view of slope failures along the debris flow



Road condition



Existing countermeasures / anomalies: Retaining wall is being constructed at the toe of the debris flow





Code no.	Sat_	N	9	5	_	3			
Region Office									
Maintenance Unit									

## Evaluation sheet (debris flow)

Coordinates	Latitude	35° 25' 19.6"							
	Longitude	72° 36' 5.6"							
Road Name					Km				

Date	2018/8/4
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km <sup>2</sup> or more	
		0.15km <sup>2</sup> - 0.50km <sup>2</sup>	√
		less than 0.15km <sup>2</sup>	
	steepest slope of river bed	40°or more	√
		30° - 40°	
		less than 30°	
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km <sup>2</sup> or more	
		0.08km <sup>2</sup> - 0.20km <sup>2</sup>	
		less than 0.08km <sup>2</sup>	√
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km <sup>2</sup> or more	
		0.02km <sup>2</sup> - 20km <sup>2</sup>	
		less than 0.02km <sup>2</sup>	√
	artificial works that cause negative effects	certain	
		none	√
	new crack and/or slope failure in stream	certain	√
		none	
	traces of large slope failure in stream	certain	√
		none	

### [Road structure]

structure	category of score	Check
River width	10m or more	
	5m - 10m	
	3m - 5m	
	less than 3m	√
Beam height	less than 1m or No bridge / box culvert	√
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

### [History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	√
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

### [Potential disaster mode]

	Check
Damage of bridge/culvert	√
Outflow of embankment	
Debris flooding on the road	

### [Expected size of disaster] (width, length, depth, etc.)

L= 1200 m, W=50 m, D= 2-3 m
-----------------------------

### [Countermeasure]

[Countermeasure]		Check
Type of countermeasure		
Drainage Culvert		
Effect of existing countermeasure	none・low	
	moderate	√
	high	
	enough	

### [Evaluation Rank]

Risk \ Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffic when potential disaster

-Great risk: road closed for 2 days or more

-Medium risk: road closed for 1 day or less

-Low risk: no road closure

### [Description/comments]

*An active debris flow. Water is coming in the slide from the upstream glaciers. Upstream of the debris flow is also prone to rock fall. Detached boulders are present in the DF channel. The DF can be activated during the rainfall. No counter measures are constructed to stabilize the slide.*

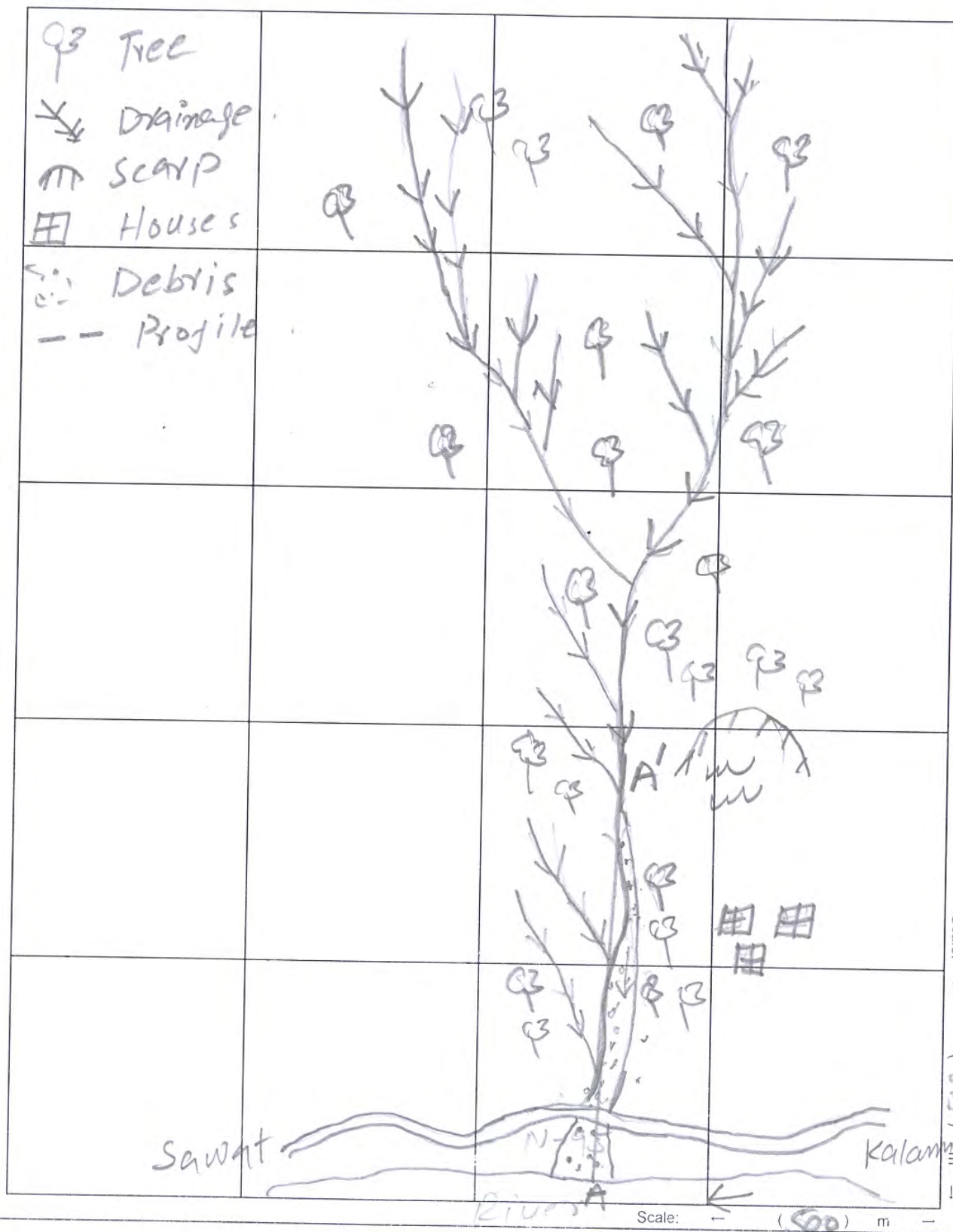
Code no.	N - 9 5 0 3
Region Office	
Maintenance Unit	

### Sketch sheet

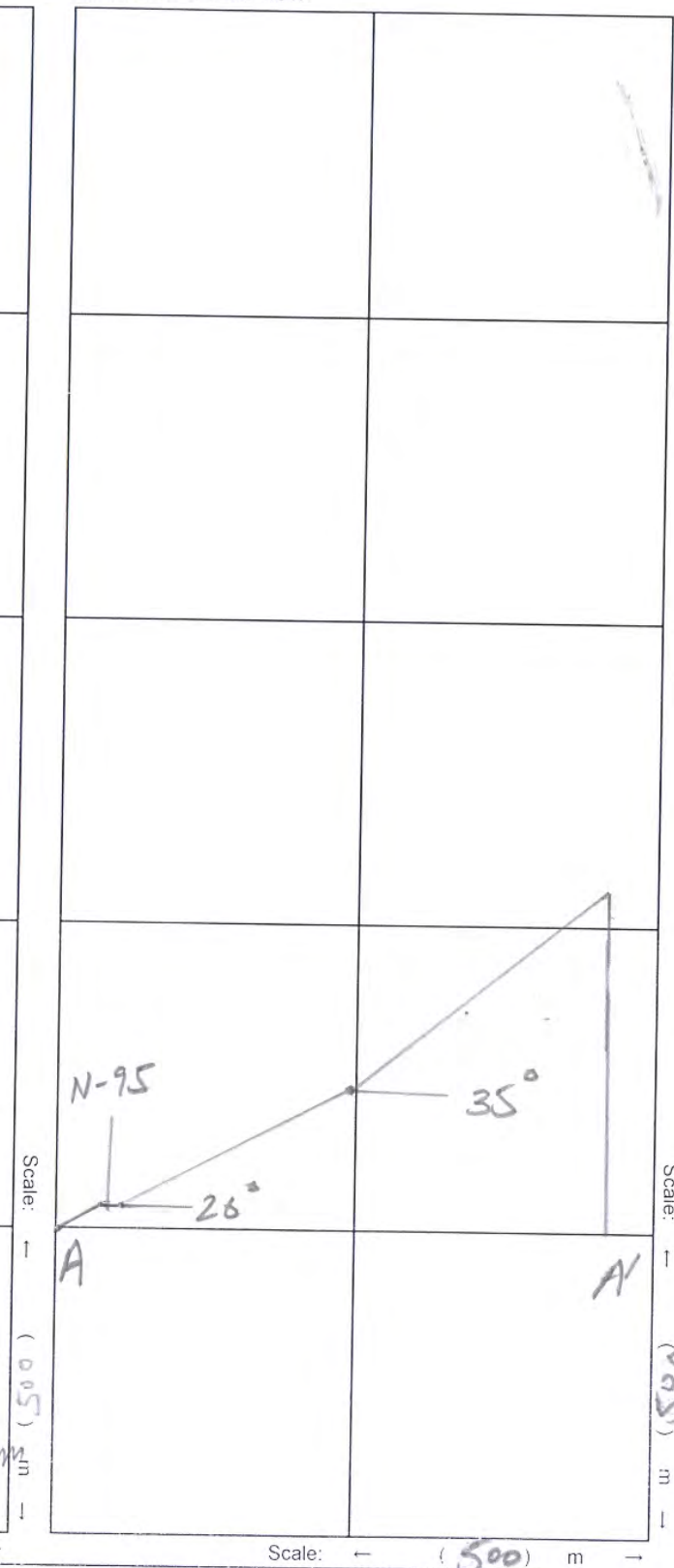
Coordinates	Latitude	35° 25' 19.6"
	Longitude	72° 36' 5.6"
Road Name	N-95 Km 3	

Date	8/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Cross sectional view



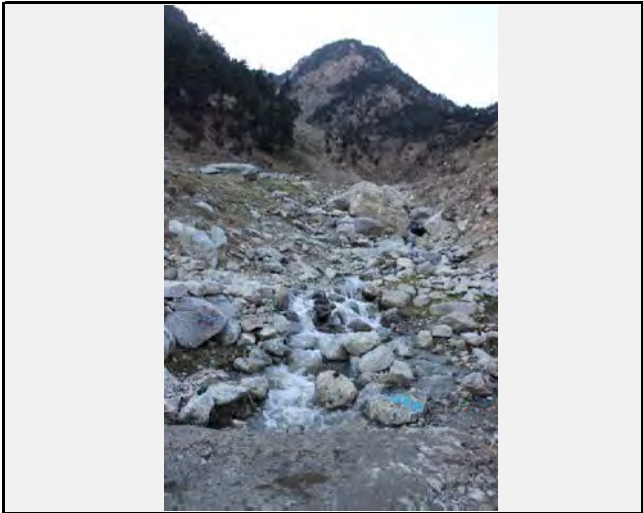


Code no.	Sat_	N	9	5	_	3		
Region Office								
Maintenance Unit								

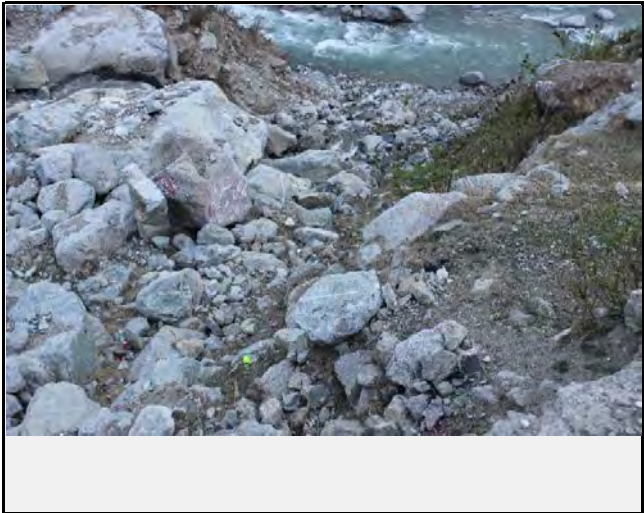
Photo sheet

Coordinates	Latitude	35° 25' 19.6"								
	Longitude	72° 36' 5.6"								
Road Name					Km					

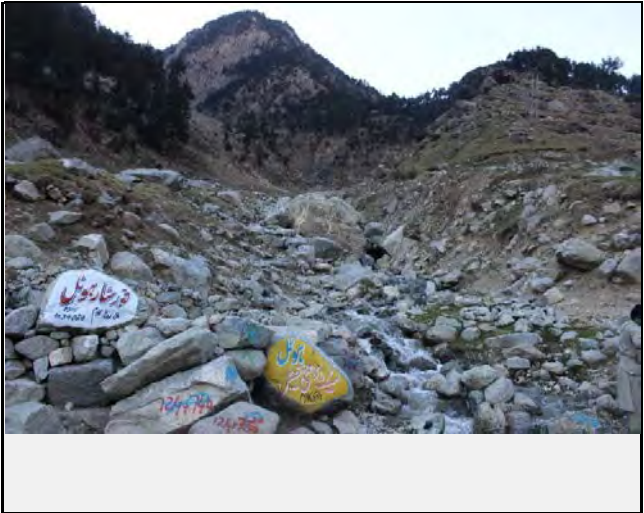
Date	2018/8/4
Inspector	Yasir, Sajid, Shafique, Basharat



Mountain side view of the debris flow



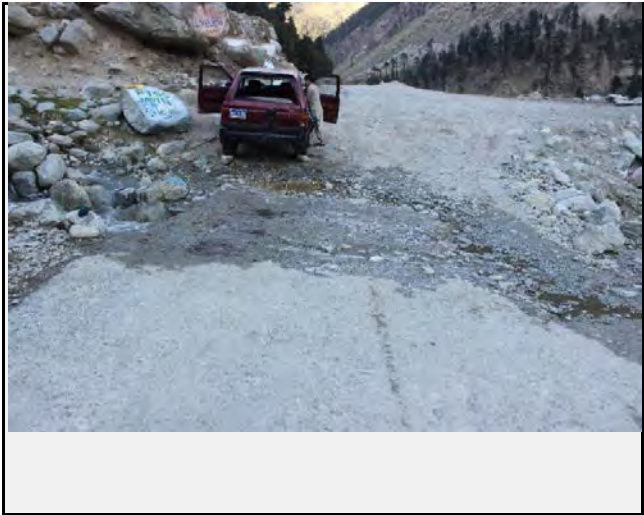
Valley side view of the debris flow



Front view of the debris flow



The damage on road has been observed with inlet of pipes for debris flow



Road condition



Existing countermeasures / anomalies: Culvert / Pipes has been installed at the toe of the debris flow





Code no.	Sat_ N 9 5 _ 4
Region Office	
Maintenance Unit	

## Evaluation sheet (Slope failure/Rockfall)

Coordinates	Latitude	35° 30' 58.7"
	Longitude	72° 33' 2.0"
Road name		Km

Date	2018/9/4
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

Item	factor	category of score	Check
topography	Collapsed factor	talus slope, clear convex break of slope, eroded toe of slope, overhang, water catchment slope	3 or more correspondences
		2 correspondences	
Geological conditions	Soil	1 correspondences	
		no correspondence	
		marked	✓
	Rock	a little marked	
		None	
		marked	✓
	Structure	a little marked	
		None	
Surface condition	dip slope of bedding plane / Joint Planes	It corresponds.	✓
		None	
		marked	✓
	debris on impermeability bedrock, the upper part is a hard /the toe of slope is weak.	a little marked	
		None	
		marked	✓
Profile	Topsoil, detached rock and unsteady rock	instability	✓
		a little unstable	
		stability	
	Spring water	notable spring water	
		seepage	
		none	✓
Anomaly	Surface condition	bare land with minor vegetation	✓
		intermediate (bare•grass•tree)	
		mainly structure, mainly tree	
	Height (H), dip (i)	H ≥ 50m	✓
		30 ≤ H < 50m	
		15 ≤ H < 30m	
Anomaly	Height (H), dip (i)	H < 15m	
		i ≥ 70°	
		45° ≤ i < 70°	✓
	Surface collapse, small fallen rock, gully, erosion, piping hole, subsidence, heaving, bending of tree root, fallen tree, crack, open crack, anomaly of countermeasure	2 or more correspondences • clarity	✓
		certain • unclarity	
		none	

### [Countermeasure]

Type of countermeasures	
Approx. 1m high Retaining wall at the toe of Slope Failure	
Effectiveness of existing countermeasures	Check
Potential slope failure are prevented enough, or, it is defended enough when it is generated.	
Potential slope failure are considerably prevented, or it is considerably defended when it is generated.	
Potential slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.	✓
There is no countermeasure, or there is not effective even if countermeasures are not performed.	

### [Disaster type]

Rock fall	✓
Slope failure	✓

### [Main check object]

Cut slope	✓
Natural slope	✓

### [History]

Level of disaster history	Check
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic.	
There is a history about small fallen rocks and slope failures that did not get to the road.	
No disaster records	

### [Expected size of disaster](width, length, depth, etc.)

L= 780 m, W= 1500 m, D= 3-4 m
-------------------------------

### [Evaluation Rank]

Scale of disaster	Risk		
	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

### [Description]

It is a complex slide comprising of rock fall and debris flow. Debris is comprised of boulders, gravels, sand and silt. Source of debris is from steep outcrop with fractured and jointed rocks. Hanging and detached boulders are lying on the debris that are prone to sliding during the rainfall. Soil erosion leads to development of water channels in the slide. The loose material on the slide is prone to debris flow during the rainy season. Excavation of the loose debris for construction material also trigger the slide. A small retaining wall is built, however, it is also damaged due to falling rocks and not effective to stabilize the slide.
---

Organization responsible for countermeasure works according to the scale of the disaster

- Big: Grant aid
- Medium: Major contractor in Pakistan
- Small: Local contractor

Influence on the traffic when potential disaster

- Great risk: road closed for 2 days or more
- Medium risk: road closed for 1 day or less
- Low risk: no road closure

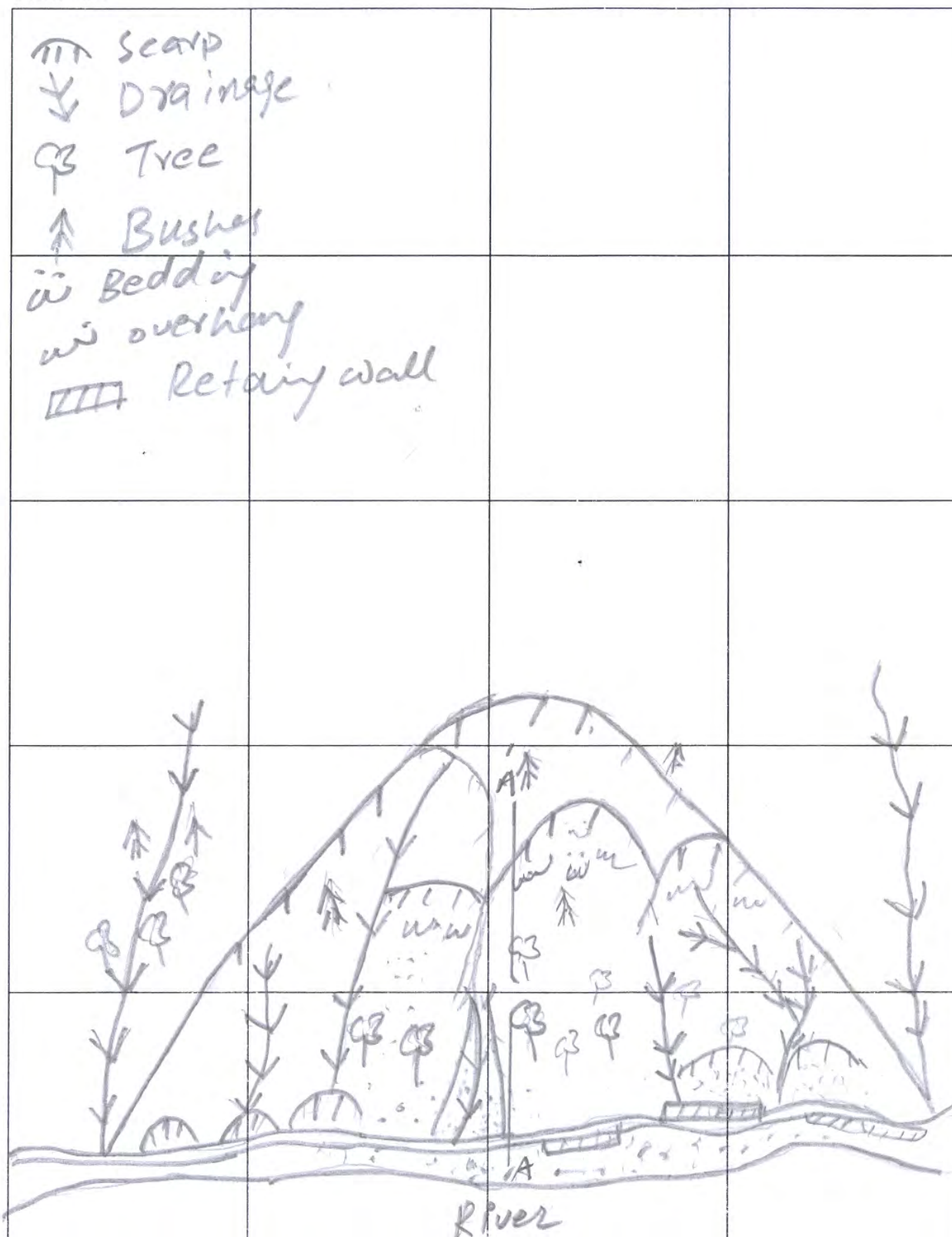
Code no.	N	-	9	5					0	4
Region Office										
Maintenance Unit										

### Sketch sheet

Coordinates	Latitude	35° 30' 58.7"									
	Longitude	72° 33' 2.0"									
Road name	- 9.5 Km	2									

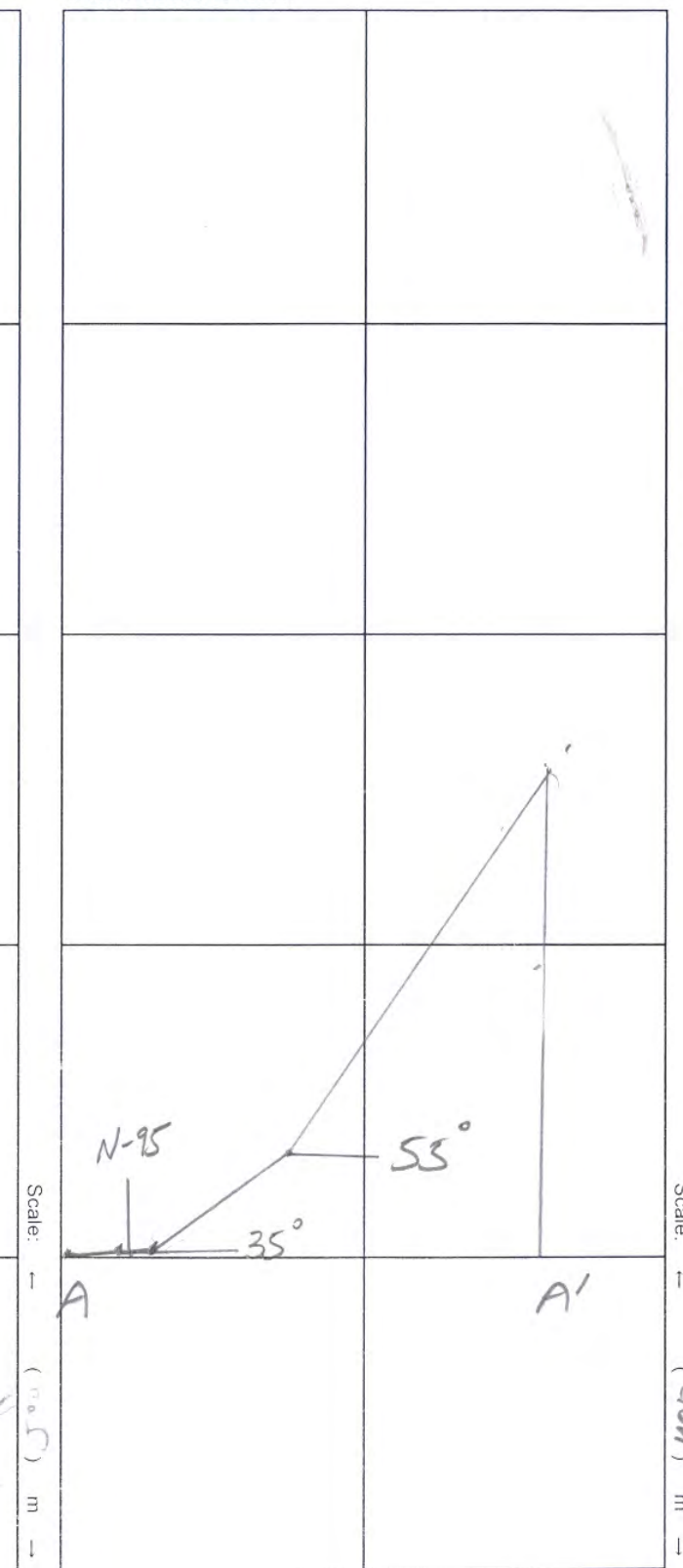
Date	9/4/2018									
Inspector	Yasir, Sajid, Shafique, Basharat									

Plane view



Scale: (500) m

Cross sectional view



Scale: (400) m



Code no.	Sat_	N	9	5	_	4	
Region Office							
Maintenance Unit							

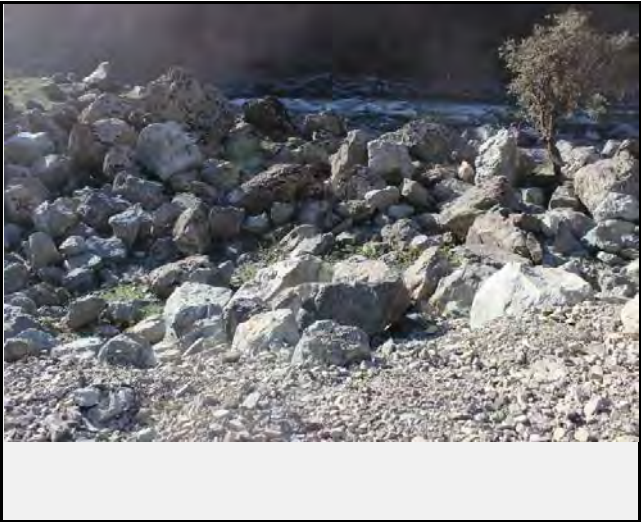
Photo sheet

Coordinates	Latitude	35° 30' 58.7"							
	Longitude	72° 33' 2.0"							
Road name					Km				

Date	2018/9/4
Inspector	Yasir, Sajid, Shafique, Basharat



Full view of the landslide



View of landslide on Valley side:



Road condition: Cut slope at the start point



View of the slope failure at the middle point



Existing countermeasures / anomalies: View of Retaining Wall as counter measure



View of gully developed in the slope failure



Code no.	Sat_ N 9 5 _ 5
Region Office	
Maintenance Unit	

## Evaluation sheet (debris flow)

Coordinates	Latitude	35° 30' 59.8"
	Longitude	72° 32' 7.5"
Road Name		Km

Date	2018/10/4
Inspector	Yasir, Sajid, Shafique, Basharat

### [Causes]

item	factor	category	Check
Property of river	areas that river bed is 15° or more in watershed area	0.50km <sup>2</sup> or more	
		0.15km <sup>2</sup> - 0.50km <sup>2</sup>	✓
		less than 0.15km <sup>2</sup>	
	steepest slope of river bed	40°or more	✓
30° - 40°			
less than 30°			
Property of slope	area that slope gradient is 30° or more in watershed area	0.20km <sup>2</sup> or more	
		0.08km <sup>2</sup> - 0.20km <sup>2</sup>	
		less than 0.08km <sup>2</sup>	✓
	area that meadow and shrub (less than 10m height) occupy in watershed area	0.20km <sup>2</sup> or more	
		0.02km <sup>2</sup> - 20km <sup>2</sup>	
		less than 0.02km <sup>2</sup>	✓
	artificial works that cause negative effects	certain	✓
		none	
	new crack and/or slope failure in stream	certain	✓
		none	
traces of large slope failure in stream	certain	✓	
	none		

### [Road structure]

structure	category of score	Check
River width	10m or more	
	5m - 10m	✓
	3m - 5m	
	less than 3m	
Beam height	less than 1m or No bridge / box culvert	✓
	1m - 2m	
	2m - 3m	
	3m - 5m	
	5m or more	

### [History]

category of score	Check
There is a history about debris flow that were obstacles to the road traffic after construction of recent measures.	✓
There is a history about debris flow though there is no obstacle to traffic.	
There is no history of debris flow	

### [Potencial disaster mode] Check

Damage of bridge/culvert	
Outflow of embankment	
Debris flooding on the road	✓

### [Expected size of disaster] (width, length, depth, etc.)

L= 1280 m, W=460 m, D= 2-3 m
------------------------------

### [Countermeasure]

Type of countermeasure		Check
No Counter Measures		
Effect of existing countermeasure	none • low	✓
	moderate	
	high	
	enough	

### [Evaluation Rank]

Risk \ Scale of disaster	Big	Medium	Small
Great risk	1	2	3
Medium risk	1	2	3
Low risk	2	3	4

Organization responsible for countermeasure works according to the scale of the disaster

-Big: Grant aid

-Medium: Major contractor in Pakistan

-Small: Local contractor

Influence on the traffic when potential disaster

-Great risk: road closed for 2 days or more

-Medium risk: road closed for 1 day or less

-Low risk: no road closure

### [Description/comments]

This is an old debris flow and the road is built in the debris. Debris is comprised of boulder, gravels, sand and silt. Detached boulders are lying on the debris that are prone to slide to the road. Active erosion leads to development of gullies. Scarp of the slide is prone to rock fall. Eroded talus is present along the road. Excavation of the loose debris for construction material also trigger the slide. The slide is frequently damaging the road and obstructing the traffic, however, no mitigation measures are constructed to stabilize the slide.



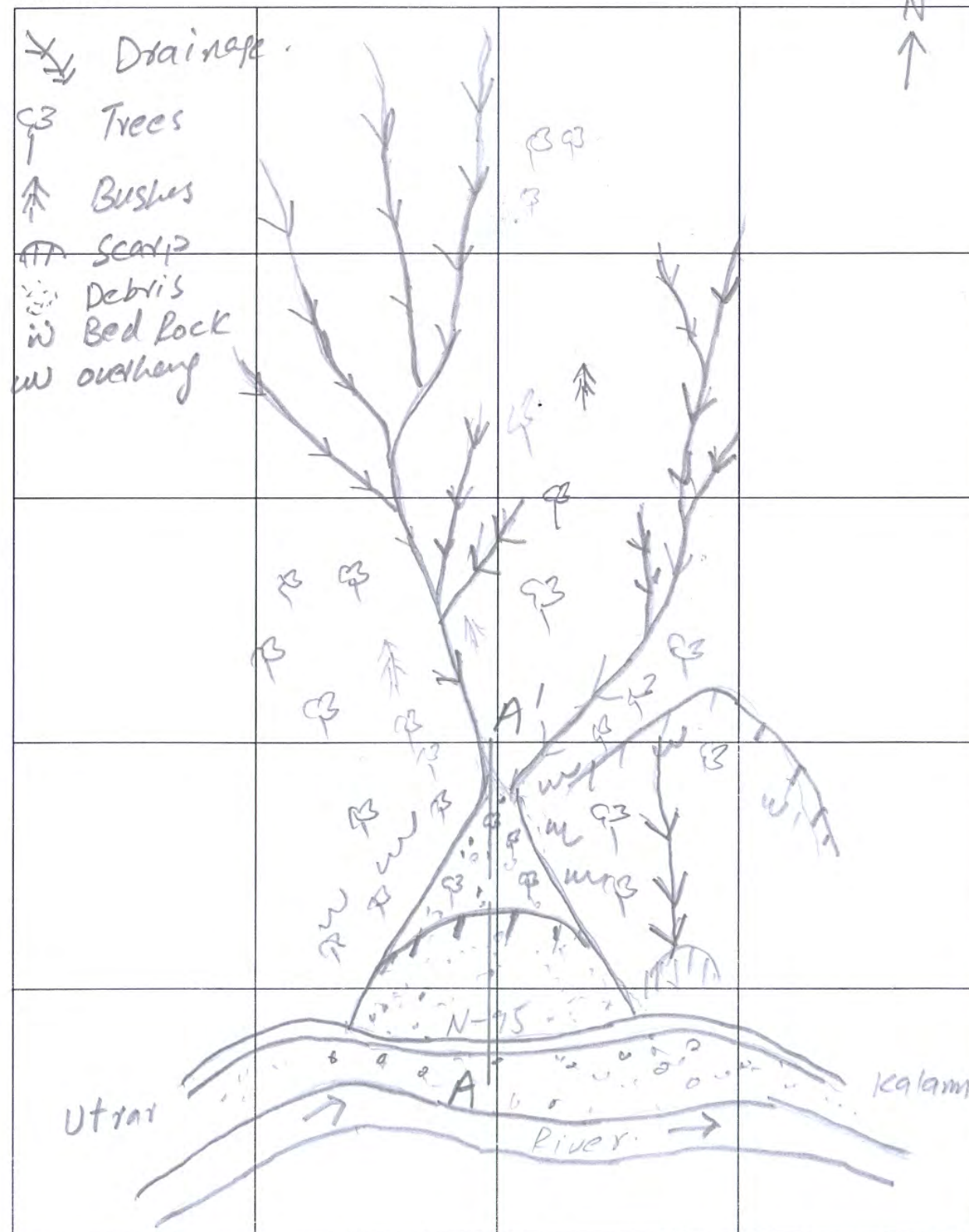
Code no.	N - 9 5 0 5
Region Office	
Maintenance Unit	

# Sketch sheet

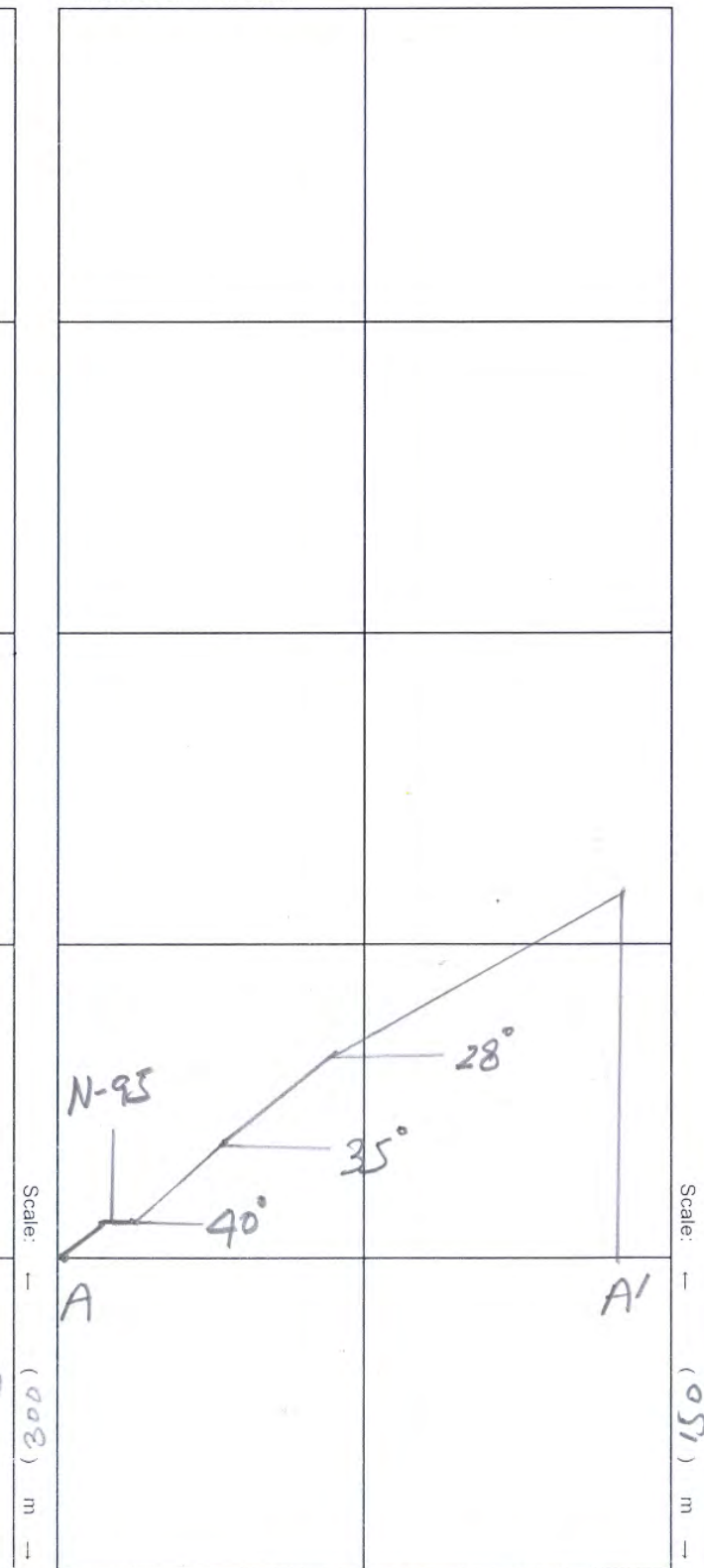
Coordinates	Latitude	35° 30' 59.8"
	Longitude	72° 32' 7.5"
Road Name	N-95	Km S

Date	10/4/2018
Inspector	Yasir, Sajid, Shafique, Basharat

Plane view



Cross sectional view



Scale: (300) m

Scale: (150) m

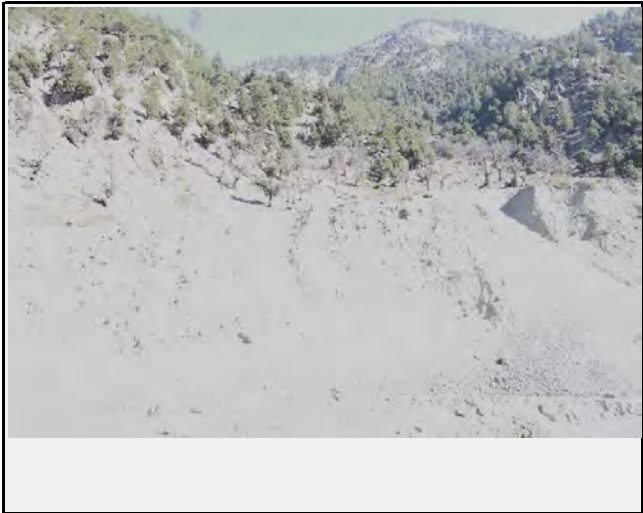


Code no.	Sat_	N	9	5	_	5		
Region Office								
Maintenance Unit								

Photo sheet

Coordinates	Latitude	35° 30' 59.8"									
	Longitude	72° 32' 7.5"									
Road Name						Km					

Date	2018/10/4
Inspector	Yasir, Sajid, Shafique, Basharat



Mountain side view of the debris flow



Valley side view of the debris flow



Front view of the debris flow



The existing road has been damaged. Red line shows the old road displaced by the debris flow.



Road condition



View of debris material and old road

