Classified as “G”

GOVERNMENT OF INDIA
GEOLOGICAL SURVEY OF INDIA

LANDSLIDE INVENTORY ALONG NH & SH OF GHAT ROADS IN COORG AND UTTAR KANNADA DISTRICTS, KARNATAKA

(Progress Report for the Field Season 2013-14)
Code No.: LHZ/ SR/ KG/2013/070

By
K.V.Maruthi, Superintending Geologist

Project: ENGINEERING GEOLOGY
State Unit: Karnataka and Goa
BANGALORE
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ABSTRACT

In order to implement the proposed action plan 2006 of the National Disaster Management Authority (NDMA) on landslide hazard and risk mitigation and to prepare a landslide database for future landslide studies, landslide inventory of the Ghat section of Western Ghat in parts of Karnataka state has been taken up since F.S. 2007-08. To update the database, an item pertaining to the landslide inventory along National highway (NH) and State highway (SH) roads in Ghat sections was taken up under Mission-IV 'Engineering geology and Geotechnical investigation programme of GSI. The landslide inventory was carried out along the road sections of the Western Ghat in Coorg, and Uttar Kannada districts covering parts of toposheet nos. 48 P/12, 14 &15; 58 A/1; 48 J/1,5,6 & 9. A total of 263 line km was covered and 68 incidences of landslides were recorded.

The present study reveals that most of the landslides are shallow (<2m depth) debris slides/slumps confined to the cut walls made for roads. The height of the cut-slope as well as the inclination playing a major role in triggering the slides. Majority of the slides are on the cut slopes having more than 10m height and quite a steep slope angle varying between 70^0 and 90^0. The relative height of the cut-slope has also been low to moderate varying between 5m to 20m in all the sections with overburden thickness varying from 0.5-4.0 m. The main causes of landslides in the Western Ghat are toe-cutting of hill slopes for the formation of road and benches for locating dwelling units. In addition, presence of highly weathered and transformed rock mass and changes in water content due to heavy rainfall are aiding factors. Intense action of water is known to favour weathering of rocks that would in turn cause reduction in the shearing resistance. The heavy rainfall in the Western Ghats during monsoon is in general known to trigger most of the landslides. The generalized recommendations for the study area are as follows i) Vertical cut slopes should be avoided in future as it leads to instability in such terrain. ii) Engineered geometrical modification of the slope iii) Bio geotechnical slope protection like turfing or growing of Vetiver grass along the slope. iv) Provision of surface, toe and horizontal drainages.Slide specific recommendations for each slide are provided along with other details of the individual slides.

LANDSLIDE INVENTORY ALONG NH & SH OF GHAT ROADS IN COORG AND UTTAR KANNADA DISTRICTS, KARNATAKA

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1. INTRODUCTION

Geological Survey of India, being the Nodal Agency for Landslides in India since 2004, vigorously and swiftly started integrated approach towards landslide hazard studies which included site specific landslide studies, landslide hazard zonation along road corridors and townships and preparation of landslide inventory. As far as State unit: Karnataka and Goa of Geological Survey of India is concerned Landslide inventory was first carried out during FS 2007-08 in the states of Karnataka and Goa separately.

In order to implement the proposed action plan 2006 of the National Disaster Management Authority (NDMA) on landslide hazard as well as risk mitigation and also to prepare a landslide database, preparation of an inventory on landslides at various stretches under the Western Ghat in parts of Karnataka state has been taken up. The Engineering Geology Division under the State unit of Karnataka and Goa has been preparing systematically, the landslide database of Karnataka since 2007-08. To update the landslide database, a field season item pertaining to landslide inventory along the Ghat sections of National Highways(NH) as well as State Highways (SH) was proposed taken up under pursuant to the annual programme of Geological Survey of India, Southern Region vide item no LHZ/SR/KG/2013/070.

The landslide inventory was carried out along the arterial road sections of the Western Ghat in Coorg, and Uttar Kannada districts falling in parts of toposheet nos. 48 P/12, 14 &15; 58 A/1; 48 J/1,5,6 & 9. A total of 263 line km was covered and 68 incidences of landslides were recorded.

1.1. LOCATION

Karnataka is bound by the Arabian Sea in the west, Goa and Maharashtra in the northwest and north respectively and Tamilnadu and Kerala to the south. During the FS 2013-14, landslide inventory was carried out along the Ghat roads in the Western Ghat belt covering districts of Coorg and Uttar Kannada (Plate-1). The Western Ghat belt, known for its thickly vegetated forests and mineralization, is an irregularly elongated NW-SE trending belt. In Karnataka, the Western Ghats extend from Coorg district in the south to Uttar Kannada district in the north.

1.2. NATURE AND QUANTUM OF WORK

Nature of Work	Total work envisaged	Work proposed for FS: 2013-14	Work completed
Aerial photo / Image interpretation	500 sq.km	500 Sq.km	500 Sq.km
Inventory in 1:50,000 scale	250 L km (At least 1 km on either side of the road)	263 L. Km (68 Landslide incidences)	263 L. Km (68 Landslide incidences)

I.3. PRESENT WORK

During the field season landslide inventory studies have been carried out along Ghat roads in the Western Ghat belt. A total of 263 line km has been covered and 68 incidences of landslides were recorded.

The details of the Ghat sections of NH,SH roads and Main District Roads (MDR) covered during the study are given below.

A) Madikeri-Suntikoppa road section (SH-88): 4 landslides were recorded for nearly 15 km stretch *(Plate 2).*

B) Virajpet-Kakkabe-Bhagamandala Road section (SH-90): 4 landslides were recorded in for nearly 24 km stretch *(Plate 3)*

C) Madikeri-Madapur-Somawarpet Road section (SH-27): 7 landslides were recorded for nearly 31 km stretch *(Plate 2)*

D) Suntikoppa-Madapur Road section (District road): No landslides were observed in this road section for nearly 10 km stretch.

E) Somawarpet- Kushalnagar Road section (SH-112): No landslides were observed in this road section for nearly 26 km stretch.

F) Gonikoppa-Kutta (Kerala boundary) - Nagarhole, SH-89: 2 landslides were recorded for nearly 30 km stretch *(Plate 4.)*

G) Karwar-Kaiga Road section (SH-06): 10 landslides were recorded for nearly 50 km stretch *(Plate 1 and Plate 6)*

H) Karwar-Anshi road section (SH-34): 18 landslides were recorded for nearly 50 km stretch *(Plate 1 and Plate 6)*

I) Karwar-Goa border road section (NH-17): 2 landslides were recorded for nearly 10 km stretch *(Plate 5).*

J) Ankola-Yellapur road section (NH-63): This road section was partially covered in FS 2007-08 but not completely covered so this section was again taken up for Inventory studies this year. 21 landslides were recorded section for nearly 53 km stretch *(Plate 8).*

1.4. METHODOLOGY ADOPTED FOR PREPARATION OF LANDSLIDE INVENTORY

1. The data on the old landslides were collected wherever available from the offices of the District Commissioners, PWD and other district authorities.

2. Prioritization of the landslides for inventory assessment was based on the locational importance of the road sections and number of landslide incidences.
3. Only insufficient data could be obtained from aerial photographic study as the magnitude of landslides are relatively small and no temporal data was available. However, the details of the Aerial photographs studied are given separately in section I.5.
4. The 41 point data sheet newly provided by GHRM cell including different parameters on the landslides for Landslide inventory studies was used.(details are given in Section I.6) The filled up detailed data sheet is enclosed in annexure-I.
5. The check list table was prepared i.e., which road section to be carried out first, whether any data of reported landslides are available, consultation of aerial photos etc.,
6. Individual slides were meticulously studied and discrete measurements of various components were made.
7. During the field season 2007-08, the system of giving a unique ID number to individual landslides to enable storage in an appropriate landslide inventory database (Mishra & Pradhan, 2010) was started. For the landslides in Karnataka, the numbers were given as KA-01, KA-02 etc. Accordingly, during 2008-09, the landslides were numbered between KA-65 and KA-278 (Maruthi et.al, 2010). The sequence was continued in the subsequent years (Maruthi & Mishra, 2011, Maruthi & Chandran, 2012, Maruthi & Chandran 2013) and the first slide studied during the current study is assigned the number KA-538. As we are using the 41 point inventory system for the first time the earlier practice of slide numbering continued but the in the slide name the procedure as described in the 41 point format is followed.
8. Non availability of data particularly on the exact date of occurrence for many of the landslides, the date of data was collection was taken as a criteria for assigning the ID numbers.
9. The numbers of images captured on a particular landslide is shown in parenthesis as KA-388 (1), KA-388 (2)… etc and the images are stored in the inventory database in 'jpeg' format.
10. The data is entered and stored in an Excel format as per the check-list. A copy lies with the Dy.DG, SU: Karnataka and Goa and the Director EG would be holding safe custody of the data.

I.5. AERIAL PHOTO STUDIES:

Following aerial photographs were studied for the purpose of preparing the Landslide inventory.

Toposheet	Task	Run Nos.	Photo nos	Toposheet	Task Nos.	Run Nos.	Photo nos
48P/11	570A	31	5-11	48J/5	725 A	36	11-19
		32	3-8			37	12-19
		74	15-20			38	1-9
		75	13-18			39	6-14
48P/12	570A	80	19-23			40	1-4
		80	14-18			41	9-13
		82	1-5			42	9-12
		83	18-21			43	6-9
48P/14	790A	8	11-20	48J/6	725A	38	12-19
		9	11-21			39	8-11
		10	10-18	48J/9	725 A	23	29-41
		11	11-19			24	34-47
48P/15	790A	12	11-21			28	33-45
		13	11-19			30	28-40
		14	13-23			33	29-42
		15	11-19			37	32-45
48P/16	562A	62	2-5			38	38-39
		63	3-6			40	1-12
		64	2-3				
48J/1	752A	51	40-51				
		53	13-26				

I.6. 41 POINT DATA SHEET FOR PRILIMINARY INVESTIGATION OF LANDSLIDE

No	Field		Description
1	Slide No (LS.No.)	:	*State/district/toposheet/year/serial no.*
2	State	:	*Name*
3	District	:	*Name*
4	Toposheet	:	*No.*
5	Name of the slide	:	*Maximum20 character*
6	NH/SH/Locality	:	*National Highway / State Highway/ Name of nearest village or locality (Maximum50 character)*
7	Latitude	:	*Lat in decimal degree (in WGS 1984)*
8	Longitude	:	*Long in decimal degree (in WGS 1984)*
9	Length	:	*m*
10	Width	:	*m*
11	Height	:	*m*
12	Area	:	*m 2*
13	Depth	:	*m*
14	Volume	:	*m3*
15	Run out distance	:	*m*
16	Type of Material	:	*Rock/soil/debris/rock-cum- debris/ debris-cum-rock*

17	Type of movement	:	*Falls / Topple / Slide/subsidence/Flows / Lateral /spread/ creep*
18	Rate of movement	:	*Extremely Rapid, Very Rapid, rapid, moderate, slow, very slow, extremely slow*
19	Activity	:	*Active/ Reactivated/ Suspended/ Dormant/ Abandoned/ Stabilized/Relict*
20	Distribution	:	*Advancing/ Retrogressive/ Widening/ Enlarging/Confined/ Diminishing/ Moving*
21	Style	:	*Complex/ Successive/ Multiple/Single*
22	Failure mechanism	:	*Shallow planar failure/Deep planar failure/ Shallow Rotational failure/Deep rotational failure*
23	History	:	*Date of initiation & subsequent reactivations(date/year)*
24	Geomorphology	:	*Topography, landform , processes (Maximum 100character)*
25	Geology	:	*Lithological description (100 character)*
26	Structure	:	*Details of discontinuity in whole circle (eg: J_1:50°:150°)*
27	Landuse/ Landcover	:	*Barren / cultivated /forest /rural / urban/ anthropogenic activity/ any other (Maximum 50 character)*
28	Hydrological condition	:	*Dry/Wet/dripping/ Flowing*
29	Triggering Factor	:	*Rainfall in mm/Earthquake (intensity in Richter scale)/lakebursting/Anthropogenic factors like roadcutting, blasting etc (Maximum 50 character*
30	Death of persons	:	*numbers*
31	People affected	:	*numbers*
32	Live stock loss	:	*Cattle death*
33	Communication	:	*Road/Rail/transmission line (blocked/damaged)*
34	Infrastructure	:	*Numbers of houses/building/dam/barrages damaged*
35	Agriculture/forest/ Barren	:	*(Maximum 50 character)*
36	Geo-scientific Causes	:	*Topple /planner failure/ wedge failure/ pore waterpressure/ piping/reduction of strength on super-saturation/ toe erosion by stream/ gully erosion/Anthropogenic activities(unplanned cutting of slope, unplanned construction, loading at headregion, afforestation, adverse cultivation pattern /combination of above factors/ any other factor (maximum 200 character)*
37	Remedial measures	:	*(maximum200 character)*
38	Remarks	:	*If any (maximum200 character)*
39	Photos. Sketch of Plan & section of the slide	:	*Affected by landslide – quantity / type of cultivation* *Send in jpeg format*
40	Summary/Abstract	:	*(with in 1000 character)*
41	Pdf	:	*Soft copy of landslide report*

Date	(Name & Designation)
Place	Division

I.7. CONSTRAINTS, LIMITATIONS AND ASSUMPTIONS

1. Collection of complete data on many of the landslides might not have been possible in many places due to inaccessibility to the Crown/ Head portions of landslides and hence some measurements like scarp depth/width were visually estimated and inferred.
2. The task of studying the landslides with the help of either satellite imagery or the aerial photograph is difficult as the magnitude of the slides in the Western Ghats is relatively small. Due to extensive developmental activity in the area that has resulted in modification of slopes in recent times, many of the earlier landslides could not be spotted in the aerial photographs. Besides, recent aerial photographs and temporal imageries were not always available.
3. Thickness of overburden/ weathered depth is deciphered visually either by observing in the cut section at site or in stream section(s) in nearby area.

I.8. ACKNOWLEDGEMENTS

The author is sincerely thankful to the then Dy. Director General, SU: Karnataka and Goa Shri. M.Ravikumar and present Dy. Director General Shri.T.Krishnappa for providing all the logistic support, guidance and encouragement. He is thankful to M.K.Rao, Director for Supervising the work and finally Dr.H.S.M.Prakash, Director (CT) for careful scrutiny of the report.

2. REGIONAL GEOLOGY

The landslide inventory study area forms a part of Western Ghats that grade into a plateau towards east. The area exposes Late Archaean rocks (<3000 ma) viz., Peninsular Gneiss-I of Tonalite-Trondjhemite-Granodiorite composition as well as Middle Archaean (>3000 ma) Sargur Group, with ultramafic-mafic intrusive complex, serpentinised komatiitic and amphibolites, etc. in addition to lower to middle Archaean (≈ 3400 ma) older Gneisses.

In Coorg District the Sargur Group is represented by a number of enclaves within gneisses and granites and the enclaves are quartzite, amphibolite, iron formation, garnetiferous mica schist, kyanite-staurolite schist, silimanite-garnet schist, calc-silicate rock and ultramafics. The Charnockite Group forms a major rock unit in the SW part of Coorg district constituted by hornblende diopside granulite, calc granulite & charnockite and pyroxene granulite. The Peninsular Gneiss of this region is a complex of migmatitic gneiss and granitoids represented by biotite gneiss, hornblende-biotite gneiss and hornblende gneiss. The peninsular gneiss is unconformably overlain by rocks of the Dharwar Supergroup (Bababudan Group). Stratigraphically, the area exposes rocks belonging to Sargur Group, Peninsular Gneisses-I, Charnockite Group, Migmatite Complex, Bababudan Group and Chitradurga Group of rocks. Acid and basic intrusives are common. The majority of the rock sequences are lateritised that occur as extensive cappings in the Western Ghats and in coastal plains.

In Uttar Kannada District area is occupied by rocks of Sargur Group, Peninsular Gneissic Complex (PGC), older granitoids and Chitradurga Group of Dharwar Supergroup of Archaean age. Dolerite dykes of Palaeoproterozoic age intruding these rocks. The older metamorphics of Sargur Group are represented by amphibolite occurring as enclaves within granite. The rocks belonging to the PGC are represented by granitic gneiss and granodiorite. The granite gneiss at places is migmatitic in nature. The Dharwar Supergroup of rocks and PGC-I are intruded by older granitoids is referred as 'Karwar Granite'. The granite is massive, generally coarse grained, porphyritic found in shades of grey and pink consisting of quartz, K-feldspars, plagioclase and biotite. The Goa belt represented by Chitradurga Group is exposed in the area as 'Barcem Formation' consisting of metabasalt (schistose), BMQ and acid volcanics. The area is also intruded by numerous swarms of dolerite dykes. The majority of the rock sequences are lateritised that occur as extensive cappings in the Western Ghats and in coastal plains. Their thickness ranges from a few cm to 60 m. (Chalpathi Rao, 1968; Chalpathi Rao & Kannan,1970; Davay,1968; Gopal Rao,1968;Pazhamalainathan et.al, 1982; Ramakrishna, 1967; Shafeeq Ahmed, 1990; Subramanian, 1968; Subramanian, 1969).

3. GENERAL DESCRIPTION OF LANDSLIDES STUDIED IN 2013-14

3.1. Madikeri-Suntikoppa Road section of SH-88: Four landslides (KA-638 to KA-641) were recorded in this Ghat section of about 15 km stretch. The slides are shallow with 0.5-1.0 m depth. The cut slope angle is 70° to 80° with height varying from 8-10m. The overburden thickness varies from 1-2 m comprises soil and weathered rock. The bedrock part of slope forming material is weathered Gneiss. The land cover of the slope is either forest land or moderately vegetated land with coffee Plantation. The slides are caused mainly due to tampering of the natural slope for making road. The cut slope has failed due to antecedent rainfall condition and the resultant pore pressure build up.

3.2. Madikeri-Madapur-Somawarpet Road section of SH-27: Seven landslides (KA-642 to KA-648) were recorded in this Ghat section of about 31 km stretch. The slides are shallow with 0.5-1.0 m depth and mainly debris slide, one debris slump and a rock fall. The cut slope angle is 70° to 90° with height varying from 8-12.5m. The overburden thickness varies from 0.5-2.0 m comprises soil and weathered rock. The bedrock part of slope forming material is weathered Gneiss/ Gneiss. The land cover of the slope is either forest land or moderately vegetated land with coffee Plantation. The slides are caused mainly due to tampering of the natural slope for making road. The cut slope has failed due to antecedent rainfall condition and the resultant pore pressures build up.

3.3. Virajpet-Kakkabe-Bhagamandala SH-90: Four landslides (KA-649 to KA-652) were recorded in this Ghat section of about 24 km stretch. The slides are shallow with 0.5 m depth. The cut slope angle is 70° to 90° with height varying from 9-10.0m. The overburden thickness varies from 1-2.0 m comprises soil and weathered rock. The bedrock part of slope forming material is weathered Gneiss. The land cover of the slope is moderately vegetated land with coffee Plantation. The slides are caused mainly due to tampering of the natural slope for making road. The cut slope has failed due to antecedent rainfall condition and the resultant pore pressures build up.

3.4. Gonikoppa-Kutta-Nagarhole of SH-89: Two landslides (KA-653 to KA-654) were recorded in this Ghat section of about 31 km stretch. The slides are shallow with 0.5-1.0 m depth and mainly debris slide, one debris slump and a rock fall. The cut slope angle is 70° to 90°.The area is having undulating topography and mostly plain land with minimum cut slopes both in height and angle of cut. Only 2 old earth slumps(KA-653 to KA-654) noticed where the cut slope height is relatively higher around 10.0m. The overburden thickness varies from 0.5-2.0 m comprises soil and weathered rock. The bedrock part of slope forming material is weathered Gneiss. The land cover of the slope is moderately vegetated land with coffee Plantation. The slides are caused mainly due to tampering of the natural slope for making road. The cut slope has failed due to antecedent rainfall condition and the resultant pore pressures build up.

3.5. Karwar-Kaiga Road section of SH-06: Ten landslides (KA-655 to KA-664) were recorded in this Ghat section of about 50 km stretch. The slides are shallow with less than 2.0m depth. The

cut slope angle is 70° to 80° with height varying from 8-11.0m. The overburden thickness varies from 1-5.0 m comprises soil and weathered rock. The bedrock part of slope forming material is weathered Granite/granite/laterite/ weathered metabaslat. The land cover of the slope is mainly forest land, moderately vegetated with cashew and acacia Plantation. The slides are caused mainly due to tampering of the natural slope for making road. The cut slope has failed due to antecedent rainfall condition and the resultant pore pressures build up.

3.6. Karwar-Anshi road section of SH-93: Eighteen landslides (KA-665 to KA-682) were recorded in this Ghat section of about 50 km stretch. The slides are shallow with less than 2.0m depth. The cut slope angle is 70° to 80° with height varying from 8-11.0m. The overburden thickness varies from 1-5.0 m comprises soil and weathered rock. The bedrock part of slope forming material is weathered Granite/granite/laterite/ weathered metabaslat. The land cover of the slope is thickly vegetated forest area. The slides are caused mainly due to tampering of the natural slope for making road. The cut slope has failed due to antecedent rainfall condition and the resultant pore pressures build up.

3.7. Karwar-Goa border road section of NH-17: Two landslides (KA-683 to KA-684) were recorded in this Ghat section of about 10 km stretch. The slides are shallow with less than 2.0m depth. The slides are mainly rock slides near Sadashivgad wherein the slope is modified for road construction, some remedial measures have been given but still the slides are reactivated as whole stretch is not treated. The bedrock part of slope forming material is Granite. The slides are caused mainly due to tampering of the natural slope for making road.

3.8. Ankola-Yellapur road section of NH-63: This road section was partially covered in FS 2007-08 but not completely covered. So this section was again taken up for Inventory studies this year. Twenty-one landslides (KA-685 to KA-705) were recorded in this Ghat section of about 53km stretch. The slides are shallow with less than 2.0m depth. The cut slope angle is 70° to 80° with height varying from 8-15.0m. The overburden thickness varies from 1-4.0 m comprises soil and weathered rock. The bedrock part of slope forming material is weathered Granite/ Ultramafite/Phyllite/Argillite. The land cover of the slope is thickly vegetated forest area. The slides are caused mainly due to tampering of the natural slope for making road. The cut slope has failed due to antecedent rainfall condition and the resultant pore pressures build up.

3.9. Suntikoppa-Madapur Road section: No landslides were observed in this ghat road section for nearly 10 km distance.

3.10. Somawarpet- Kushalnagar Road section of SH-112: No landslides were observed in this ghat road section for nearly 26 km distance. The ghat stretch passes through Yadvanadu Reserved Forest area.

4. GENERAL CHARACTERISTICS OF LANDSLIDES STUDIED DURING 2013-14

4.1. Type of slides: A total of 68 landslide sites (KA-638 to KA-705) have been studied during F.S.2013-14. Out of 68 landslides, 43 slides are categorized under 'Debris slides', 15 under 'Debris' and 'Earth' slumps, 10 as 'Rock-falls'. Accordingly, the percentage distribution is depicted in Table 1 and graphically represented in Fig. 1.

Table 1: Type of landslides observed during 2013-14.

Type of slides	No of slide	%
Debris slide	43	63.24
Debris slump	9	13.24
Earth slump	6	8.82
Rock fall	10	14.71
Total	68	100

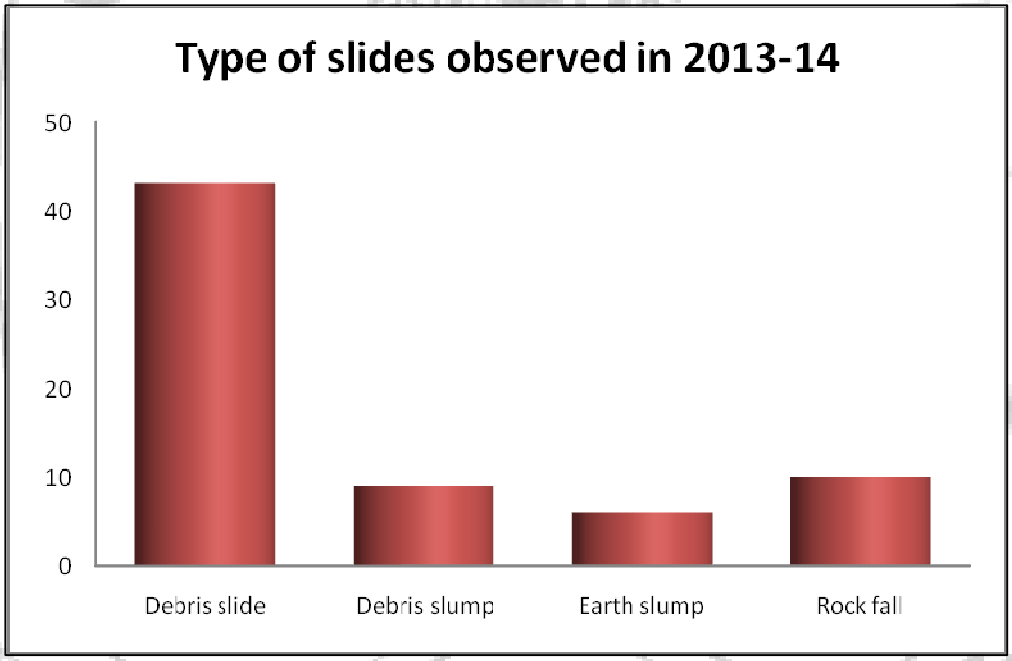

Fig 1: Type of landslides observed during 2013-14

Section-wise analysis of landslides reveals that Ankola-Yellapur section is having maximum number of debris slides (15 nos), closely followed by Karwar-Anshi section (11 nos). The Ankola-Yellapur section and Virajpet-Kakkabe-Bhagamandala has a maximum number of debris slumps (3 nos in each section). Karwar-Anshi has maximum number of rock falls (5 nos) followed by 2

nos in Karwar-Goa border section. Earth slumps were mainly observed two each in Gonikoppa-Kutta-Nagarhole and Karwar-Anshi road sections (Table 2 & 3).

Table 2: Type of landslides observed in each section

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
Debris slide	2	5	1	0	9	11	0	15
Debris slump	2	1	3	0	0	0	0	3
Earth slump	0	0	0	2	1	2	0	1
Rock fall	0	1	0	0	0	5	2	2
Total	4	7	4	2	10	18	2	21

Table 3: Percentage distribution of type of slides observed in each section

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
Debris slide	50.00	71.43	25.00	0.00	90.00	61.11	0.00	71.43
Debris slump	50.00	14.29	75.00	0.00	0.00	0.00	0.00	14.29
Earth slump	0.00	0.00	0.00	100.00	10.00	11.11	0.00	4.76
Rock fall	0.00	14.29	0.00	0.00	0.00	27.78	100.00	9.52
Total	100	100	100	100	100	100	100	100

4. 2. Dimensions of landslides: The dimensions in terms of length, width and depth of individual landslides and the percentages are presented in Table 4, 5 and graphically represented in Fig 2a, 2b and 2c. It can be noted from the table that 91.17 % of the slides are < 20.0 m in length and 61.76 % of the slides are < 20.0 m in width. With regard to depth, 92.65% of the slides are shallow with ≤1.0m depth. The dimensions of slides in each road sections are also presented in Table 6, 7, 8, 9, 10 and 11 with corresponding percentage distribution.

The Standard deviation of the dimensions of the observed landslides reveals that all the slides are shallow slides and the depth of failure varies between 0.5m and 2m.The Width of the slides varies over a wide range because of the fact that the multiple source/event slides are juxtaposed and difficult to delimit. The base length variation is mainly dependant on the cut slope height and

lateral progradation of the slides. Also the length of the slides is restricted by road cuttings and cut slope height considering very few slides which have extended below the roads (Fig 2d).

Table 4: Dimensions of landslides (length and widthwise) with percentage distribution observed during 2013-14

Length/ Width	No of Landslides	% distribution	No of Landslides	% distribution
≤10m	25	36.76	2	2.94
>10m≤20m	37	54.41	40	58.82
>20m≤30m	4	5.88	14	20.59
>30m≤40m	2	2.94	7	10.29
>40m≤50m	0	0.00	0	0.00
>50m	0	0.00	5	7.35
Total	68	100.00	68	100.00

Table 5: Dimensions of landslides (Depth wise) with percentage distribution observed during 2013-14

Depth	No of Landslides	% distribution
≤1.0m	63	92.65
>1.0m≤2.0m	5	7.35
>2.0m≤5.0m	0	0.00
>5.0m	0	0.00
Total	68	100.00

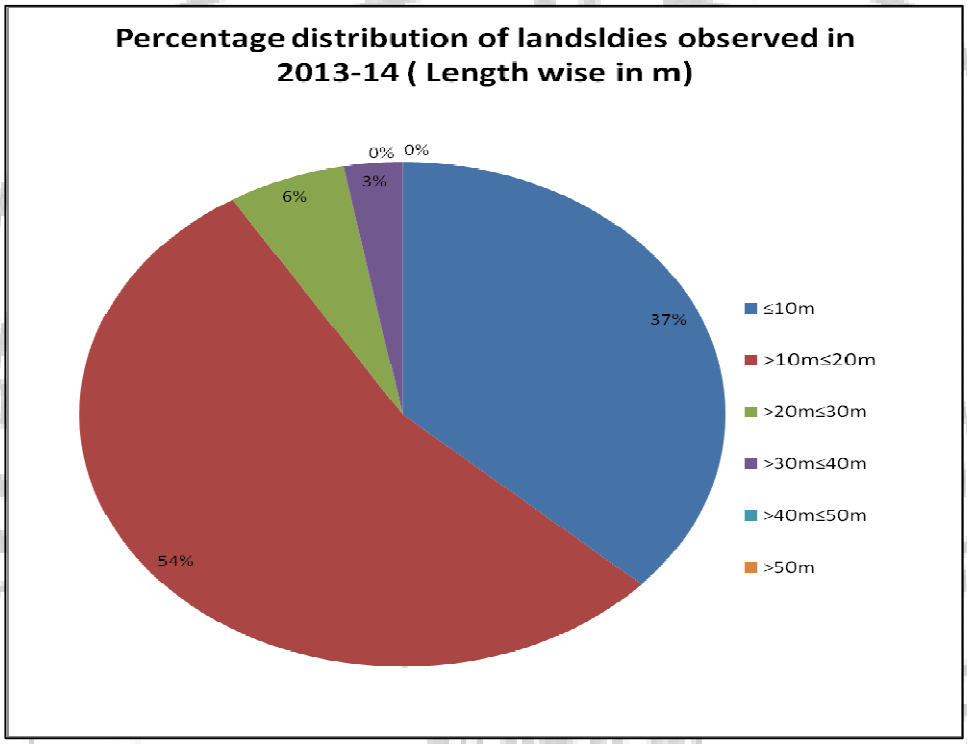

Fig 2a: Percentage distribution of landslides with respect to their length

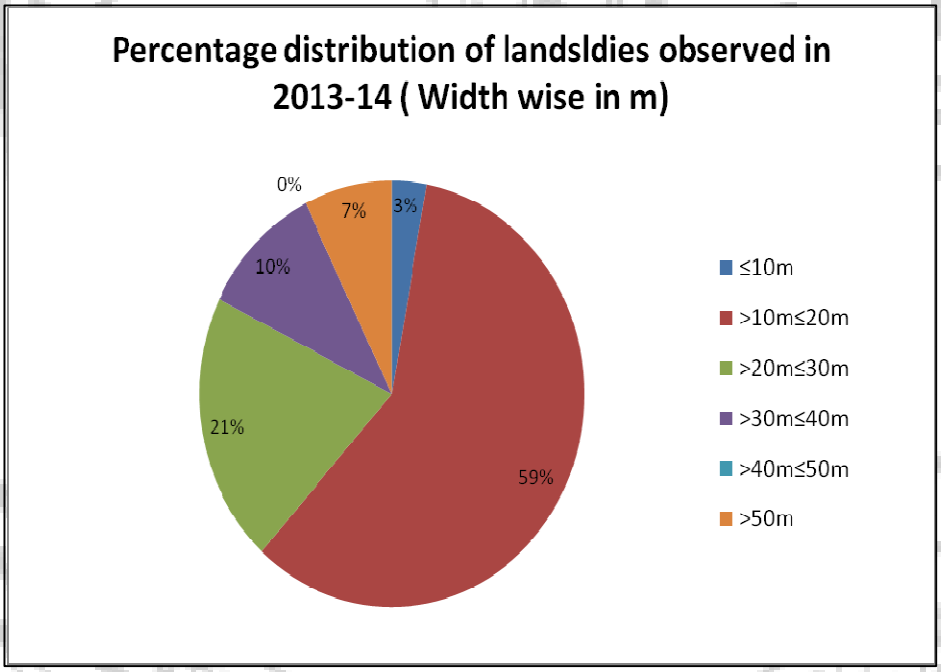

Fig 2b: Percentage distribution of landslides with respect to their width

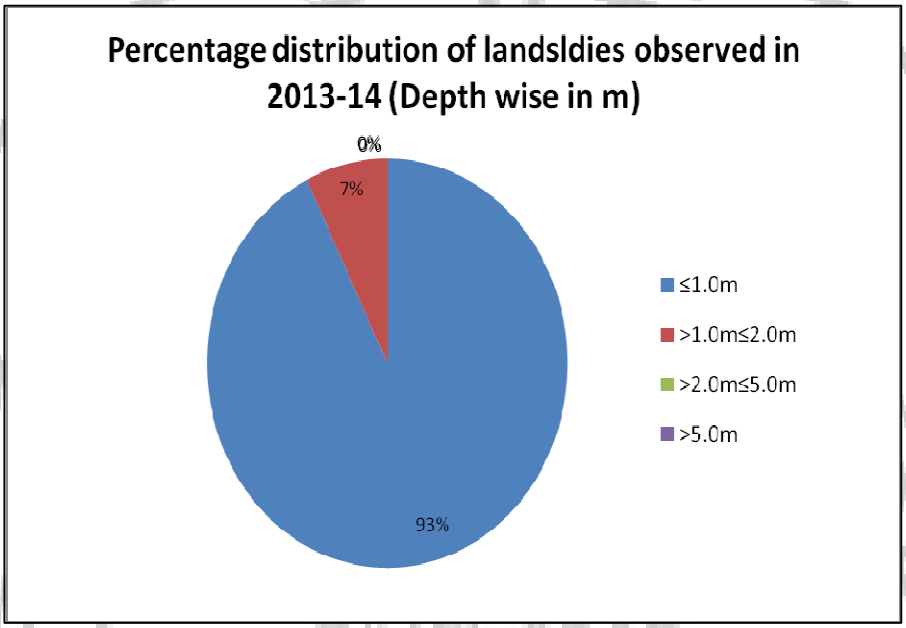

Fig 2c: Percentage distribution of landslides with respect to their depth

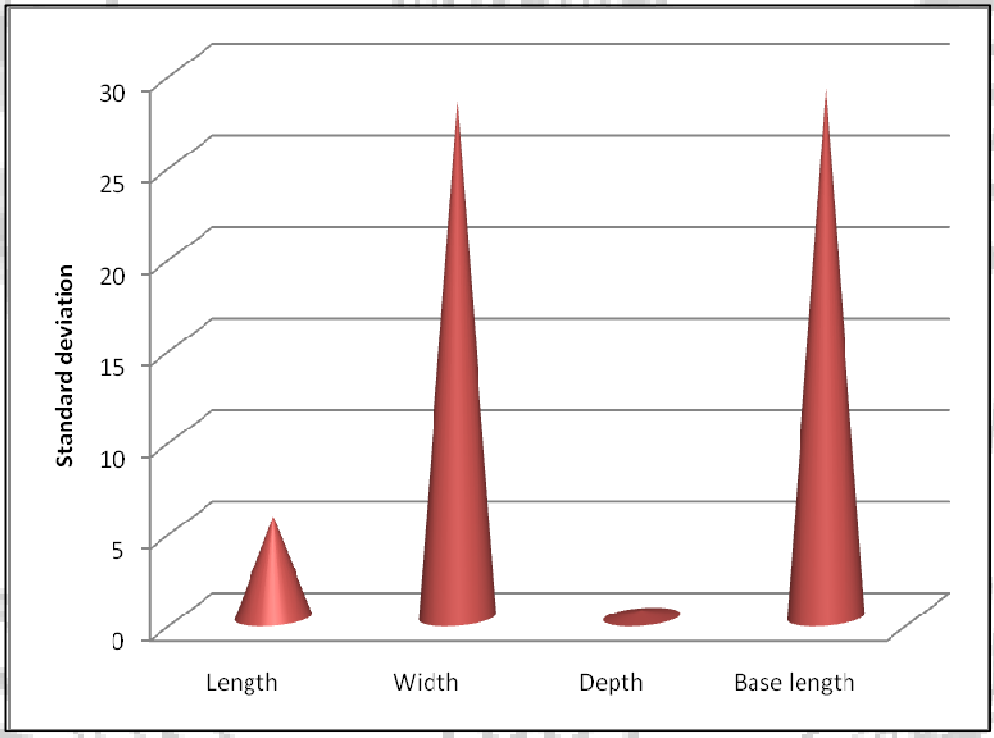

Fig 2d: Standard deviation of the basic dimensions of the landslides observed during 2013-14

Table 6: Dimension of slides in each section (length in m)

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
≤10m	3	2	3	2	3	7	0	5
>10m≤20m	1	5	1	0	6	11	0	13
>20m≤30m	0	0	0	0	1	0	0	3
>30m≤40m	0	0	0	0	0	0	2	0
>40m≤50m	0	0	0	0	0	0	0	0
>50m	0	0	0	0	0	0	0	0
Total	4	7	4	2	10	18	2	21

Table 7: Percentage distribution of dimension of slides in each section (length in m)

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
≤10m	75.00	28.57	75.00	100.00	30.00	38.89	0.00	23.81
>10m≤20m	25.00	71.43	25.00	0.00	60.00	61.11	0.00	61.90
>20m≤30m	0.00	0.00	0.00	0.00	10.00	0.00	0.00	14.29
>30m≤40m	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
>40m≤50m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
>50m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 8: Dimension of slides in each section (width in m)

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
≤10m	0	0	0	0	0	2	0	0
>10m≤20m	3	5	2	2	6	13	0	9
>20m≤30m	1	0	2	0	3	2	0	6
>30m≤40m	0	2	0	0	1	0	0	4
>40m≤50m	0	0	0	0	0	0	0	0
>50m	0	0	0	0	0	1	2	2
Total	4	7	4	2	10	18	2	21

Table 9: Percentage distribution of dimension of slides in each section (width in m)

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
≤10m	0.00	0.00	0.00	0.00	0.00	11.11	0.00	0.00
>10m≤20m	75.00	71.43	50.00	100.00	60.00	72.22	0.00	42.86
>20m≤30m	25.00	0.00	50.00	0.00	30.00	11.11	0.00	28.57
>30m≤40m	0.00	28.57	0.00	0.00	10.00	0.00	0.00	19.05
>40m≤50m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
>50m	0.00	0.00	0.00	0.00	0.00	5.56	100.00	9.52
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 10: Dimension of slides in each section (depth in m)

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
≤1.0m	4	7	4	2	9	18	0	19
>1.0m≤2.0m	0	0	0	0	1	0	2	2
>2.0m≤5.0m	0	0	0	0	0	0	0	0
>5.0m	0	0	0	0	0	0	0	0
Total	4	7	4	2	10	18	2	21

Table 11: Percentage distribution of dimension of slides in each section (depth in m)

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
≤1.0m	100.00	100.00	100.00	100.00	90.00	100.00	0.00	90.48
>1.0m≤2.0m	0.00	0.00	0.00	0.00	10.00	0.00	100.00	9.52
>2.0m≤5.0m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
>5.0m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

4.3.Bedrock Geology: A large majority of the landslides have occurred where bedrock is granite/weathered granite amounting to a total of 29 slides, forming 42.65 % of the total slides. This is followed by Gneiss/weathered gneiss totaling 17 slides that constitute around 25.00%. Weathered phyllite as bed rock was observed in 8 slides and constituting 11.76% of the total slides. 4 slides were seen where the bedrock is metabaslat and laterite (5.88% of the total respectively) and 3 slides are seen on argillite/weathered argillite and weathered ultramafite (4.41% of the total respectively) (Table 12).

Table 12: Bed rock Geology of slides observed during 2012-13

Bed rock geology	No of landslides	%
Gneiss/Weathered Gneiss	17	25.00
Granite/Weathered granite	29	42.65
Metabasalt	**4**	5.88
Argillite/Weathered argillite	3	4.41
Weathered phyllite	8	11.76
Weathered ultramafite	3	4.41
Laterite	4	5.88
Total	**68**	**100.00**

4.4. Depth/length (D/L) ratio: The depth to length ratio (D/L) for most of the slides fall in between 0.04 to 0.08indicating their 'shallow depth'. One slide in Karwar-Kaiga falling in SH-06 is relatively deep landslide with D/L ratio exceeding 0.1 (Fig 3).

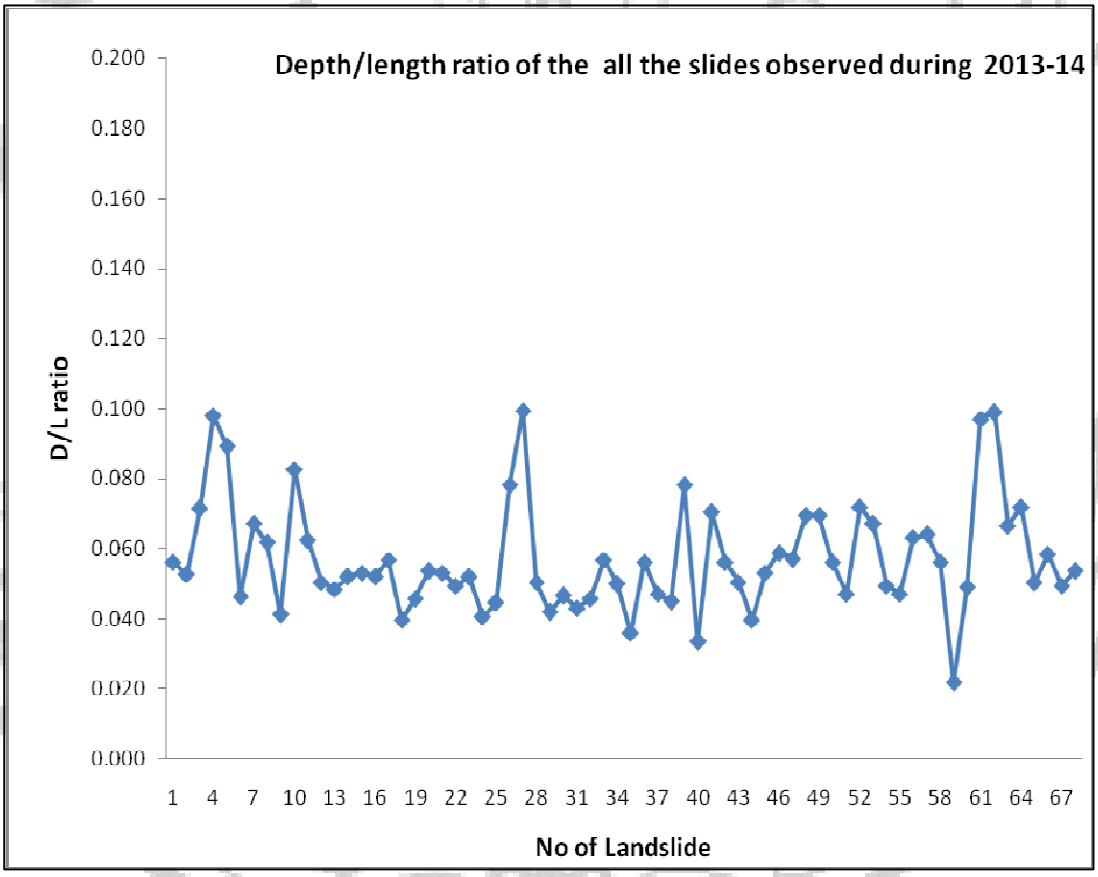

Fig 3: Depth/length ratio of all slides observed during 2013-14

4.5. History of landslides: Due to the lack of data on the date of occurrence of landslides the age of landslide is difficult to arrive at; therefore history was taken on the morphological features observed on hill slopes. The landslides with fresh surface having less vegetation on debris was categorized as new slides and rest are grouped as old slides. As regard to reactivated ones, the old slides wherein new slides developed are considered along with the slides wherein authorities have provided some remedial measures but still then failed are also grouped under reactivated ones. Most of the landslides in the area are grouped as Old and reactivated slides with total of 31 failures constituting around 45.59%. The fact that reactivation of old slides suggest that the slides are recurring problem due to non-provision of suitable treatment measures. The new slides are eight in number constituting 11.76% of the total may suggest the slopes were at the threshold of instability in which failures started after a certain excedance of pore water pressure in slope forming material. The old slides are 29 in number constituting around 42.65% of the total slides (Table 13).

Table 13: Number of landslides observed during 2013-14 according to their history

History of slides	No of slide	%
New	8	11.76
Old	29	42.65
Old and reactivated	31	45.59
Total	68	100.00

Table 14: Number of landslides in each section observed during 2013-14 according to their history

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
New	1	0	0	0	1	2	0	4
Old	2	2	2	2	5	10	0	6
Old and Reactivated	1	5	2	0	4	6	2	11
Total	4	7	4	2	10	18	2	21

Table 15: Percentage distribution of landslides according to their history during each section observed during 2013-14

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
New	25.00	0.00	0.00	0.00	10.00	11.11	0.00	19.05
Old	50.00	28.57	50.00	100.00	50.00	55.56	0.00	28.57
Old and Reactivated	25.00	71.43	50.00	0.00	40.00	33.33	100.00	52.38
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

History of landslides in each road section reveals that majority of new slides have occurred in Ankola-Yellapur and Karwar-Anshi road sections (4 & 2 slides respectively) constituting around 19.05 & 11.1% respectively of the total slides in those sections. Old slides are seen in every section maximum being in Karwar-Anshi (10 slides) amounting to 55.56% of the total slides in that section. The old and reactivated slides are seen maximum in Ankola-Yellapur road section where 11 such slides are recorded constituting around 52.38% of total slides in the road section and also in Madikeri-Madapur-Somawarpet section 5 in number constituting around 71.43% of total slides in the road section (Table 14, 15).

4.6. Cut slope heights: Majority of the slides totaling 68 observed during the study have cut slope heights ranging between 5 m and 15 m. Such slides constitute around 91.18 % of total slides. This is followed by >15m and ≤20m cut slopes accounting for 4 slides constituting around 5.88% of total slides. Two slides have cut slopes >20m and ≤ 25m constituting around 2.94% of total slides (Table 16, 17 and 18, Fig 4).

Table 16: Number of landslides observed during 2013-14 with different cut slope height

Cut slope Heights	No of slides	%
≤5m	0	0.00
>5m≤10m	34	50.00
>10m≤15m	28	41.18
>15m≤20m	4	5.88
>20m≤25m	2	2.94
>25m	0	0.00
Total	68	100.00

Table 17: Number of landslides in each section observed during 2013-14 with different cut slope height

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
≤5m	0	0	0	0	0	0	0	0
>5m≤10m	3	2	4	2	5	9	0	9
>10m≤15m	1	5	0	0	5	9	0	8
>15m≤20m	0	0	0	0	0	0	0	4
>20m≤25m	0	0	0	0	0	0	2	0
>25m	0	0	0	0	0	0	0	0
Total	4	7	4	2	10	18	2	21

Table 18: Percentage distribution of cut slope heights of slides in each section observed during 2013-14

	Madikeri-Suntikoppa road section (SH-88)	Madikeri-Madapur-Somwarpet road section(SH-27)	Virajpet-Kakkabe-Bhaghamanadala road section(SH-90)	Gonikoppa-Kutta-Nagarhole road section(SH-89)	Karwar-Kaiga road section(SH-06)	Karwar-Aanshi road section(SH-93)	Karwar-Goa border rosd section(NH-17)	Ankola-Yellapur road section (NH-63)
≤5m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
>5m≤10m	75.00	28.57	100.00	100.00	50.00	50.00	0.00	42.86
>10m≤15m	25.00	71.43	0.00	0.00	50.00	50.00	0.00	38.10
>15m≤20m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.05
>20m≤25m	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
>25m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

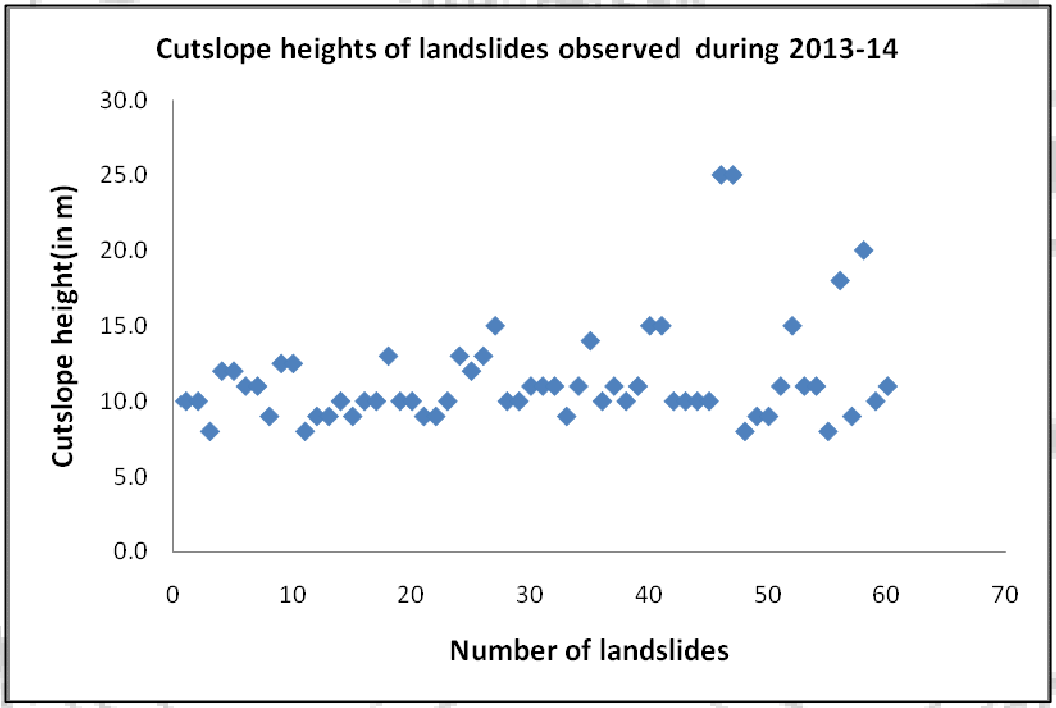

Fig 4: Cut slope heights of slides observed during 2013-14

5. SUMMARY

1. Almost all landslides studied in the area appear to have caused due to the human interference in modifying the existing natural slopes. The specific causes of landslides in Western Ghat in general as well the study area in particular are removal of lateral support by 'toe cutting' of hill slopes for the construction of road, for human settlement, presence of weathered and loose rock mass, heavy and frequent rain etc.
2. All slides are triggered by heavy rainfall mainly in rainy seasons extending for 4 months from June to September. The ubiquitous presence of water is favorable for intense weathering of rocks causing appreciable drop in their shearing resistance. The heavy rainfall during monsoon is the major triggering factor for all the slides.
3. Majority of the slides studied are 'debris slides' totaling to 43 slides constituting around 63.24%. 'Slumps' - both debris as well as earth are 15 in number, constituting 22.06% of the total slides. Incidence of 'rock falls' is 10, constituting 14.71% of the total number. The 'debris slides' were mainly noticed in Ankola-Yellapur section (15 nos), followed by Karwar-Anshi section (11 nos). In general, there is a close correlation with the cut slope height and debris slides. Where cut slope height is relatively higher, the dominance of debris slides are noticed and small cut slope height and almost vertical to sub vertical slope angle may be attributed for the occurrence of debris slump and earth slumps.
4. Ten 'rock falls' were mainly noticed in Karwar-Anshi section(5 nos) and Karwar-Goa border section(2 nos), and two in Ankola-Yellapur section. The rock falls are mainly planar/wedge failure types attributed to formation of wedge blocks due to intersecting joints.
5. Majority of the slides are small in dimension, Around 91.17% of the slides observed are less than 20 m in length and all such slides are shallow with less than 2m depth. The width of the slides varies over a wide range probably related to multiple sources and lateral grading of slides. Such slides are juxtaposed and difficult to delimit.
6. Majority of the landslides are confined to where bedrock is granite/weathered granite amounting to a total of 29 slides, forming 42.65 % of the total slides. This is followed by Gneiss/weathered gneiss totaling 17 slides that constitute around 25.00%. Weathered phyllite as bed rock was observed in 8 slides and constituting 11.76% of the total slides. 4 slides were seen where the bedrock is metabaslat and laterite (5.88% of the total respectively) and 3 slides are seen on argillite/weathered argillite and weathered ultramafite (4.41% of the total respectively).
7. Majority of the slides studied occurred on cut slope with heights above 5 m and less than 15 m (62 slides or 91.18 % of total slides) .
8. Due to lack of information on date of occurrence the landslides were categorized as new, old and reactivated based on the freshness of the rupture and height and nature of vegetation growth on slide debris. As regard to reactivated ones, the old slides wherein new slides are developed are considered along with the slides wherein authorities have provided some remedial measures but still then failed are grouped under reactivated ones. Most of the landslides in the area are grouped as old and reactivated slides totaling 31 constituting around 45.59% of the total slides. The new slides are eight in number constituting 11.76% of the total and the old slides are 29 in number constituting around 42.65% of the total slides

9. The depth to length ratio (D/L) for most of the slides fall in between 0.04 to 0.08 indicating 'shallow depth'. One slide in Karwar-Kaiga falling in SH-06 is relatively deep landslide with D/L ratio exceeding 0.1.
10. Cut slope angle and height appear to have played a major role in slope failure.
11. The overburden thickness is around 1-4 m consisting of mostly soil and weathered rock in most of the cases.

6. RECOMMENDATIONS

In order to minimize landslide occurrences, the following measures in general are recommended although slide specific recommendations are given for each slide.

1 Provision and maintenance of drainages. The drainage is seen blocked or absent in around 60% of the affected areas. The water from uphill slope needs to be diverted in the following ways in order to minimize sliding.

a. Provision of contour drainage at the crown part.

b. Provision of toe drainages along toe of the cut walls. Insertion of horizontal perforated pipes into the slopes which will drain subsurface water and reduce the pore pressure. The spacing may be decided suitable to the site condition. The spacing may be decided suitable to the site condition.

2. Avoidance of steep/ sub vertical cuts, instead engineered cut in such terrain.
3. Restraining structures like retaining structures like retaining wall, stone pitching are recommended as per the site condition.

4. Bio geotechnical measures of slope protection like turfing with vetiver grass.

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SYNOPSIS OF WORK DONE

<table>
<tr><td>1.</td><td>Title of the report</td><td>LANDSLIDE INVENTORY ALONG NH & SH OF GHAT ROADS IN COORG AND UTTAR KANNADA DISTRICTS, KARNATAKA</td></tr>
<tr><td>2.</td><td>Item No.</td><td>LHZ/ SR/ KG/2013/070</td></tr>
<tr><td>3</td><td>Field Season</td><td>2013-14</td></tr>
<tr><td>4</td><td>Date of commencement</td><td>April 2013</td></tr>
<tr><td>5</td><td>Date of completion</td><td>March 2014</td></tr>
<tr><td>6</td><td>Officers Associated with investigation</td><td>K.V.Maruthi, Superintending Geologist</td></tr>
<tr><td>7</td><td colspan="2">Quantum of work done
<table>
<tr><th>Nature of Work</th><th>Total work envisaged</th><th>Work proposed for FS: 2013-14</th><th>Work completed</th></tr>
<tr><td>Aerial photo / Image interpretation</td><td>500 sq.km</td><td>500 Sq.km</td><td>500 Sq.km</td></tr>
<tr><td>Inventory in 1:50,000 scale</td><td>250 L km
(At least 1 km on either side of the road)</td><td>263 L. Km
(68 Landslide incidences)</td><td>263 L. Km
(68 Landslide incidences)</td></tr>
</table></td></tr>
<tr><td>8</td><td>Expenditure
(1) POL
(2) Wages
(3) Misc./other charges</td><td>
Rs 5773=00
Rs. 5376=00
Rs. 24,270=00(Including charges for hiring vehicle)</td></tr>
<tr><td>9</td><td>Other information if any</td><td>----</td></tr>
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						Deg	Min	Sec	Deg	Min	Sec																
MADIKERI-SUNTIKOPPA SECTION (SH-88)																											
KA-638	Karnataka	Coorg	48P/15	KNCRG48P1520130638	SH-88 /1.2 km from Madikeri towards Suntikoppa	12	25	6.8	75	44	29.5	8.90	11.80	9.5	105.0	0.5	26.3	10.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 10.0m. The slide direction is 275^0
KA-639	Karnataka	Coorg	48P/15	KNCRG48P1520130639	SH-88/ 3.2 km from Madikeri towards Suntikoppa	12	25	47.8	75	45	29.9	9.50	28.00	10.0	266.0	0.5	66.5	10.0	Soil	Slump	Slow	Reactivated	Widening	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 10.0m. The slide direction is 275^0
KA-640	Karnataka	Coorg	48P/15	KNCRG48P1520130640	SH-88/ 4.8 km from Madikeri towards Suntikoppa	12	25	39.3	75	45	35.3	7.00	10.10	8.0	70.7	0.5	17.7	9.0	Soil	Slump	Slow	Dormant	Widening	Single	Rotational	New	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 8.0m. The slide direction is 275^0
KA-641	Karnataka	Coorg	48P/15	KNCRG48P1520130641	SH-88/After Bykeri 0.5 km towards Suntikoppa	12	25	47.5	75	46	59.8	10.20	20.00	11.0	204.0	1.0	102.0	12.0	Debris-cum-soil	Slide	Moderate	Dormant	Widening	Single	Transitional	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 12.0m. The slide direction is 275^0
MADIKERI-MADAPUR-SOMAWARPET SECTION (SH-27)																											
KA-642	Karnataka	Coorg	48P/15	KNCRG48P1520130642	SH-27 / 2.0 km after makandur village towards Somwarpet.	12	26	12.6	75	45	42	11.20	11.60	12.0	129.9	1.0	65.0	12.0	Debris	Slide	Slow	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 12.0m. The slide direction is 275^0
KA-643	Karnataka	Coorg	48P/15	KNCRG48P1520130643	SH-27 / 2.8 km after makandur village towards Somwarpet.	12	26	20	75	45	40.6	10.80	11.00	11.0	118.8	0.5	29.7	12.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 11.0m. The slide direction is 275^0
KA-644	Karnataka	Coorg	48P/15	KNCRG48P1520130644	SH-27 /25 m from Slide no KA-643 towards Somwarpet.	12	26	21.3	75	45	41.3	14.90	18.60	16.0	277.1	1.0	138.6	16.0	Debris	Slide	Moderate	Reactivated	Widening	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 11.0m. The slide direction is 280^0
KA-645	Karnataka	Coorg	48P/14	KNCRG48P1520130645	SH-27 /Near Balaji coffee estate.	12	27	37.1	75	46	37.6	8.10	13.60	10.0	110.2	0.5	27.5	10.0	Debris	Slump	Slow	Reactivated	Confined	Single	Transitional	Old	Topographically the area is having undulating topography and the slide is located on a cutslope. The general slope gradient is around 16^0. The cutslope height is 9.0m. The slide direction is 45^0
KA-646	Karnataka	Coorg	48P/14	KNCRG48P1520130646	SH-27 /Near 44 KM stone	12	27	53.5	75	46	33.6	12.10	30.10	13.0	364.2	0.5	91.1	13.5	Debris	Slide	Slow	Reactivated	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a cutslope. The general slope gradient is around 18^0. The cutslope height is 12.5m. The slide direction is 25^0
KA-647	Karnataka	Coorg	48P/14	KNCRG48P1520130647	SH-27/ 1 km after slide no KA-646 towards Somwarpet.	12	27	53.4	75	46	27	12.10	31.30	13.0	378.7	1.0	189.4	14.0	Debris	Slide	Moderate	Reactivated	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 12.5m. The slide direction is 270^0
KA-648	Karnataka	Coorg	48P/14	KNCRG48P1520130648	SH-27/ Near karakolli Estate.	12	33	39	75	50	56.5	8.00	14.60	9.0	116.8	0.5	29.2	9.0	Rock-cum-debris	Falls	Moderate	Dormant	Confined	Single	Transitional	Old	Topographically the area is having undulating topography and the slide is located on a cutslope. The general slope gradient is around 20^0. The cutslope height is 8.0m. The slide direction is 335^0
VIRAJPET-KAKKABE-BHAGHMANDALA SECTION (SH-90)																											
KA-649	Karnataka	Coorg	48P/12	KNCRG48P1520130649	SH-90/ 5 km from Kadnur towards Napoklu	12	13	20.2	75	43	34.7	9.90	17.20	11.0	170.3	0.5	42.6	11.0	Debris	Slump	Slow	Dormant	Confined	Single	Rotational	Old	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around 18^0. The cutslope height is 9.0m. The slide direction is 315^0
KA-650	Karnataka	Coorg	48P/12	KNCRG48P1520130650	SH-90 / 2 km after slide no KA-649 towards Napoklu	12	13	0.2	75	42	10.8	10.30	24.70	11.0	254.4	0.5	63.6	12.0	Debris	Slump	Slow	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around 18^0. The cutslope height is 9.0m. The slide direction is 10^0

KA-651	Karnataka	Coorg	48P/12	KNCRG48P1520130651	SH-90/ 6 km after Cheyyanadne towards Napoklu.	12	14	38.8	75	38	54.6	9.60	20.70	10.0	198.7	0.5	49.7	11.0	Debris	Slump	Slow	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around $17^{0.}$ The cutslope height is 10.0m. The slide direction is 45^{0}
KA-652	Karnataka	Coorg	48P/12	KNCRG48P1520130652	SH-90 / 150-200 m from slide no KA-651 towards Napoklu.	12	14	41.5	75	38	51.4	9.40	10.70	10.0	100.6	0.5	25.1	10.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around $18^{0.}$ The cutslope height is 9.0m. The slide direction is 90^{0}
GONIKOPPA-KUTTA-NAGARHOLE SECTION (SH-89)																											
KA-653	Karnataka	Coorg	58A/1	KNCRG48P1520130653	SH-89 / 5 km from Srimangala towards Kutta.	12	0	19.5	76	0	17.9	9.60	14.90	10.0	143.0	0.5	35.8	10.5	Soil	Slump	Slow	Dormant	Confined	Single	Rotational	Old	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around $15^{0.}$ The cutslope height is 10.0m. The slide direction is 215^{0}
KA-654	Karnataka	Coorg	58A/1	KNCRG48P1520130654	SH-89 / 20-30 m from slide no KA-653 towards Kutta.	12	0	18.5	76	0	18.5	8.80	10.30	10.0	90.6	0.5	22.7	10.0	Soil	Slump	Slow	Dormant	Confined	Single	Rotational	Old	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around $15^{0.}$ The cutslope height is 10.0m. The slide direction is 213^{0}
KARWAR-KAIGA SECTION (SH-06)																											
KA-655	Karnataka	Uttar Kannada	48J/5	KNUKAN48P1520130655	SH-06/900 m from Kaiga gate towrads Kadra.	14	51	59.2	74	24	59.4	12.60	13.10	11.0	165.1	0.5	41.3	13.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a cutslope. The general slope gradient is around $20^{0.}$ The cutslope height is 13.0m. The slide direction is 325^{0}
KA-656	Karnataka	Uttar Kannada	48J/5	KNUKAN48P1520130656	SH-06/1 km from Kunchegar village towrads Kadra.	14	53	8.8	74	22	7.8	10.90	23.80	11.0	259.4	0.5	64.9	12.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around $20^{0.}$ The cutslope height is 10.0m. The slide direction is 90^{0}
KA-657	Karnataka	Uttar Kannada	48J/5	KNUKAN48P1520130657	SH-06 /2 km from Slide no KA-656 towrads Kadra.	14	53	32.8	74	21	12.9	9.30	18.20	10.0	169.3	0.5	42.3	10.0	Debris	Slide	Moderate	Suspended	Confined	Single	Rotational	Old and reactivated	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around $20^{0.}$ The cutslope height is 10.0m. The slide direction is 20^{0}
KA-658	Karnataka	Uttar Kannada	48J/5	KNUKAN48P1520130658	SH-06 /400-500 m from Slide no KA-657 towrads Kadra.	14	53	38.5	74	21	2.7	9.40	30.20	10.0	283.9	0.5	71.0	10.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around $20^{0.}$ The cutslope height is 9.0m. The slide direction is 346^{0}
KA-659	Karnataka	Uttar Kannada	48J/5	KNUKAN48P1520130659	SH-06 / 3 km from mallapur towards Karwar.	14	53	25.8	74	17	43.9	10.10	11.20	11.0	113.1	0.5	28.3	11.0	Debris	Slide	Slow	Dormant	Confined	Single	Rotational	Old	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around $20^{0.}$ The cutslope height is 9.0m. The slide direction is 330^{0}
KA-660	Karnataka	Uttar Kannada	48J/5	KNUKAN48P1520130660	SH-06 / near Km stone-35	14	53	27.8	74	16	40.8	9.60	14.30	10.0	137.3	0.5	34.3	10.5	Debris	Slide	Moderate	Suspended	Confined	Single	Rotational	New	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around $18^{0.}$ The cutslope height is 10.0m. The slide direction is 152^{0}
KA-661	Karnataka	Uttar Kannada	48J/5	KNUKAN48P1520130661	SH-06 / near Km stone-25	14	51	11.9	74	15	30.4	12.30	15.10	13.0	185.7	0.5	46.4	13.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around $18^{0.}$ The cutslope height is 13.0m. The slide direction is 281^{0}
KA-662	Karnataka	Uttar Kannada	48J/5	KNUKAN48P1520130662	SH-06 / 3 km after slide no KA-661	14	51	16.6	74	15	29	11.20	12.60	11.0	141.1	0.5	35.3	12.0	Debris	Slump	Slow	Suspended	Enlarging	Multiple	Transitional	Old and reactivated	Topographically the area is having rolling topography and the slide is located on a cutslope. The general slope gradient is around $18^{0.}$ The cutslope height is 12.0m. The slide direction is 65^{0}
KA-663	Karnataka	Uttar Kannada	48J/1	KNUKAN48P1520130663	SH-06 / 3 km after siddar village towards Karwar.	14	50	49.1	74	12	7.9	12.80	21.90	13.0	280.3	1.0	140.2	13.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having rolling topography and the slide is located on a spur. The general slope gradient is around $17^{0.}$ The cutslope height is 13.0m. The slide direction is 19^{0}

KA-664	Karnataka	Uttar Kannada	48J/1	KNUKAN48P152013 0664	SH-06 / Near Mundaralli village	14	56	48.4	74	10	58.7	20.10	30.00	18.0	603.0	2.0	603.0	22.0	Debris	Slide	Moderate	Stablized	Confined	Single	Rotational	Old	Topographically the area is having rolling topography and the slide is located on a spur. The general slope gradient is around 17^0. The cutslope height is 15.0m. The slide direction is 340^0
			KARWAR-ANSHI SECTION (SH-93)																								
KA-665	Karnataka	Uttar Kannada	48J/1	KNUKAN48P152013 0665	SH-93 / 2 km after Hankon village from Karwar towards Anshi.	14	53	12	74	9	53.8	9.90	28.80	11.0	285.1	0.5	71.3	11.0	Debris	Slump	Slow	Suspended	Enlarging	Multiple	Rotational	Old	Topographically the area is having rolling topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 10.0m. The slide direction is 335^0
KA-666	Karnataka	Uttar Kannada	48J/1	KNUKAN48P152013 0666	SH-93 / 2 km after Asnoti village from Karwar towards Anshi.	14	54	1.5	74	11	50.7	11.90	12.60	12.0	149.9	0.5	37.5	13.0	Debris	Slide	Slow	Reactivated	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 10.0m. The slide direction is 325^0
KA-667	Karnataka	Uttar Kannada	48J/1	KNUKAN48P152013 0667	SH-93 / 1 km after slide no KA-666 towrads Anshi.	14	54	31.8	74	12	14.9	10.70	11.90	11.0	127.3	0.5	31.8	12.0	Debris	Slide	Slow	Reactivated	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a cutslope. The general slope gradient is around 20^0. The cutslope height is 11.0m. The slide direction is 105^0
KA-668	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0668	SH-93 / Near Hapkarni Village.	14	54	49.2	74	15	26	11.60	13.90	11.0	161.2	0.5	40.3	13.0	Debris	Slide	Slow	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a cutslope. The general slope gradient is around 18^0. The cutslope height is 11.0m. The slide direction is 125^0
KA-669	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0669	SH-93 / 5 k from Ghotegali village towards Anshi.	14	55	28.6	74	21	3.4	10.90	12.80	11.0	139.5	0.5	34.9	11.0	Debris	Slide	Moderate	Reactivated	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 11.0m. The slide direction is 265^0
KA-670	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0670	SH-93 / 1 km after Kadra cross towards Anshi.	14	55	31.9	74	21	4.8	8.80	9.60	9.0	84.5	0.5	21.1	8.0	Rock-cum-debris	Falls	Moderate	Suspended	Confined	Single	Transitional	New	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 19^0. The cutslope height is 9.0m. The slide direction is 90^0
KA-671	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0671	SH-93 /200-250 m from slide no KA-670 towrads Anshi.	14	55	27.5	74	21	11.3	10.00	24.00	11.0	240.0	0.5	60.0	11.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 11.0m. The slide direction is 140^0
KA-672	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0672	SH-93 / 2.5 Km from slide no KA-671 towards Anshi.	14	55	41.3	74	21	17.1	13.90	9.60	14.0	133.4	0.5	33.4	14.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 14.0m. The slide direction is 235^0
KA-673	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0673	SH-93 / 1.5 Km from slide no KA-672 towards Anshi.	14	55	47.7	74	21	19.8	8.90	10.10	9.0	89.9	0.5	22.5	11.0	Rock-cum-debris	Falls	Moderate	Dormant	Confined	Single	Transitional	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 10.0m. The slide direction is 275^0
KA-674	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0674	SH-93 / 100-150 m from slide no KA-673 towards Anshi.	14	55	49.8	74	21	26.6	10.60	11.30	9.0	119.8	0.5	29.9	12.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 11.0m. The slide direction is 350^0
KA-675	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0675	SH-93 / 2 km from slide no KA-674 towards Anshi.	14	56	8.5	74	21	27.9	11.10	12.10	11.5	134.3	0.5	33.6	12.0	Debris	Slide	Slow	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 20^0. The cutslope height is 10.0m. The slide direction is 330^0
KA-676	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0676	SH-93 /1 km from slide no KA-675 towards Anshi.	14	56	11.3	74	21	36.8	12.8	13.1	13.0	167.7	1.0	83.8	13.0	Rock-cum-debris	Falls	Moderate	Suspended	Confined	Single	Transitional	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 20^0. The cutslope height is 11.0m. The slide direction is 300^0
KA-677	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0677	SH-93 /600-700 m from slide no KA-675 towards Anshi.	14	56	20.9	74	21	39.8	14.90	18.10	15.0	269.7	0.50	67.4	15.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 20^0. The cutslope height is 15.0m. The slide direction is 300^0
KA-678	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0678	SH-93 /3 km from slide no KA-676 towards Anshi.	14	56	43	74	21	40.6	14.20	16.80	15.0	238.6	1.00	119.3	15.0	Rock-cum-debris	Falls	Slow	Suspended	Confined	Single	Transitional	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 20^0. The cutslope height is 15.0m. The slide direction is 270^0

KA-679	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0679	SH-93 /Near KM stone 123	14	58	16.5	74	22	15.1	8.90	15.90	9.0	141.5	0.50	35.4	10.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	New	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 10.0m. The slide direction is 275^0
KA-680	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0680	SH-93 /1.8 km from slide no KA-678 towards Anshi.	14	56	59.4	74	21	53	9.90	11.60	13.0	114.8	0.50	28.7	10.5	Debris	Slide	Slow	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 10.0m. The slide direction is 295^0
KA-681	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0681	SH-93 /Near KM stone 125	14	57	36.1	74	22	18	12.60	120.00	13.0	1512.0	0.50	378.0	13.0	Rock-cum-debris	Falls	Slow	Suspended	Confined	Single	Transitional	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 17^0. The cutslope height is 10.0m. The slide direction is 165^0
KA-682	Karnataka	Uttar Kannada	48J/5	KNUKAN48P152013 0682	SH-93 /Near KM stone 122	14	58	28.7	74	22	13.2	9.40	13.90	10.0	130.7	0.50	32.7	10.0	Debris	Slump	Slow	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 22^0. The cutslope height is 10.0m. The slide direction is 255^0
KARWAR-GOA BORDER SECTION (NH-17)																										
KA-683	Karnataka	Uttar Kannada	48J/1	KNUKAN48P152013 0683	NH-17 / after Sadashivagad bridge From Karwar towards Goa.	14	50	49.4	74	7	53.7	34.00	150.00	85.0	5100.0	2.00	5100.0	40.00	Rock-cum-debris	Falls	Very Rapid	Suspended	Confined	Single	Transitional	Old and reactivated	Topographically the area is having Plain topography after the bridge the hillock has been cut and the road was made and the slide is located on a cutslope. The general slope gradient is around 18^0. The cutslope height is 25.0m. The slide direction is 275^0

KA-684	Karnataka	Uttar Kannada	48J/1	KNUKAN48P152013 0684	NH-17 / after Sadashivagad bridge From Karwar towards Goa(on the other side of the road).	14	50.0	49.0	74	7	53	35.00	152.00	85.0	5320.0	2.00	5320.0	40.00	Rock-cum-debris	Falls	Very Rapid	Suspended	Confined	Single	Transitional	Old and reactivated	Topographically the area is having Plain topography after the bridge the hillock has been cut and the road was made and the slide is located on a cutslope. The general slope gradient is around 18$^{0.}$ The cutslope height is 25.0m. The slide direction is 85^{0}
ANKOLA-YELLAPUR SECTION (NH-63)																										
KA-685	Karnataka	Uttar Kannada	48J/6	KNUKAN48P152013 0685	NH-63 / 3 km from Balegulli cross towards Yellapur.	14	41.0	24.7	74	20	36.4	7.20	21.60	8.0	155.5	0.50	38.9	8.0	Rock-cum-debris	Falls	Rapid	Suspended	Confined	Single	Transitional	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 15$^{0.}$ The cutslope height is 8.0m. The slide direction is 180^{0}
KA-686	Karnataka	Uttar Kannada	48J/6	KNUKAN48P152013 0686	NH-63 / 1.5 km from slide no KA-685 towards yellapur, near KM stone 5.	14	41	14.9	74	21	14.3	8.90	22.60	9.0	201.1	0.50	50.3	10.0	Rock-cum-debris	Falls	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a cutslope. The general slope gradient is around 15$^{0.}$ The cutslope height is 9.0m. The slide direction is 200^{0}
KA-687	Karnataka	Uttar Kannada	48J/6	KNUKAN48P152013 0687	NH-63/ 25 m from slide no KA-686 towards Yellapur.	14	41	14.4	74	21	16.3	10.60	20.70	11.0	219.4	0.50	54.9	11.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a cutslope. The general slope gradient is around 15$^{0.}$ The cutslope height is 9.0m. The slide direction is 190^{0}
KA-688	Karnataka	Uttar Kannada	48J/6	KNUKAN48P152013 0688	NH-63/250-300 m from slide no KA-687 towards Yellapur.	14	41	12	74	21	26.2	13.90	33.60	14.5	467.0	1.00	233.5	15.0	Debris	Slide	Moderate	Suspended	Confined	Single	Rotational	New	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18$^{0.}$ The cutslope height is 11.0m. The slide direction is 215^{0}
KA-689	Karnataka	Uttar Kannada	48J/6	KNUKAN48P152013 0689	NH-63/ Near Navgadde village.	14	41	10.3	74	22	28.1	14.90	15.00	16.0	223.5	1.00	111.8	15.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 15$^{0.}$ The cutslope height is 15.0m. The slide direction is 60^{0}
KA-690	Karnataka	Uttar Kannada	48J/6	KNUKAN48P152013 0690	NH-63/ Near Navgadde village.	14	41	8.8	74	22	29	10.10	13.10	11.0	132.3	0.50	33.1	11.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 15$^{0.}$ The cutslope height is 11.0m. The slide direction is 60^{0}
KA-691	Karnataka	Uttar Kannada	48J/10	KNUKAN48P152013 0691	NH-63/ 5km after Sunksal village towards Yellapur.	14	42	30.8	74	30	6.2	10.60	24.80	11.0	262.9	0.50	65.7	11.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	New	Topographically the area is having undulating topography and the slide is located on a Cutslope. The general slope gradient is around 18$^{0.}$ The cutslope height is 11.0m. The slide direction is 60^{0}
KA-692	Karnataka	Uttar Kannada	48J/10	KNUKAN48P152013 0692	NH-63 / 3 km from Slide no KA-691 towards Yellapur.	14	42	34.8	74	30	13.2	7.90	12.60	8.0	99.5	0.50	24.9	9.0	Debris	Slump	Slow	Dormant	Confined	Single	Rotational	New	Topographically the area is having undulating topography and the slide is located on a Cutslope. The general slope gradient is around 17$^{0.}$ The cutslope height is 8.0m. The slide direction is 335^{0}
KA-693	Karnataka	Uttar Kannada	48J/10	KNUKAN48P152013 0693	NH-63 / 500 m from Slide no KA-691 towards Yellapur.	14	43	10	74	30	54.4	15.60	33.90	17.0	528.8	1.00	264.4	17.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18$^{0.}$ The cutslope height is 18.0m. The slide direction is 90^{0}
KA-694	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0694	NH-63 / 3 km from Heggar towards Yellapur.	14	46	47.8	74	34	2.3	8.90	18.30	9.0	162.9	0.50	40.7	9.0	Debris	Slump	Slow	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 15$^{0.}$ The cutslope height is 9.0m. The slide direction is 150^{0}
KA-695	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0695	NH-63/ 1 km afetr Ramanguli towards Yellapur.	14	47	51.7	74	35	36	22.80	40.00	23.0	912.0	0.50	228.0	24.0	Debris	Slide	Slow	Dormant	Confined	Single	Rotational	New	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 19$^{0.}$ The cutslope height is 20.0m. The slide direction is 180^{0}
KA-696	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0696	NH-63 / I km afetr Arabail near Km stone 50 towards Yellapur.	14	51	30.8	74	38	53.1	10.20	20.60	11.0	210.1	0.50	52.5	11.0	Debris	Slide	Slow	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18$^{0.}$ The cutslope height is 10.0m. The slide direction is 270^{0}
KA-697	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0697	NH-63 / 1.5 km from slide no KA-696 towards Yellapur.	14	51	52.7	74	39	12.4	10.30	14.10	11.0	145.2	1.00	72.6	11.0	Debris	Slide	Slow	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18$^{0.}$ The cutslope height is 11.0m. The slide direction is 270^{0}
KA-698	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0698	NH-63 / 1 km from slide no KA-697 towards Yellapur.	14	52	8.2	74	39	17.6	10.10	14.60	11.0	147.5	1.00	73.7	11.0	Debris	Slide	Slow	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 15$^{0.}$ The cutslope height is 10.0m. The slide direction is 240^{0}

KA-699	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0699	NH-63 / 800 m from slide no KA-698 towards Yellapur.	14	52	29.5	74	39	14.7	15.00	30.80	16.0	462.0	1.00	231.0	18.0	Debris	Slide	Slow	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 13.0m. The slide direction is 90^0
KA-700	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0700	NH-63 /600- 700 m from slide no KA-699towards Yellapur.	14	52	33.3	74	39	18.8	13.90	22.30	14.0	310.0	1.00	155.0	15.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 12.0m. The slide direction is 190^0
KA-701	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0701	NH-63 /2.5 km from slide no KA-700 towards Yellapur.	14	53	25.2	74	39	16.3	29.80	80.00	30.0	2384.0	1.50	1788.0	32.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 18.0m. The slide direction is 125^0
KA-702	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0702	NH-63 /600- 700 m from slide no KA-701 towards Yellapur.	14	53	36.8	74	39	14.3	25.60	80.60	27.0	2063.4	1.50	1547.5	28.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 18.0m. The slide direction is 130^0
KA-703	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0703	NH-63 / 2 km after Idagundi towards Yellapur.	14	56	11.3	74	41	0.9	10.10	11.30	11.0	114.1	0.50	28.5	11.0	Debris	Slump	Slow	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 18^0. The cutslope height is 9.0m. The slide direction is 330^0
KA-704	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0704	NH-63 / 3 km from Idagundi from Yellapur side towards Ankola.	14	54	1.3	74	39	5.1	9.30	11.60	10.0	107.9	0.50	27.0	11.0	Debris	Slump	Slow	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 15^0. The cutslope height is 10.0m. The slide direction is 90^0.
KA-705	Karnataka	Uttar Kannada	48J/9	KNUKAN48P152013 0705	NH-63 / 1 km from slide KA-704 towards Ankola.	14	53	47.2	74	39	12.7	11.80	13.10	12.0	154.6	0.50	38.6	12.0	Debris	Slide	Moderate	Dormant	Confined	Single	Rotational	Old and reactivated	Topographically the area is having undulating topography and the slide is located on a spur. The general slope gradient is around 15^0. The cutslope height is 12.0m. The slide direction is 90^0

Weathered gneiss is the exposed rock type in the area.	J1:145^0:86^0 J2:80^0:83^0 J3:170^0:22^0	Forest land with fairly dense scrub.SH-88 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-88 was blocked.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0042014	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Forest land with fairly dense scrub.SH-88 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-88 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage on both sides of the road, a nala is flowing nearby and proper drainage outlet for this nala is must. Slide may reactivate in monsoon so the remdial measures may be	-	Photo 0022014	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Forest land with fairly dense scrub.SH-88 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-88 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0032014	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-88 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-88 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Removal of fallen debris from slope. Proper lined drainage as drainage at toe is clogged and slope grading are also recommended.	-	Photo 0042014	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-27 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-27 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended or else slide may prograde as drainage is clogged at toe	-	Photo 0052014	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-27 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-27 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended or else slide may prograde as drainage is clogged at toe	-	Photo 0062014	-	-	Old	
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-27 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-27 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Protective measures in the form of Slope grading in the form of benches constructed but has breached at many places.Proper maintenance of protective measures and proper drainage at head and toe is recommended as drainage is clogged.		Photo 0072014				
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-27 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-27 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended or else slide may prograde as drainage is clogged at toe.	-	Photo 0082014	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-27 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-27 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended or else slide may reactivate as drainage is clogged at toe.	-	Photo 0092014	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-27 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-27 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended or else slide may reactivate as drainage is clogged at toe.	-	Photo 0102014	-	-		
Gneiss is the exposed rock type in the area.	J1:270^0:80^0 J2:70^0:68^0 J3:40^0:41^0	Forest land with fairly dense scrub.SH-27 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-27 was damaged.	Nil	Forest land	Effect of human interference and high rainfall with ineffective drainage and highly weathered slope material and unfavourable dipping rocks.	Old rock fall stabilized. Plant growth seen on slope material. Small boulders fallen from left flank has to be removed.	-	Photo 0112014	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-90 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-90 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Small slump stabalised. Proper drainage at Toe and catch water drains are recommended to avoid any reactivation.	-	Photo 0122014	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-90 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-90 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slump reactivated may again reactivate in monsoon. Two big trees precariously hanging on slope, if fallen may block the road. Proper drainage at toe and slope grading recommended.	-	Photo 0132014	-	-		

Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-90 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-90 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slump stabalized and plant growth seen on slope.Proper drainage at toe to arrest any reactivation.	-	Photo 0142014	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-90 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-90 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated at toe due to road widening. Tree precariously hanging at crown, if fallen may block the road.Removal od fallen debris from toe and proper drainage at toe are recommended.	-	Photo 0152015	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-89 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-89 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended or else slide may prograde as drainage is clogged at toe.	-	Photo 0162014	-	-		
Weathered gneiss is the exposed rock type in the area.	Nil	Cultivated land with coffee plantations.SH-89 is the element at risk is another landuse.	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-89 was damaged.	Nil	Cultivated coffee plantation.	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended or else slide may prograde as drainage is clogged at toe.	-	Photo 0172014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-06 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-06 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part and also weathering pattern in the area are unfavorable.	Old slide stabalized,plant growth seen. Proper drainage at toe to arrest reactivation. The slanting trees on the slope indicating the distrssed zone.	-	Photo 0182014	-	-		
Weathered metabasalt is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-06 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-06 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part and also weathering pattern in the area are unfavorable.	Old slide reactivated. Removal of fallen debris from the slope. Proper drainage at toe and slope easing or else slide may reactivate.	-	Photo 0192014	-	-		
Weathered metabasalt is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-06 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-06 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide stabalized,plant growth seen. Proper drainage at toe to arrest reactivation.	-	Photo 0202014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-06 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-06 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended or else slide may prograde as drainage is clogged at toe.	-	Photo 0212014	-	-		
Laterite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-06 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-06 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended to arrest reactivation.	-	Photo 0222014	-			
Weathered granite is the exposed rock type in the area.	J1:295^0:90^0 J2:30^0:49^0	Forest land with fairly densebushes and trees.SH-06 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-06 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Removal of fallen debris from the slope and also heaped up debris in front of toe.Draiange at toe is clogged. Tree is precariously hanging from the crown.Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0232014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-06 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-06 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabalized, chances of reactivationis there as slope still in distrssed condition. Toe removal has been taken place which may reactivate slide. Proper drainage at toe and proper benching/slope grading at toe are recommended.	-	Photo 0242014	-	-		
Laterite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes .SH-06 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-06 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated at toe due to water action. Proper drainage at toe, slope grading is recommended to arrest any reactivation.	-	Photo 0252014	-	-		
Laterite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes .SH-06 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	Inside the SH-06 no particular damge to road.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide stabalized,plant growth seen. Proper drainage at toe to arrest reactivation.	-	Photo 0262014	-	-		

Granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes .SH-06 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-06 was blocked.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide stabalized by providing retaining wall at toe, proper maintainace of wep holes in thw wall are recommended.	-	Photo 0272014	-	-		
Laterite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes .SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Side by side two slides are there. Slope easing, proper drainage at toe are recommended.	-	Photo 0282014	-	-		
Granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated on the left flank. Removal of debris from slope, proper drainage at toe are recommended.	-	Photo 0292014	-	-		
Granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated on the left flank. Tree precariously hanging at crown above electric pole.Removal of debris from slope, proper drainage at toe are recommended.	-	Photo 0302014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended to arrest reactivation.	-	Photo 0312014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended to arrest reactivation.	-	Photo 0322014	-	-		
Granite is the exposed rock type in the area.	J1:10^0:89^0 J2:90^0:2^0	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference and high rainfall with ineffective drainage and highly weathered slope material and unfavourable dipping rocks.	Removal of fallen debris, tree from slope. Slope easing and proper drainage at toe are recommended. Overburden weathered material has failed may prograde laterally.	-	Photo 0332014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide stabalized,plant growth seen. Proper drainage at toe to arrest reactivation.	-	Photo 0342014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference and high rainfall with ineffective drainage and highly weathered slope material and unfavourable dipping rocks.	Removal of fallen debris and trees from the slope.Slope easing and proper drainage at toe are recommended as slide is prograding laterally.	-	Photo 0352014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference and high rainfall with ineffective drainage and highly weathered slope material and unfavourable dipping rocks.	Old rock fall stabalized. Removal of fallen boulders from slope and proper drainage at toe are recommended.	-	Photo 0362014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended to arrest reactivation.	-	Photo 0372014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide stabalized,plant growth seen. Proper drainage at toe to arrest reactivation.	-	Photo 0382014	-	-		
Granite is the exposed rock type in the area.	J1:290^0:54^0 J2:350^0:0^0 J3:40^0:86^0	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference and high rainfall with ineffective drainage and highly weathered slope material and unfavourable dipping rocks.	Old rock fall, plannar failure noticed on J-i plane.Removal of fallen boulders from slope and proper drainage at toe are recommended.	-	Photo 0392014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide stabalized,plant growth seen. Proper drainage at toe to arrest reactivation.	-	Photo 0402014	-	-		
Metabasalt is the exposed rock type in the area.	J1:60^0:88^0 J2:150^0:62^0	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference and high rainfall with ineffective drainage and highly weathered slope material and unfavourable dipping rocks.	Old slide reactivated in the left flank in the form a rock fall.Removal of fallen boulders from slope and toe and proper drainage at toe are recommended.	-	Photo 0412014	-	-		

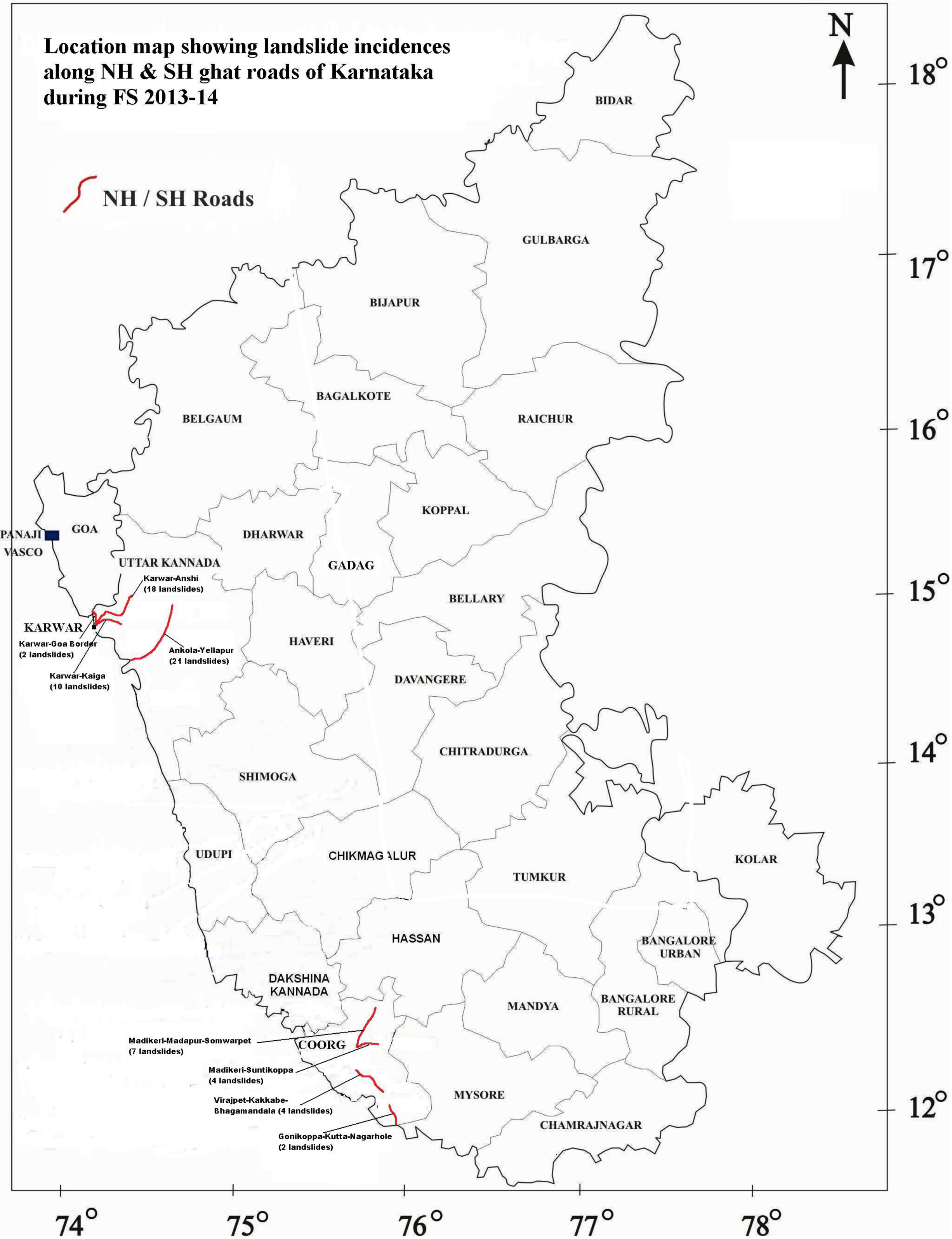
Weathered metabasalt is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0422014	-	-		
Granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended to arrest reactivation.	-	Photo 0432014	-	-		
Granite is the exposed rock type in the area.	J1:0^0:88^0 J2:280^0:38^0	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference and high rainfall with ineffective drainage and highly weathered slope material and unfavourable dipping rocks.	Removal of fallen debris from toe and precariously hanging tree. Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0442014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.SH-93 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	SH-93 was damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Small slump, removal of debris, proper drainage at toe as drainage is clogged are recommended. Trees are precariously hanging at the crown portion.	-	Photo 0452014	-	-		
Granite is the exposed rock type in the area.	J1:330^0:47^0 J2:90^0:90^0 J3:130^0:0^0	Forest land with little scrub.NH-17 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-17 is blocked and damged.	Nil	Forest land	Effect of human interference and high rainfall with ineffective drainage and highly weathered slope material and unfavourable dipping rocks.	The rockfall is trated with shotcrating, wire mesh and bolting. Proper draingae at toe for seepage of driiping water should be made and sighn boards on either side of the road should be errrected as the zone is rock fall prone area. The exsisting measures should be maintained and inspected periodicalyy		Photo 0462014				

Granite is the exposed rock type in the area.	J1:330^0:47^0 J2:90^0:90^0 J3:130^0:0^0	Forest land with little scrub.NH-17 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-17 is blocked and damged.	Nil	Forest land	Effect of human interference and high rainfall with ineffective drainage and highly weathered slope material and unfavourable dipping rocks.	The rockfall is trated with shotcrating, wire mesh and bolting. Proper draingae at toe for seepage of driiping water should be made and sighn boards on either side of the road should be errected as the zone is rock fall prone area. The exsisting measures should be maintained and inspected periodicalyy		Photo 0472014				
Granite is the exposed rock type in the area.	J1:50^0:76^0 J2:290^0:84^0 J3:30^0:72^0	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0482014	-	-		
Granite is the exposed rock type in the area.	J1:0^0:90^0 J2:80^0:72^0	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged and blocked.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabalised, Removal of fallen debris from toe and precariously hanging tree. Slope easing in the form of benches and proper lined drainage at toe are recommended to arrest	-	Photo 0492014	-	-		
Granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged and blocked.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated,removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0502014	-	-		
Granite is the exposed rock type in the area.	J1:325^0:84^0 J2:30^0:86^0	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged and blocked.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0512014	-	-		
Granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated.Removal of fallen boulders from slope and toe and proper drainage at toe are recommended.	-	Photo 0522014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide stabalized,plant growth seen. Proper drainage at toe to arrest reactivation.	-	Photo 0532014	-	-		
Weathered Ultramafite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Removal of fallen tree and boulders from toe,Trees on right flank of the slide are hanging precariously. Slope easing and proper lined drainage at the toe are recommended.	-	Photo 0542014	-	-		
Weathered Ultramafite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0552014	-	-		
Weathered Ultramafite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide stabalized,plant growth seen. Proper drainage at toe to arrest reactivation.	-	Photo 0562014	-	-		
Weathered granite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabilized. Removal of debris from toe, proper drainage at toe is recommended or else slide may prograde as drainage is clogged at toe.	-	Photo 0572014	-	-		
Weathered phyllite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide almost stabalized, as cutslope height is more may reactivate. Slope easing, proper drainage at toe to arrest reactivation for entire strech of neary 1 km.		Photo 0582014				
Weathered phyllite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide stabalized,plant growth seen. Proper drainage at toe to arrest reactivation.	-	Photo 0592014	-	-		
Weathered phyllite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated,removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0602014	-	-		
Weathered phyllite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide stabalized,removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0612014	-	-		

Weathered phyllite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated may agaain reactivate in monsoon,removal of fallen debris/ trees from toe & slope, Slope easing in the form of benches and proper lined drainage at toe are recommended.Sign boards on either side of the road should be errected as the zone is highly distressed and landslide prone area.	-	Photo 0622014	-	-		
Weathered phyllite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated,removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended. Electric pole is in grave danger if the slide is reactivated.	-	Photo 0632014	-	-		
Weathered phyllite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated. The exsisting toe wall(200 m Length, 2m height and 1 m width in the left flank has to be extended for another 40 m length.Removal of fallen debris from toe,proper lined drainage at toe are recommended.Sign boards on either side of the road should be errected as the zone is highly distressed and landslide prone area.	-	Photo 0642014	-	-		
Weathered phyllite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated. Retaing wall at toe to be constructed with 100 m length, 1 m width and 2 m height. Removal of debris and proper drainage at toe are also recommended.	-	Photo 0652014	-	-		
Weathered phyllite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated,removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0662014	-	-		
Argillite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated,removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0672014	-	-		
Argillite is the exposed rock type in the area.	Nil	Forest land with fairly densebushes and trees.NH-63 is the element at risk which constitutes the sole landuse in the area	Wet	Road cutting and high rainfall	Nil	Nil	Nil	NH-63 was Damaged.	Nil	Forest land	Effect of human interference in the form of slope cutting for construction of road coupled with high rainfall with ineffective drainage at toe part.	Old slide reactivated,removal of fallen debris from toe, Slope easing in the form of benches and proper lined drainage at toe are recommended.	-	Photo 0682014	-	-		

PLATE - 1

Location map showing landslide incidences along NH & SH ghat roads of Karnataka during FS 2013-14



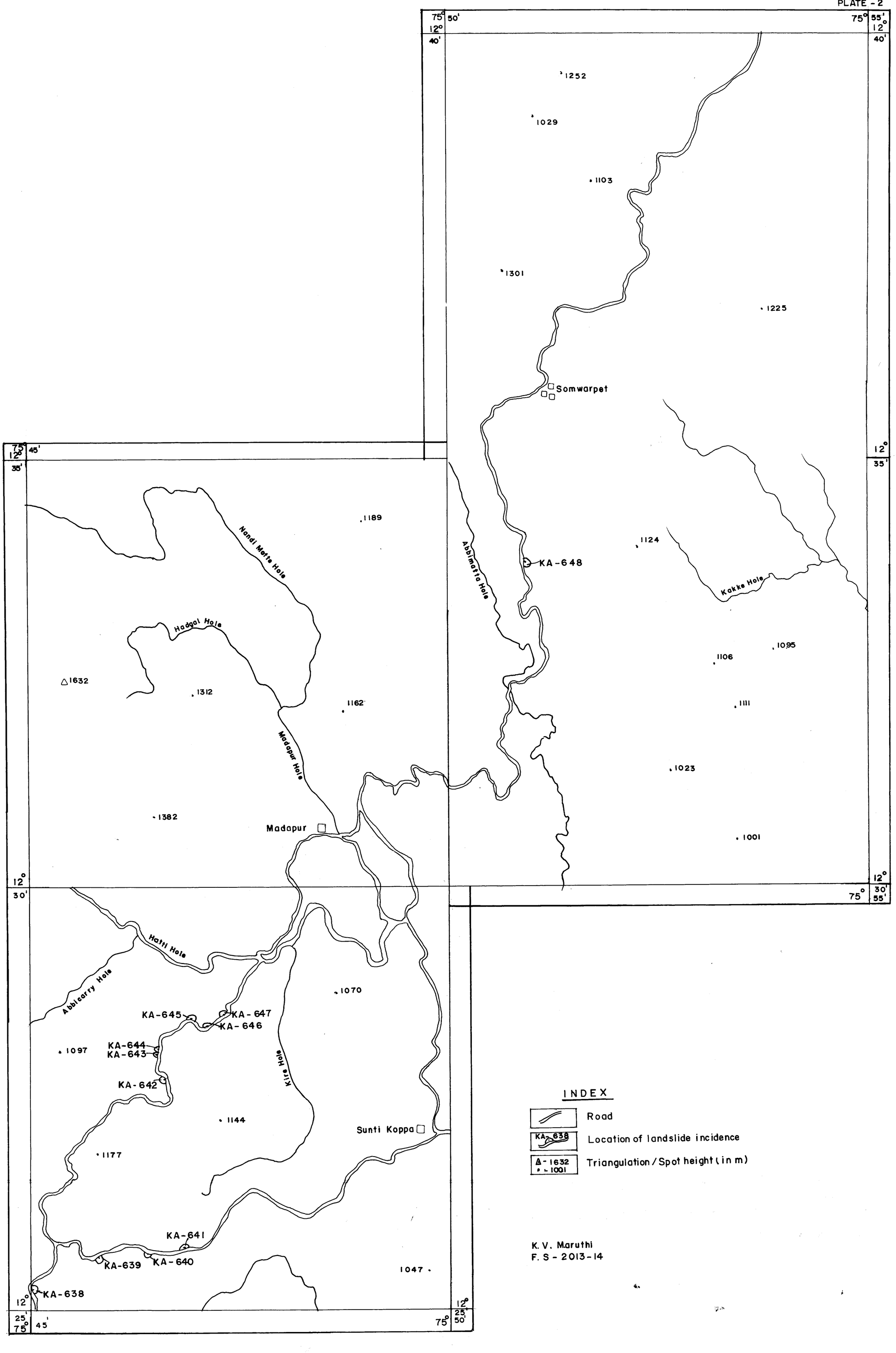
LANDSLIDE INVENTORY MAP ALONG NH 8 SH GHAT ROADS OF KARNATAKA
PARTS OF TOPOSHEET NO 48P/14 & 15

0 1 2 3 4 Km

SCALE : 1 : 50,000

N

PLATE - 2



INDEX

- Road
- KA-638 — Location of landslide incidence
- △ 1632 / • 1001 — Triangulation / Spot height (in m)

K.V. Maruthi
F.S - 2013-14

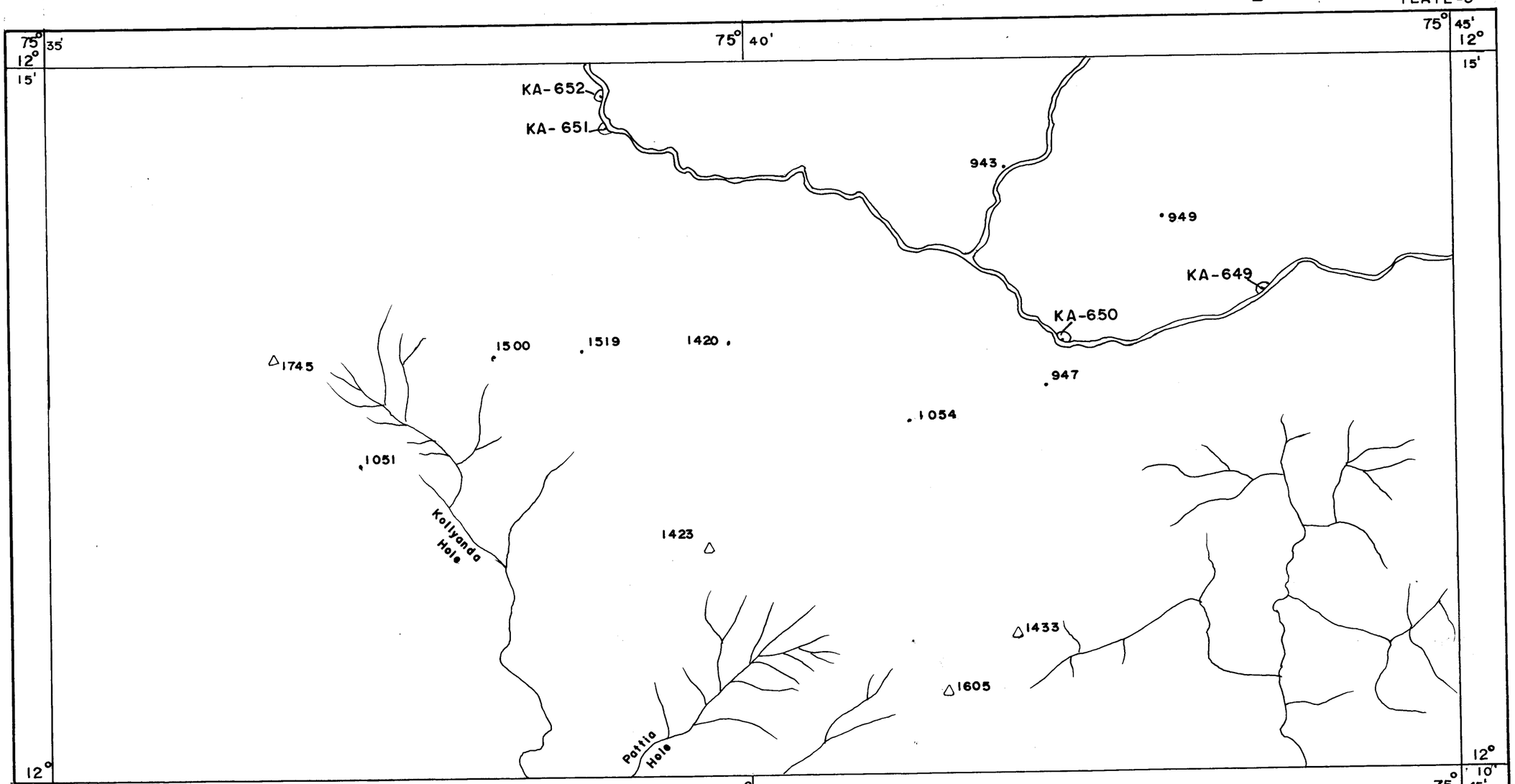
LANDSLIDE INVENTORY MAP ALONG NH 8 SH GHAT ROADS OF KARNATAKA
PART OF TOPOSHEET NO 48P/12

0 1 2 3Km

SCALE : 1 : 50,000

N

PLATE - 3



INDEX

- Road
- KA-649 — Location of landslide incidence
- △ 1433 / • 1500 — Triangulation / Spot height (in m)

K.V. Maruthi
F.S - 2013-14

G.S.I/K.T.A/DO. No. 24/14

LANDSLIDE INVENTORY MAP ALONG NH & SH GHAT ROADS OF KARNATAKA

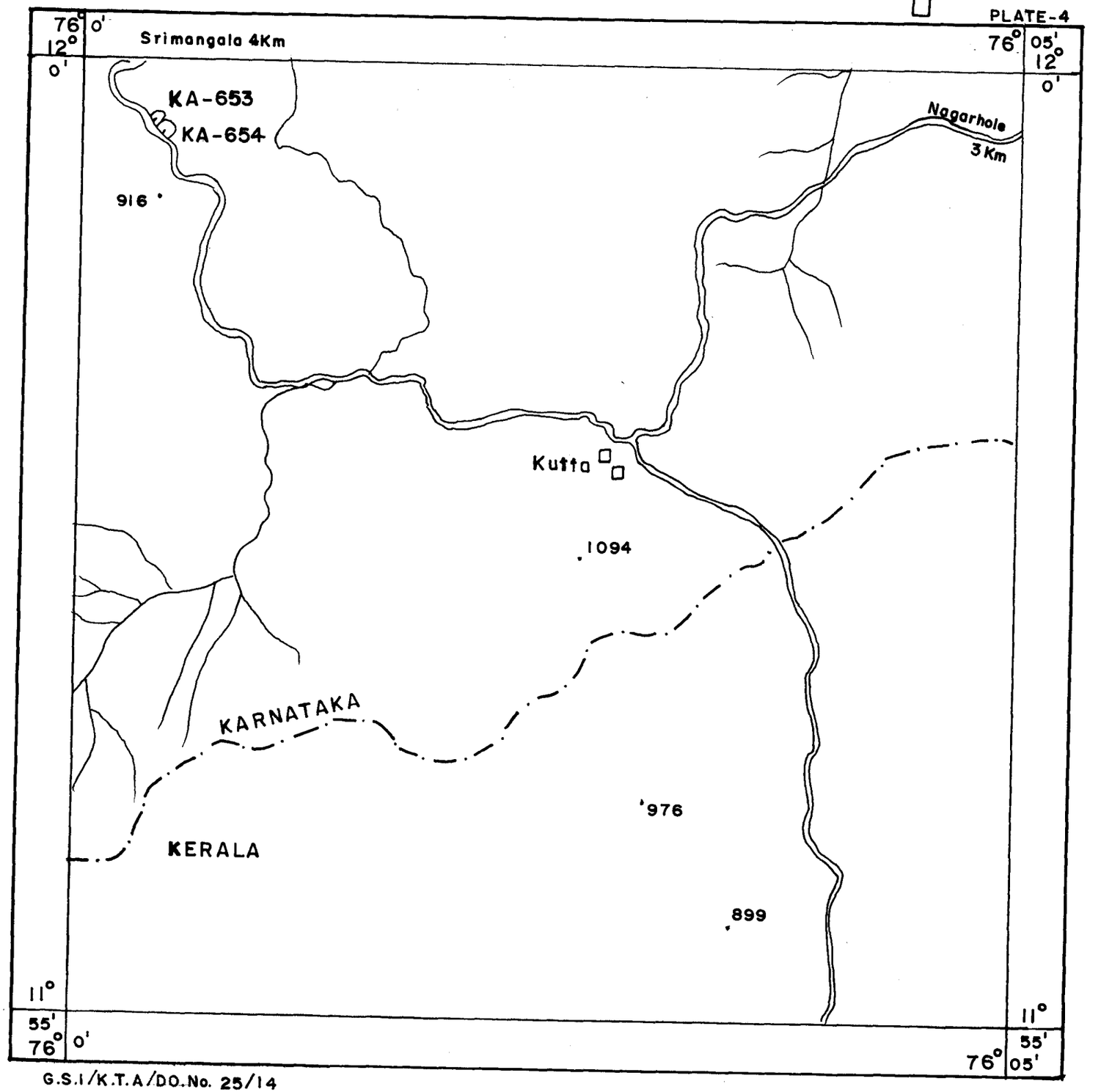
PARTS OF TOPOSHEET NO 58A/1

0 1 2 3 Km

Scale: 1: 50,000

N

PLATE-4



G.S.I/K.T.A/DO.No. 25/14

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- Road
- KA-653 — Location of landslide incidence
- 916 — Spot height

By,

K.V. Maruti
F.S-2013-14

LANDSLIDE INVENTORY MAP ALONG NH & SH GHAT ROADS OF KARNATAKA
PART OF TOPOSHEET NO 48J/5

0 1 2 3Km

SCALE: 1:50,000

N

PLATE - 5

74° 15' 74° 20' 74° 25' 74° 30'

15° 0'

14° 55'

14° 50'

Belgaum 119Km

Anshi

Karwar

Kaiga

KA-668
KA-661
KA-662
KA-660
KA-659
KA-658
KA-657
KA-656
KA-655
KA-669
KA-670
KA-671
KA-672
KA-673
KA-674
KA-675
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KA-681
KA-682

790 631 406 410 214 506 486 454 515 456 450 739 496 611 552 508 512 551 460 528 541 346 448 427 423

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- Road
- KA-655 — Location of landslide incidence
- Δ-448 • -541 — Triangulation/Spot height (in m)

K.V. Maruthi
F. S - 2013-14

G.S.I/K.T.A/D.O. No. 26/14

LANDSLIDE INVENTORY ALONG NH & SH GHAT ROADS OF KARNATAKA

PARTS OF TOPOSHEET NO 48J/1

0 1 2 3Km

Scale: 1:50,000

N

Plate-6

74° 05' | 74° 10' | 74° 15'

14° 55'

To Panaji

Kadra

101

KA-667

KA-666

109

KA-665

142

Kali River

82

Siddar

344

KA-683

KA-684

KALI NADI CREEK

KA-664

KA-663

366

14° 55'

14° 50'

ARABIAN SEA

404

KARWAR

Shemad

382

513

380

548

552

185

258

NH-17

321

Ankola

14° 45'

74° 05' | 74° 10' | 74° 15'

G.S.I/K.T.A/DO.No. 27/14

INDEX

Road

KA-635 — Location of landslide incidence

A-552 / • -185 — Triangulation point/ Spot height (in m)

K.V. Maruti
F.S-2013-14

LANDSLIDE INVENTORY MAP ALONG NH & SH GHAT ROADS OF KARNATAKA

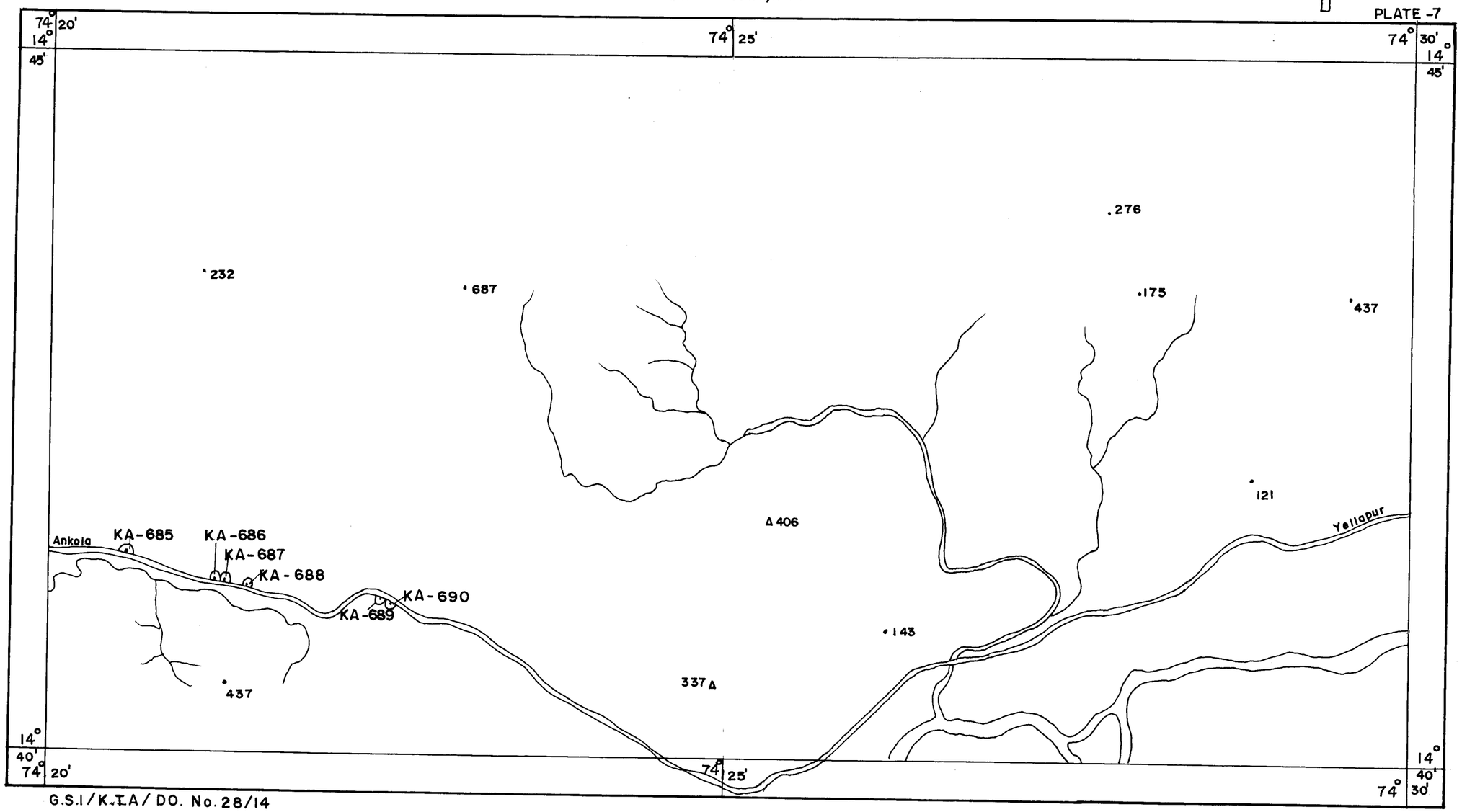
PART OF TOPOSHEET NO 48J/6

0 1 2 Km

SCALE: 1:50,000

N

PLATE -7



INDEX

- Road
- KA-688 — Location of landslide incidence
- Δ - 406 / • - 175 — Triangulation point / Spot height (in m)

K. V. MARUTHI
F.S - 2013-14

G.S.I/K.I.A/DO. No. 28/14

LANDSLIDE INVENTORY MAP ALONG NH & SH GHAT ROADS OF KARNATAKA

PARTS OF TOPOSHEET NO 48J/9 & 48J/10

0 1 2 3 4 5Km

SCALE : 1:50,000

N

PLATE - 8

74° 35' | 74° 40' | 74° 45'
15° 0' | 14° 55' | 14° 45'

Hubli
Yellapur
Idgundi
Arabail
GANGAVALI RIVER

KA-703
KA-704
KA-705
KA-702
KA-701
KA-700
KA-699
KA-698
KA-697
KA-696
KA-695
KA-694
KA-693
KA-692
KA-691

△583 · 591 △582 △564 △493 · 456 △538 · 393 △233 · 492 △482 · 185 △497 · 546 △116 · 360 BM-51.4 △562 · 534 △522

74° 30' | 74° 35' | 74° 40'
14° 50' | 14° 45' | 14° 40'

INDEX

- Road
- KA-695 — Location of landslide incidence
- △-116, ·-534 — Triangulation point / Spot height (in m)

K. V. MARUTHI
F. S - 2013-14

G.S.I/K.T.A /DO. No. 29/14