A.4.3 An Evaluation Points for Restoration level

Route No.	Name of city	Sireal Number of Disaster Critical spots	Type of disaster	Distance from Managua	Length of slope and Bridge(m)	Evaluation					
						Distannce from Managua	Space for diversion	Condition of detour road	Type of disaster	The scale of Disaster	Total
Nic1		1	R.F.	100	890	1	1	1	2	5	10
		2	R.F.	100	350	1	1	1	2	5	10
	Sebaco	3	Bridge	150	29.3	2	1	1	4	3	11
		4	Bridge	150	18.6	2	1	3	4	1	11
	Esteli	5	Bridge	200	62	3	1	3	4	3	14
		6	Bridge	200	15.5	3	1	3	4	1	12
		7	R.F.	200	600	3	1	3	2	5	14
		8	R.C.	200	280	3	1	3	3	5	15
		9	R.C.	200	200	3	1	3	3	5	15
		10	R.C.	200	440	3	1	3	3	5	15
		11	R.C.	200	460	3	1	3	3	5	15
		12	R.C.	200	130	3	1	3	3	3	13
		13	R.C.	200	360	3	1	3	3	5	15
		14	R.F.	200	240	3	1	3	2	5	14
		15	R.C.	200	220	3	1	3	3	5	15
		16	R.C.	200	120	3	1	3	3	3	13
	Yaraguina	17	R.F.	250	110	4	1	1	2	3	11
		18	Bridge	250	64	4	1	1	4	3	13
		19	Bridge	250	109	4	1	1	4	5	15
		20	R.C.	250	200	4	1	1	3	5	14
		21	R.F.	250	230	4	1	1	2	5	13
	El Espino	22	R.F.	250	145	4	1	1	2	3	11
Nic3	Sebaco	23	R.C.	150	130	2	5	5	3	3	18
		24	R.C.	150	170	2	5	5	3	3	18
		25	R.C.	150	90	2	5	5	3	1	16
		26	Bridge	150	17.5	2	5	5	4	1	17
		27	R.C.	150	150	2	5	5	3	3	18
	Matagalpa	28	R.C.	150	110	2	5	5	3	3	18
		29	S.S.	150	180	2	5	5	5	3	20
		30	D.F.	150	150	2	5	5	5	3	20
		31	S.S.	150	140	2	5	5	5	3	20
		32	S.S.	150	192	2	5	5	5	3	20
		33	S.S.	150	45	2	5	5	5	1	18
	Jinotega	34	R.C.	150	180	2	5	5	3	3	18
Nic5		35	R.F.	200	200	3	5	5	2	5	20
Nic15	Ocotal	36	D.F.	250	45	4	1	1	5	1	12
		37	D.F.	250	65	4	1	1	5	1	12
		38	D.F.	250	70	4	1	1	5	1	12
	LasManos	39	D.F.	250	100	4	1	1	5	3	14
Nic26	San Isidor	40	R.F.	150	105	2	5	3	2	3	15
		41	R.F.	150	235	2	5	3	2	5	17
		42	R.F.	150	160	2	5	3	2	3	15
		43	R.F.	150	115	2	5	3	2	3	15
		44	R.F.	150	160	2	5	3	2	3	15
		45	Bridge	150	31	2	5	3	4	3	17
		46	R.F.	150	77	2	5	3	2	1	13
		47	R.C.	150	110	2	5	3	3	3	16
		48	R.F.	150	60	2	5	3	2	1	13
		49	R.C.	150	300	2	5	3	3	5	18
		50	R.F.	150	150	2	5	3	2	3	15
	El Jicalal	51	R.C.	150	90	2	3	1	3	1	10
		52	Bridge	150	17.9	2	3	1	4	1	11
		53	R.C.	150	280	2	3	1	3	5	14
		54	Bridge	150	7.2	2	3	1	4	1	11
	Telica	55	Bridge	150	5.1	2	3	1	4	1	11

Evaluation Criteria			Point
Distance from Managua		≦100km	1
		100< L ≦150km	2
		150< L ≦200km	3
		200km< L	4
Space for management or calamity restoration		There is a enough space	1
		There is not a enough space	5
		The above-mentioned middle	3
Condition of detour road		There is a detour.	1
		There is no detour.	5
		Much time is required for detour	5
Type of disaster		Rock Falling (R.F.)	2
		Rock Collapsing (R.C.)	3
		Slop slide (S.S.)	5
		Debris Flow (D.F.)	5
		Scoring of fundation (Bridge)	4
Length of slope and Bridge	Slope	≦100m	1
		100< L ≦200m	3
		200m< L	5
	Bridge	≦20m	1
		20< L ≦100m	3
		100m< L	5

A.4.4 Development situation and an Evaluation Points

Route No.	Section		Serial Number of Disaster Critical Spots	The outline of a project	Evaluation	Total
Nic1	Sanbenito	Sebaco	1,2	Base point	1	10
				Road improvement construction will be completed in 2002.	5	
				Two bridges were reconstructed by the Japanese grantaide	4	
	Sebaco	Esteli	3,4	Base point	1	6
				Road improvement construction will be completed in 2002.	5	
	Esteli	Yaraguina	5~16	Base point	1	9
				Road improvement construction will be completed in 2002.	5	
				Two bridges were reconstructed by the IDBC	2	
				There is an urban development design in Esteli	1	
	Yaraguina	El Espino	17~22	Base point	1	10
				Road improvement construction will be completed in 2002.	5	
				Road improvement construction between Somot toSan Lucas will be completed in 2002.	3	
				There is an urban development design in Somot	1	
Nic3	Sebaco	Matagalpa	23~27	Base point	1	5
				A bridge was reconstructed	2	
				Grants-in-aid (Denmark) of the shortcut road to Jinotega are determine	1	
				There is an urban development design in Mtagalpa	1	
	Matagalpa	Jinotega	28~34	Base point	1	2
				There is an urban development design in Jinotega	1	
Nic5	Matagalpa	El Tuna	35	Base point	1	1
Nic15	Yalaguina	Ocotal		Base point	1	12
				Road improvement construction will be completed in 2002.	5	
				One bridge was reconstructed	2	
				Improvement construction for the road conect to the object road and Ja	3	
				There is an urban development design in Ocotal	1	
	Ocotal	LasManos	36~39	Base point	1	13
				Road improvement construction will be completed in 2002.	5	
				Four bridges were reconstructed	8	
Nic26	El Jicalal	San Isidoro	40~50	Two bridges were reconstructed	4	10
				Some new School are built by Japanese grants-in-aide	2	
				There is the Plan for road improvement construction project	3	
					1	
	Telica	El Jicalal	51~55	Base point	1	5
				There is the Plan for road improvement construction project	3	
				There is the Plan for improvement construction project for the road b etween Lapas~Nic24	1	
				Some new School were built by Japanese grants-in-aide	1	

Evaluation Criteria	Pint
Base point	1 /Section
Road improvement construction will be completed in 2002.	5 /Project
Reconstruction of bridge on the object road was copleted	2 /Project
There is the Plan for road improvement construction project on the object road	3 /Project
There is the Brigde reconstruction of bridge on Object road was copleted	1 /Project
Improvement construction for the road that conect to the object road will be completed in 2002.	3 /Project
There is the Plan for improvement construction project for the road that conect to the object road	1 /Project
the Project for Education or Urbandivelopement will be completed over five years.	2 /Project
There is the Plan for Education or Urbandivelopement	1 /Project

A.4.5 Review of Score of Stability Survey

Route No. Nic.1

Serial Number of Disaster Critical Spots	Score of Phase1	Score of Phase2	ID.No	Kilometer from Managua (km)	Type of disaster
1	70	78	N001A290	60.9	R.F.
2	78	84	N001A280	73.2	R.F.
3	90	90	Junquillal	113.19	Bridge
4	100	100	San Nicolas	135.64	Bridge
5	90	90	(R.Estell)	150.33	Bridge
6	100	100	San Ramon	151.85	Bridge
7	84	84	N001A240	168.4	R.F.
8	72	75	N001B230	168.6	R.C.
9	72	72	N001B200	169.8	R.C.
10	72	72	N001B190	170.7	R.C.
11	78	81	N001B170	171.3	R.C.
12	76	79	N001B150	175.0	R.C.
13	74	76	N001B120	176.2	R.C.
14	76	76	N001A110	178.7	R.F.
15	73	73	N001B100	187.3	R.C.
16	73	76	N001B070	204.7	R.C.
17	70	70	N001A050	214.7	R.F.
18	100	100	Rio Inali	226.89	Bridge
19	100	100	RioTapacalf	233.245	Bridge
20	75	75	N001B030	232.5	R.C.
21	73	73	N001A020	233.7	R.F.
22	73	73	N001A010	235.6	R.F.
Sub-total			22spots		

Route No. Nic..3

Serial Number of Disaster Critical Spots	Score of Phase1	Score of Phase2	ID.No	Distance from Sebaco(km) (*Bridge: from Managua)	Type of disaster
23	74	74	003B420	3.9	R.C.
24	72	75	003B400	6.9	R.C.
25	80	80	003B370	7.4	R.C.
26	100	100	El Guayacan	119.05	Bridge
27	74	76	N003B320	22.1	R.C.
28	70	72	N003B240	32.7	R.C.
29	73	73	N003C230	32.9	S.S.
30	83	83	N003E170	35.2	D.F.
31	71	71	N003C160	35.9	S.S.
32	90	90	N003C150	38.9	S.S.
33	90	90	N003C140	39.4	S.S.
34	81	83	N003B120	40	R.C.
Sub-total			12spots		

A.4.5 Review of Score of Stability Survey

Route No. NIC.5

Serial Number of Disaster Critical Spots	Score of Phase1	Score of Phase2	ID.No	Distance from Matagalupa (km)	Type of disaster
35	76	80	N005A010	24.6	R.F.
Sub-total			1spots		

Route No. Nic.15

Serial Number of Disaster Critical Spots	Score of Phase1	Score of Phase2	ID.No	Distance from Las Manos (km)	Type of disaster
36	70	70	N015E010	9.9	D.F.
37	70	70	N015E020	11.1	D.F.
38	70	70	N015E050	11.7	D.F.
39	70	70	N015E060	13.6	D.F.
Sub-total			4spots		

Route No. Nic.26

Serial Number of Disaster Critical Spots	Score of Phase1	Score of Phase2	ID.No	between San Ishidoro & Sebaco (km) (*Bridge:from Managua)	Type of disaster
40	71	71	N026A010	9.0	R.F.
41	70	70	N026A020	12.7	R.F.
42	71	71	N026A030	19.9	R.F.
43	72	72	N026A040	20.9	R.F.
44	70	78	N026A060	24.7	R.F.
45	100	100	La Banderita	170+952	Bridge
46	76	78	N026A100	29.3	R.F.
47	73	73	N026B110	29.8	R.C.
48	72	72	N026A130	33.6	R.F.
49	80	80	N026B140	34.0	R.C.
50	85	87	N026A150	34.2	R.F.
51	86	86	N026B160	37.0	R.C.
52	90	90	San Juan de Dios	156+785	Bridge
53	71	71	N026B210	45.5	R.C.
54	90	90	Papalón	108+154	Bridge
55	100	100	Solis	107+533	Bridge
Sub-total			16spots		
Total			Nic.1,3,5,15,26		

R.F. :Rock Falling
R.C. :Rock Collapsing
S.S. :Slop slide
D.F. :Debris Flow
Bridge :Scoring of fundation

APPENDICES- PART B

Appendix B1: Bridge Conditions (Chapter17)

Appendix B2: Formulary of Solicitude of Environment Permission (Chapter19)

Appendix B3: Cost/Benefit Data (Chapter20)

Appendix B1

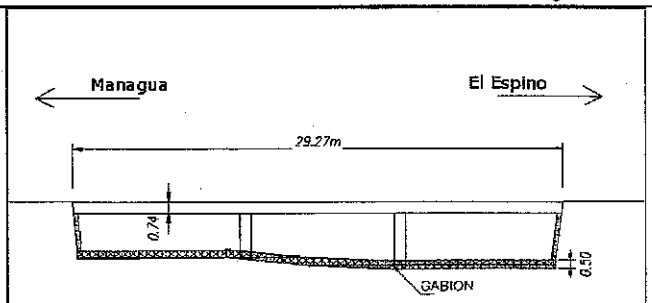
Bridge Conditions (Chapter17)

Appendix B1 Bridge Conditions

Table B1.1 Bridge Conditions (Junqillal)

Bridge Name	Junqillal Bridge	Rout No.	Nic1	Station No.	113+190	Construction Year	1956

Outline of Brigde



Grade of river		0.14	%
Width of river	Upper	19.00	m
	Down	25.00	m
river bed condition		Cohesive soil	
Roughness Coefficient		0.027	
Obstruction ratio(%)		4.5	
standard span length(m)		12.5	

Survay Result on First phase

Stability		Abnormality				evaluation for scouring
abutment	75	abutment	foundation of riverside protection	50	total	90
			bank protection	10	70	
Pier	80		conecting portion of riverside and dike	10		
		Pier		90		

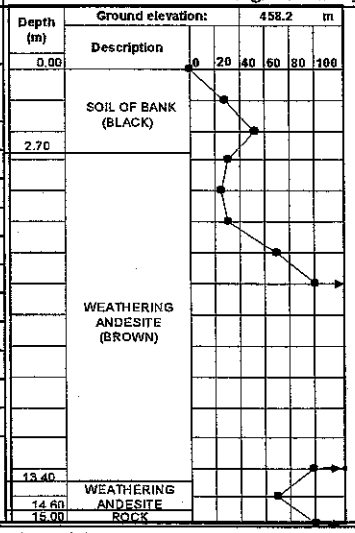
site situation photograph

Survay Result on Second phase

Hydrogical Survey Result

Survay Result	maximam velocity	m/s	0.061
	Q for maximam velocity	m3/s	0.445
Analysis result	cathment area	km2	49.8
	Runoff Coefficient		0.46
	Rainfall intensity (mm/h)	25years	38.7
		50years	43.1
		100years	48.1
	Peak discharge (m3/s)	25years	246.28
		50years	274.28
		100years	306.1
	Velocity (m/s)	25years	1.86
		50years	1.89
		100years	1.91
	Free space(m)	100years	0

Geological Survay Result



Reflection of Countermeasure

(i) The lands are used as paddy fields both in upstream area and downstream area. Even in the dry season, water remains around the bridge.

(ii) Although, even in the rainy season, the river doesn't seem to have water flow, the trace of river scouring is seen on the upstream side of bridge (the size of scouring is 5 meters from the pier to upstream channel).

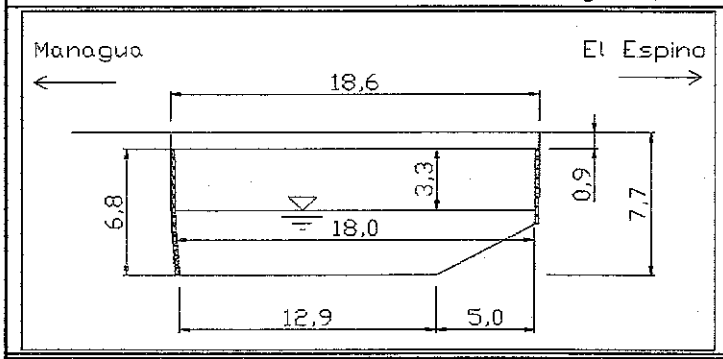
(iii) Because owing to the remaining water it is impossible to see through the bottom of scouring, the bottom of scouring seems to be deep, judging from the size of remaining water in upstream side

(iv) The mad generated by scouring seems to be piled up in the downstream side.

Table B1.2 Bridge Conditions (San Nicolas)

Bridge Name	San Nicolas Bridge	Rout No.	Nic1	Station No.	135+640	Construction Year	1957

Outline of Brigde



Grade of river		2.42	%
Width of river	Upper	17.00	m
	Down	13.50	m
river bed condition		Gravel	
Roughness Coefficient		0.02	
Obstruction ratio(%)		-	
standard span length(m)		12.5	

Survay Result on First phase

Stability		Abnormality				evaluation for scouring
abutment	45	abutment	foundation of riverside protection	50	total	100
			bank protection	50		
Pier	-		conecting portion of riverside and dike	50		
		Pier		-		

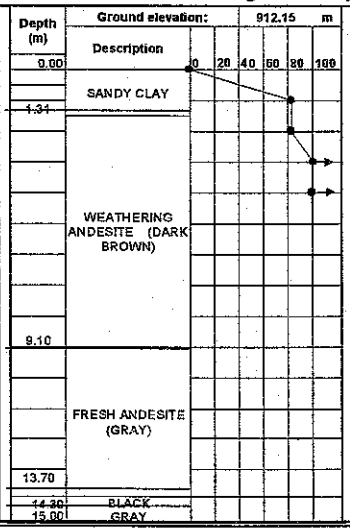
site situation photograph

Survay Result on Second phase

Hydrogical Survey Result

Survay Result	maximam velocity	m/s	0.037
	Q for maximam velocity	m3/s	0.037
Analysis result	cathment area	km2	6.1
	Runoff Coefficient		0.42
	Rainfall intensity (mm/h)	25years	96.8
		50years	107.7
		100years	117.7
	Peak discharge (m3/s)	25years	68.89
		50years	69.94
		100years	83.77
	Velocity (m/s)	25years	1.72
		50years	1.78
		100years	1.84
	Clerlance (m)	100years	3.3

Geological Survay Result



Reflection of Countermeasure

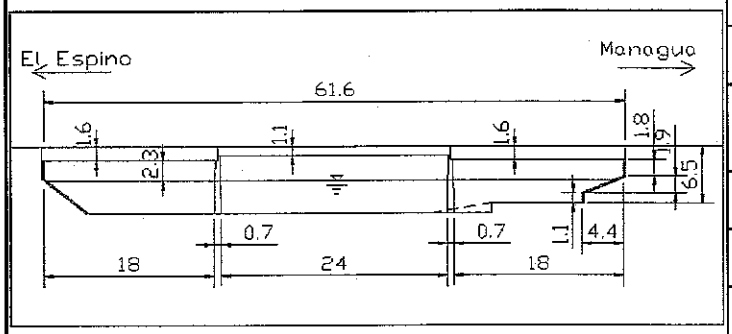
(i) The revetment of front of abutment in the Managua side and revetment in the upstream side are running off. The soils behind abutments has been running off, and there is a space behind abutments

(ii) The total condition of scouring on the riverbed is not so remarkable.

Table B1.3 Bridge Conditions (Las Chanillas)

Bridge Name	Las Chanillas Bridge	Rout No.	Nic1	Station No.	150+330	Construction Year	1958

Outline of Brigde



Grade of river		1.70	%
Width of river	Upper	54.50	m
	Down	41.00	m
river bed condition		Gravel	
Roughness Coefficient		0.028	
Obstruction ratio(%)		1.6	
standard span length(m)		20.0	

Survay Result on First phase

Stability		Abnormality				evaluation for scouring
abutment	65	abutment	foundation of riverside protection	30	total 70	90
			bank protection	30		
Pier	60		conecting portion of riverside and dike	10		
		Pier		90		

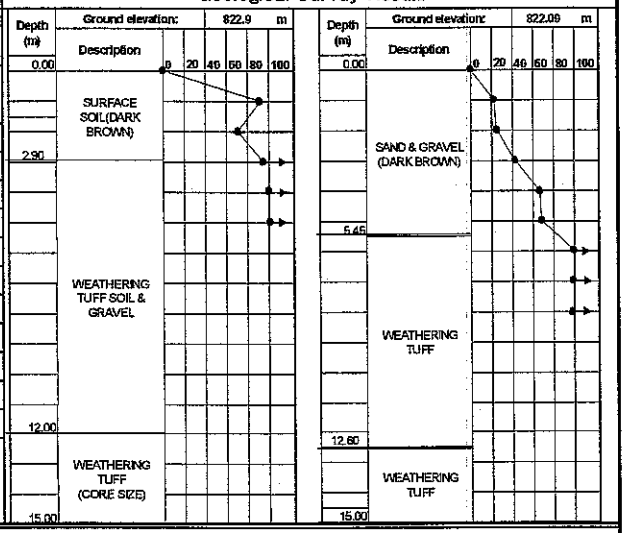
site situation photograph

Survay Result on Second phase

Hydrogical Survey Result

Survay Result	maximam velocity	m/s	0.431
	Q for maximam velocity	m3/s	0.431
Analysis result	cathment area	km2	114.6
	Runoff Coefficient		0.6
	Rainfall intensity (mm/h) 25years		35
	Rainfall intensity (mm/h) 50years		38
	Rainfall intensity (mm/h) 100years		42
	Peak discharge (m3/s) 25years		668.61
	Peak discharge (m3/s) 50years		725.92
	Peak discharge (m3/s) 100years		802.33
	Velocity (m/s) 25years		4.76
	Velocity (m/s) 50years		4.88
	Velocity (m/s) 100years		5.03
	Clerlance (m) 100years		2.3

Geological Survay Result



Reflection of Countermeasure

(i) There is a large size of scouring around the piers.

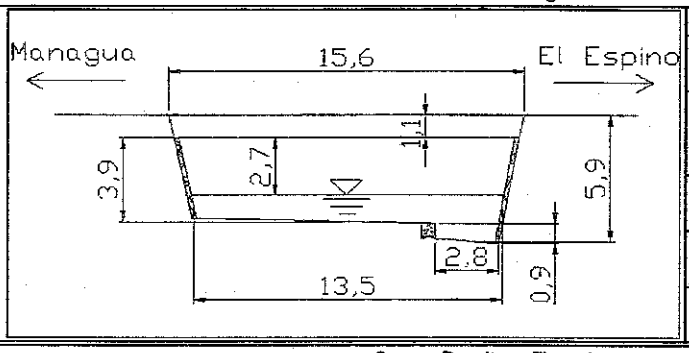
(ii) The vertical alignment of river channel is steep around bridge. The level of riverbed has descended because of the scouring of bridge foundation.

(iii) No large abnormality is seen around abutments.

Table B1.4 Bridge Conditions (San Ramon)

Bridge Name	San Ramon Bridge	Rout No.	Nic1	Station No.	151+850	Construction Year	1957

Outline of Brigde



Grade of river		0.50	%
Width of river	Upper	9.80	m
	Down	9.30	m
river bed condition		Sandy soil	
Roughness Coefficient		0.045	
Obstruction ratio(%)		-	
standard span length(m)		9.8	

Survay Result on First phase

Stability		Abnormality				evaluation for scouring
abutment	30	abutment	foundation of riverside protection	50	total	100
			bank protection	50		
Pier	-		conecting portion of riverside and dike	30		
		Pier		-		

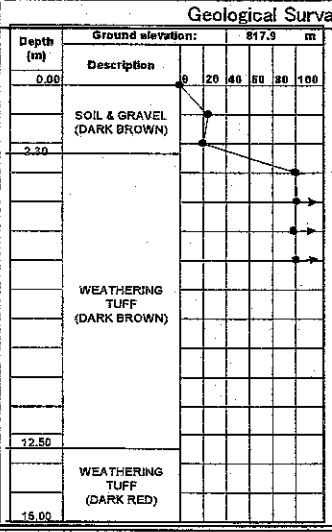
site situation photograph

Survay Result on Second phase

Hydrogical Survey Result

Survay Result	maximam velocity	m/s	0.175
	Q for maximam velocity	m3/s	0.009
Analysis result	cathment area	km2	2.7
	Runoff Coefficient		0.48
	Rainfall intensity (mm/h)	25years	96.8
		50years	107.7
		100years	117.7
	Peak discharge (m3/s)	25years	34.85
		50years	38.78
		100years	42.38
	Velocity (m/s)	25years	2.36
		50years	2.46
		100years	2.54
	Clerlance (m)	100years	2.7

Geological Survay Result



Reflection of Countermeasure

(i) Abutment of former bridge remains in front of end side abutment of present bridge (3m away). The present abutment is eroded by the water that flows between present abutment and former abutment.

(ii) Because the sand is heaped up between start side abutment and the former abutment, the center of river channel is shifted to the side of end side abutment. Therefore the position of bridge doesn't correspond to the position of river properly.

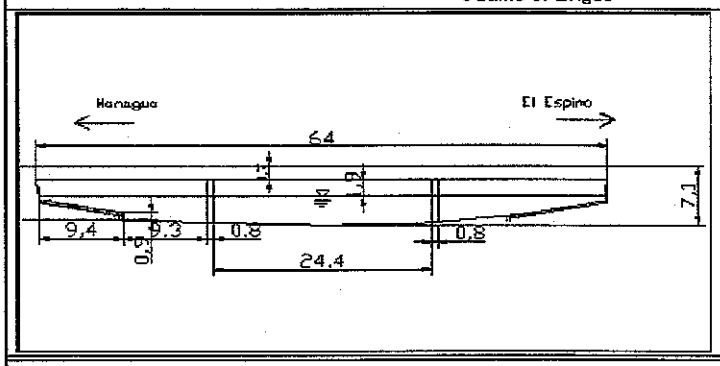
(iii) The ups and downs of riverbed is very intense near the bridge although it is unknown whether those were caused by the natural river flow or by artificial effect. And this makes it impossible to judge which side is upstream in the dry season

(iv) The vertical alignment of the part where water seems to flow all the time in the river channel is deepest at the bridge.

Table B1.5 Bridge Conditions (Inali)

Bridge Name	Inali Bridge	Rout No.	Nic1	Station No.	226+890	Construction Year	1954

Outline of Brigde



Grade of river		0.95	%
Width of river	Upper	84.00	m
	Down	95.00	m
river bed condition		Gravel	
Roughness Coefficient		0.028	
Obstruction ratio(%)		11	
standard span length(m)		20.0	

Survay Result on First phase

Stability		Abnormality				evaluation for scouring
abutment	90	abutment	foundation of riverside protection	30	total	100
			bank protection	10	50	
Pier	100		conecting portion of riverside and dike	10		
		Pier		50		

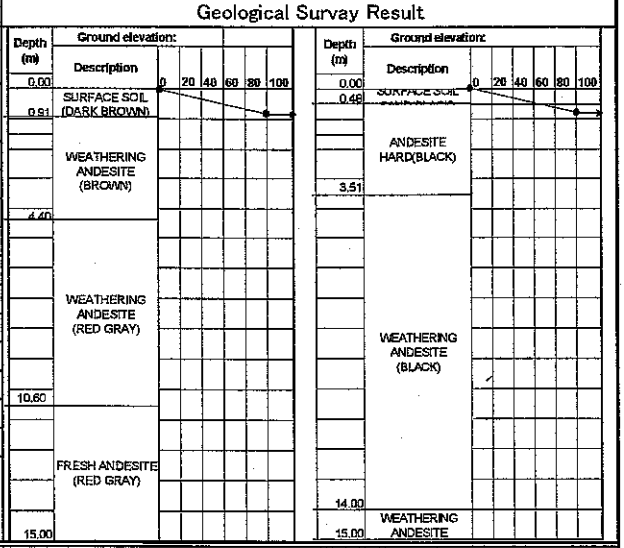
site situation photograph

Survay Result on Second phase

Hydrogical Survey Result

Survay Result	maximam velocity	m/s	0.271
	Q for maximam velocity	m3/s	0.255
Analysis result	cathment area	km2	84.8
	Runoff Coefficient		0.59
	Rainfall intensity (mm/h)	25years	41.7
		50years	45.7
		100years	50
	Peak discharge (m3/s)	25years	579.8
		50years	635.18
		100years	694.94
	Velocity (m/s)	25years	4.69
		50years	4.8
		100years	4.92
	Clerlance (m)	100years	1.9

Geological Survay Result



Reflection of Countermeasure

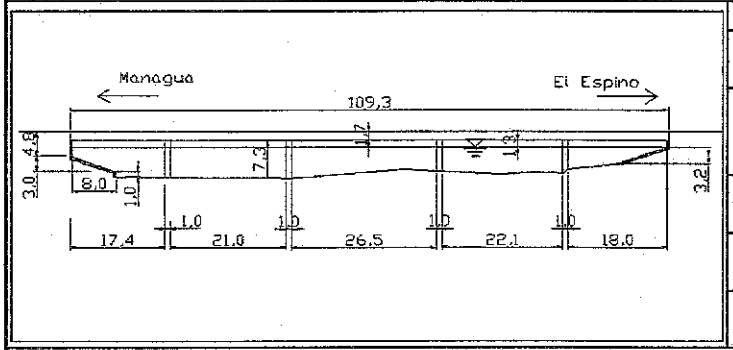
(i) No major damage is seem, the width of river channel was widened by the Mitti flood.

(ii) Because the riverbed is a little bit lowered at the bridge spot, the effect of river scouring of bridge foundation can be seen.

Table B1.6 Bridge Conditions (Tacapali)

Bridge Name	Tacapali Bridge	Rout No.	Nic1	Station No.	233+245	Construction Year	1954

Outline of Brigde



Grade of river		0.30	%
Width of river	Upper	90.00	m
	Down	70.00	m
river bed condition		Gravel	
Roughness Coefficient		0.028	
Obstruction ratio(%)		8.8	
standard span length(m)		20.0	

Survay Result on First phase

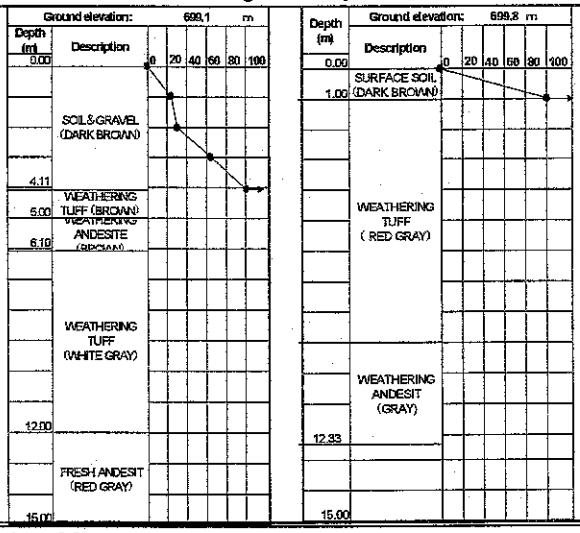
Stability		Abnormality				evaluation for scouring	site situation photograph
abutment	75	abutment	foundation of riverside protection	50	total	100	
			bank protection	50			
Pier	70		conecting portion of riverside and dike	10			
		Pier		90			

Survay Result on Second phase

Hydrogical Survey Result

Survay Result	maximam velocity	m/s	0.048
	Q for maximam velocity	m3/s	0.0348
Analysis result	cathment area	km2	147.11
	Runoff Coefficient		0.62
	Rainfall intensity (mm/h) 25years		30
	Rainfall intensity (mm/h) 50years		40
	Rainfall intensity (mm/h) 100years		45
	Peak discharge (m3/s) 25years		886.75
	Peak discharge (m3/s) 50years		1013.4
	Peak discharge (m3/s) 100years		1266.8
	Velocity (m/s) 25years		2.65
	Velocity (m/s) 50years		2.78
	Velocity (m/s) 100years		2.9
	Clerlance (m) 100years		1.3

Geological Survay Result



Reflection of Countermeasure

(i) The revetment of start side abutment suffers from major damage (although the rehabilitation has been already done by the rainy season)

(ii) Because the river is curving at right anngle in front of river, the major tracks of river scouring can be seen at the start side abutment and start side pier. For the reason, the sand was heaped up at the end side of those structures

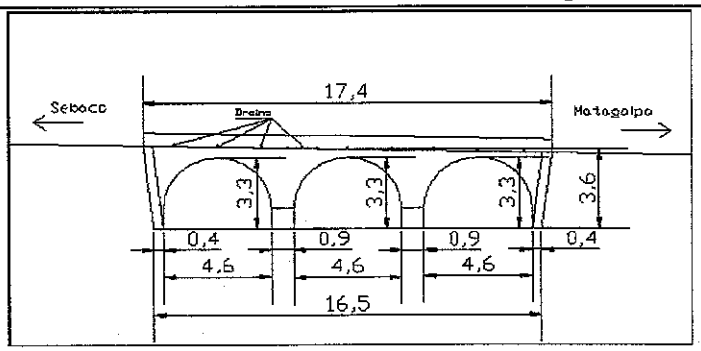
(iii) The scouring of start side pier is local, 4m in width, 10m in length, and 1m in depth.

(iv) Around the middle piers, it is not clear due to the water, but the depth is 0.5m–1m, the width is 15m, and the length is 30m.

Table B1.7 Bridge Conditions (El Guayacan)

Bridge Name	El Guayacan Bridge	Rout No.	Nic3	Station No.	119+050	Construction Year	1945

Outline of Brigde

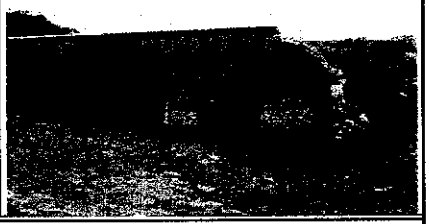


Grade of river		1.30	%
Width of river	Upper	38.80	m
	Down	42.00	m
river bed condition		Gravel	
Roughness Coefficient		0.027	
Obstruction ratio(%)		27	
standard span length(m)		12.5	

Survay Result on First phase

Stability		Abnormality				evaluation for scouring
abutment	100	abutment	foundation of riverside protection	50	total	100
			bank protection	50		
Pier	90		conecting portion of riverside and dike	50		
		Pier		90		

site situation photograph



Survay Result on Second phase

Hydrogical Survey Result

Survay Result	maximam velocity	m/s	N/A
	Q for maximam velocity	m3/s	N/A
Analysis result	cathment area	km2	28.3
	Runoff Coefficient		0.49
	Rainfall intensity (mm/h)	25years	38.7
		50years	43.1
		100years	48.1
	Peak discharge (m3/s)	25years	149.08
		50years	166.03
		100years	185.29
	Velocity (m/s)	25years	1.02
		50years	1.04
		100years	1.07
	Clerlance (m)	100years	0

Geological Survay Result

Depth (m)	Ground elevation: m / Description	0	20	40	60	80	100
0.00							
0.91	SOIL(BROWN)						
	SLIGHTLY WEATHERING ANDESITE (GRAY)						
6.10							
	FRESH ANDESITE (GRAY)						
11.10							

Reflection of Countermeasure

(i) The type of bridge is arched one, and the obstruction ratio is large

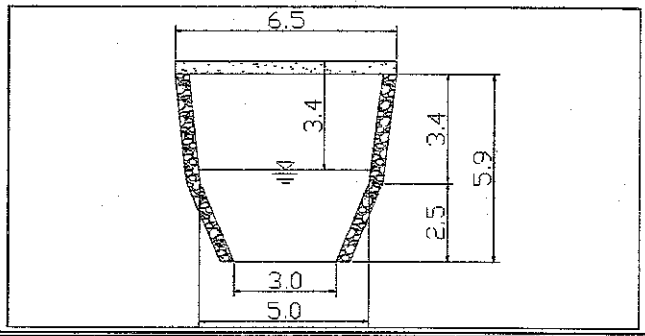
.(ii) Because the end side abutment subsided due to the scouring of bridge foundation, the wing of bridge was broken.

(iii) The position of bridge does not correspond to that of river.

Table B1.8 Bridge Conditions (Solis)

Bridge Name	Solis Bridge	Rout No.	Nic26	Station No.	107+533	Construction Year	1963

Outline of Brigde



Grade of river		2.00	%
Width of river	Upper	6.20	m
	Down	5.80	m
river bed condition		Sand	
Roughness Coefficient		0.016	
Obstruction ratio(%)		-	
standard span length(m)		6.2	

Stability		Abnormality				evaluation for scouring
abutment	75	abutment	foundation of riverside protection	50	total	100
			bank protection	10		
Pier	-		conecting portion of riverside and dike	50		
		Pier		-		

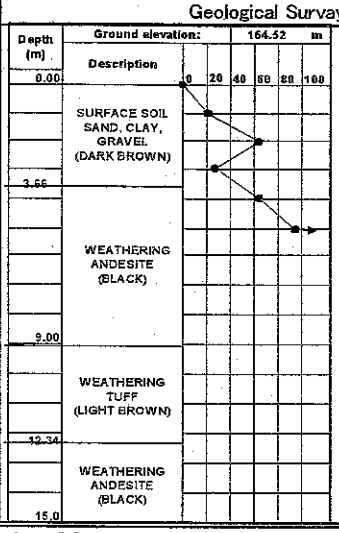
site situation photograph

Survay Result on Second phase

Hydrogical Survey Result

Survay Result	maximam velocity	m/s	N/A
	Q for maximam velocity	m3/s	N/A
Analysis result	cathment area	km2	0.8
	Runoff Coefficient		0.45
	Rainfall intensity (mm/h)	25years	105.9
		50years	114.7
		100years	123.4
	Peak discharge (m3/s)	25years	10.59
		50years	11.47
		100years	12.34
	Velocity (m/s)	25years	2.28
		50years	2.34
		100years	2.37
	Clerlance (m)	100years	3.4

Geological Survay Result



Reflection of Countermeasure

(i) The scouring of bridge foundation is intense, and the level of riverbed is 30–40 cm lower than the bottom of footing of abutment due to the erosion.

(ii) The level of riverbed has descended not only a to the part of bridge but also whole river channel. For that reason, there is no considerable change in vertical alignment at the part of bridge

(iii) The width of river at the bridge spot is narrower that in the upstream and downstream. Because of the progress of erosion, the H.W.L and the free space under the beam are adequate.

(iv) The riverbed is relatively solid, but it is covered by the powdered fine-gained soil whose thickness is about 10cm. So that soil would be washed away easily if there were water flow.

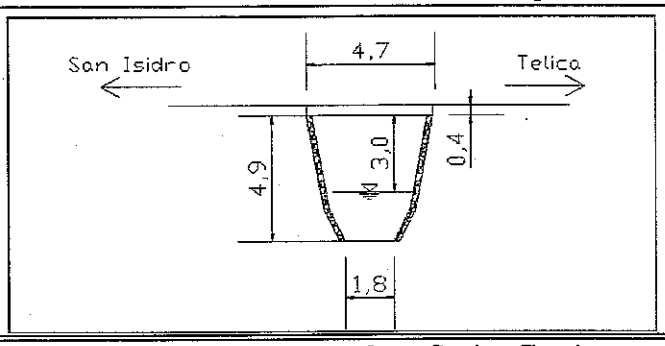
(v) The back of upstream side of wing was eroded largely

(vi) The slope of river is 2% and relatively steep. And there is a few obstructions. So the velocity of water flow is fast even if the amount of water flow is quite small.

Table B1.9 Bridge Conditions (Papalon)

Bridge Name	Papalón Bridge	Rout No.	Nic26	Station No.	108+154	Construction Year	1963

Outline of Brigde

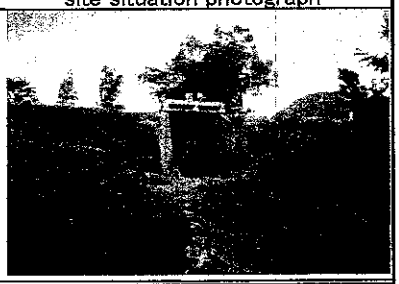


Grade of river		2.20	%
Width of river	Upper	6.80	m
	Down	7.00	m
river bed condition		Sand	
Roughness Coefficient		0.016	
Obstruction ratio(%)		-	
standard span length(m)		7.0	

Survay Result on First phase

Stability		Abnormality				evaluation for scouring
abutment	70	abutment	foundation of riverside protection	30	total	90
			bank protection	10		
Pier	-		conecting portion of riverside and dike	50		
		Pier	-			

site situation photograph

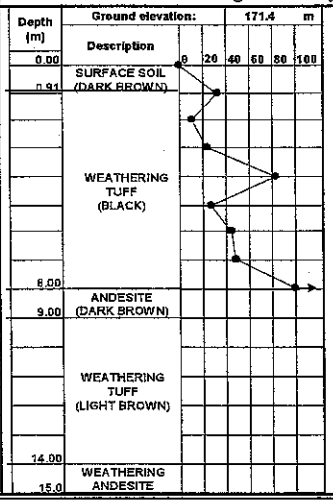


Survay Result on Second phase

Hydrogical Survey Result

Survay Result	maximam velocity	m/s	N/A
	Q for maximam velocity	m3/s	N/A
Analysis result	cathment area	km2	0.6
	Runoff Coefficient		0.46
	Rainfall intensity (mm/h)	25years	105.9
		50years	114.7
		100years	123.4
	Peak discharge (m3/s)	25years	8.12
		50years	8.79
		100years	9.46
	Velocity (m/s)	25years	2.47
		50years	2.61
		100years	2.76
	Clerlance (m)	100years	3.00

Geological Survay Result



Reflection of Countermeasure

(i) The scouring of bridge foundation is intense, and the level of riverbed is 30–40 cm lower than the bottom of footing of abutment due to the erosion.

(ii) The level of riverbed has descended not only a to the part of bridge but also whole river channel. For that reason, there is no considerable change in vertical alignment at the part of bridge.

(iii) The width of river at the bridge spot is narrower that in the upstream and downstream. Because of the progress of erosion, the H.W.L and the free space under the beam are adequate.

(iv) The riverbed is relatively solid, but it is covered by the powdered fine-gained soil whose thickness is about 10cm. So that soil would be washed away easily if there were water flow.

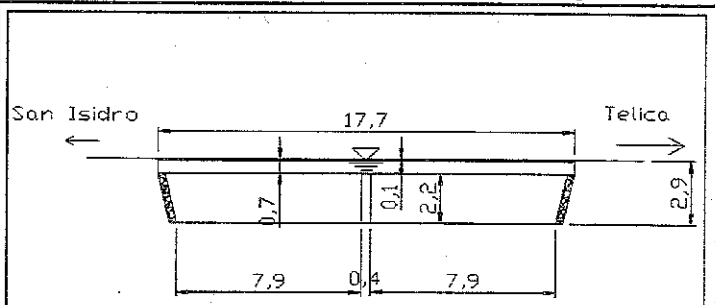
(v) The back of upstream side of wing was eroded largely

(vi) The slope of river is 2% and relatively steep. And there is a few obstructions. So the velocity of water flow is fast even if the amount of water flow is quite small.

Table B1.10 Bridge Conditions (San Juan de Dios)

Bridge Name	SanJuan de Dios Bridge	Rout No.	Nic26	Station No.	156+785	Construction Year	1965

Outline of Brigde



Grade of river		1.00	%
Width of river	Upper	17.90	m
	Down	19.20	m
river bed condition		Sand	
Roughness Coefficient		0.027	
Obstruction ratio(%)		2.5	
standard span length(m)		12.5	

Survay Result on First phase

Stability		Abnormality				evaluation for scouring
abutment	75	abutment	foundation of riverside protection	30	total	90
			bank protection	10	90	
Pier	65		conecting portion of riverside and dike	50		
		Pier		20		

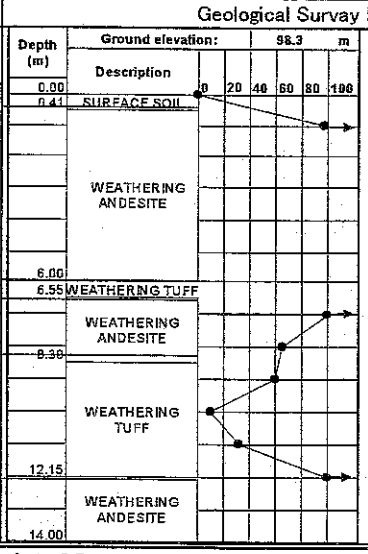
site situation photograph

Survay Result on Second phase

Hydrogical Survey Result

Survay Result	maximam velocity	m/s	0.186
	Q for maximam velocity	m3/s	0.017
Analysis result	cathment area	km2	9
	Runoff Coefficient		0.44
	Rainfall intensity (mm/h)	25years	61.1
		50years	66.1
		100years	73.8
	Peak discharge (m3/s)	25years	67.22
		50years	72.72
		100years	81.19
	Velocity (m/s)	25years	1.04
		50years	1.05
		100years	1.07
	Clerlance (m)	100years	0.1

Geological Survay Result



Reflection of Countermeasure

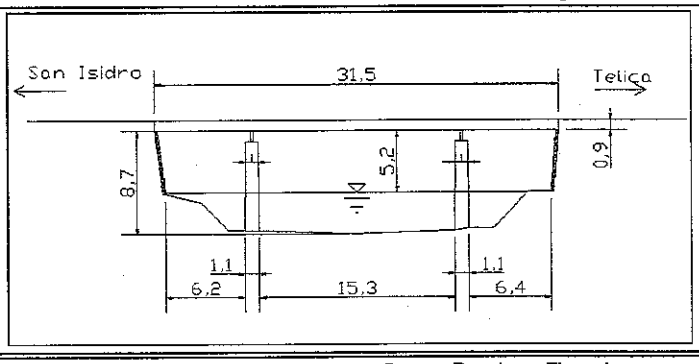
(i) Because the river flow is split into 2 way in the upstream, the soils are piled up between columns of bridge structure in the Telica side whose volume of water flow is small. Further more because the river channel inclines to the end side, the scouring of abutment is identified.

(ii) Partially, the scouring has proceeded up to the level close to the floor surface.

Table B1.11 Bridge Conditions (La Banderita)

Bridge Name	La Banderita Bridge	Rout No.	Nic26	Station No.	170+952	Construction Year

Outline of Brigde



Grade of river		1.79	%
Width of river	Upper	19.30	m
	Down	18.00	m
river bed condition		Gravel	
Roughness Coefficient		0.027	
Obstruction ratio(%)		6.7	
standard span length(m)		12.5	

Survay Result on First phase

Stability		Abnormality				evaluation for scouring
abutment	50	abutment	foundation of riverside protection	50	total	100
			bank protection	30		
Pier	50		conecting portion of riverside and dike	30		
		Pier		20		

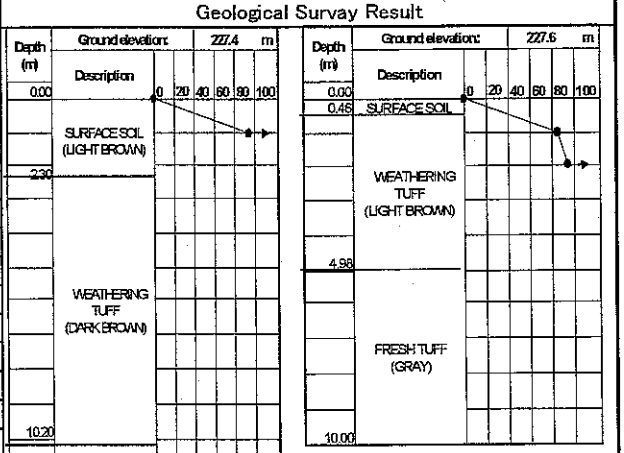
site situation photograph

Survay Result on Second phase

Hydrogical Survey Result

Survay Result	maximam velocity	m/s	0.192
	Q for maximam velocity	m3/s	0.047
Analysis result	cathment area	km2	7.7
	Runoff Coefficient		0.46
	Rainfall intensity (mm/h)	25years	61.1
		50years	66.1
		100years	73.8
	Peak discharge (m3/s)	25years	60.12
		50years	65.04
		100years	72.62
	Velocity (m/s)	25years	1.19
		50years	1.22
		100years	1.26
	Clerlance (m)	100years	5.2

Geological Survay Result



Reflection of Countermeasure

(i) Although the piers are rigid frame ones, the scouring around the piers are few.

(ii) Although the bottom of abutment is bedded at the level of about 3 meter higher than the riverbed, the erosion has proceeded due to the small distance between the pier and the slope in front of abutment (about 2 meters)

(iii) The abutment seems to be bedded on the weathered tuff. The weathering is intense at the exposed part of front of abutment.

Appendix B2

Formulary of Solicitude of
Environment Permission (Chapter19)

Appendix B2 Formulary of Solicitude of Environment Permission

MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES (MARENA)
GENERAL DIRECTION OF ENVIRONMENT (DGA)

FORMULARY OF SOLICITUDE OF ENVIRONMENT PERMISSION
MINISTRY OF TRANSPORT AND INFRASTRUCTURE

File No._____

I GENERAL DATA

1. Project name:_____
2. Client name: _____
3. Client address: _____
4. Telephone: _____ Fax: _____E-mail: _____
5. Type of project (match with x)

Roads ☐ Port ☐ Houses ☐ Bridge ☐

Airport ☐ Others ☐

Specify: _____

II PROJECT LOCATION

1. Department or Region: _____
2. Municipium: _____
3. Boundary: _____
4. Zone: ☐ Urbane ☐ Rural ☐
5. Project location:_____
6. Project dimension:
7. To annex a plane of the location or a map in scale 1:50.000 of the project location, besides materials banks that can be use and ways of access to the project.

III PROJECT DATA

1. Characteristics: (a) New ☐ (b) Rehabilitation ☐

(c) Enlargement ☐ (d) Reconvert ☐

(d_1) Change of traced : ____
(d_2) Asphalt : ____
(d_3) Bridges construction : ____
(d_4) Others : ____

1

2 Project phase:

Profile ☐ Feasibility ☐ Pre feasibility ☐ Design ☐

3 Little description of the project (identify and describe relevant actions of the project or susceptible technologies of produce environment impacts):

4 Indicate in the land where will be locate the project, in a perimeter of 1000 m, the existence of:

Protected Areas ☐ Rivers, Flowing ☐ Estuaries ☐

Corals Reef ☐ Archeological and Cultural goods ☐

Others ☐

Spicify: _____

5 Describe the representative activities in the area of the project :_

6 Does the project stop or affect the use of others naturals resources for the local population?

Yes ☐ No ☐

Specify: _____

7 Will be built access roads to the place of the project: Yes ☐ No ☐

8 Are you thinking in the exploitation of loans banks during the construction?

Yes ☐ No ☐ Situate in a map

9 Do you count with the special permission to the exploitation of the materials banks or are they in process?

Explain:

10 Will be affecting the vegetable cover in the phase of construction of the project?

Yes ☐ No ☐

11 Will be displacement the population? Yes ☐ No ☐

Specify the families' number: _____

IV SERVICE THAT DEMAND THE PROJECT

Water resources in the phases of construction and functioning

Providing Sources	**Consumption (m^3/día)**	
	Construction	**Functioning**
Connect to the net	**No**	
Well	**No**	
Others Supply (Specify): Rivers	**Yes, it will depend of the engineering study**	

Water table deep: this will determinate the engineering study

V ENERGY DEMAND

Providing Sources: __ ___Quantity (Kw/h)_____

Indicate if you possess others providing sources :	
Type of combustible used	
Used quantity to generate the electric fluid (by time unit)	
Form to store the combustible	

Point of final discharge to the affluent of the domestic or industrial residuals waters . (Match with a X).

River	☐	Open sea	☐
Lake	☐	Ravine or rivulet	☐
Drain	☐	Municipal sewerage	☐
Impounding	☐	Others	☐

16. Describe the type of solids residue generated and previous disposition, including the method of transport to the place of the final disposition. (Use additional pages)

17. Describe the emissions type that are generating to the atmosphere and prevent method. (Use additional pages).

18. Indicate the repercussion of the project in the community, taking note of any opinion that have been formed about the project by the mayors office, the associations, the community and the regional government.

I _____ confirm that all the information in this instrument and the attach annex are truly and correct, and by this way I ask the solicitude of environmental permission for the project before mentioned.

Sign _____

Date of the Solicitude: _____

Date of received in the E.I.A. office: _____

Sign and Stamp of the management of the E.I.A. office: _____

NOTE: PRESENT ORIGINAL AND COPY OF THE FORMULARY (ATTACH DETAILS OF: PROJECT DESCRIPTION, PLANE OF LOCATION AND OFFICIAL RECEIPT OF THE OFFICIAL CASH BOX OF THE PROCESS PAYMENT FOR THE ENVIRONMENTAL PERMISSION).

Appendix B3

Cost/Benefit Data (Chapter20)

Appendix B3 Cost/ Benefit Data

Cost-Benefit Analysis

Base Case

Site No	1	N001A290	A-Node	1109	B-Node 706
Site Name	NIC 1, 60.9		Link Length (km)		31.2

Maintenance Cost per km: 1340

Type of Disaster	Rock Fall	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 70 Benefit Factor 70

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	286774	391821	437200	713997	780521
2	472217	509041	691700	785385	1230257	1361510
3	161758	169458	199148	217435	271850	292703
4	193383	208435	309413	343656	560748	611220
5	131812	137885	199698	211750	379407	397997
6	93606	97090	107094	113766	260251	272737

AADT / Vehicle / Kilometres / input from / JICASTRADA / Traffic Model

Cars / Pick-ups / Buses / L Goods / M Goods / H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	18699	1265950	45379	3072226	4503773
215.1	36824	2890742	93685	7354419	10303566
529.7	7700	1488840	18287	3535899	4032051
549.1	15052	3016767	34243	6863084	10115748
768.2	6073	1702803	12052	3379249	5212432
878.5	3484	1117100	6672	2139291	4003475
Total		**11482201**		**26344168**	**38171046**

Capital Cost Estimate US $: 413370

1	4299	5165	6165	7173	11365	13511
2	7579	9258	10981	12965	19726	23744
3	2686	3079	3136	3524	4340	4985
4	3128	3725	4931	5749	9028	10748
5	2118	2394	3100	3446	6030	6786
6	1558	1737	1683	1840	4141	4616

AADT / Vehicle / Hours / input from / JICASTRADA / Traffic Model

Cars / Pick-ups / Buses / L Goods / M Goods / H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	866	921933	1008	1294622	5957326
1.09	1679	686026	1984	977985	4280947
14.9	393	2195038	388	2614461	9393975
1.04	597	232740	818	384725	1748498
1.04	276	107598	346	162732	768526
0.75	179	50324	157	53251	348224
Total		**4193660**		**5487777**	**22497498**
Value of Time Factors	Base	1.027		1.239	2.678
	Sensitivity	0.97		0.924	0.811

Occurrence probability 1/3

Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	413370		413370	413370	1887485	689369	0	1333	1333	-412037	-412037
2004	0	8267	8267	7441	2236494	719759	1	1972169	1774952	1963901	1767511
2005	0	8267	8267	6697	2585503	750149	0	1333	1080	-6934	-5617
2006	0	8267	8267	6027	2934512	780539	0	1333	972	-6934	-5055
2007	0	8267	8267	5424	3283521	810930	0	1333	875	-6934	-4549
2008	0	8267	8267	4882	3632530	841320	0	1333	787	-6934	-4094
2009	0	8267	8267	4394	3981539	871710	0	1333	709	-6934	-3685
2010	0	8267	8267	3954	4330548	902100	0	1333	638	-6934	-3317
2011	0	8267	8267	3559	4524963	1181712	0	1333	574	-6934	-2985
2012	0	8267	8267	3203	4719377	1461324	0	1333	517	-6934	-2686
2013	413370		413370	144133	4913791	1740936	0	1333	465	-412037	-143668
2014	0	8267	8267	2594	5108206	2020548	1	4753836	1491804	4745568	1489210
2015	0	8267	8267	2335	5302620	2300160	0	1333	377	-6934	-1958
2016	0	8267	8267	2101	5497035	2579771	0	1333	339	-6934	-1763
2017	0	8267	8267	1891	5691449	2859383	0	1333	305	-6934	-1586
2018	0	8267	8267	1702	5885864	3138995	0	1333	275	-6934	-1428
2019	0	8267	8267	1532	6080278	3418607	0	1333	247	-6934	-1285
2020	0	8267	8267	1379	6274692	3698219	0	1333	222	-6934	-1156
2021											
2022											
2023											
Total	826,740	132,278	959018	**616,618**	78,870,408	30,765,532		6,747,338	**3,276,470**	**5,788,319**	**2,659,851**
										B/C	**5.31**
										EIRR	**4%**

Cost-Benefit Analysis

Site No	2	N001A280	A-Node	1109	B-Node	1102
Site Name	NIC 1, 73.2		Link Length (km)		36.4	

Base Case
Maintenance Cost per km 1340

Type of Disaster	Rock Fall	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in years

Score	78	Benefit Factor	78

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	289512	391813	440747	713975	783332
2	472217	505241	691648	778155	1230257	1343893
3	161758	169705	199148	217227	271850	291178
4	193383	209752	309370	344033	560748	610522
5	131812	137811	199683	210966	379385	396166
6	93606	97189	107094	113857	260251	272008

AADT Vehicle Kilometres input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003	2010	2020
185.5	21437	1451317	3312904	4695572
215.1	33024	2592436	6790935	8920604
529.7	7947	1536599	18079	3495681	3737183
549.1	16369	3280724	34663	6947262	9975853
768.2	5999	1682054	11283	3163629	4705208
878.5	3583	1148843	6763	2168469	3769731
Total		**11691972**		**25878881**	**35804151**

Capital Cost Estimate US $
12339

1	4300	5208	6167	7239	11365	13634
2	7586	9116	10991	12749	19747	23359
3	2686	3058	3136	3503	4340	4940
4	3133	3750	4938	5777	9042	10812
5	2121	2390	3105	3432	6042	4634
6	1560	1739	1684	1842	4146	4636

AADT Vehicle Hours input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003	2010	2020
2.84	908	966646	1072	1376820	6298778
1.09	1530	625146	1758	866582	3848378
14.9	372	2077746	367	2472957	8738582
1.04	617	240537	839	394602	1799327
1.04	269	104869	327	153796	-1431329
0.75	179	50324	158	53590	359220
Total		**4065269**		**5318347**	**19612955**

Value of Time Factors	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	12339		12339	12339	480492	167066	0	1333	1333	-11006	-11006
2004	0	247	247	222	563781	174422	1	493469	444122	493222	443900
2005	0	247	247	200	647070	181779	0	1333	1080	1087	880
2006	0	247	247	180	730359	189136	0	1333	972	1087	792
2007	0	247	247	162	813648	196492	0	1333	875	1087	713
2008	0	247	247	146	896937	203849	0	1333	787	1087	642
2009	0	247	247	131	980227	211206	0	1333	709	1087	577
2010	0	247	247	118	1063516	218562	0	1333	638	1087	520
2011	0	247	247	106	966973	277307	0	1333	574	1087	468
2012	0	247	247	96	870431	336052	0	1333	517	1087	421
2013	0	247	247	86	773889	394797	0	1333	465	1087	379
2014	0	247	247	77	677347	453542	0	1333	418	1087	341
2015	0	247	247	70	580805	512287	0	1333	377	1087	307
2016	0	247	247	63	484262	571032	0	1333	339	1087	276
2017	0	247	247	56	387720	629777	0	1333	305	1087	249
2018	0	247	247	51	291178	688522	0	1333	275	1087	224
2019	0	247	247	46	194636	747267	0	1333	247	1087	201
2020	0	247	247	41	98094	806012	0	1333	222	1087	181
2021											
2022											
2023											
Total	12,339	4,195	16535	**14,190**	11,501,366	6,959,107		516,136	**454,254**	**499,601**	**440,064**
										B/C	**32.01**
										EIRR	**44%**

Cost-Benefit Analysis

Base Case

Site No	3	Junquillal	A-Node	1101	B-Node	1102
Site Name	NIC 1, 113.2		Link Length (km)		10.4	

Maintenance Cost per km: 1340

Type of Disaster	Bridge Scouring	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 90 Benefit Factor 90

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	289503	391813	440012	713975	790357
2	472217	522499	691648	800377	1230257	1399546
3	161758	182692	199148	231323	271850	315491
4	193383	214298	309370	351475	560748	632607
5	131812	141319	199683	214772	379385	408119
6	93606	98849	107094	115397	260251	278904

AADT Vehicle <---- Kilometres input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	21428	1450707	48199	3263144	5171175
215.1	50282	3947216	108729	8535397	13289452
529.7	20934	4047712	32175	6221226	8438245
549.1	20915	4191847	42105	8438809	14402195
768.2	9507	2665658	15089	4230790	8056698
878.5	5243	1681100	8303	2662250	5980844
Total		**17984241**		**33351616**	**55338608**

Capital Cost Estimate US $: 51825

1	4300	5158	6167	7192	11365	13522
2	7586	9359	10991	13147	19747	24070
3	2686	3319	3136	3852	4340	5423
4	3133	3807	4938	5890	9042	11018
5	2121	2497	3105	3586	6042	7052
6	1560	1763	1684	1873	4146	4714

AADT Vehicle <---- Hours input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	858	913417	1025	1316456	5987864
1.09	1773	724434	2156	1062770	4605907
14.9	633	3535520	716	4824624	15773140
1.04	674	262758	952	447749	2008740
1.04	376	146583	481	226226	1026734
0.75	203	57072	189	64104	416402
Total		**5639783**		**7941929**	**29818788**

Value of Time Factors	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 1000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	51825		51825	51825	739078	231772	0	667	667	-51159	-51159
2004	0	1037	1037	933	829298	201770	1	688045	619241	587009	618308
2005	0	1037	1037	840	919517	171768	0	667	540	-370	-300
2006	0	1037	1037	756	1009737	141766	0	667	486	-370	-270
2007	0	1037	1037	680	1099956	111764	0	667	437	-370	-243
2008	0	1037	1037	612	1190176	81762	0	667	394	-370	-218
2009	0	1037	1037	551	1280395	51761	0	667	354	-370	-197
2010	0	1037	1037	496	1370614	21759	0	667	319	-370	-177
2011	0	1037	1037	446	1460972	142126	0	667	287	-370	-159
2012	0	1037	1037	402	1551329	262493	0	667	258	-370	-143
2013	51825	0	51825	18070	1641687	382860	0	667	232	-51158	-17838
2014	0	1037	1037	325	1732044	503227	1	1490848	467844	1489811	467519
2015	0	1037	1037	293	1822402	623594	0	667	188	-370	-104
2016	0	1037	1037	263	1912759	743961	0	667	169	-370	-94
2017	0	1037	1037	237	2003117	864328	0	667	153	-370	-85
2018	0	1037	1037	213	2093474	984695	0	667	137	-370	-76
2019	0	1037	1037	192	2183832	1105063	0	667	124	-370	-69
2020	0	1037	1037	173	2274189	1225430	0	667	111	-370	-62
2021											
2022											
2023											
Total	103,650	16,584	120235	**77,307**	27,114,577	7,851,900		2,189,560	**1,091,941**	**2,069,325**	**1,014,634**
										B/C	**14.12**
										EIRR	**12%**

Cost-Benefit Analysis

Site No	4	San Nicolás	A-Node	304	B-Node	1101	Base Case
Site Name	NIC 1, 135.64		Link Length (km)			20.8	Maintenance Cost per km 1340

Type of Disaster	Bridge Scouring	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in years

Score 100 Benefit Factor 100

	2003		2010		2020			
Mode	Base	Disaster	Base	Disaster	Base	Disaster		
1	267097	285605	391813	418104	713997	760768	AADT	Cars
2	470719	504343	691648	740532	1230274	1313252	Vehicle	Pick-ups
3	161384	171408	199148	211679	271850	288832	← Kilometres	Buses
4	192832	204035	309370	327249	560766	592874	input from	L Goods
5	131282	136891	199683	206529	379407	392346	JICASTRADA	M Goods
6	93418	97176	107094	110753	260286	269366	Traffic Model	H Goods

Veh. Op Cost		Benefits, US $, per year			
1000 km		**2003**		**2010**	**2020**
185.5	18508	1253019	26291	1779940	3166466
215.1	33624	2639537	48884	3837471	6513903
529.7	10024	1938200	12531	2422943	3283570
549.1	11203	2245339	17879	3583362	6435181
768.2	5609	1572702	6846	1919543	3627954
878.5	3758	1204954	3659	1173211	2911385
Total		**10853750**		**14716470**	**25938459**

Capital Cost Estimate US $ 30849

1	4299	4731	6166	6754	11367	12643	AADT	Cars
2	7584	8364	10988	12062	19743	21999	Vehicle	Pick-ups
3	2686	2941	3135	3438	4340	4826	← Hours	Buses
4	3131	3391	4936	5319	9038	9938	input from	L Goods
5	2119	2288	3104	3328	6039	6545	JICASTRADA	M Goods
6	1558	1654	1683	1769	4143	4428	Traffic Model	H Goods

Passenger		Benefits, US $, per year			
VOT, 2002		**2003**		**2010**	**2020**
2.84	432	459902	588	755196	3542195
1.09	780	318702	1074	529413	2403638
14.9	255	1424262	303	2041705	7078251
1.04	260	101361	383	180134	914912
1.04	169	65885	224	105353	514384
0.75	96	26990	86	29169	208934
Total		**2397100**		**3640971**	**14662314**

Value of Time	Base	1.027		1.239	2.678	Occurrence probability 1/3
Factors	Sensitivity	0.97		0.924	0.811	Restoration Cost 1000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits	Total Dis. Benefits	Benefits - Cost	Net Pre Value
								$ US	$ US	$ US	$ US
2002											
2003	30849		30849	30849	446045	98511	0	667	667	-30182	-30182
2004	0	617	617	555	468722	105814	1	383690	345321	383073	344766
2005	0	617	617	500	491399	113116	0	667	540	50	40
2006	0	617	617	450	514077	120419	0	667	486	50	36
2007	0	617	617	405	536754	127721	0	667	437	50	33
2008	0	617	617	364	559432	135024	0	667	394	50	29
2009	0	617	617	328	582109	142326	0	667	354	50	26
2010	0	617	617	295	604786	149629	0	667	319	50	24
2011	0	617	617	266	650904	194922	0	667	287	50	21
2012	0	617	617	239	697022	240215	0	667	258	50	19
2013	30849	0	30849	10756	743140	285509	0	667	232	-30182	-10524
2014	0	617	617	194	789257	330802	1	747373	234534	746756	234340
2015	0	617	617	174	835375	376095	0	667	188	50	14
2016	0	617	617	157	881493	421388	0	667	169	50	13
2017	0	617	617	141	927611	466681	0	667	153	50	11
2018	0	617	617	127	973729	511974	0	667	137	50	10
2019	0	617	617	114	1019846	557268	0	667	124	50	9
2020	0	617	617	103	1065964	602561	0	667	111	50	8
2021											
2022											
2023											
Total	61,697	9,872	71569	46,016	12,787,665	4,979,975		1,141,730	584,712	1,070,161	538,695
										B/C	12.71
										EIRR	12%

Cost-Benefit Analysis

Base Case

Site No	5	Las Chanillas	A-Node 303	B-Node	302
Site Name	NIC 1, 150.33		Link Length (km)		11.4

Maintenance Cost per km: 1340

Type of Disaster	Bridge Scouring	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 90 Benefit Factor 90

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	283215	391813	413404	713975	755041
2	472217	494278	691648	725035	1230257	1290990
3	161758	169277	199148	208355	271850	285828
4	193383	202409	309370	325099	560748	589534
5	131812	137046	199683	207544	379385	393355
6	93606	96577	107094	110014	260251	267905

<---- AADT, Vehicle, Kilometres input from JICASTRADA Traffic Model

Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Veh. Op Cost — Benefits, US $, per year

1000 km		2003	2010	2020
185.5	15140	1025000	1461743	2780229
215.1	22061	1731823	2620932	4767636
529.7	7519	1453843	1780228	2702729
549.1	9026	1809018	3152453	5769376
768.2	5234	1467556	7861	2204138	3917035
878.5	2971	952613	2920	936260	2454157
Total		**8439853**		**12155754**	**22391161**

Capital Cost Estimate US $: 233215

1	4300	4879	6167	7004	11365	12907
2	7586	8369	10991	12143	19747	21785
3	2686	2940	3136	3445	4340	4785
4	3133	3485	4938	5522	9042	10067
5	2121	2400	3105	3531	6042	6764
6	1560	1692	1684	1821	4146	4507

<---- AADT, Vehicle, Hours input from JICASTRADA Traffic Model

Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Passenger VOT, 2002 — Benefits, US $, per year

		2003	2010	2020
2.84	579	616397	837	1074999	4280615
1.09	783	319927	1152	567862	2171371
14.9	254	1418676	309	2082135	6481115
1.04	352	137227	584	274669	1041983
1.04	279	108768	426	200358	733963
0.75	132	37111	137	46467	264650
Total		**2638106**		**4246491**	**14973697**

Value of Time Factors	Base	1.027	1.239	2.678	Occurrence probability 1/3
	Sensitivity	0.97	0.924	0.811	Restoration Cost 1000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits -Cost $ US	Net Pre Value $ US
2002											
2003	233215		233215	233215	346843	108415	0	667	667	-232548	-232548
2004	0	4664	4664	4198	368659	117858	1	325011	292510	320347	288312
2005	0	4664	4664	3778	390474	127300	0	667	540	-3998	-3238
2006	0	4664	4664	3400	412290	136743	0	667	486	-3998	-2914
2007	0	4664	4664	3060	434105	146186	0	667	437	-3998	-2623
2008	0	4664	4664	2754	455921	155628	0	667	394	-3998	-2361
2009	0	4664	4664	2479	477736	165071	0	667	354	-3998	-2125
2010	0	4664	4664	2231	499552	174513	0	667	319	-3998	-1912
2011	0	4664	4664	2008	541615	218598	0	667	287	-3998	-1721
2012	0	4664	4664	1807	583678	262682	0	667	258	-3998	-1549
2013	233215	0	233215	81317	625741	306767	0	667	232	-232548	-81084
2014	0	4664	4664	1464	667805	350851	1	679771	213319	675106	211855
2015	0	4664	4664	1317	709868	394935	0	667	188	-3998	-1129
2016	0	4664	4664	1186	751931	439020	0	667	169	-3998	-1016
2017	0	4664	4664	1067	793995	483104	0	667	153	-3998	-915
2018	0	4664	4664	960	836058	527189	0	667	137	-3998	-823
2019	0	4664	4664	864	878121	571273	0	667	124	-3998	-741
2020	0	4664	4664	778	920185	615357	0	667	111	-3998	-667
2021											
2022											
2023											
Total	466,429	74,629	541058	**347,883**	10,694,577	5,301,490		1,015,448	**510,686**	**474,390**	**162,803**
										B/C	**1.47**
										EIRR	**0%**

Cost-Benefit Analysis

Site No	6	San Ramón	A-Node	303	B-Node	302
Site Name	NIC 1, 151.9		Link Length (km)			11.4

Type of Disaster	Bridge Scouring	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Base Case

Maintenance Cost per km 1340

Risk : Without Prevention Measures Road will fail in years

Score 100 Benefit Factor 100

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	283215	391813	413404	713975	755041
2	472217	494278	691648	725035	1230257	1290990
3	161758	169277	199148	208355	271850	285828
4	193383	202409	309370	325099	560748	589534
5	131812	137046	199683	207544	379385	393355
6	93606	96577	107094	110014	260251	267905

AADT Vehicle Kilometres input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Capital Cost Estimate US $ 11105

Veh. Op Cost 1000 km — Benefits, US $, per year

		2003		2010	2020
185.5	15140	1025000	21591	1461743	2780229
215.1	22061	1731823	33387	2620932	4767636
529.7	7519	1453843	9207	1780228	2702729
549.1	9026	1809018	15729	3152453	5789376
768.2	5234	1467556	7861	2204138	3917035
878.5	2971	952613	2920	936260	2454157
Total		**8439853**		**12155754**	**22391161**

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	4300	4879	6167	7004	11365	12907
2	7586	8369	10991	12143	19747	21785
3	2686	2940	3136	3445	4340	4785
4	3133	3485	4938	5522	9042	10067
5	2121	2400	3105	3531	6042	6764
6	1560	1692	1684	1821	4146	4507

AADT Vehicle Hours input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002 — Benefits, US $, per year

		2003		2010	2020
2.84	579	616397	837	1074999	4280615
1.09	783	319927	1152	567862	2171371
14.9	254	1418676	309	2082135	6481115
1.04	352	137227	584	274669	1041983
1.04	279	108768	426	200358	733963
0.75	132	37111	137	46467	264650
Total		**2638106**		**4246491**	**14973697**

Value of Time Factors				
	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 1000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits	Total Dis. Benefits	Benefits - Cost	Net Pre Value
								$ US	$ US	$ US	$ US
2002											
2003	11105		11105	11105	346843	108415	0	667	667	-10439	-10439
2004	0	222	222	200	368659	117858	1	325011	292510	324789	292310
2005	0	222	222	180	390474	127300	0	667	540	445	360
2006	0	222	222	162	412290	136743	0	667	486	445	324
2007	0	222	222	146	434105	146186	0	667	437	445	292
2008	0	222	222	131	455921	155628	0	667	394	445	263
2009	0	222	222	118	477736	165071	0	667	354	445	236
2010	0	222	222	106	499552	174513	0	667	319	445	213
2011	0	222	222	96	541615	218598	0	667	287	445	191
2012	0	222	222	86	583678	262682	0	667	258	445	172
2013	11105	0	11105	3872	625741	306767	0	667	232	-10439	-3640
2014	0	222	222	70	667805	350851	1	679771	213319	679548	213249
2015	0	222	222	63	709868	394935	0	667	188	445	126
2016	0	222	222	56	751931	439020	0	667	169	445	113
2017	0	222	222	51	793995	483104	0	667	153	445	102
2018	0	222	222	46	836058	527189	0	667	137	445	92
2019	0	222	222	41	878121	571273	0	667	124	445	82
2020	0	222	222	37	920185	615357	0	667	111	445	74
2021											
2022											
2023											
Total	22,211	3,554	25765	**16,566**	10,694,577	5,301,490		1,015,448	**510,686**	**989,684**	**494,120**
										B/C	**30.83**
										EIRR	**30%**

Cost-Benefit Analysis

Base Case

Site No	7	N001A240	A-Node	302	B-Node	301
Site Name	NIC 1, 168.4			Link Length (km)		26.0

Maintenance Cost per km: 1340

Type of Disaster	Rock Fall	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score	84	Benefit Factor	84

	2003		2010		2020	
Mode	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	277292	391813	404830	713975	737697
2	472217	486793	691648	713654	1230257	1267254
3	161758	166566	199148	205011	271850	280087
4	193383	198866	309370	318958	560748	578093
5	131812	134526	199683	203777	379385	386096
6	93606	95278	107094	108679	260251	264403

<---- Kilometres

AADT Vehicle input from JICASTRADA Traffic Model

Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	9217	624005	13017	881270	1605015
215.1	14576	1144239	22006	1727506	2904323
529.7	4808	929655	5863	1133646	1592673
549.1	5483	1098919	9588	1921655	3476336
768.2	2714	760976	4094	1147913	1881691
878.5	1672	536105	1585	508210	1331285
Total		**5093899**		**7320199**	**12792322**

Capital Cost Estimate US $: 32082

1	4300	4688	6167	6726	11365	12375
2	7586	8106	10991	11739	19747	21043
3	2686	2851	3136	3333	4340	4617
4	3133	3363	4938	5316	9042	9698
5	2121	2314	3105	3398	6042	6528
6	1560	1653	1684	1780	4146	4400

<---- Hours

AADT Vehicle input from JICASTRADA Traffic Model

Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	388	413060	559	717950	2803775
1.09	520	212468	748	368716	1380813
14.9	165	921581	197	1327445	4034312
1.04	230	89665	378	177783	666869
1.04	193	75241	293	137805	494052
0.75	93	26146	96	32561	186208
Total		**1738161**		**2762260**	**9566030**

Value of Time Factors	Base	1.027	1.239	2.678	Occurrence probability 1/3
	Sensitivity	0.97	0.924	0.811	Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits	Total Dis. Benefits	Benefits - Cost	Net Pre Value
								$ US	$ US	$ US	$ US
2002											
2003	32082		32082	32082	628015	214294	0	1333	1333	-30749	-30749
2004	0	642	642	577	667226	232331	1	601038	540934	600396	540356
2005	0	642	642	520	706436	250368	0	1333	1080	692	560
2006	0	642	642	468	745647	268405	0	1333	972	692	504
2007	0	642	642	421	784858	286442	0	1333	875	692	454
2008	0	642	642	379	824069	304479	0	1333	787	692	408
2009	0	642	642	341	863280	322516	0	1333	709	692	368
2010	0	642	642	307	902490	340553	0	1333	638	692	331
2011	0	642	642	276	969955	424435	0	1333	574	692	298
2012	0	642	642	249	1037419	508317	0	1333	517	692	268
2013	32082	0	32082	11186	1104884	592199	0	1333	465	-30749	-10722
2014	0	642	642	201	1172348	676081	1	1233620	387123	1232978	386922
2015	0	642	642	181	1239813	759963	0	1333	377	692	195
2016	0	642	642	163	1307278	843845	0	1333	339	692	176
2017	0	642	642	147	1374742	927727	0	1333	305	692	158
2018	0	642	642	132	1442207	1011609	0	1333	275	692	142
2019	0	642	642	119	1509671	1095491	0	1333	247	692	128
2020	0	642	642	107	1577136	1179374	0	1333	222	692	115
2021											
2022											
2023											
Total	64,165	10,266	74431	**47,857**	18,857,473	10,238,427		1,855,991	**937,770**	**1,781,569**	**889,914**
										B/C	**19.60**
										EIRR	**19%**

Cost-Benefit Analysis

Site No	8	N001B230	A-Node	302	B-Node	301
Site Name	NIC 1, 168.6		Link Length (km)			26.0

Base Case

Maintenance Cost per km 1340

Type of Disaster	Rock Collapse	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 72 Benefit Factor 72

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	277292	391813	404830	713975	737697
2	472217	486793	691648	713654	1230257	1267254
3	161758	166566	199148	205011	271850	280087
4	193383	198866	309370	318958	560748	578093
5	131812	134526	199683	203777	379385	386096
6	93606	95278	107094	108679	260251	264403

AADT Vehicle Kilometres input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003	2010	2020
341.9	9217	1150222	1624437	2960351
365.6	14576	1945080	2936569	4937028
909.8	4808	1596526	1946967	2735318
891.9	5483	1784955	3121311	5646552
1289.8	2714	1277689	4094	1927361	3159384
1509.8	1672	921401	1585	873457	2288072
Total		**8675972**		**12430102**	**21726705**

Capital Cost Estimate US $ 7404

1	4300	4688	6167	6725	11365	12375
2	7586	8106	10991	11739	19747	21043
3	2686	2851	3136	3333	4340	4617
4	3133	3363	4938	5316	9042	9698
5	2121	2314	3105	3398	6042	6528
6	1560	1653	1684	1780	4146	4400

AADT Vehicle Hours input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003	2010	2020
2.84	388	413060	559	717950	2803775
1.09	520	212468	748	368716	1380813
14.9	165	921581	197	1327445	4034312
1.04	230	89665	378	177783	686869
1.04	193	75241	293	137805	494052
0.75	93	26146	96	32561	186208
Total		**1738161**		**2762260**	**9566030**

Value of Time Factors	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	7404		7404	7404	178273	35716	0	1333	1333	-6070	-6070
2004	0	148	148	133	189293	38722	1	153343	138009	153195	137876
2005	0	148	148	120	200313	41728	0	1333	1080	1185	964
2006	0	148	148	108	211333	44734	0	1333	972	1185	864
2007	0	148	148	97	222353	47740	0	1333	875	1185	778
2008	0	148	148	87	233373	50746	0	1333	787	1185	700
2009	0	148	148	79	244393	53753	0	1333	709	1185	630
2010	0	148	148	71	255413	56759	0	1333	638	1185	567
2011	0	148	148	64	274516	70739	0	1333	574	1185	510
2012	0	148	148	57	293618	84719	0	1333	517	1185	459
2013	7404	0	7404	2581	312721	98700	0	1333	465	-6070	-2117
2014	0	148	148	46	331823	112680	1	297669	93412	297521	93365
2015	0	148	148	42	350926	126661	0	1333	377	1185	335
2016	0	148	148	38	370029	140641	0	1333	339	1185	301
2017	0	148	148	34	389131	154621	0	1333	305	1185	271
2018	0	148	148	30	408234	168602	0	1333	275	1185	244
2019	0	148	148	27	427337	182582	0	1333	247	1185	220
2020	0	148	148	25	446439	196562	0	1333	222	1185	198
2021											
2022											
2023											
Total	14,807	2,369	17176	**11,044**	5,339,520	1,706,405		472,346	**241,134**	**455,169**	**230,091**
										B/C	**21.83**
										EIRR	**24%**

Cost-Benefit Analysis

Base Case

Site No	11	N001B170	A-Node 302	B-Node	301
Site Name	NIC 1, 171.3		Link Length (km)		26.0

Maintenance Cost per km: 1340

Type of Disaster	Rock Coliapse	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 78 Benefit Factor 78

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	277292	391813	404830	713975	737697
2	472217	486793	691648	713654	1230257	1267254
3	161758	166566	199148	205011	271850	280087
4	193383	198866	309370	318958	560748	578093
5	131812	134526	199683	203777	379385	386096
6	93606	95278	107094	108679	260251	264403

AADT Vehicle Kilometres input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	9217	624005	13017	881270	1606015
215.1	14576	1144239	22006	1727506	2904323
529.7	4808	929655	5863	1133646	1592673
549.1	5483	1098919	9588	1921655	3476336
768.2	2714	760976	4094	1147913	1881691
878.5	1672	536105	1585	508210	1331285
Total		**5093899**		**7320199**	**12792322**

Capital Cost Estimate US $: 1961965

1	4300	4688	6167	6725	11365	12375
2	7586	8106	10991	11739	19747	21043
3	2686	2851	3136	3333	4340	4617
4	3133	3363	4938	5316	9042	9698
5	2121	2314	3105	3398	6042	6528
6	1560	1653	1684	1780	4146	4400

AADT Vehicle Hours input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	388	413060	559	717950	2803775
1.09	520	212468	748	368716	1380813
14.9	165	921581	197	1327445	4034312
1.04	230	89665	378	177783	666869
1.04	193	75241	293	137805	494052
0.75	93	26146	96	32561	186208
Total		**1738161**		**2762260**	**9566030**

Value of Time Factors	Base	1.027	1.239	2.678	Occurrence probability 1/3
	Sensitivity	0.97	0.924	0.811	Restoration Cost 400 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	1961965		1961965	1961965	2791177	952417	0	267	267	-1961698	-1961698
2004	0	39239	39239	35315	2965448	1032582	1	2665619	2399057	2626380	2363742
2005	0	39239	39239	31784	3139718	1112746	0	267	216	-38973	-31568
2006	0	39239	39239	28605	3313988	1192910	0	267	194	-38973	-28411
2007	0	39239	39239	25745	3488258	1273074	0	267	175	-38973	-25570
2008	0	39239	39239	23170	3662528	1353239	0	267	157	-38973	-23013
2009	0	39239	39239	20853	3836798	1433403	0	267	142	-38973	-20712
2010	0	39239	39239	18768	4011068	1513567	0	267	128	-38973	-18640
2011	0	39239	39239	16891	4310910	1886377	0	267	115	-38973	-16776
2012	0	39239	39239	15202	4610753	2259186	0	267	103	-38973	-15099
2013	0	39239	39239	13682	4910595	2631995	0	267	93	-38973	-13589
2014	0	39239	39239	12314	5210438	3004804	0	267	84	-38973	-12230
2015	0	39239	39239	11082	5510280	3377614	0	267	75	-38973	-11007
2016	0	39239	39239	9974	5810122	3750423	0	267	68	-38973	-9906
2017	0	39239	39239	8977	6109965	4123232	0	267	61	-38973	-8916
2018	0	39239	39239	8079	6409807	4496042	0	267	55	-38973	-8024
2019	0	39239	39239	7271	6709649	4868851	0	267	49	-38973	-7222
2020	0	39239	39239	6544	7009492	5241660	0	267	44	-38973	-6500
2021											
2022											
2023											
Total	1,961,965	667,068	2629033	**2,256,222**	83,810,993	45,504,122		2,670,153	**2,401,084**	**41,120**	**144,861**
										B/C	**1.06**
										EIRR	**0.3%**

Cost-Benefit Analysis

Site No	12	N001B150	A-Node	302	B-Node	301
Site Name	NIC 1, 175.0		Link Length (km)			26.0

Base Case

Maintenance Cost per km
1340

Type of Disaster	Rock Collapse	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in years

Score 76 Benefit Factor 76

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	277292	391813	404830	713975	737697
2	472217	486793	691648	713654	1230257	1267254
3	161758	166566	199148	205011	271850	280087
4	193383	198866	309370	318958	560748	578093
5	131812	134526	199683	203777	379385	386096
6	93606	95278	107094	108679	260251	264403

AADT Vehicle Kilometres input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	9217	624005	13017	881270	1606015
215.1	14576	1144239	22006	1727506	2904323
529.7	4808	929655	5863	1133646	1592673
549.1	5483	1098919	9588	1921655	3476336
768.2	2714	760976	4094	1147913	1881691
878.5	1672	536105	1585	508210	1331285
Total		**5093899**		**7320199**	**12792322**

Capital Cost Estimate US $: 33316

1	4300	4688	6167	6726	11365	12375
2	7586	8106	10991	11739	19747	21043
3	2686	2851	3136	3333	4340	4617
4	3133	3363	4938	5316	9042	9698
5	2121	2314	3105	3398	6042	6528
6	1560	1653	1684	1780	4146	4400

AADT Vehicle Hours input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	388	413060	559	717950	2803775
1.09	520	212468	748	368716	1380813
14.9	165	921581	197	1327445	4034312
1.04	230	89665	378	177783	666869
1.04	193	75241	293	137805	494052
0.75	93	26146	96	32561	186208
Total		**1738161**		**2762260**	**9566030**

Value of Time Factors				
	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	33316		33316	33316	837353	285725	0	1333	1333	-31983	-31983
2004	0	666	666	600	889634	309774	1	800939	720845	800273	720246
2005	0	666	666	540	941915	333824	0	1333	1080	667	540
2006	0	666	666	486	994196	357873	0	1333	972	667	486
2007	0	666	666	437	1046477	381922	0	1333	875	667	438
2008	0	666	666	393	1098758	405972	0	1333	787	667	394
2009	0	666	666	354	1151039	430021	0	1333	709	667	354
2010	0	666	666	319	1203320	454070	0	1333	638	667	319
2011	0	666	666	287	1293273	565913	0	1333	574	667	287
2012	0	666	666	258	1383226	677756	0	1333	517	667	258
2013	0	666	666	232	1473179	789599	0	1333	465	667	233
2014	0	666	666	209	1563131	901441	0	1333	418	667	209
2015	0	666	666	188	1653084	1013284	0	1333	377	667	188
2016	0	666	666	169	1743037	1125127	0	1333	339	667	170
2017	0	666	666	152	1832989	1236970	0	1333	305	667	153
2018	0	666	666	137	1922942	1348812	0	1333	275	667	137
2019	0	666	666	123	2012895	1460655	0	1333	247	667	124
2020	0	666	666	111	2102847	1572498	0	1333	222	667	111
2021											
2022											
2023											
Total	33,316	11,328	44644	**38,313**	25,143,298	13,651,237		823,606	**730,977**	**778,962**	**692,664**
										B/C	**19.08**
										EIRR	**24%**

Cost-Benefit Analysis

Base Case

Site No	13	N001B120	A-Node	302	B-Node	301
Site Name	NIC 1, 176.2		Link Length (km)		26.0	

Maintenance Cost per km: 1340

Type of Disaster	Rock Collapse	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 74 Benefit Factor 74

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	277292	391813	404830	713975	737697
2	472217	486793	691648	713654	1230257	1267254
3	161758	166566	199148	205011	271850	280087
4	193383	198866	309370	318958	560748	578093
5	131812	134526	199683	203777	379385	386096
6	93606	95278	107094	108679	260251	264403

<---- AADT Vehicle Kilometres input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	9217	524005	13017	881270	1606015
215.1	14576	1144239	22006	1727506	2904323
529.7	4808	929655	5863	1133646	1592673
549.1	5483	1098919	9588	1921655	3476336
768.2	2714	760976	4094	1147913	1881691
878.5	1672	536105	1585	508210	1331285
Total		**5093899**		**7320199**	**12792322**

Capital Cost Estimate US $: 1004427

1	4300	4688	6167	6726	11365	12375
2	7586	8106	10991	11739	19747	21043
3	2686	2851	3136	3333	4340	4617
4	3133	3363	4938	5316	9042	9698
5	2121	2314	3105	3398	6042	6528
6	1560	1653	1684	1780	4146	4400

<---- AADT Vehicle Hours input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	388	413060	559	717950	2803775
1.09	520	212468	748	368716	1380813
14.9	165	921581	197	1327445	4034312
1.04	230	89665	378	177783	666869
1.04	193	75241	293	137805	494052
0.75	93	26146	96	32561	186208
Total		**1738161**		**2762260**	**9566030**
Value of Time Factors	Base	1.027		1.239	2.678
	Sensitivity	0.97		0.924	0.811

Occurrence probability 1/3

Restoration Cost 7000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	1004427		1004427	1004427	1884045	128506	0	4667	4667	-999761	-999761
2004	0	20089	20089	18080	2001677	256099	1	1509851	1358866	1489762	1340786
2005	0	20089	20089	16272	2119309	383692	0	4667	3780	-15422	-12492
2006	0	20089	20089	14645	2236942	511285	0	4667	3402	-15422	-11243
2007	0	20089	20089	13180	2354574	638879	0	4667	3062	-15422	-10118
2008	0	20089	20089	11862	2472206	766472	0	4667	2756	-15422	-9106
2009	0	20089	20089	10676	2589839	894065	0	4667	2480	-15422	-8196
2010	0	20089	20089	9608	2707471	1021658	0	4667	2232	-15422	-7376
2011	0	20089	20089	8647	2909865	1273304	0	4667	2009	-15422	-6639
2012	0	20089	20089	7783	3112258	1524950	0	4667	1808	-15422	-5975
2013	0	20089	20089	7004	3314652	1776597	0	4667	1627	-15422	-5377
2014	0	20089	20089	6304	3517045	2028243	0	4667	1464	-15422	-4840
2015	0	20089	20089	5674	3719439	2279889	0	4667	1318	-15422	-4356
2016	0	20089	20089	5106	3921833	2531536	0	4667	1186	-15422	-3920
2017	0	20089	20089	4596	4124226	2783182	0	4667	1068	-15422	-3528
2018	0	20089	20089	4136	4326620	3034828	0	4667	961	-15422	-3175
2019	0	20089	20089	3722	4529013	3286474	0	4667	865	-15422	-2858
2020	0	20089	20089	3350	4731407	3538121	0	4667	778	-15422	-2572
2021											
2022											
2023											
Total	1,004,427	341,505	1345933	**1,155,072**	56,572,420	28,657,780		1,589,184	**1,394,328**	**243,252**	**239,256**
										B/C	**1.21**
										EIRR	**0.5%**

Cost-Benefit Analysis

Site No	18	Rio Inali	A-Node	405	B-Node	404
Site Name	NIC 1, 226.9		Link Length (km)		18.7	

Type of Disaster	Bridge Scouring	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in years

Score 100 Benefit Factor 100

Base Case

Maintenance Cost per km
1340

	2003		2010		2020			
Mode	Base	Disaster	Base	Disaster	Base	Disaster		
1	268075	268115	391813	391891	713975	714321	AADT	Cars
2	472217	472678	691648	692283	1230257	1231245	Vehicle	Pick-ups
3	161758	161746	199148	199141	271850	271839	<---- Kilometres	Buses
4	193383	193290	309370	309245	560748	560748	input from	L Goods
5	131812	131637	199683	199406	379365	378861	JICASTRADA	M Goods
6	93606	94105	107094	107553	260251	261674	Traffic Model	H Goods

Veh. Op Cost		Benefits, US $, per year			
1000 km		**2003**		**2010**	**2020**
185.5	40	2708	78	5281	23425
215.1	461	36189	635	49848	77560
529.7	-12	-2320	-7	-1353	-2127
549.1	-93	-18639	-125	-25053	0
768.2	-175	-49068	-277	-77668	-146924
878.5	499	159998	459	147172	456267
Total		**128868**		**98228**	**408200**

Capital Cost Estimate US $
1021702

1	4300	4323	6167	6198	11365	11432
2	7586	7625	10991	11046	19747	19823
3	2686	2694	3136	3146	4340	4351
4	3133	3164	4938	4983	9042	9111
5	2121	2141	3105	3138	6042	6089
6	1560	1581	1684	1704	4146	4202

							AADT	Cars
							Vehicle	Pick-ups
							<---- Hours	Buses
							input from	L Goods
							JICASTRADA	M Goods
							Traffic Model	H Goods

Passenger		Benefits, US $, per year			
VOT, 2002		**2003**		**2010**	**2020**
2.84	23	24486	31	39815	185993
1.09	39	15935	55	27111	80974
14.9	8	44683	10	67383	160207
1.04	31	12085	45	21165	70143
1.04	20	7797	33	15521	47779
0.75	21	5904	20	6784	41054
Total		**110890**		**177778**	**586150**

Value of Time	Base	1.027	1.239	2.678	Occurrence probability	1/3
Factors	Sensitivity	0.97	0.924	0.811	Restoration Cost	5000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits	Total Dis. Benefits	Benefits - Cost	Net Pre Value
								$ US	$ US	$ US	$ US
2002											
2003	1021702		1021702	1021702	190653	164056	0	3333	3333	-1018369	-1018369
2004	0	20434	20434	18391	184178	178193	1	244914	220422	224479	202032
2005	0	20434	20434	16552	177702	192330	0	3333	2700	-17101	-13852
2006	0	20434	20434	14896	171226	206467	0	3333	2430	-17101	-12466
2007	0	20434	20434	13407	164750	220603	0	3333	2187	-17101	-11220
2008	0	20434	20434	12066	158274	234740	0	3333	1968	-17101	-10098
2009	0	20434	20434	10859	151799	248877	0	3333	1771	-17101	-9088
2010	0	20434	20434	9774	145323	263014	0	3333	1594	-17101	-8179
2011	0	20434	20434	8796	191182	323431	0	3333	1435	-17101	-7361
2012	0	20434	20434	7917	237041	383847	0	3333	1291	-17101	-6625
2013	1021702	0	1021702	356246	282900	444264	0	3333	1162	-1018369	-355083
2014	0	20434	20434	6412	328759	504681	1	558960	175407	538526	168995
2015	0	20434	20434	5771	374618	565097	0	3333	941	-17101	-4830
2016	0	20434	20434	5194	420477	625514	0	3333	847	-17101	-4347
2017	0	20434	20434	4675	466336	685930	0	3333	763	-17101	-3912
2018	0	20434	20434	4207	512195	746347	0	3333	686	-17101	-3521
2019	0	20434	20434	3786	558054	806764	0	3333	618	-17101	-3169
2020	0	20434	20434	3408	603913	867180	0	3333	556	-17101	-2852
2021											
2022											
2023											
Total	2,043,405	326,945	2370350	**1,524,059**	5,319,377	7,661,336		857,206	**420,114**	**-1,513,143**	**-1,103,945**
										B/C	**0.28**
										EIRR	**#DIV/0!**

Cost-Benefit Analysis

Base Case

Site No	19	Rio Tapacali	A-Node	405	B-Node	404
Site Name	NIC 1, 233.2		Link Length (km)			18.7

Maintenance Cost per km: 1340

Type of Disaster	Bridge Scouring	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 100 Benefit Factor 100

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	268115	391813	391891	713975	714321
2	472217	472678	691648	692283	1230257	1231245
3	161758	161746	199148	199141	271850	271839
4	193383	193290	309370	309245	560748	560748
5	131812	131637	199683	199406	379385	378861
6	93806	94105	107094	107553	260251	261674

AADT Vehicle Kilometres input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	40	2708	78	5281	23425
215.1	461	36189	635	49848	77560
529.7	-12	-2320	-7	-1353	-2127
549.1	-93	-18639	-125	-25053	0
768.2	-175	-49068	-277	-77668	-146924
878.5	499	159998	459	147172	456267
Total		**128868**		**98228**	**408200**

Capital Cost Estimate US $: 347971

	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	4300	4323	6167	6198	11365	11432
2	7586	7625	10991	11046	19747	19823
3	2686	2694	3136	3146	4340	4351
4	3133	3164	4938	4983	9042	9111
5	2121	2141	3105	3138	6042	6089
6	1560	1581	1684	1704	4146	4202

AADT Vehicle Hours input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	23	24486	31	39815	185993
1.09	39	15935	55	27111	80974
14.9	8	44683	10	67383	160207
1.04	31	12085	45	21165	70143
1.04	20	7797	33	15521	47779
0.75	21	5904	20	6784	41054
Total		**110890**		**177778**	**586150**

Value of Time Factors		2003	2010	2020
	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 1000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	347971		347971	347971	105919	91142	0	667	667	-347304	-347304
2004	0	6959	6959	6263	102321	98996	1	134878	121390	127918	115127
2005	0	6959	6959	5637	98723	106850	0	667	540	-6293	-5097
2006	0	6959	6959	5073	95126	114704	0	667	486	-6293	-4587
2007	0	6959	6959	4566	91528	122557	0	667	437	-6293	-4129
2008	0	6959	6959	4109	87930	130411	0	667	394	-6293	-3716
2009	0	6959	6959	3699	84333	138265	0	667	354	-6293	-3344
2010	0	6959	6959	3329	80735	146119	0	667	319	-6293	-3010
2011	0	6959	6959	2996	106212	179684	0	667	287	-6293	-2709
2012	0	6959	6959	2696	131689	213249	0	667	258	-6293	-2438
2013	347971	0	347971	121330	157167	246813	0	667	232	-347304	-121098
2014	0	6959	6959	2184	182644	280378	1	309348	97077	302388	94893
2015	0	6959	6959	1966	208121	313943	0	667	188	-6293	-1777
2016	0	6959	6959	1769	233598	347508	0	667	169	-6293	-1600
2017	0	6959	6959	1592	259075	381072	0	667	153	-6293	-1440
2018	0	6959	6959	1433	284553	414637	0	667	137	-6293	-1296
2019	0	6959	6959	1290	310030	448202	0	667	124	-6293	-1166
2020	0	6959	6959	1161	335507	481767	0	667	111	-6293	-1049
2021											
2022											
2023											
Total	695,942	111,351	807293	**519,064**	2,955,209	4,256,298		454,892	**223,324**	**-352,401**	**-295,740**
										B/C	**0.43**
										EIRR	**#DIV/0!**

Cost-Benefit Analysis

Site No	24	N003B400	A-Node	1115	B-Node	1102
Site Name	NIC 3, 6.9		Link Length (km)		9.0	

Base Case

Maintenance Cost per km 1340

Type of Disaster	Rock Collapse	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in years

Score 72 Benefit Factor 72

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	285360	391813	417062	713975	757858
2	472217	505010	691648	739359	1230257	1312652
3	161758	169090	199148	207977	271850	284020
4	193383	205837	309370	328691	560748	594278
5	131812	135869	199683	205365	379385	389506
6	93606	94563	107094	108290	260251	263698

AADT Vehicle Kilometres input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	17285	1170220	25249	1709395	2970944
215.1	32793	2574302	47711	3745388	6468137
529.7	7332	1417685	8629	1707139	2353141
549.1	12454	2496068	19321	3872372	6720182
768.2	4057	1137538	5682	1593170	2837817
878.5	957	306850	1196	383482	1105236
Total		**9102663**		**13010947**	**22455458**

Capital Cost Estimate US $ 49358

Passenger VOT, 2002		2003		2010	2020
1	4300	4732	6167	6760	11365	12515
2	7586	8409	10991	12120	19747	21897
3	2686	2928	3136	3418	4340	4770
4	3133	3436	4938	5374	9042	9689
5	2121	2249	3105	3287	6042	6367
6	1560	1593	1684	1718	4146	4257

AADT Vehicle Hours input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

		2003		2010	2020
2.84	432	459902	593	761618	3192417
1.09	823	336271	1129	556525	2290701
14.9	242	1351652	282	1900201	6262650
1.04	303	118124	436	205061	861034
1.04	128	49901	182	85599	330385
0.75	33	9278	34	11532	81374
Total		**2325128**		**3520536**	**13018561**

Value of Time Factors				
	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	49358		49358	49358	2244492	573319	0	1333	1333	-48024	-48024
2004	0	987	987	888	2382162	615428	1	1999726	1799754	1998739	1798865
2005	0	987	987	800	2519831	657536	0	1333	1080	346	280
2006	0	987	987	720	2657501	699644	0	1333	972	346	252
2007	0	987	987	648	2795170	741753	0	1333	875	346	227
2008	0	987	987	583	2932840	783861	0	1333	787	346	204
2009	0	987	987	525	3070509	825969	0	1333	709	346	184
2010	0	987	987	472	3208179	868077	0	1333	638	346	166
2011	0	987	987	425	3441057	1102275	0	1333	574	346	149
2012	0	987	987	382	3673935	1336473	0	1333	517	346	134
2013	0	987	987	344	3906814	1570671	0	1333	465	346	121
2014	0	987	987	310	4139692	1804869	0	1333	418	346	109
2015	0	987	987	279	4372570	2039067	0	1333	377	346	98
2016	0	987	987	251	4605449	2273265	0	1333	339	346	88
2017	0	987	987	226	4838327	2507463	0	1333	305	346	79
2018	0	987	987	203	5071206	2741660	0	1333	275	346	71
2019	0	987	987	183	5304084	2975858	0	1333	247	346	64
2020	0	987	987	165	5536962	3210056	0	1333	222	346	58
2021											
2022											
2023											
Total	49,358	16,782	66139	**56,760**	66,700,781	27,327,245		2,022,393	**1,809,886**	**1,956,254**	**1,753,125**

B/C 31.89

EIRR 41%

Cost-Benefit Analysis

Base Case

Site No	25	N003B370	A-Node	1115	B-Node	1102
Site Name	NIC 3, 7.4		Link Length (km)		9.0	

Maintenance Cost per km: 1340

Type of Disaster	Rock Collapse	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 80 Benefit Factor 80

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	285360	391813	417062	713975	757858
2	472217	505010	691648	739359	1230257	1312652
3	161758	169090	199148	207977	271850	284020
4	193383	205837	309370	328691	560748	594278
5	131812	135869	199683	205365	379385	389506
6	93606	94563	107094	108290	260251	263698

<---- Kilometres

AADT Vehicle input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	17285	1170220	25249	1709395	2970944
215.1	32793	2574302	47711	3745388	6468137
529.7	7332	1417685	8829	1707139	2353141
549.1	12454	2496068	19321	3872372	6720182
768.2	4057	1137538	5682	1593170	2837817
878.5	957	306850	1196	383482	1105236
Total		**9102663**		**13010947**	**22455458**

Capital Cost Estimate US $: 215940

1	4300	4732	6167	6760	11365	12515
2	7586	8409	10991	12120	19747	21897
3	2686	2928	3136	3418	4340	4770
4	3133	3436	4938	5374	9042	9889
5	2121	2249	3105	3287	6042	6367
6	1560	1593	1684	1718	4146	4257

<---- Hours

AADT Vehicle input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	432	459902	593	761618	3192417
1.09	823	336271	1129	556525	2290701
14.9	242	1351652	282	1900201	6262650
1.04	303	118124	436	205061	861034
1.04	128	49901	182	85599	330385
0.75	33	9278	34	11532	81374
Total		**2325128**		**3520536**	**13018561**
Value of Time Factors	Base	1.027		1.239	2.678
	Sensitivity	0.97		0.924	0.811

Occurrence probability 1/3

Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	215940		215940	215940	1122246	286660	0	1333	1333	-214606	-214606
2004	0	4319	4319	3887	1191081	307714	1	1000530	900477	996211	896590
2005	0	4319	4319	3498	1259916	328768	0	1333	1080	-2985	-2418
2006	0	4319	4319	3148	1328750	349822	0	1333	972	-2985	-2176
2007	0	4319	4319	2834	1397585	370876	0	1333	875	-2985	-1959
2008	0	4319	4319	2550	1466420	391930	0	1333	787	-2985	-1763
2009	0	4319	4319	2295	1535255	412985	0	1333	709	-2985	-1587
2010	0	4319	4319	2066	1604089	434039	0	1333	638	-2985	-1428
2011	0	4319	4319	1859	1720529	551138	0	1333	574	-2985	-1285
2012	0	4319	4319	1673	1836968	668237	0	1333	517	-2985	-1157
2013	0	4319	4319	1506	1953407	785336	0	1333	465	-2985	-1041
2014	0	4319	4319	1355	2069846	902434	0	1333	418	-2985	-937
2015	0	4319	4319	1220	2186285	1019533	0	1333	377	-2985	-843
2016	0	4319	4319	1098	2302724	1136632	0	1333	339	-2985	-759
2017	0	4319	4319	988	2419164	1253731	0	1333	305	-2985	-683
2018	0	4319	4319	889	2535603	1370830	0	1333	275	-2985	-615
2019	0	4319	4319	800	2652042	1487929	0	1333	247	-2985	-553
2020	0	4319	4319	720	2768481	1605028	0	1333	222	-2985	-498
2021											
2022											
2023											
Total	215,940	73,419	289359	**248,326**	33,350,390	13,663,622		1,023,196	**910,609**	**733,837**	**662,283**
										B/C	**3.67**
										EIRR	**4%**

Cost-Benefit Analysis

Site No	26	El Guayacán	A-Node	1115	B-Node	1116
Site Name	NIC 3, 119.1		Link Length (km)		8.2	

Base Case

Maintenance Cost per km 1340

Type of Disaster	Bridge Scouring	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in years

Score 100 Benefit Factor 90

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	285360	391813	416884	713975	756194
2	472217	504898	691648	738891	1230257	1309210
3	161758	169090	199148	207977	271850	283857
4	193383	205726	309370	328244	560748	592807
5	131812	135869	199583	205365	379385	389185
6	93606	94563	107094	108290	260251	263551

AADT Vehicle Kilometres input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	17285	1170220	25071	1697344	2858289
215.1	32681	2565510	47243	3708650	6197934
529.7	7332	1417685	8829	1707139	2321624
549.1	12343	2473821	18874	3782783	6425360
768.2	4057	1137538	5682	1593170	2747812
878.5	957	306850	1196	383482	1058103
Total		**9071624**		**12872568**	**21609123**

Capital Cost Estimate US $ 1701604

1	4300	4732	6167	6758	11365	12523
2	7586	8410	10991	12119	19747	21920
3	2686	2928	3136	3418	4340	4767
4	3133	3437	4938	5375	9042	9891
5	2121	2249	3105	3287	6042	6367
6	1560	1593	1684	1718	4146	4258

AADT Vehicle Hours input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	432	459902	591	759049	3214625
1.09	824	336680	1128	556032	2315206
14.9	242	1351652	282	1900201	6218957
1.04	304	118514	437	205532	863067
1.04	128	49901	182	85599	330385
0.75	33	9278	34	11532	82107
Total		**2325927**		**3517945**	**13024348**

Value of Time Factors	Base	1.027		1.239	2.678
	Sensitivity	0.97		0.924	0.811

Occurrence probability 1/3

Restoration Cost 1000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	1701604		1701604	1701604	9071624	6372401	0	667	667	-1700937	-1700937
2004	0	34032	34032	30629	9614616	5964622	1	10386825	9348143	10352793	9317514
2005	0	34032	34032	27566	10157608	5556843	0	667	540	-33365	-27026
2006	0	34032	34032	24809	10700600	5149063	0	667	486	-33365	-24323
2007	0	34032	34032	22328	11243592	4741284	0	667	437	-33365	-21891
2008	0	34032	34032	20096	11786584	4333504	0	667	394	-33365	-19702
2009	0	34032	34032	18086	12329576	3925725	0	667	354	-33365	-17732
2010	0	34032	34032	16277	12872568	3517945	0	667	319	-33365	-15959
2011	0	34032	34032	14650	13746224	4468585	0	667	287	-33365	-14363
2012	0	34032	34032	13185	14619879	5419226	0	667	258	-33365	-12926
2013	0	34032	34032	11866	15493535	6369866	0	667	232	-33365	-11634
2014	0	34032	34032	10680	16367190	7320506	0	667	209	-33365	-10470
2015	0	34032	34032	9612	17240845	8271146	0	667	188	-33365	-9423
2016	0	34032	34032	8650	18114501	9221787	0	667	169	-33365	-8481
2017	0	34032	34032	7785	18988156	10172427	0	667	153	-33365	-7633
2018	0	34032	34032	7007	19861812	11123067	0	667	137	-33365	-6870
2019	0	34032	34032	6306	20735467	12073708	0	667	124	-33365	-6183
2020	0	34032	34032	5676	21609123	13024348	0	667	111	-33365	-5564
2021											
2022											
2023											
Total	1,701,604	578,545	2280149	**1,956,812**	264,553,502	127,026,053		10,398,159	**9,353,209**	**8,118,010**	**7,396,397**
										B/C	**4.78**
										EIRR	**5%**

Cost-Benefit Analysis

Base Case

Site No	27	N003B320	A-Node	1116	B-Node 1103
Site Name	NIC 3, 22.1		Link Length (km)		13.0

Maintenance Cost per km: 1340

Type of Disaster	Rock Collapse	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

***Risk**: Without Prevention Measures Road will fall in* ____ *years*

Score 74 Benefit Factor 74

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	284859	390157	403981	710529	734347
2	472217	504008	687643	713452	1222922	1267241
3	*161758*	*169090*	*198464*	*204131*	*270874*	*278928*
4	193383	204835	307556	317340	556835	574399
5	131812	135869	198831	201147	377752	382686
6	93606	94563	106710	107223	259277	261018

<-- *Kilometres*

AADT / Vehicle / input from JICASTRADA / Traffic Model

Buses / L Goods / M Goods / H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	16784	1136302	13824	935905	1612514
215.1	*31791*	*2495643*	*25809*	*2026047*	*3479111*
529.7	7332	1417685	5667	1095748	1557288
549.1	11452	2295244	9784	1960938	3520229
768.2	4057	1137538	2316	649381	1383439
878.5	957	306850	513	164487	558229
Total		**8789262**		**6832506**	**12110811**

Capital Cost Estimate US $: *294912*

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	*4229*	*4357*	*6138*	*6536*	*11289*	*11910*
2	7581	7771	10923	11633	19581	20690
3	2686	2721	3124	3336	4134	4585
4	3128	3227	4903	5151	8959	9344
5	2114	2153	3091	3202	6007	6163
6	1560	1580	1678	1690	4126	4167

<-- Hours

AADT / Vehicle / input from JICASTRADA / Traffic Model

Cars / Pick-ups / Buses / M Goods / H Goods

Benefits, US $, per year

Passenger *VOT, 2002*		*2003*		*2010*	*2020*
2.84	128	136267	398	511170	1723905
1.09	190	77632	710	349985	1181576
14.9	35	195487	212	1428520	6568501
1.04	99	38595	248	116640	391379
1.04	39	15204	111	52206	158585
0.75	20	5623	12	4070	30057
Total		***468809***		***2462591***	***10054002***
Value of Time Factors	Base	1.027		1.239	2.678
	Sensitivity	0.97		0.924	0.811

Occurrence probability 1/3

Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	294912		294912	294912	722405	38532	0	1333	1333	-293578	-293578
2004	0	5898	5898	5308	699430	61943	1	508915	458023	503017	452715
2005	0	5898	5898	4778	676454	85353	0	1333	1080	-4565	-3698
2006	0	5898	5898	4300	653478	108763	0	1333	972	-4565	-3328
2007	0	5898	5898	3870	630503	132174	0	1333	875	-4565	-2995
2008	0	5898	5898	3483	607527	155584	0	1333	787	-4565	-2696
2009	*0*	*5898*	*5898*	*3135*	*584551*	*178994*	*0*	*1333*	*709*	*-4565*	*-2426*
2010	0	5898	5898	2821	561576	202405	0	1333	638	-4565	-2183
2011	0	5898	5898	2539	604959	264800	0	1333	574	-4565	-1965
2012	0	5898	5898	2285	648343	327195	0	1333	517	-4565	-1769
2013	0	5898	5898	2057	691726	389590	0	1333	465	-4565	-1592
2014	0	5898	5898	1851	735109	451985	0	1333	418	-4565	-1433
2015	0	5898	5898	1666	778492	514381	0	1333	377	-4565	-1289
2016	*0*	*5898*	*5898*	*1499*	*821876*	*576776*	*0*	*1333*	*339*	*-4565*	*-1160*
2017	0	5898	5898	1349	865259	639171	0	1333	305	-4565	-1044
2018	0	5898	5898	1214	908642	701566	0	1333	275	-4565	-940
2019	0	5898	5898	1093	952026	763961	0	1333	247	-4565	-845
2020	0	5898	5898	984	995409	826356	0	1333	222	-4565	-761
2021											
2022											
2023											
Total	294,912	100,270	395182	**339,143**	13,137,766	6,419,529		531,581	**468,155**	**136,400**	**129,012**
										B/C	**1.38**
										EIRR	**69%**

Cost-Benefit Analysis

Base Case

Site No	**29**	N003C230	A-Node	602	B-Node	610
Site Name	NIC 3, 32.9		Link Length (km)			13.0

Maintenance Cost per km: 1340

Type of Disaster	Slope Slide	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 73 Benefit Factor 73

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster		
1	268075	269916	390157	390157	710529	710674	AADT	Cars
2	472267	478408	687643	687685	1222922	1223285	Vehicle	Pick-ups
3	161758	162820	198464	198464	270874	270874	<---- Kilometres	Buses
4	191426	195880	307556	307440	556835	557116	input from	L Goods
5	131812	132815	198831	198831	377752	378125	JICASTRADA	M Goods
6	93606	94274	106710	106710	259277	259306	Traffic Model	H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003	2010	2020
185.5	1841	124638	0	0	9817
215.1	6141	482078	42	3297	28496
529.7	1062	205344	0	0	0
549.1	4454	892684	-116	-23249	56319
768.2	1003	281230	0	0	104585
878.5	668	214186	0	0	9298
Total		**2200160**		**-19952**	**208515**

Capital Cost Estimate US $: 404732

1	4229	4357	6138	6138	11289	11292	AADT	Cars
2	7581	7771	10923	10924	19581	19590	Vehicle	Pick-ups
3	2686	2721	3124	3124	4134	4136	<---- Hours	Buses
4	3128	3227	4903	4905	8959	8969	input from	L Goods
5	2114	2153	3091	3091	6007	6005	JICASTRADA	M Goods
6	1560	1580	1678	1678	4126	4127	Traffic Model	H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003	2010	2020
2.84	128	136267	0	0	8328
1.09	190	77632	1	493	9589
14.9	35	195487	0	0	29129
1.04	99	38595	2	941	10166
1.04	39	15204	0	0	-2033
0.75	20	5623	0	0	733
Total		**468809**	**1434**		**55911**

Value of Time Factors				
	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 3000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	404732		404732	404732	904175	192661	0	2000	2000	-402732	-402732
2004	0	8095	8095	7285	773836	165222	1	628039	585235	619944	557950
2005	0	8095	8095	6557	643497	137783	0	2000	1620	-6095	-4937
2006	0	8095	8095	5901	513158	110345	0	2000	1458	-6095	-4443
2007	0	8095	8095	5311	382818	82906	0	2000	1312	-6095	-3999
2008	0	8095	8095	4780	252479	55467	0	2000	1181	-6095	-3599
2009	0	8095	8095	4302	122140	28028	0	2000	1063	-6095	-3239
2010	0	8095	8095	3872	-8199	589	0	2000	957	-6095	-2915
2011	0	8095	8095	3484	1190	2828	0	2000	861	-6095	-2624
2012	0	8095	8095	3136	10579	5067	0	2000	775	-6095	-2361
2013	0	8095	8095	2822	19968	7306	0	2000	697	-6095	-2125
2014	0	8095	8095	2540	29357	9544	0	2000	628	-6095	-1913
2015	0	8095	8095	2286	38746	11783	0	2000	565	-6095	-1721
2016	0	8095	8095	2058	48135	14022	0	2000	508	-6095	-1549
2017	0	8095	8095	1852	57524	16261	0	2000	458	-6095	-1394
2018	0	8095	8095	1667	66913	18500	0	2000	412	-6095	-1255
2019	0	8095	8095	1500	76302	20738	0	2000	371	-6095	-1129
2020	0	8095	8095	1350	85691	22977	0	2000	334	-6095	-1016
2021											
2022											
2023											
Total	404,732	137,609	542341	**465,435**	4,018,308	902,027		662,039	**580,433**	**119,698**	**114,999**
										B/C	**1.25**
										EIRR	**0.01**

Cost-Benefit Analysis

Base Case

Site No	30	N003E170	A-Node	602	B-Node	610
Site Name	NIC 3, 35.2		Link Length (km)		13.0	

Maintenance Cost per km: 1340

Type of Disaster	Debris Flow	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 83 Benefit Factor 83

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	269916	390157	390157	710529	710674
2	472267	478408	687643	687685	1222922	1223285
3	161758	162820	198464	198464	270874	270874
4	191426	195880	307556	307440	556835	557116
5	131812	132815	198831	198831	377752	378125
6	93606	94274	106710	106710	259277	259306

AADT Cars / Vehicle Pick-ups / <---- Kilometres Buses / input from L Goods / JICASTRADA M Goods / Traffic Model H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	1841	124638	0	0	9817
215.1	6141	482078	42	3297	28496
529.7	1062	205344	0	0	0
549.1	4454	892684	-116	-23249	56319
768.2	1003	281230	0	0	104585
878.5	668	214186	0	0	9298
Total		**2200160**		**-19952**	**208515**

Capital Cost Estimate US $: 382521

	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	4229	4357	6138	6138	11289	11292
2	7581	7771	10923	10924	19581	19590
3	2686	2721	3124	3124	4134	4136
4	3128	3227	4903	4905	8959	8969
5	2114	2153	3091	3091	6007	6005
6	1560	1580	1678	1678	4126	4127

AADT Cars / Vehicle Pick-ups / <---- Hours Buses / input from L Goods / JICASTRADA M Goods / Traffic Model H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	128	136267	0	0	8328
1.09	190	77632	1	493	9589
14.9	35	195487	0	0	29129
1.04	99	38595	2	941	10166
1.04	39	15204	0	0	-2033
0.75	20	5623	0	0	733
Total		**468809**		**1434**	**55911**

Value of Time Factors		2003	2010	2020
	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	382521		382521	382521	1100080	234404	0	1333	1333	-381188	-381188
2004	0	7650	7650	6885	941501	201020	1	763014	686713	755364	679827
2005	0	7650	7650	6197	782921	167636	0	1333	1080	-6317	-5117
2006	0	7650	7650	5577	624342	134253	0	1333	972	-6317	-4605
2007	0	7650	7650	5019	465762	100869	0	1333	875	-6317	-4145
2008	0	7650	7650	4518	307183	67485	0	1333	787	-6317	-3730
2009	0	7650	7650	4066	148603	34101	0	1333	709	-6317	-3357
2010	0	7650	7650	3659	-9976	717	0	1333	638	-6317	-3021
2011	0	7650	7650	3293	1447	3441	0	1333	574	-6317	-2719
2012	0	7650	7650	2964	12871	6165	0	1333	517	-6317	-2447
2013	0	7650	7650	2668	24294	8888	0	1333	465	-6317	-2203
2014	0	7650	7650	2401	35717	11612	0	1333	418	-6317	-1982
2015	0	7650	7650	2161	47141	14336	0	1333	377	-6317	-1784
2016	0	7650	7650	1945	58564	17060	0	1333	339	-6317	-1606
2017	0	7650	7650	1750	69988	19784	0	1333	305	-6317	-1445
2018	0	7650	7650	1575	81411	22508	0	1333	275	-6317	-1301
2019	0	7650	7650	1418	92834	25232	0	1333	247	-6317	-1171
2020	0	7650	7650	1276	104258	27956	0	1333	222	-6317	-1054
2021											
2022											
2023											
Total	382,521	130,057	512579	**439,892**	4,888,941	1,097,466		785,681	**696,845**	**273,102**	**256,952**
										B/C	**1.58**
										EIRR	**0.01**

Cost-Benefit Analysis

							Base Case
Site No	32	N003C150	A-Node	602	B-Node	610	Maintenance Cost per km 1340
Site Name	NIC 3, 38.9			Link Length (km)		13.0	

Type of Disaster	Slope Slide	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in years

Score 90 Benefit Factor 90

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	269916	390157	390157	710529	710674
2	472267	478408	687643	687685	1222922	1223285
3	161758	162820	198464	198464	270874	270874
4	191426	195880	307556	307440	556835	557116
5	131812	132815	198831	198831	377752	378125
6	93605	94274	106710	106710	259277	259306

AADT Cars
Vehicle Pick-ups
<---- Kilometres Buses
input from L Goods
JICASTRADA M Goods
Traffic Model H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	1841	124638	0	0	9817
215.1	6141	482078	42	3297	28496
529.7	1062	205344	0	0	0
549.1	4454	892684	-116	-23249	56319
768.2	1003	281230	0	0	104585
878.5	668	214186	0	0	9298
Total		**2200160**		**-19952**	**208515**

Capital Cost Estimate US $ 1132757

Passenger VOT, 2002		2003		2010	2020
2.84	128	136267	0	0	8328
1.09	190	77632	1	493	9589
14.9	35	195487	0	0	29129
1.04	99	38595	2	941	10166
1.04	39	15204	0	0	-2033
0.75	20	5623	0	0	733
Total		**468809**		**1434**	**55911**

1	4229	4357	6138	6138	11289	11292
2	7581	7771	10923	10924	19581	19590
3	2686	2721	3124	3124	4134	4136
4	3128	3227	4903	4905	8959	8969
5	2114	2153	3091	3091	6007	6005
6	1560	1580	1678	1678	4126	4127

AADT Cars
Vehicle Pick-ups
<---- Hours Buses
input from L Goods
JICASTRADA M Goods
Traffic Model H Goods

Value of Time Factors				
	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3
Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	1132757		1132757	1132757	2200160	468809	0	1333	1333	-1131424	-1131424
2004	0	22655	22655	20390	1883001	402041	1	1524695	1372225	1502040	1351836
2005	0	22655	22655	18351	1565842	335273	0	1333	1080	-21322	-17271
2006	0	22655	22655	16516	1248684	268505	0	1333	972	-21322	-15544
2007	0	22655	22655	14864	931525	201737	0	1333	875	-21322	-13989
2008	0	22655	22655	13378	614366	134969	0	1333	787	-21322	-12590
2009	0	22655	22655	12040	297207	68201	0	1333	709	-21322	-11331
2010	0	22655	22655	10836	-19952	1434	0	1333	638	-21322	-10198
2011	0	22655	22655	9752	2895	6881	0	1333	574	-21322	-9178
2012	0	22655	22655	8777	25741	12329	0	1333	517	-21322	-8261
2013	0	22655	22655	7899	48588	17777	0	1333	465	-21322	-7434
2014	0	22655	22655	7109	71435	23225	0	1333	418	-21322	-6691
2015	0	22655	22655	6398	94282	28672	0	1333	377	-21322	-6022
2016	0	22655	22655	5759	117128	34120	0	1333	339	-21322	-5420
2017	0	22655	22655	5183	139975	39568	0	1333	305	-21322	-4878
2018	0	22655	22655	4664	162822	45016	0	1333	275	-21322	-4390
2019	0	22655	22655	4198	185669	50464	0	1333	247	-21322	-3951
2020	0	22655	22655	3778	208515	55911	0	1333	222	-21322	-3556
2021											
2022											
2023											
Total	1,132,757	385,137	1517894	**1,302,649**	9,777,883	2,194,932		1,547,361	**1,382,357**	**29,467**	**79,708**
										B/C	**1.06**
										EIRR	**0.00**

Cost-Benefit Analysis

Base Case

Site No	33	N003C140	A-Node	602	B-Node 610
Site Name	NIC 3, 39.4		Link Length (km)		13.0

Maintenance Cost per km: 1340

Type of Disaster	Slope Slide	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ *years*

Score: 90 Benefit Factor: 90

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	269916	390157	390157	710529	710674
2	472267	478408	687643	687685	1222922	1223285
3	*161758*	*162820*	*198464*	*198464*	*270874*	*270874*
4	191426	195880	307556	307440	556835	557116
5	131812	132815	198831	198831	377752	378125
6	93606	94274	106710	106710	259277	259306

AADT / Vehicle / *Kilometres* / input from JICASTRADA Traffic Model — Cars / Pick-ups / *Buses* / L Goods / M Goods / H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003	2010	2020
185.5	1841	124638	0	0	9817
215.1	*6141*	*482078*	*42*	*3297*	*28496*
529.7	1062	205344	0	0	0
549.1	4454	892684	-116	-23249	56319
768.2	1003	281230	0	0	104585
878.5	668	214186	0	0	9298
Total		**2200160**		**-19952**	**208515**

Capital Cost Estimate US $: *924221*

1	*4229*	*4357*	*6138*	*6138*	*11289*	*11292*
2	7581	7771	10923	10924	19581	19590
3	2686	2721	3124	3124	4134	4136
4	3128	3227	4903	4905	8959	8969
5	2114	2153	3091	3091	6007	6005
6	1560	1580	1678	1678	4126	4127

AADT / Vehicle / Hours / input from JICASTRADA Traffic Model — *Cars* / Pick-ups / Buses / L Goods / M Goods / H Goods

Benefits, US $, per year

Passenger VOT, 2002		*2003*	*2010*	*2020*
2.84	128	136267	0	0	8328
1.09	190	77632	1	493	9589
14.9	35	195487	0	0	29129
1.04	99	38595	2	941	10166
1.04	39	15204	0	0	-2033
0.75	20	5623	0	0	733
Total		***468809***	***1434***	***55911***

Value of Time Factors	Base	1.027	1.239	2.678	Occurrence probability	1/3
	Sensitivity	0.97	0.924	0.811	Restoration Cost	2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits	Total Dis. Benefits	Benefits - Cost	Net Pre Value
								$ US	$ US	$ US	$ US
2002											
2003	924221		924221	924221	1808351	385322	0	1333	1333	-922888	-922888
2004	0	18484	18484	16636	1547672	330444	1	1253411	1128070	1234927	1111434
2005	0	18484	18484	14972	1286994	275567	0	1333	1080	-17151	-13892
2006	0	18484	18484	13475	1026315	220689	0	1333	972	-17151	-12503
2007	0	18484	18484	12128	765637	165811	0	1333	875	-17151	-11253
2008	0	18484	18484	10915	504958	110934	0	1333	787	-17151	-10128
2009	*0*	*18484*	*18484*	*9823*	*244280*	*56056*	*0*	*1333*	*709*	*-17151*	*-9115*
2010	0	18484	18484	8841	-16399	1178	0	1333	638	-17151	-8203
2011	0	18484	18484	7957	2379	5656	0	1333	574	-17151	-7383
2012	0	18484	18484	7161	21157	10134	0	1333	517	-17151	-6645
2013	0	18484	18484	6445	39935	14611	0	1333	465	-17151	-5980
2014	0	18484	18484	5801	58714	19089	0	1333	418	-17151	-5382
2015	0	18484	18484	5221	77492	23566	0	1333	377	-17151	-4844
2016	*0*	*18484*	*18484*	*4698*	*96270*	*28044*	*0*	*1333*	*339*	*-17151*	*-4360*
2017	0	18484	18484	4229	115048	32522	0	1333	305	-17151	-3924
2018	0	18484	18484	3806	133826	36999	0	1333	275	-17151	-3531
2019	0	18484	18484	3425	152604	41477	0	1333	247	-17151	-3178
2020	0	18484	18484	3083	171382	45954	0	1333	222	-17151	-2860
2021											
2022											
2023											
Total	924,221	314,235	1238456	**1,062,837**	8,036,616	1,804,054		1,276,078	**1,138,202**	**37,621**	**75,365**
										B/C	**1.07**
										EIRR	**0.00**

Cost-Benefit Analysis

Base Case

Site No	**35**	N005A010	A-Node	1117	B-Node	1111
Site Name	NIC 5, 24.6		Link Length (km)		12.0	

Maintenance Cost per km: 1340

Type of Disaster	Rock Fall	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 76 Benefit Factor 76

Mode	2003 Base	2003 4976	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	269904	270850	394190	395397	719386	720589
2	488684	495999	717076	728372	1276519	1294976
3	166510	167628	205422	206844	280705	282296
4	194878	195909	310937	312251	564193	566762
5	134970	136623	204274	206725	386998	391867
6	94185	94437	107931	108295	261770	262304

AADT Vehicle Kilometres input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	946	64046	1207	81716	88215
215.1	7315	574239	11296	886754	1448903
529.7	1118	216172	1422	274952	307629
549.1	1031	206636	1314	263356	514887
768.2	1653	463483	2451	687233	1365214
878.5	252	80801	364	116712	171220
Total		**1605376**		**2310723**	**3896069**

Capital Cost Estimate US $: 480003

Mode	2003 Base	2003 4976	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	4342	4401	6229	6313	11498	11638
2	7963	8346	11579	12165	20803	21843
3	2795	2876	3280	3386	4541	4683
4	3165	3213	4976	5034	9123	9257
5	2192	2277	3210	3333	6216	6445
6	1574	1587	1703	1722	4180	4211

AADT Vehicle Hours input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	59	62811	84	107885	388642
1.09	383	156491	586	288861	1108060
14.9	81	452412	106	714260	2068131
1.04	48	18713	58	27279	136220
1.04	85	33137	123	57850	232794
0.75	13	3655	19	5444	22726
Total		**727219**		**1202579**	**3956574**

Value of Time Factors		2003	2010	2020
	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	480003		480003	480003	989615	448286	0	1333	1333	-478669	-478669
2004	0	9600	9600	8640	1051730	490147	1	1029251	926326	1019651	917686
2005	0	9600	9600	7776	1113845	532008	0	1333	1080	-8267	-6696
2006	0	9600	9600	6998	1175959	573870	0	1333	972	-8267	-6026
2007	0	9600	9600	6299	1238074	615731	0	1333	875	-8267	-5424
2008	0	9600	9600	5669	1300189	657593	0	1333	787	-8267	-4881
2009	0	9600	9600	5102	1362303	699454	0	1333	709	-8267	-4393
2010	0	9600	9600	4592	1424418	741316	0	1333	638	-8267	-3954
2011	0	9600	9600	4133	1522145	911083	0	1333	574	-8267	-3559
2012	0	9600	9600	3719	1619872	1080849	0	1333	517	-8267	-3203
2013	0	9600	9600	3347	1717599	1250616	0	1333	465	-8267	-2882
2014	0	9600	9600	3013	1815325	1420383	0	1333	418	-8267	-2594
2015	0	9600	9600	2711	1913052	1590150	0	1333	377	-8267	-2335
2016	0	9600	9600	2440	2010779	1759917	0	1333	339	-8267	-2101
2017	0	9600	9600	2196	2108506	1929683	0	1333	305	-8267	-1891
2018	0	9600	9600	1977	2206233	2099450	0	1333	275	-8267	-1702
2019	0	9600	9600	1779	2303959	2269217	0	1333	247	-8267	-1532
2020	0	9600	9600	1601	2401686	2438984	0	1333	222	-8267	-1379
2021											
2022											
2023											
Total	480,003	163,201	643204	**551,994**	29,275,290	21,508,736		1,051,918	**936,458**	**408,714**	**384,464**

B/C **1.70**

EIRR **0.01**

Cost-Benefit Analysis

Base Case

Site No	44	N026A060	A-Node	1101	B-Node	604
Site Name	NIC26, 24.7		Link Length (km)			26.0

Maintenance Cost per km: 1340

Type of Disaster	Rock Fall	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 70 Benefit Factor 70

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	269413	391813	393527	713975	716938
2	472217	477630	691648	698644	1230257	1242272
3	161758	164996	199148	202950	271850	276824
4	193383	196945	309370	314928	560748	569767
5	131812	133080	199683	200944	379385	380919
6	93606	94114	107094	107693	260251	261726

AADT Vehicle Kilometres input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	1338	90585	1714	116040	200599
215.1	5413	424929	6996	549197	943196
529.7	3237	625893	3802	735139	961752
549.1	3562	713907	5558	1113951	1807615
768.2	1248	349926	1261	353571	430117
878.5	508	162884	599	192062	472940
Total		**2368122**		**3059960**	**4816219**

Capital Cost Estimate US $: 389925

1	4300	4350	6167	6253	11365	11523
2	7586	7737	10991	11244	19747	20191
3	2686	2759	3136	3235	4340	4468
4	3133	3225	4938	5101	9042	9327
5	2121	2167	3105	3183	6042	6184
6	1560	1580	1684	1717	4146	4225

AADT Vehicle Hours input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003	2010	2020
2.84	50	53229	86	110454	438610
1.09	151	61697	253	124713	473056
14.9	73	407730	99	667092	1864231
1.04	92	35866	163	76663	289722
1.04	46	17933	78	36685	144353
0.75	20	5623	33	11193	57915
Total		**582079**		**1026800**	**3267887**

Value of Time Factors		2003	2010	2020
	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	389925		389925	389925	811001	199342	0	1333	1333	-388592	-388592
2004	0	7799	7799	7019	844848	221099	1	711965	640768	704166	633750
2005	0	7799	7799	6317	878695	242857	0	1333	1080	-6465	-5237
2006	0	7799	7799	5685	912542	264614	0	1333	972	-6465	-4713
2007	0	7799	7799	5117	946390	286372	0	1333	875	-6465	-4242
2008	0	7799	7799	4605	980237	308129	0	1333	787	-6465	-3818
2009	0	7799	7799	4144	1014084	329886	0	1333	709	-6465	-3436
2010	0	7799	7799	3730	1047931	351644	0	1333	638	-6465	-3092
2011	0	7799	7799	3357	1108077	428393	0	1333	574	-6465	-2783
2012	0	7799	7799	3021	1168223	505143	0	1333	517	-6465	-2505
2013	0	7799	7799	2719	1228369	581892	0	1333	465	-6465	-2254
2014	0	7799	7799	2447	1288515	658642	0	1333	418	-6465	-2029
2015	0	7799	7799	2203	1348661	735392	0	1333	377	-6465	-1826
2016	0	7799	7799	1982	1408807	812141	0	1333	339	-6465	-1643
2017	0	7799	7799	1784	1468953	888891	0	1333	305	-6465	-1479
2018	0	7799	7799	1606	1529098	965640	0	1333	275	-6465	-1331
2019	0	7799	7799	1445	1589244	1042390	0	1333	247	-6465	-1198
2020	0	7799	7799	1301	1649390	1119140	0	1333	222	-6465	-1078
2021											
2022											
2023											
Total	389,925	132,575	522500	**448,406**	21,223,066	9,941,607		734,632	**650,901**	**212,132**	**202,494**
										B/C	**1.45**
										EIRR	**0.01**

Cost-Benefit Analysis

Base Case

Site No	45	La Banderita	A-Node	1101	B-Node	604
Site Name	NIC26, 24.7		Link Length (km)			26.0

Maintenance Cost per km: 1340

Type of Disaster	Rock Fall	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 70 Benefit Factor 70

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	269413	391813	393527	713975	716938
2	472217	477630	691648	698644	1230257	1242272
3	161758	164995	199148	202950	271850	276824
4	193383	196945	309370	314928	560748	569767
5	131812	133060	199683	200944	379385	380919
6	93606	94114	107094	107693	260251	261726

AADT Cars / Vehicle Pick-ups / <---- Kilometres Buses / input from L Goods / JICASTRADA M Goods / Traffic Model H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	1338	90585	1714	116040	200599
215.1	5413	424929	6996	549197	943196
529.7	3237	625893	3802	735139	961752
549.1	3562	713907	5558	1113951	1807615
768.2	1248	349926	1261	353571	430117
878.5	508	162884	599	192062	472940
Total		**2368122**		**3059960**	**4816219**

Capital Cost Estimate US $: 38252

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	4300	4350	6167	6253	11365	11523
2	7586	7737	10991	11244	19747	20191
3	2686	2759	3136	3235	4340	4468
4	3133	3225	4938	5101	9042	9327
5	2121	2167	3105	3183	6042	6184
6	1560	1580	1684	1717	4146	4225

AADT Cars / Vehicle Pick-ups / <---- Hours Buses / input from L Goods / JICASTRADA M Goods / Traffic Model H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	50	53229	86	110454	438610
1.09	151	61697	253	124713	473056
14.9	73	407730	99	667092	1864231
1.04	92	35866	163	76663	289722
1.04	46	17933	78	36685	144353
0.75	20	5623	33	11193	57915
Total		**582079**		**1026800**	**3267887**

Value of Time Factors				
	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 1000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	38252		38252	38252	194640	47842	0	1000	1000	-37252	-37252
2004	0	765	765	689	202764	53064	1	171552	154396	170787	153708
2005	0	765	765	620	210887	58286	0	1000	810	235	190
2006	0	765	765	558	219010	63507	0	1000	729	235	171
2007	0	765	765	502	227134	68729	0	1000	656	235	154
2008	0	765	765	452	235257	73951	0	1000	590	235	139
2009	0	765	765	407	243380	79173	0	1000	531	235	125
2010	0	765	765	366	251504	84394	0	1000	478	235	112
2011	0	765	765	329	265939	102814	0	1000	430	235	101
2012	0	765	765	296	280374	121234	0	1000	387	235	91
2013	0	765	765	267	294809	139654	0	1000	349	235	82
2014	0	765	765	240	309244	158074	0	1000	314	235	74
2015	0	765	765	216	323679	176494	0	1000	282	235	66
2016	0	765	765	194	338114	194914	0	1000	254	235	60
2017	0	765	765	175	352549	213334	0	1000	229	235	54
2018	0	765	765	158	366984	231754	0	1000	206	235	48
2019	0	765	765	142	381419	250174	0	1000	185	235	44
2020	0	765	765	128	395854	268593	0	1000	167	235	39
2021											
2022											
2023											
Total	38,252	13,006	51258	**43,989**	5,093,536	2,385,986		188,552	**161,995**	**137,294**	**118,006**
										B/C	**3.68**
										EIRR	**0.04**

Cost-Benefit Analysis

Base Case

Site No	**49**	N026B140	A-Node	302	B-Node 301
Site Name	NIC 26, 34.0		Link Length (km)		26.0

Maintenance Cost per km: 1340

Type of Disaster	Rock Collapse	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 80 Benefit Factor 80

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	271711	391813	396818	713975	722465
2	472217	480873	691648	703098	1230257	1249978
3	161758	167419	199148	205533	271850	280477
4	193383	197817	309370	315853	560748	571425
5	131812	134167	199683	202956	379385	384300
6	93606	94293	107094	107741	260251	262138

AADT Vehicle Kilometres input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Capital Cost Estimate US $: 1115482

Veh. Op Cost — Benefits, US $, per year

1000 km		2003		2010	2020
185.5	3636	246163	5005	338846	574786
215.1	8656	679510	11450	898843	1548129
529.7	5661	1094588	6385	1234577	1668081
549.1	4434	888675	6483	1299342	2139916
768.2	2355	660316	3273	917713	1378112
878.5	687	220278	647	207452	605042
Total		**3789529**		**4896774**	**7914067**

1	4300	4457	6167	6429	11365	11890
2	7586	7928	10991	11545	19747	20808
3	2686	2858	3136	3375	4340	4686
4	3133	3306	4938	5236	9042	9604
5	2121	2244	3105	3302	6042	6432
6	1560	1605	1684	1752	4146	4347

AADT Vehicle Hours input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Passenger — Benefits, US $, per year

VOT, 2002		2003		2010	2020
2.84	157	167140	262	336499	1457408
1.09	342	139738	554	273087	1130434
14.9	172	960678	239	1610454	5039249
1.04	173	67444	298	140157	571312
1.04	123	47951	197	92654	396462
0.75	45	12651	68	23064	147354
Total		**1395604**		**2475914**	**8742218**

Value of Time	Base	1.027		1.239	2.678	Occurrence probability 1/3
Factors	Sensitivity	0.97		0.924	0.811	Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	1115482		1115482	1115482	2180277	802950	0	1333	1333	-1114149	-1114149
2004	0	22310	22310	20079	2271284	891743	1	2110018	1899016	2087708	1878937
2005	0	22310	22310	18071	2362290	980535	0	1333	1080	-20976	-16991
2006	0	22310	22310	16264	2453296	1069328	0	1333	972	-20976	-15292
2007	0	22310	22310	14637	2544303	1158121	0	1333	875	-20976	-13763
2008	0	22310	22310	13174	2635309	1246913	0	1333	787	-20976	-12386
2009	0	22310	22310	11856	2726316	1335706	0	1333	709	-20976	-11148
2010	0	22310	22310	10671	2817322	1424499	0	1333	638	-20976	-10033
2011	0	22310	22310	9604	2990920	1785026	0	1333	574	-20976	-9030
2012	0	22310	22310	8643	3164517	2145553	0	1333	517	-20976	-8127
2013	0	22310	22310	7779	3338115	2506080	0	1333	465	-20976	-7314
2014	0	22310	22310	7001	3511713	2866607	0	1333	418	-20976	-6583
2015	0	22310	22310	6301	3685310	3227134	0	1333	377	-20976	-5924
2016	0	22310	22310	5671	3858908	3587661	0	1333	339	-20976	-5332
2017	0	22310	22310	5104	4032506	3948188	0	1333	305	-20976	-4799
2018	0	22310	22310	4593	4206103	4308715	0	1333	275	-20976	-4319
2019	0	22310	22310	4134	4379701	4669242	0	1333	247	-20976	-3887
2020	0	22310	22310	3721	4553299	5029769	0	1333	222	-20976	-3498
2021											
2022											
2023											
Total	1,115,482	379,264	1494746	**1,282,783**	57,711,488	42,983,770		2,132,684	**1,909,148**	**637,938**	**626,365**
										B/C	**1.49**
										EIRR	**0.01**

Cost-Benefit Analysis

Base Case

Site No	**50**	N026A150	A-Node	302	B-Node	301
Site Name	NIC 26, 34.2		Link Length (km)			26.0

Maintenance Cost per km: 1340

Type of Disaster	Rock Fall	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in ____ years

Score 85 Benefit Factor 85

Mode	2003 Base	2003 Disaster	2010 Base	2010 Disaster	2020 Base	2020 Disaster
1	268075	271711	391813	396818	713975	722465
2	472217	480873	691648	703098	1230257	1249978
3	161758	167419	199148	205533	271850	280477
4	193383	197817	309370	315853	560748	571425
5	131812	134167	199683	202956	379385	384300
6	93606	94293	107094	107741	260251	262138

AADT Vehicle Kilometres input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Veh. Op Cost 1000 km		2003		2010	2020
185.5	3636	246163	5005	338846	574786
215.1	8656	679510	11450	898843	1548129
529.7	5661	1094588	6385	1234577	1668081
549.1	4434	888675	6483	1299342	2139916
768.2	2355	660316	3273	917713	1378112
878.5	687	220278	647	207452	605042
Total		**3789529**		**4896774**	**7914067**

Capital Cost Estimate US $: 259127

Mode	Passenger Base	Passenger Disaster	Freight Base	Freight Disaster	Commercial Base	Commercial Disaster
1	4300	4457	6167	6429	11365	11890
2	7586	7928	10991	11545	19747	20808
3	2686	2858	3136	3375	4340	4686
4	3133	3306	4938	5236	9042	9604
5	2121	2244	3105	3302	6042	6432
6	1560	1605	1684	1752	4146	4347

AADT Vehicle Hours input from JICASTRADA Traffic Model — Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Benefits, US $, per year

Passenger VOT, 2002		2003		2010	2020
2.84	157	167140	262	336499	1457408
1.09	342	139738	554	273087	1130434
14.9	172	960678	239	1610454	5039249
1.04	173	67444	298	140157	571312
1.04	123	47951	197	92654	396462
0.75	45	12651	68	23064	147354
Total		**1395604**		**2475914**	**8742218**

Value of Time Factors	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3

Restoration Cost 2000 US$

<With Project>

Year	Capital Cost US$	Maintenance Cost (US$)	Total Cost (US $)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits $ US	Total Dis. Benefits $ US	Benefits - Cost $ US	Net Pre Value $ US
2002											
2003	259127		259127	259127	467202	172061	0	1333	1333	-257794	-257794
2004	0	5183	5183	4664	486704	191088	1	453194	407875	448012	403211
2005	0	5183	5183	4198	506205	210115	0	1333	1080	-3849	-3118
2006	0	5183	5183	3778	525706	229142	0	1333	972	-3849	-2806
2007	0	5183	5183	3400	545208	248169	0	1333	875	-3849	-2525
2008	0	5183	5183	3060	564709	267196	0	1333	787	-3849	-2273
2009	0	5183	5183	2754	584210	286223	0	1333	709	-3849	-2046
2010	0	5183	5183	2479	603712	305250	0	1333	638	-3849	-1841
2011	0	5183	5183	2231	640911	382506	0	1333	574	-3849	-1657
2012	0	5183	5183	2008	678111	459761	0	1333	517	-3849	-1491
2013	0	5183	5183	1807	715310	537017	0	1333	465	-3849	-1342
2014	0	5183	5183	1626	752510	614273	0	1333	418	-3849	-1208
2015	0	5183	5183	1464	789709	691529	0	1333	377	-3849	-1087
2016	0	5183	5183	1317	826909	768785	0	1333	339	-3849	-978
2017	0	5183	5183	1186	864108	846040	0	1333	305	-3849	-881
2018	0	5183	5183	1067	901308	923296	0	1333	275	-3849	-793
2019	0	5183	5183	960	938507	1000552	0	1333	247	-3849	-713
2020	0	5183	5183	864	975707	1077808	0	1333	222	-3849	-642
2021											
2022											
2023											
Total	259,127	88,103	347231	**297,992**	12,366,747	9,210,808		475,861	**418,007**	**128,630**	**120,015**
										B/C	**1.40**
										EIRR	**0.01**