Technical Assistance Consultant's Report

Volume 2: Annexes B – Q
(Chapters 2, 3 & 4)

Project Number: 47085
September 2015

Lao People's Democratic Republic: Road Sector Governance and Maintenance Project
(Financed by the Asian Development Bank)

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For Ministry of Public Works and Transport
Department of Roads

Asian Development Bank

Lao Peoples Democratic Republic (Lao PDR)

Ministry of Public Works and Transport

ADB TA-8492 LAO:

ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085-001)

Final Report

Volume 2: Annexes B – Q [Chapters 2, 3 & 4]

September, 2015

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Annex B – Overloading Statistics

OVERLOADED TRUCKS STATISTICS, 2014

No	Province	Location of Stations	Number of Stations	Number of days Operated	Number of days with broken scale	Number of Staffs at Stations	Number of Trucks Measured	Number of overloaded trucks			% Over loaded	Total Amount of fines and Service	Total Operating Cost	Remark
								0 - 20 %	20 - 40 %	More 40 %				
		Sites	Unit		Days	People	Trucks	Trucks	Trucks	Trucks	%	Kips	Kips	
1	Phongsali	Road 1B, Ban Yo junction, Bounnua District, Phongsali Province			0									
2	Luangnamtha	Road 17A, Muongsing junction, BanSingchaleune, Sing District, Luangnamtha Province.	1	181		4	1,890	340	185	57	30.79%	59,503,000		
		Road 3, Km 35, Ban Natei, Namtha District, Luangnamtha Province												Delete
		Road 3, Km 54, Ban Natei, Namtha District, (Lao-China Border) Luangnamtha Province	1	181	0	4	10,591	2735	1006	-	35.32%	188,330,000		
3	Bokeo	Road 3, Km 2, Houisay District, Bokeo Province												No Data
4	Houaphanh	Road 6, Km 84, Ban Namsoy, Viengxay District, Houaphanh Province	1	180	0	3	167	37	5	2	26.35%	29,144,100	23,621,000	
5	Xiengkhouang	Road 7, Namkan (Lao-Vietnam) Border, Xiangkhoang Province	1	181	0	4	1,272	93	38	14	11.40%	87,620,000	27,261,000	
		Road 7, Km 14, Ban Khankhay, Phouan District, Xiengkhouan Province	1		0	4								
6	Oudomxai	Road 13 north, Km 4, Ban Houai khoum, Xay District, Oudomxai Province												
7	Luangphabang	Road 13 north, Km20, BanMouth, Xiengngeun District, Luangphabang Province												
8	Xayyabouri	Road 4, Km 162, Ban Nakhangan, Paklay District, Xayabouri Province												
		Road 4, Km 260, Kenthao District, (Namheuang Lao-Thai Bridge) Xayabouri Province	1	180	0	3	234	8	-	-	3.42%	7,358,500		No data
9	Vientiane Province	Road 13 north, Km128+700, Ban Sivilay, Vanvieng District, Vientiane Province												
10	Vientiane Capital	Road 13 north, Km 21, Ban Khoksivilay, Xaithany District, Vientiane Capital	1	181	0	3	396	204	22	12	60.10%	79,717,000	40,309,600	
		Road A12, Km 17, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	181	0	3	2,606	147	40	16	7.79%	58,371,500	151,949,600	
		Road 11, Km 5, Ban Kaoleo, Sikhottabong District, Vientiane Capital	1	181	0	3	-	-	-	-		-	38,712,600	
		Road 13 north, Km 30, Ban Chengsavang, Naxaythong District, Vientiane Capital	1	181	0	3	1,063	439	29	3	44.31%	114,582,000	41,503,100	
		Road 1, Mittaphap Bridge, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1		0	2								
		Mobile Inspection	1	181	0	5	886	153	90	446	77.77%	273,644,000	26,254,000	
11	Borikhamxay	Road 13 south, km 2, Pakxan District, Borikhamxai Province				3								
		Road 8, Km 1, Ban Viengkham, Pakading District, Borikhamxai Province				3								
		Road 13 south, Km 244, Ban Na In, Pakkading District, Borikhamxai Province				3								
		Road 8, Km 10, Ban Lak 12, Khamkeut District, Borikhamxai Province	1	181		3	1,164	103	187	-	24.91%	50,060,000	34,260,000	
12	Khammouane	Road 13 south, Km 4, Pasack, Ban Thakheknuea, Thakek District, Khammouan Province			0	3								
		Road 13 south, Km 8, Ban Nabouab, Thakek District, Khammouan Province				3								
		Road 12, Km 50, Ban Lakchet, Mahaxai District, Khammouane Province	1	181	0	3	301	2	7	-	2.99%	14,900,000		
13	Savannakhet	Road 9, Savannakhet Mittaphap Bridge (Lao-Thai) Border	1	180	0	3	2,917	-			0.00%	15,090,663		
		Road 9, Km25, Ban Nathat, Outhoumphon District, Savannakhet Province	1		0	3								
		Road 13 south, Km 35, Ban Lak35, Champhon District, Savannakhet Province	1	180	0	3	1,623	27			1.66%	2,438,750		
		Road 9, Km 64, Atsaphangthong District, Savannakhet Province	1	180	0	3	5,019	10			0.20%	24,810,150		
		Road 9, (Lao - Vietnam) Border, (Dansavan) Xepone District, Savannakhet Province	1	180	0	3	4,325	658			15.21%	1,284,777,300		
14	Champasak	Road 16, Km 30, (Lao-Thai) Border, Phonthong District, Champasak Province	1	181	0	3	6,092	145	2		2.41%	29,083,150		
		Road 13 south, Km 26, Xanasomboun District, Champasak Province	1	181	0	3	387	5			1.29%	1,562,500		
		Road 13 south (Pakse-Khong), Km 21, Pathoumphon District, Champasak Province	1	181	0	4	277	5			1.81%	13,360,000		
		Road 16, Km 11, Bachiengchaleunsouk District, Champasak Province	1	181	0	3	2,655	15	6		0.79%	7,141,800		
		Km 7 Salakhyo-Dongjong, Pakse District, Champasak Province	1			3								No data
		Road 13 south (Pakse-Khong), Km 84, Khong District, Champasak Province	1	181	0	3	273	5			1.83%	2,492,500		
15	Saravanh	Road 13, Km 113, Ban Phonthan, Nakhonpheng District, Saravanh Province				3								No data
		Road 20, Km 26, Ban Beng, Saravanh District, Saravanh Province				3								No data
		Road 15, Km 156, Ban Lalaykong, Samouai District, Saravanh Province				3								No data
16	Attapeu	Road 18B, Km 7, Ban Khanmakkong, Saysetha District, Attapeu Province	1	151	0	3	1,473	93			6.31%			
17	Sekong	Road 16, Km 51, Ban Thateng, Thateng District, Sekong Province				4								
	TOTAL		**26**	**3,946**	**-**	**112**	**45,611**	**5,224**	**1,617**	**550**	**0**	**2,372,856,913**	**383,870,900**	

Remark: Saravanh Province no scales

OVERLOADED TRUCKS STATISTICS, 2013

No	Province	Location of Stations	Number of Stations	Number of days Operated	Number of days with broken scale	Number of Staffs at Stations	Number of Trucks Measured	Number of overloaded trucks			% Over loaded	Total Amount of fines and Service	Total Operating Cost	Remark
								0 - 20 %	20 - 40 %	More 40 %				
		Sites	Unit		Days	People	Trucks	Trucks	Trucks	Trucks	%	Kips	Kips	
1	Phongsali	Road 1B, Ban Yo junction, Bounnua District, Phongsali Province			0									
2	Luangnamtha	Road 17A, Muongsing junction, BanSingchaleune, Sing District, Luangnamtha Province.	1	181		4	815	137	143	101	46.75%	78,100,000		
		Road 3, Km 35, Ban Natei, Namtha District, Luangnamtha Province												Delete
		Road 3, Km 54, Ban Natei, Namtha District, (Lao-China Border) Luangnamtha Province	1	181	0	4	9,705	3712	7	-	38.32%	135,545,000		
3	Bokeo	Road 3, Km 2, Houisay District, Bokeo Province												No Data
4	Houaphanh	Road 6, Km 84, Ban Namsoy, Viengxay District, Houaphanh Province	1	180	0	3	183	41	5	3	26.78%	29,787,550	25,540,000	
5	Xiengkhouang	Road 7, Namkan (Lao-Vietnam) Border, Xiangkhoang Province	1	163	0	4	4,462	669	17	2	15.42%	243,120,000	29,280,000	
		Road 7, Km 14, Ban Khankhay, Phouan District, Xiengkhouan Province	1	70	0	4	879	90	2	-	10.47%			
6	Oudomxai	Road 13 north, Km 4, Ban Houai khoum, Xay District, Oudomxai Province												
7	Luangphabang	Road 13 north, Km20, BanMouth, Xiengngeun District, Luangphabang Province												
8	Xayyabouri	Road 4, Km 162, Ban Nakhangan, Paklay District, Xayabouri Province												
		Road 4, Km 260, Kenthao District, (Namheuang Lao-Thai Bridge) Xayabouri Province	1	180	0	3	456	3	-	-	0.66%	3,564,950		No data
9	Vientiane Province	Road 13 north, Km128+700, Ban Sivilay, Vanvieng District, Vientiane Province												
10	Vientiane Capital	Road 13 north, Km 21, Ban Khoksivilay, Xaithany District, Vientiane Capital	1	181	0	3	-							
		Road A12, Km 17, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	181	0	3	-					24,711,000		
		Road 11, Km 5, Ban Kaoleo, Sikhottabong District, Vientiane Capital	1	181	0	3	-					8,010,000		
		Road 13 north, Km 30, Ban Chengsavang, Naxaythong District, Vientiane Capital	1	181	0	3	-							
		Road 1, Mittaphap Bridge, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	181	0	2	29,932	3147	-	-	10.51%	26,740,000		
		Mobile Inspection	1	181	0	5	817	219+92	117	218		251,387,000		
11	Borikhamxay	Road 13 south, km 2, Pakxan District, Borikhamxai Province				3								
		Road 8, Km 1, Ban Viengkham, Pakading District, Borikhamxai Province				3								
		Road 13 south, Km 244, Ban Na In, Pakkading District, Borikhamxai Province				3								
		Road 8, Km 10, Ban Lak 12, Khamkeut District, Borikhamxai Province	1	180		3	280	28	-	-	10.00%	10,350,000		
12	Khammouane	Road 13 south, Km 4, Pasack, Ban Thakheknuea, Thakek District, Khammouan Province			0	3								
		Road 13 south, Km 8, Ban Nabouab, Thakek District, Khammouan Province				3								
		Road 12, Km 50, Ban Lakchet, Mahaxai District, Khammouane Province	1	181	0	3	728	26	7	1	4.67%	41,150,000		
13	Savannakhet	Road 9, Savannakhet Mittaphap Bridge (Lao-Thai) Border	1	181	0	3	3,553	22	24	10	1.58%	73,812,400		
		Road 9, Km25, Ban Nathat, Outhoumphon District, Savannakhet Province	1		0	3								
		Road 13 south, Km 35, Ban Lak35, Champhon District, Savannakhet Province	1	181	0	3	1,733	482	-	-	27.81%	5,617,000		
		Road 9, Km 64, Atsaphangthong District, Savannakhet Province	1	181	0	3	3,007	-	-	-	0.00%	-		
		Road 9, (Lao - Vietnam) Border, (Dansavan) Xepone District, Savannakhet Province	1	181	0	3	2,812	1,039	56	71	41.47%	176,662,660		
14	Champasak	Road 16, Km 30, (Lao-Thai) Border, Phonthong District, Champasak Province	1	180	0	3	4,174	266	1	-	6.40%	46,540,250		
		Road 13 south, Km 26, Xanasomboun District, Champasak Province	1	180	0	3	82	-	-	-	0.00%	-		
		Road 13 south (Pakse-Khong), Km 21, Pathoumphon District, Champasak Province	1	180	0	4	22	-	-	-				
		Road 16, Km 11, Bachiengchaleunsouk District, Champasak Province	1	180	0	3	2,119	10	20	5	1.65%	9,223,000		
		Km 7 Salakhyo-Dongjong, Pakse District, Champasak Province	1			3								No data
		Road 13 south (Pakse-Khong), Km 84, Khong District, Champasak Province	1	180	0	3	268	3	-	-	1.12%	609,200		
15	Saravanh	Road 13, Km 113, Ban Phonthan, Nakhonpheng District, Saravanh Province				3								No data
		Road 20, Km 26, Ban Beng, Saravanh District, Saravanh Province				3								No data
		Road 15, Km 156, Ban Lalaykong, Samouai District, Saravanh Province				3								No data
16	Attapeu	Road 18B, Km 7, Ban Khanmakkong, Saysetha District, Attapeu Province	1	182	0	3	1,405	10			0.71%	12,085,400		
17	Sekong	Road 16, Km 51, Ban Thateng, Thateng District, Sekong Province				4								
	TOTAL		26	4,208	-	112	67,432	9,685	399	411	15.56%	1,177,015,410	54,784,000	

Remark: Saravanh Province no scales

OVERLOADED TRUCKS STATISTICS, 2012

No	Province	Location of Stations	Number of Stations	Number of days Operated	Number of days with broken scale	Number of Staffs at Stations	Number of Trucks Measured	Number of overloaded trucks			% Over loaded	Total Amount of fines and Service	Total Operating Cost	Remark
								0 - 20 %	20 - 40 %	More 40 %				
		Sites	Unit		Days	People	Trucks	Trucks	Trucks	Trucks	%	Kips	Kips	
1	Phongsali	Road 1B, Ban Yo junction, Bounnua District, Phongsali Province	1		0	4								
2	Luangnamtha	Road 17A, Muongsing junction, BanSingchaleune, Sing District, Luangnamtha Province.	1	243		4	449	220	26	45	64.81%	31,850,000		
		Road 3, Km 35, Ban Natei, Namtha District, Luangnamtha Province												Delete
		Road 3, Km 54, Ban Natei, Namtha District, (Lao-China Border) Luangnamtha Province	1	365	0	4	10,614	2664	32	10	25.49%	277,724,000		
3	Bokeo	Road 3, Km 2, Houisay District, Bokeo Province												No Data
4	Houaphanh	Road 6, Km 84, Ban Namsoy, Viengxay District, Houaphanh Province	1	362	0	3	306	64	18	7	29.08%	50,854,350	44,454,000	
5	Xiengkhouang	Road 7, Namkan (Lao-Vietnam) Border, Xiangkhoang Province	1	365	0	4	13,325	1842	91	0	14.51%	632,485,000	60,413,000	
		Road 7, Km 14, Ban Khankhay, Phouan District, Xiengkhouan Province	1	102	0	4	1,200	259	0	0	21.58%	30,000,000	4,275,000	
6	Oudomxai	Road 13 north, Km 4, Ban Houai khoum, Xay District, Oudomxai Province	1		0	4								
7	Luangphabang	Road 13 north, Km20, BanMouth, Xiengngeun District, Luangphabang Province	1		0	3								
8	Xayyabouri	Road 4, Km 162, Ban Nakhangan, Paklay District, Xayabouri Province	1	364	0	3	1,500	5	0	0	0.33%	5,546,900		
		Road 4, Km 260, Kenthao District, (Namheuang Lao-Thai Bridge) Xayabouri Province	1											No data
9	Vientiane Province	Road 13 north, Km128+700, Ban Sivilay, Vanvieng District, Vientiane Province	1	358		3	1,122	608	3	0	54%	67,800,000		
10	Vientiane Capital	Road 13 north, Km 21, Ban Khoksivilay, Xaithany District, Vientiane Capital	1	365	0	3	41	12	8	-	48.78%	3,340,000	65,543,100	
		Road A12, Km 17, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	365	0	3	1,156	368	54	3	36.76%	23,653,800	161,093,200	
		Road 11, Km 5, Ban Kaoleo, Sikhottabong District, Vientiane Capital	1	365	0	3	-	-	-	-		5,500,000	67,760,700	
		Road 13 north, Km 30, Ban Chengsavang, Naxaythong District, Vientiane Capital	1	365	0	3	176	99	2	-	57.39%	13,191,000	69,289,100	
		Road 1, Mittaphap Bridge, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	365	0	2	67,957	7524	-	-	11.07%	73,509,000	-	
		Mobile Inspection	1	365	0	5	2,002	933	234	230	69.78%	511,391,000	63,008,500	
11	Borikhamxay	Road 13 south, km 2, Pakxan District, Borikhamxai Province	1			3								
		Road 8, Km 1, Ban Viengkham, Pakading District, Borikhamxai Province	1			3								
		Road 13 south, Km 244, Ban Na In, Pakkading District, Borikhamxai Province	1			3								
		Road 8, Km 10, Ban Lak 12, Khamkeut District, Borikhamxai Province	1	365		3	1,096	71	0	0	6.48%	9,050,000		
12	Khammouane	Road 13 south, Km 4, Pasack, Ban Thakheknuea, Thakek District, Khammouan Province	1		0	3								
		Road 13 south, Km 8, Ban Nabouab, Thakek District, Khammouan Province	1			3								
		Road 12, Km 50, Ban Lakchet, Mahaxai District, Khammouane Province	1	365		3	1,711	72	14	4	5.26%	80,372,000	38,870,000	
13	Savannakhet	Road 9, Savannakhet Mittaphap Bridge (Lao-Thai) Border	1	213	0	3	4,109	222	77	38	0.21%	266,964,300		
		Road 9, Km25, Ban Nathat, Outhoumphon District, Savannakhet Province	1		0	3					0.00%			
		Road 13 south, Km 35, Ban Lak35, Champhon District, Savannakhet Province	1		0	3					0.00%			
		Road 9, Km 64, Atsaphangthong District, Savannakhet Province	1		0	3					1.55%			
		Road 9, (Lao - Vietnam) Border, (Dansavan) Xepone District, Savannakhet Province	1	213	0	3	4,096	1,229	261	903	0.00%	6,215,694,250		
14	Champasak	Road 16, Km 30, (Lao-Thai) Border, Phonthong District, Champasak Province	1	365	0	3	8,993	568	9	4	6.46%	95,639,850		
		Road 13 south, Km 26, Xanasomboun District, Champasak Province	1		0	3								
		Road 13 south (Pakse-Khong), Km 21, Pathoumphon District, Champasak Province	1		0	4								
		Road 16, Km 11, Bachiengchaleunsouk District, Champasak Province	1		0	3								
		Km 7 Salakhyo-Dongjong, Pakse District, Champasak Province	1			3							-	No data
		Road 13 south (Pakse-Khong), Km 84, Khong District, Champasak Province	1	365	0	3	667	15	0	0	2.25%	5,696,600	-	
15	Saravanh	Road 13, Km 113, Ban Phonthan, Nakhonpheng District, Saravanh Province	1			3								No data
		Road 20, Km 26, Ban Beng, Saravanh District, Saravanh Province	1			3								No data
		Road 15, Km 156, Ban Lalaykong, Samouai District, Saravanh Province	1			3								No data
16	Attapeu	Road 18B, Km 7, Ban Khanmakkong, Saysetha District, Attapeu Province	1	364	0	3	2,177	29	0	0	1.33%	25,115,300	-	
17	Sekong	Road 16, Km 51, Ban Thateng, Thateng District, Sekong Province		352		4	332	0	0	0	0.00%	-	-	0
	TOTAL		41		-	130	123,029	16,804	829	1244	15.34%	8,425,377,350	574,706,600	

Remark: Saravanh Province no scales

OVERLOADED TRUCKS STATISTICS, 2011

No	Province	Location of Stations	Number of Stations	Number of days Operated	Number of days with broken scale	Number of Staffs at Stations	Number of Trucks Measured	Number of overloaded trucks			% Over loaded	Total Amount of fines and Service	Total Operating Cost	Remark
								0 - 20 %	20 - 40 %	More 40 %				
		Sites	Unit		Days	People	Trucks	Trucks	Trucks	Trucks	%	Kips	Kips	
1	Phongsali	Road 1B, Ban Yo junction, Bounnua District, Phongsali Province	1	272	0	4	290	74	0	1	25.86%	31,174,000		
2	Luangnamtha	Road 17A, Muongsing junction, BanSingchaleune, Sing District, Luangnamtha Province.	1	364		4	3,779	1847	19	8	49.59%	212,658,500		
		Road 3, Km 35, Ban Natei, Namtha District, Luangnamtha Province												Delete
		Road 3, Km 54, Ban Natei, Namtha District, (Lao-China Border) Luangnamtha Province	1	364	0	4	8,706	1539	5	0	17.73%	155,089,400		
3	Bokeo	Road 3, Km 2, Houisay District, Bokeo Province	1		0	4								No Data
4	Houaphanh	Road 6, Km 84, Ban Namsoy, Viengxay District, Houaphanh Province	1	360	0	3	378	61	15	6	21.69%	65,309,000	51,215,000	
5	Xiengkhouang	Road 7, Namkan (Lao-Vietnam) Border, Xiangkhoang Province	1	365	0	4	5,384	491	22	1	9.55%	156,055,000	37,306,000	
		Road 7, Km 14, Ban Khankhay, Phouan District, Xiengkhouan Province	1	181	0	4	3,091	283	0	0	9.16%	90,570,000	27,560,000	
6	Oudomxai	Road 13 north, Km 4, Ban Houai khoum, Xay District, Oudomxai Province	1	365	0	4	12,841	869	899	79	14.38%	538,020,000		
7	Luangphabang	Road 13 north, Km20, BanMouth, Xiengngeun District, Luangphabang Province	1	365	0	3	14,875	433	0	0	2.91%	148,830,000		
8	Xayyabouri	Road 4, Km 162, Ban Nakhangan, Paklay District, Xayabouri Province	1	365	0	5	3,487	11	0	0	0.32%	7,857,100		
		Road 4, Km 260, Kenthao District, (Namheuang Lao-Thai Bridge) Xayabouri Province	1											No data
9	Vientiane Province	Road 13 north, Km128+700, Ban Sivilay, Vanvieng District, Vientiane Province	1	365		4	3,286	2136	0	0	65%	114,106,000		
10	Vientiane Capital	Road 13 north, Km 21, Ban Khoksivilay, Xaithany District, Vientiane Capital	1	364	0	3	3,596	1453	16	6	41.02%	103,667,500	83,486,200	
		Road A12, Km 17, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	364	0	3	6,427	1214	23	15	19.48%	64,813,700	79,984,500	
		Road 11, Km 5, Ban Kaoleo, Sikhottabong District, Vientiane Capital	1	364	0	3	-	-	-	-				
		Road 13 north, Km 30, Ban Chengsavang, Naxaythong District, Vientiane Capital	1	364	0	3	8199	3200	103	20	40.53%	387,451,100	79,683,200	
		Road 1, Mittaphap Bridge, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	364	0	2	63,091	5613	13	-	8.92%	17,008,000	-	
		Mobile Inspection	1	364	0	5	988	464	83	28	58.20%	55,863,600	79,190,200	
11	Borikhamxay	Road 13 south, km 2, Pakxan District, Borikhamxai Province	1	365		3	852	21	0	0	2.46%	4,605,000	42,129,000	
		Road 8, Km 1, Ban Viengkham, Pakading District, Borikhamxai Province	1	365		3	251	47	0	0	18.73%	2,000,000	43,120,000	
		Road 13 south, Km 244, Ban Na In, Pakkading District, Borikhamxai Province	1	365		3	169	2	0	0	1.18%	-	40,442,000	
		Road 8, Km 10, Ban Lak 12, Khamkeut District, Borikhamxai Province	1	365		3	1,941	163	0	0	8.40%	5,770,000	43,656,000	
12	Khammouane	Road 13 south, Km 4, Pasack, Ban Thakheknuea, Thakek District, Khammouan Province	1	285	0	3	4,981	186	1	0	3.75%	43,357,000	41,873,501	
		Road 13 south, Km 8, Ban Nabouab, Thakek District, Khammouan Province	1	285		3	13,426	243	0	0	1.81%	54,372,000	46,520,295	
		Road 12, Km 50, Ban Lakchet, Mahaxai District, Khammouane Province	1	349		3	1,881	344	23	12	20.15%	177,381,000	62,687,423	
13	Savannakhet	Road 9, Savannakhet Mittaphap Bridge (Lao-Thai) Border	1	360	0	3	3,315	53	116	98	0.21%	401,943,800	45,646,000	
		Road 9, Km25, Ban Nathat, Outhoumphon District, Savannakhet Province	1	360	0	3	7,502	233	23	0	0.00%	25,684,700	83,722,326	
		Road 13 south, Km 35, Ban Lak35, Champhon District, Savannakhet Province	1	360	0	3	1,624	0	0	0	0.00%	972,800	57,615,226	
		Road 9, Km 64, Atsaphangthong District, Savannakhet Province	1	360	0	3	9,100	15	12	0	1.55%	64,009,000	58,851,031	
		Road 9, (Lao - Vietnam) Border, (Dansavan) Xepone District, Savannakhet Province	1	360	0	3	8,426	4,153	342	828	0.00%	6,028,690,000	60,451,547	
14	Champasak	Road 16, Km 30, (Lao-Thai) Border, Phonthong District, Champasak Province	1	363	0	3	10,166	721	9	1	7.19%	134,624,000		
		Road 13 south, Km 26, Xanasomboun District, Champasak Province	1	363	0	3	2,362	3	0	0	0.13%	742400		
		Road 13 south (Pakse-Khong), Km 21, Pathoumphon District, Champasak Province	1	363	0	4	995	6	0	0	0.60%	1,640,700		
		Road 16, Km 11, Bachiengchaleunsouk District, Champasak Province	1	363	0	3	4,565	33	4	0	0.81%	222,502,000		
		Km 7 Salakhyo-Dongjong, Pakse District, Champasak Province	1			3							-	No data
		Road 13 south (Pakse-Khong), Km 84, Khong District, Champasak Province	1	363	0	3	910	11	0	0	1.21%	4,113,400	-	
15	Saravanh	Road 13, Km 113, Ban Phonthan, Nakhonpheng District, Saravanh Province	1			3								No data
		Road 20, Km 26, Ban Beng, Saravanh District, Saravanh Province	1			3								No data
		Road 15, Km 156, Ban Lalaykong, Samouai District, Saravanh Province	1			3								No data
16	Attapeu	Road 18B, Km 7, Ban Khanmakkong, Saysetha District, Attapeu Province	1	365	0	3	2,443	1			0.04%	10,364,400	-	
17	Sekong	Road 16, Km 51, Ban Thateng, Thateng District, Sekong Province		350		4	1,127	1	0	0	0.09%	438,000	-	0
	TOTAL		41			133	214,454	25,944	1,728	1103	13.42%	9,331,950,100	1,145,539,349	

Remark: Saravanh Province no scales

OVERLOADED TRUCKS STATISTICS, 2010

No	Province	Location of Stations	Number of Stations	Number of days Operated	Number of days with broken scale	Number of Staffs at Stations	Number of Trucks Measured	Number of overloaded trucks			% Over loaded	Total Amount of fines and Service	Total Operating Cost	Remark
								0 - 20 %	20 - 40 %	More 40 %				
		Sites	Unit		Days	People	Trucks	Trucks	Trucks	Trucks	%	Kips	Kips	
1	Phongsali	Road 1B, Ban Yo junction, Bounnua District, Phongsali Province	1	360	0	4	544	125	6	0	24.08%	53,900,000		
2	Luangnamtha	Road 17A, Muongsing junction, BanSingchaleune, Sing District, Luangnamtha Province.	1	347		4	1,238	335	16	16	29.64%	47,955,960		
		Road 3, Km 35, Ban Natei, Namtha District, Luangnamtha Province												Delete
		Road 3, Km 54, Ban Natei, Namtha District, (Lao-China Border) Luangnamtha Province	1	365	0	4	6,320	694	27	0	11.41%	84,141,770		
3	Bokeo	Road 3, Km 2, Houisay District, Bokeo Province	1	360	45	4	202	48	0	0	23.76%	10,044,400	10,029,000	No Data
4	Houaphanh	Road 6, Km 84, Ban Namsoy, Viengxay District, Houaphanh Province	1	360	0	2	603	20	0	0	3.32%	70,495,400	-	
5	Xiengkhouang	Road 7, Km 14, Ban Khankhay, Phouan District, Xiengkhouan Province	1	365		4	4,281	749	1	0	17.52%	147,030,000	31,529,000	
		Road 7, Namkan (Lao-Vietnam) Border, Xiangkhoang Province	1	365	0	4	4,665	557	45	0	12.90%	137,960,000	23,917,000	
6	Oudomxai	Road 13 north, Km 4, Ban Houai khoum, Xay District, Oudomxai Province	1	360	0	4	4,324	692	943	84	39.75%	454,640,000	-	
7	Luangphabang	Road 13 north, Km20, BanMouth, Xiengngeun District, Luangphabang Province	1	365	0	5	13,947	499	18	2	3.72%	205,470,000	22,850,000	
8	Xayyabouri	Road 4, Km 162, Ban Nakhangan, Paklay District, Xayabouri Province	1	360	0	5	4,559	13	0	0	0.29%	11,944,800		
		Road 4, Km 260, Kenthao District, (Namheuang Lao-Thai Bridge) Xayabouri Province	1											No data
9	Vientiane Province	Road 13 north, Km128+700, Ban Sivilay, Vanvieng District, Vientiane Province	1	365		5	3,054	1977	2	0	64.80%	97,720,000		
10	Vientiane Capital	Road 13 north, Km 21, Ban Khoksivilay, Xaithany District, Vientiane Capital	1	365	0	4	3,743	1012	13	17	27.84%	160,336,200	83,232,400	
		Road A12, Km 17, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	365	0	4	5,573	1567	105	19	30.34%	95,194,650	87,770,500	
		Road 11, Km 5, Ban Kaoleo, Sikhottabong District, Vientiane Capital	1	365	0	4	2841	755	54	7	28.72%	17,480,700	78,647,800	
		Road 13 north, Km 30, Ban Chengsavang, Naxaythong District, Vientiane Capital	1	365	0	4	6785	2710	126	15	42.02%	689,507,250	87,252,200	
		Road 1, Mittaphap Bridge, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	365	0	2	56,647	4954	108	-	8.94%	15,537,050	-	
		Mobile Inspection	1	365	0	4	1,965	657	74	16	38.02%	209,257,250	81,038,100	
11	Borikhamxay	Road 13 south, km 2, Pakxan District, Borikhamxai Province	1	365		5	2,001	37	0	0	1.85%	26,719,000	19,329,000	
		Road 13 south, Km 244, Ban Na In, Pakkading District, Borikhamxai Province	1	334		4	620	35	0	0	5.65%	19,129,500	15,790,000	
		Road 8, Km 1, Ban Viengkham, Pakading District, Borikhamxai Province	1	367		4	497	27	0	0	5.43%	23,099,000	16,942,000	
		Road 8, Km 10, Ban Lak 12, Khamkeut District, Borikhamxai Province	1	365		5	2,508	68	0	0	2.71%	26,498,000	19,316,000	
12	Khammouane	Road 13 south, Km 4, Pasack, Ban Thakheknuea, Thakek District, Khammouan Province	1	365	0	3	8,612	330	6	1	3.91%	74,808,000	61,246,952	
		Road 13 south, Km 8, Ban Nabouab, Thakek District, Khammouan Province	1	365		3	15,164	337	3	1	2.25%	168,126,000	62,781,175	
		Road 12, Km 50, Ban Lakchet, Mahaxai District, Khammouane Province	1	365		3	1,871	331	25	10	19.56%	96,699,000	67,267,137	
13	Savannakhet	Road 9, Savannakhet Mittaphap Bridge (Lao-Thai) Border	1	365	0	3	2,694	27	12	14	0.21%	10,334,250	32,896,920	
		Road 9, Km25, Ban Nathat, Outhoumphon District, Savannakhet Province	1	365	0	3	5,211	142	19	0	0.00%	14,388,930	47,618,538	
		Road 13 south, Km 35, Ban Lak35, Champhon District, Savannakhet Province	1	365	0	3	2,710	12	9	0	0.00%	9,306,600	50,486,596	
		Road 9, Km 64, Atsaphangthong District, Savannakhet Province	1	365	0	4	8,357	890	0	0	1.55%	42,057,750	55,736,622	
		Road 9, (Lao - Vietnam) Border, (Dansavan) Xepone District, Savannakhet Province	1	365	0	3	4,755	738	376	302	0.00%	2,634,656,400	57,195,462	
14	Champasak	Road 16, Km 30, (Lao-Thai) Border, Phonthong District, Champasak Province	1	360	0	3	11,932	439	5	1	3.73%	74,801,300		
		Road 13 south, Km 26, Xanasomboun District, Champasak Province	1	360	0	3	3,054	16	0	0	0.52%	11624800		
		Road 13 south (Pakse-Khong), Km 21, Pathoumphon District, Champasak Province	1	360	0	4	1,530	15	1	0	1.05%	4,611,100		
		Road 16, Km 11, Bachiengchaleunsouk District, Champasak Province	1	360	0	3	4,028	37	7	1	1.12%	12,125,200		
		Km 7 Salakhyo-Dongjong, Pakse District, Champasak Province	1			3	-	0	0	0		-	-	No data
		Road 13 south (Pakse-Khong), Km 84, Khong District, Champasak Province	1	360	0	3	1,057	0	0	0	0.00%	3,187,200	-	
15	Saravanh	Road 13, Km 113, Ban Phonthan, Nakhonpheng District, Saravanh Province	1			3								No data
		Road 20, Km 26, Ban Beng, Saravanh District, Saravanh Province	1			3								No data
		Road 15, Km 156, Ban Lalaykong, Samouai District, Saravanh Province	1			3								No data
16	Attapeu	Road 18B, Km 7, Ban Khanmakkong, Saysetha District, Attapeu Province	1	365	0	3	2,105	1	0	1	0.10%	2,050,000	-	
17	Sekong	Road 16, Km 51, Ban Thateng, Thateng District, Sekong Province		331		4	1,211	11	0	0	0.91%	16,187,508	-	0
	TOTAL		40			145	201,208	20,857	2,001	507	11.61%	5,779,024,968	1,012,872,402	

Remark: Saravanh Province no scales

OVERLOADED TRUCKS STATISTICS, 2009

No	Province	Location of Stations	Number of Stations	Number of days Operated	Number of days with broken scale	Number of Staffs at Stations	Number of Trucks Measured	Number of overloaded trucks			% Over loaded	Total Amount of fines and Service	Total Operating Cost	Remark
								0 - 20 %	20 - 40 %	More 40 %				
		Sites	Unit		Days	People	Trucks	Trucks	Trucks	Trucks	%	Kips	Kips	
1	Phongsali	Road 1B, Ban Yo junction, Bounnua District, Phongsali Province	1	360	0	4	461	89	14	3	22.99%	60,478,050		
2	Luangnamtha	Road 17A, Muongsing junction, BanSingchaleune, Sing District, Luangnamtha Province.	1	314	25	4	706	316	3	2	45.47%	30,793,650		
		Road 3, Km 35, Ban Natei, Namtha District, Luangnamtha Province												Delete
		Road 3, Km 54, Ban Natei, Namtha District, (Lao-China Border) Luangnamtha Province	1	92	0	1	666	59	0	0	8.86%	4,243,400		
3	Bokeo	Road 3, Km 2, Houisay District, Bokeo Province	1			4								No Data
4	Houaphanh	Road 6, Km 84, Ban Namsoy, Viengxay District, Houaphanh Province	1	360	0	2	487	122	8	9	28.54%	61,715,000		
5	Xiengkhouang	Road 7, Km 14, Ban Khankhay, Phouan District, Xiengkhouan Province	1	349	20	4	4,835	722	20	4	15.43%	114,905,000	20,845,000	
		Road 7, Namkan (Lao-Vietnam) Border, Xiangkhoang Province	1	346	0	4	6,134	1043	28	0	17.46%	154,767,000	19,815,000	
6	Oudomxai	Road 13 north, Km 4, Ban Houai khoum, Xay District, Oudomxai Province	1	360	0	4	5,239	499	752	83	25.46%	315,230,000		
7	Luangphabang	Road 13 north, Km20, BanMouth, Xiengngeun District, Luangphabang Province	1	330	0	5	11,081	282	3	0	2.57%	105,434,000	14,633,000	
8	Xayyabouri	Road 4, Km 162, Ban Nakhangan, Paklay District, Xayabouri Province	1	362	0	5	7,343	36	0	0	0.49%	45,404,700		
		Road 4, Km 260, Kenthao District, (Namheuang Lao-Thai Bridge) Xayabouri Province	1											No data
9	Vientiane Province	Road 13 north, Km128+700, Ban Sivilay, Vanvieng District, Vientiane Province	1	354	10	5	4,118	2516	13	2	61.46%	143,115,000	90,136,953	
10	Vientiane Capital	Road 13 north, Km 21, Ban Khoksivilay, Xaithany District, Vientiane Capital	1	364	0	4	2,076	915	34	18	46.58%	270,060,109	67,808,800	
		Road A12, Km 17, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	364	0	4	5,226	1,656	128	54	35.17%	92,755,800	106,713,700	
		Road 11, Km 5, Ban Kaoleo, Sikhottabong District, Vientiane Capital	1	364	0	4	1,795	1,479	91	30	89.14%	21,276,800	52,793,900	
		Road 13 north, Km 30, Ban Chengsavang, Naxaythong District, Vientiane Capital	1	364	0	4	5,997	2,335	67	32	40.59%	210,147,900	71,260,400	
		Road 1, Mittaphap Bridge, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	356	0	2	46,106	7,042	24	17	15.36%	35,054,000	-	
		Mobile Inspection	1	364	0	4	1,713	789	113	92	58.03%	97,690,800	67,255,700	
11	Borikhamxay	Road 13 south, km 2, Pakxan District, Borikhamxai Province	1	364	5	4	5,111	108	0	0	2.11%	18,200,000	62,079,000	
		Road 13 south, Km 244, Ban Na In, Pakkading District, Borikhamxai Province	1	364	4	5	3,622	8	0	0	0.22%	1,400,000	51,866,000	
		Road 8, Km 1, Ban Viengkham, Pakading District, Borikhamxai Province	1	364	4	4	1,056	9	0	0	0.85%	2,000,000	52,170,000	
		Road 8, Km 10, Ban Lak 12, Khamkeut District, Borikhamxai Province	1	364	5	5	2,497	51	11	0	2.48%	10,110,000	61,702,000	
12	Khammouane	Road 13 south, Km 8, Ban Nabouab, Thakek District, Khammouan Province	1	364	0	3	12,549	185	15	9	1.67%	183,335,000	62,432,614	
		Road 12, Km 50, Ban Lakchet, Mahaxai District, Khammouane Province	1	257	85	3	2,042	231	29	7	13.08%	101,689,000	51,172,340	
		Road 13 south, Km 4, Pasack, Ban Thakheknuea, Thakek District, Khammouan Province	1	283	19	3	6,055	433	5	1	7.25%	91,433,000	60,820,945	
13	Savannakhet	Road 9, Km25, Ban Nathat, Outhoumphon District, Savannakhet Province	1	364	0	3	10,169	12	0	0	0.21%	9,757,700	48,816,596	
		Road 9, Km 64, Atsaphangthong District, Savannakhet Province	1	364	0	3	9,624	0	0	0	0.00%	-	32,383,215	
		Road 13 south, Km 35, Ban Lak35, Champhon District, Savannakhet Province	1	364	0	3	2,689	28	0	0	0.00%	5,499,150	29,297,456	
		Road 9, (Lao - Vietnam) Border, (Dansavan) Xepone District, Savannakhet Province	1	364	0	3	4,925	58	25	6	1.55%	37,087,100	35,114,708	
		Road 9, Savannakhet Mittaphap Bridge (Lao-Thai) Border	1	364	0	3	1,200	0	0	0	0.00%	-	26,606,500	
14	Champasak	Road 16, Km 30, (Lao-Thai) Border, Phonthong District, Champasak Province	1	360	0	3	11,227	500	8	0	4.52%	85,939,600		
		Road 13 south, Km 26, Xanasomboun District, Champasak Province	1	360	0	3	2,908	5	1	0	0.21%	4337100		
		Road 13 south (Pakse-Khong), Km 21, Pathoumphon District, Champasak Province	1	360	0	4	2,291	20	1	0	0.92%	8,686,900		
		Road 16, Km 11, Bachiengchaleunsouk District, Champasak Province	1	360	0	3	3,187	88	8	1	3.04%	31,402,300		
		Km 7 Salakhyo-Dongjong, Pakse District, Champasak Province	1	2	180	3	3	0	0	0	0.00%	-		1
		Road 13 south (Pakse-Khong), Km 84, Khong District, Champasak Province	1	360	0	3	1,474	15	0	0	1.02%	2,834,000		
15	Saravanh	Road 13, Km 113, Ban Phonthan, Nakhonpheng District, Saravanh Province	1			3								No data
		Road 20, Km 26, Ban Beng, Saravanh District, Saravanh Province	1			3								No data
		Road 15, Km 156, Ban Lalaykong, Samouai District, Saravanh Province	1			3								No data
16	Attapeu	Road 18B, Km 7, Ban Khanmakkong, Saysetha District, Attapeu Province	1	362	0	3	1,769	0	0	0	0.00%	1,070,000		
17	Sekong	Road 16, Km 51, Ban Thateng, Thateng District, Sekong Province		229	60	4	1,265	5	0	0	0.40%	2,139,000	517,000	0
	TOTAL		40			141	189,646	21656	1401	370	12.35%	2,359,991,059	1,086,240,827	

Remark: Saravanh Province no scales

OVERLOADED TRUCKS STATISTICS, 2008

No	Province	Location of Stations	Number of Stations	Number of days Operated	Number of days with broken scale	Number of Staffs at Stations	Number of Trucks Measured	Number of overloaded trucks			% Over loaded	Total Amount of fines and Service	Total Operating Cost	Remark
								0 - 20 %	20 - 40 %	More 40 %				
		Sites	Unit		Days	People	Trucks	Trucks	Trucks	Trucks	%	Kips	Kips	
1	Phongsali	Road 1B, Ban Yo junction, Bounnua District, Phongsali Province	1	365	0	4	273	107	21	10	50.55%	43,453,300		
2	Luangnamtha	Road 17A, Muongsing junction, BanSingchaleune, Sing District, Luangnamtha Province.	1	350	15	4	1,477	186	2	0	12.73%	12,655,550		
		Road R3, Km 54, Ban Natei, Namtha District, (Lao-China Border) Luangnamtha Province	1	95	270	4	3,452	10	0	2	0.35%	-		Delete
		Road R3, Km 37, Ban Natei, Namtha District, Luangnamtha Province	1	288	77	4	5,760	208	31	4	4.22%	31,262,100		
3	Bokeo	Road 3, Km 2, Houisay District, Bokeo Province	1	0		4								No Data
4	Houaphanh	Road 6, Km 84, Ban Namsoy, Viengxay District, Houaphanh Province	1		0	3								
5	Xiengkhouang	Road 7, Km 14, Ban Khankhay, Phouan District, Xiengkhouan Province	1	343	22	4	1,975	286	29	0	16.10%	65,030,000		
		Road 7, Namkan (Lao-Vietnam) Border, Xiangkhoang Province	1	365	4	4	4,809	871	19	0	18.51%	162,890,000		
6	Oudomxai	Road 13 north, Km 4, Ban Houai khoum, Xay District, Oudomxai Province	1	355	10	4	6,378	276	308	64	10.16%	143,882,000		
7	Luangphabang	Road 13 north, Km20, BanMouth, Xiengngeun District, Luangphabang Province	1	360	5	5	7,251	124	2	1	1.75%	39,865,000		
8	Xayyabouri	Road 4, Km 162, Ban Nakhangan, Paklay District, Xayabouri Province	1			5								
		Road 4, Km 260, Kenthao District, (Namheuang Lao-Thai Bridge) Xayabouri Province	1											No data
9	Vientiane Province	Road 13 north, Km128+700, Ban Sivilay, Vanvieng District, Vientiane Province	1	365	0	5	2,205	1394	4	9	63.81%	124,358,160		
10	Vientiane Capital	Road 13 north, Km 21, Ban Khoksivilay, Xaithany District, Vientiane Capital	1	360	0	4	2,023	483	24	21	26.10%	278,431,702		
		Road A12, Km 17, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	338	22	4	2,627	444	93	70	23.11%	58,102,450		
		Road 11, Km 5, Ban Kaoleo, Sikhottabong District, Vientiane Capital	1	360	0	4	739	82	46	15	19.35%	18,055,300		
		Road 13 north, Km 30, Ban Chengsavang, Naxaythong District, Vientiane Capital	1	360	0	4	6505	1663	83	40	27.46%	219,493,350		
		Road 1, Mittaphap Bridge, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	360	0	2	35,343	1673	32	17	4.87%	29,603,080		
		Mobile Team	1	360	0	4	1,035	340	170	75	56.52%	73,007,350		
11	Borikhamxay	Road 8, Km 1, Ban Viengkham, Pakading District, Borikhamxai Province	1	363	2	4	4,524	74	22	0	2.12%	3,150,000		
		Road 8, Km 10, Ban Lak 12, Khamkeut District, Borikhamxai Province	1	363	2	5	3,891	94	87	1	4.68%	12,247,000		
		Road 13 south, Km 244, Ban Na In, Pakkading District, Borikhamxai Province	1	363	2	4	2,902	136	50	0	6.41%	7,024,000		
		Road 13 south, km 2, Pakxan District (4 Yak), Borikhamxai Province	1	355	11	5	4,391	346	46	0	8.93%	6,738,000		
12	Khammouane	Road 13 south, Km 8, Ban Nabouab, Thakek District, Khammouan Province	1	365	0	3	9,784	326	50	0	3.84%	70,227,192		
		Road 12, Km 50, Ban Lakchet, Mahaxai District, Khammouane Province	1	361	4	3	1,706	137	33	5	10.26%	164,064,000		
		Road 13 south, Km 4, Pasack, Ban Thakheknuea, Thakek District, Khammouan Province	1	365	9	3	4,685	498	0	2	10.67%	111,177,000		
13	Savannakhet	Road 9, Km25, Ban Nathat, Outhoumphon District, Savannakhet Province	1	360	0	3	9,044	11	0	0	0.12%	5,296,000		
		Road 9, Km 64, Atsaphangthong District, Savannakhet Province	1	360	0	3	8,134	1	0		0.01%	1,327,800		
		Road 9, Savannakhet Mittaphap Bridge (Lao-Thai) Border	1	360	0	3	4,248	6	0	0	0.14%	-		
		Road 9, (Lao - Vietnam) Border, (Dansavan) Xepone District, Savannakhet Province	1	360	0	3	3,473	59	15		2.13%	59,746,650		
		Road 13 south, Km 35, Ban Lak35, Champhon District, Savannakhet Province	1	360	0	3	1,481	35	0	0	2.36%	4,225,000		
14	Champasak	Road 16, Km 30, (Lao-Thai) Border, Phonthong District, Champasak Province	1	365	0	3	11,824	492	12	0	4.26%	113,892,900		
		Road 13 south, Km 26, Xanasomboun District, Champasak Province	1	365	0	3	972	7	1	0	0.82%	5,430,900		
		Road 13 south (Pakse-Khong), Km 21, Pathoumphon District, Champasak Province	1	365	0	4	1,384	50	3	0	3.83%	9,924,100		
		Road 16, Km 11, Bachiengchaleunsouk District, Champasak Province	1	365	0	3	2,530	35	11	2	1.90%	14,030,900		
		Km 7 Salakhyo-Dongjong, Pakse District, Champasak Province	1	365	0	3	56	2	0	0	3.57%	161,100		No data
		Road 13 south (Pakse-Khong), Km 84, Khong District, Champasak Province	1	365	0	3	953	30	7	2	4.09%	9,290,900		
15	Saravanh	Road 13, Km 113, Ban Phonthan, Nakhonpheng District, Saravanh Province	1	365	0	3	1,467	19	0	0	1.30%	44,516,500		
		Road 20, Km 26, Ban Beng, Saravanh District, Saravanh Province	1	365	0	3	1,405	10	0	0	0.71%	13,275,500		
		Road 15, Km 156, Ban Lalaykong, Samouai District, Saravanh Province	1	365	0	3	2,278	2	0	0	0.09%	5,568,000		
16	Attapeu	Road 18B, Km 7, Ban Khanmakkong, Saysetha District, Attapeu Province	1	360	0	3	3,549	16	0	0	0.45%			
17	Sekong	Road 16, Km 51, Ban Thateng, Thateng District, Sekong Province		360		4	1,149	0	0	0	0.00%	-		0
	TOTAL		41	13,364	455	149	166,515	10,533	1,201	340	7.25%	1,961,402,784		

OVERLOADED TRUCKS STATISTICS, 2007

No	Province	Location of Stations	Number of Stations	Number of days Operated	Number of days with broken scale	Number of Staffs at Stations	Number of Trucks Measured	Number of overloaded trucks			% Over loaded	Total Amount of fines and Service	Total Operating Cost	Remark
								0 - 20 %	20 - 40 %	More 40 %				
		Sites	Unit		Days	People	Trucks	Trucks	Trucks	Trucks	%	Kips	Kips	
1	Phongsali	Road 1B, Ban Yo junction, Bounnua District, Phongsali Province	1	365	0	4	524	176	37	9	42.37%	44,207,300		
2	Luangnamtha	Road 17A, Muongsing junction, BanSingchaleune, Sing District, Luangnamtha Province.	1	250	115	4	1,195	60	2	0	5.19%	729,000		
		Road 3, Km 92, Ban Namngeun, Viengphoukha District, Luangnamtha Province	1	321	44	1	3,569	118	0	2	3.36%	13,967,300		No data
		Road 3, Km 35, Ban Natei, Namtha District, Luangnamtha Province	1	344	21	4	11,303	25	0	2	0.24%	5,301,600		
3	Bokeo	Road 3, Km 2, Houisay District, Bokeo Province	1	71	203	4	102	59	17	2	70.47%			
4	Houaphanh	Road 6, Km 84, Ban Namsoy, Viengxay District, Houaphanh Province	1	360	5	3	711	172	118	13	42.62%	121,309,150	24,469,800	
5	Xiengkhouang	Road 7, Km 14, Ban Khankhay, Phouan District, Xiengkhouan Province	1	176	98	4	1,719	339	119	12	27.34%	93,400,000		
		Road 7, Namkan (Lao-Vietnam) Border, Xiangkhoang Province	1	245	29	4	4,320	834	25	2	19.93%	128,590,000		
6	Oudomxai	Road 13 north, Km 4, Ban Houai khoum, Xay District, Oudomxai Province	1	232	133	4	6,415	80	227	148	7.09%	147,353,000		
7	Luangphabang	Road 13 north, Km20, BanMouth, Xiengngeun District, Luangphabang Province	1	363	2	5	8,108	467	34	30	6.55%	243,078,000	241,478,000	
8	Xayyabouri	Road 4, Km 162, Ban Nakhangan, Paklay District, Xayabouri Province	1	141	133	5	2,716	32	0	0	1.18%	9,184,800		
		Road 4, Km 260, Kenthao District, (Namheuang Lao-Thai Bridge) Xayabouri Province	1		274									
9	Vientiane Province	Road 13 north, Km128+700, Ban Sivilay, Vanvieng District, Vientiane Province	1	365	0	5	2,026	1,264	20	14	64.07%	161,961,876	97,599,139	
10	Vientiane Capital	Road 13 north, Km 21, Ban Khoksivilay, Xaithany District, Vientiane Capital	1	364	1	4	3,087	109	32	45	6.03%	86,214,000	82,778,500	
		Road A12, Km 17, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	364	1	4	3,492	171	138	104	11.83%	130,318,000	74,078,500	
		Road 11, Km 5, Ban Kaoleo, Sikhottabong District, Vientiane Capital	1	364	1	4	1966	37	32	15	4.27%	26,746,000	63,776,500	
		Road 13 north, Km 30, Ban Chengsavang, Naxaythong District, Vientiane Capital	1	364	1	4	9231	988	111	97	12.96%	820,628,000	90,330,500	
		Road 1, Mittaphap Bridge, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	364	1	2	41,972	63	34	8	0.25%	61,612,000		
11	Borikhamxay	Road 8, Km 1, Ban Viengkham, Pakading District, Borikhamxai Province	1	365	0	4	3,409	41	9	1	1.50%	27,227,000	33,718,000	
		Road 8, Km 10, Ban Lak 12, Khamkeut District, Borikhamxai Province	1	365	0	5	1,437	29	13	0	2.92%	7,671,600	83,542,000	
		Road 13 south, Km 244, Ban Na In, Pakkading District, Borikhamxai Province	1	336	29	5	1,106	17	2	0	1.72%	1,410,000	36,680,500	
		Road 13 south, km 2, Pakxan District, Borikhamxai Province	1	347	18	5	3,396	42	19	1	1.83%	9,581,000	25,500,000	
12	Khammouane	Road 13 south, Km 8, Ban Nabouab, Thakek District, Khammouan Province	1	344	21	3	6,646	270	4	1	4.14%	22,722,000	24,701,961	
		Road 12, Km 50, Ban Lakchet, Mahaxai District, Khammouane Province	1	290	75	3	9,223	236	31	13	3.04%	179,318,000	32,505,133	
		Road 13 south, Km 4, Pasack, Ban Thakheknuea, Thakek District, Khammouan Province	1	205	160	3	2,576	244	22	1	10.36%	104,355,000	34,832,830	
13	Savannakhet	Road 9, Km25, Ban Nathat, Outhoumphon District, Savannakhet Province	1	364	0	4	6,563	88	8	0	1.46%	5,089,423	29,891,088	
		Road 9, Km 64, Atsaphangthong District, Savannakhet Province	1	364	0	4	9,767	175	15	0	1.95%	7,646,100	28,679,818	
		Road 9, Savannakhet Mittaphap Bridge (Lao-Thai) Border	1	364	0	4	3,821	70	9	0	2.07%	10,264,300	26,027,667	
		Road 9, (Lao - Vietnam) Border, (Dansavan) Xepone District, Savannakhet Province	1	364	0	4	5,928	118	12	0	2.19%	41,229,500	39,130,664	
		Road 13 south, Km 35, Ban Lak35, Champhon District, Savannakhet Province	1	364	0	4	1,746	43	0	0	2.46%	18,327,780	24,556,351	
14	Champasak	Road 13 south, Km 26, Xanasomboun District, Champasak Province	1	360	5	3	1,370	9	0	0	0.66%	3,463,400		
		Road 16, Km 11, Bachiengchaleunsouk District, Champasak Province	1	364	1	3	1,947	81	6	2	4.57%	24,109,250		
		Road 13 south (Pakse-Khong), Km 20, Pathoumphon District, Champasak Province	1	361	4	4	1,698	50	0	0	2.94%	4,448,500		
		Road 13 south (Pakse-Khong), Km 84, Khong District, Champasak Province	1	362	3	3	2,135	183	13	1	9.23%	54,238,700		
		Km 7 Salakhyo-Dongjong, Pakse District, Champasak Province	1	349	16	3	1,011	72	3	1	7.52%	10,558,800		1
		Road 16, Km 30, (Lao-Thai) Border, Phonthong District, Champasak Province	1	364	1	3	11,737	434	0	0	3.70%	97,192,100		
15	Saravanh	Road 13, Km 113, Ban Phonthan, Nakhonpheng District, Saravanh Province	1		274	3								2
		Road 20, Km 26, Ban Beng, Saravanh District, Saravanh Province	1		274	3								3
		Road 15, Km 156, Ban Lalaykong, Samouai District, Saravanh Province	1		274	3								4
16	Attapeu	Road 18B, Km 7, Ban Khanmakkong, Saysetha District, Attapeu Province	1	165	109	3	161	2	0	2	2.48%	2,014,000		
17	Sekong	Road 16, Km 51, Ban Thateng, Thateng District, Sekong Province	1	87	187	4	1,116	10	0	2	1.08%	1,833,500		
	TOTAL		41	11,537	2518	148	178,133	7,198	1,112	528	4.96%	2,727,299,979	1,094,276,951	

Remark: Saravanh Province no scales

OVERLOADED TRUCKS STATISTICS, 2006

No	Province	Location of Stations	Number of Stations	Number of days Operated	Number of days with broken scale	Number of Staffs at Stations	Number of Trucks Measured	Number of overloaded trucks			% Over loaded	Total Amount of fines and Service	Total Operating Cost	Remark
								0 - 20 %	20 - 40 %	More 40 %				
		Sites	Unit		Days	People	Trucks	Trucks	Trucks	Trucks	%	Kips	Kips	
1	Phongsali	Road 1B, Ban Yo junction, Bounnua District, Phongsali Province	1	255	18	4	579	230	33	1	45.60%	43,228,970		
2	Luangnamtha	Road 17A, Muongsing junction, BanSingchaleune, Sing District, Luangnamtha Province.	1	250	23	4	692	10	9	0	2.75%	10,985,050	10,985,050	
		Road 3, Km 92, Ban Namngeun, Viengphoukha District, Luangnamtha Province	1	273	0									No Data
		Road 3, Km 35, Ban Natei, Namtha District, Luangnamtha Province	1	130	143	4	1,589	353	2	1	22.40%	22,128,750	22,128,750	
3	Bokeo	Road 3, Km 2, Houisay District, Bokeo Province	1	83	190	4	290	185	0	0	63.79%	5,476,670		No Data
4	Houaphanh	Road 6, Km 84, Ban Namsoy, Viengxay District, Houaphanh Province	1	270	3	3	227	90	6		42.29%	60,980,100	3,725,000	
5	Xiengkhouang	Road 7, Km 14, Ban Khankhay, Phouan District, Xiengkhouan Province	1	128	145	4	1,267	231	22	22	21.70%	47,690,000	47,690,000	
		Road 7, Namkan (Lao-Vietnam) Border, Xiangkhoang Province	1	209	64	4	2,123	264	126	262	30.71%	38,170,000	33,570,000	
6	Oudomxai	Road 13 north, Km 4, Ban Houai khoum, Xay District, Oudomxai Province	1	24	249		500	7	17	20	8.80%	19,997,000	19,997,000	
7	Luangphabang	Road 13 north, Km20, BanMouth, Xiengngeun District, Luangphabang Province	1	273	0	5	5,104	191	5	1	3.86%	39,254,000	32,751,000	
8	Xayyabouri	Road 4, Km 162, Ban Nakhangan, Paklay District, Xayabouri Province	1	191	82	5	2,755	65	0	0	2.36%	80,650,000	80,650,000	
		Road 4, Km 260, Kenthao District, (Namheuang Lao-Thai Bridge) Xayabouri Province	1											
9	Vientiane Province	Road 13 north, Km128+700, Ban Sivilay, Vanvieng District, Vientiane Province	1	243	30	5	6,918	1,452	6	1	21.09%	87,325,000	87,325,000	
10	Vientiane Capital	Road 13 north, Km 21, Ban Khoksivilay, Xaithany District, Vientiane Capital	1	273	0	4	4,726	205	83	113	8.48%	227,200,000	60,071,250	
		Road A12, Km 17, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	254	19	4	3,568	142	64	96	8.46%	40,299,000	48,151,250	
		Road 11, Km 5, Ban Kaoleo, Sikhottabong District, Vientiane Capital	1	187	86	4	1,459	70	47	63	12.34%	24,572,000	34,674,000	
		Road 13 north, Km 30, Ban Chengsavang, Naxaythong District, Vientiane Capital	1	250	23	4	3,149	147	39	41	7.21%	38,450,000	50,441,750	
		Road 1, Mittaphap Bridge, Ban Dongphosy, Hatxayfong District, Vientiane Capital	1	273	0	2	22,863	313	212	155	2.97%	42,745,000		
11	Borikhamxay	Road 8, Km 1, Ban Viengkham, Pakading District, Borikhamxai Province	1	235	38	5	1,887	25	6	0	1.64%	42,390,000	39,766,000	
		Road 8, Km 10, Ban Lak 12, Khamkeut District, Borikhamxai Province	1	273	0	3	1,471	44		2	3.13%	600,000	31,276,800	
		Road 13 south, Km 244, Ban Na In, Pakkading District, Borikhamxai Province	1	101	172	5	3,515	49	0	0	1.39%	20,484,850		
		Road 13 south, km 2, Pakxan District, Borikhamxai Province	1	223	50	5	2,294	78	11	6	4.14%	28,372,000	42,660,600	
12	Khammouane	Road 13 south, Km 8, Ban Nabouab, Thakek District, Khammouan Province	1	261	12	3	3,569	387	6	2	11.07%	68,763,000	28,096,841	
		Road 12, Km 50, Ban Lakchet, Mahaxai District, Khammouane Province	1	256	17	3	4,897	2205	380	25	53.30%	119,597,000	26,849,765	
		Road 13 south, Km 4, Pasack, Ban Thakheknuea, Thakek District, Khammouan Province	1	153	120	3	1,760	290	16	0	17.39%	60,780,000	28,818,577	
13	Savannakhet	Road 9, Km25, Ban Nathat, Outhoumphon District, Savannakhet Province	1	273	0	4	6,097	457	25	0	7.91%	17,666,150	33,336,064	
		Road 9, Km 64, Atsaphangthong District, Savannakhet Province	1	273	0	4	11,388	933	67	0	8.78%	24,236,500	39,878,761	
		Road 9, Savannakhet Mittaphap Bridge (Lao-Thai) Border	1											1
		Road 9, (Lao - Vietnam) Border, (Dansavan) Xepone District, Savannakhet Province	1	273	0	4	3,622	494	90	0	16.12%	179,054,200	37,096,383	
		Road 13 south, Km 35, Ban Lak35, Champhon District, Savannakhet Province	1	273	0	4	2,575	420	47	0	18.14%	33,026,000	40,617,958	
14	Champasak	Road 13 south, Km 26, Xanasomboun District, Champasak Province	1	254	19	3	1,287	11	0	1	0.93%	11,810,900	11,810,900	
		Road 16, Km 11, Bachiengchaleunsouk District, Champasak Province	1	177	96	3	3,025	135	14	1	4.96%	34,747,050	35,629,050	
		Road 13 south (Pakse-Khong), Km 20, Pathoumphon District, Champasak Province	1	98	175	4	2,711	100	3	0	3.80%	31,924,000	31,924,000	
		Road 13 south (Pakse-Khong), Km 84, Khong District, Champasak Province	1	123	150	3	2,055	206	14	1	10.75%	61,940,850	61,940,850	
		Km 7 Salakhyo-Dongjong, Pakse District, Champasak Province	1	5	268	4	124	0	0	0	0.00%	940,000	940,000	2
		Road 16, Km 30, (Lao-Thai) Border, Phonthong District, Champasak Province	1	273	0	3	12,458	602	20	3	5.02%	265,201,100	265,201,100	
15	Saravanh	Road 13, Km 113, Ban Phonthan, Nakhonpheng District, Saravanh Province	1			3								3
		Road 20, Km 26, Ban Beng, Saravanh District, Saravanh Province	1			3								4
		Road 15, Km 156, Ban Lalaykong, Samouai District, Saravanh Province	1			3								5
16	Attapeu	Road 18B, Km 7, Ban Khanmakkong, Saysetha District, Attapeu Province	1	56	217	3	1,603	73	20	0	5.80%	17,356,080		
17	Sekong	Road 16, Km 51, Ban Thateng, Thateng District, Sekong Province	1	273	0	4	1,751	12	0	0	0.69%	9,406,000		
	TOTAL		41	8,238	2409	139	124,147	10,464	1,390	817	17.96%	1,857,447,220	1,288,003,699	

Remark: 1-Savannakhet, Road 9 (Lao-Thai) border Bridge still not open. Saravanh Province no scales

Annex C – Road Safety Assessment

ROAD SAFETY ASSESSMENT REPORT

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1 PREAMBLE

1.1 Road Safety Philosophy

Road safety must be a major consideration in any highway planning and design process and is arguably the most important part of any transport sector development programme. The World Health Organization's global safety awareness 2004 campaign slogan…

"Road Safety Is No Accident"

…remains universally relevant to present conditions in that it emphasizes the personal, social and emotional impacts of road accidents as well as the potential costs in economic terms due to loss of personal earnings and in medical bills. No society can afford to ignore these.

The slogan could be said to have two meanings:

1. Road safety must be a part of the planning, design and implementation process in any highway infrastructure project and cannot be left to chance - it must be deliberately built in;

2. Road safety must be practised and implemented by users of the facility in order to attempt to achieve a state of "no road accidents".

Road safety must be an integral part of any highway development scheme at all stages including those for 'maintenance' only as well as 'rehabilitation' interventions. It must always be included as an essential design element. However, for success to be achieved there must also be "buy-in" and commitment from all stakeholders involved including:

- The general public;
- Road users of all kinds;
- Police officers;
- Educational institutions;
- Medical authorities
- Government agencies.

1.2 Overview

Road safety should carry as much importance as any of the other engineering consideration for a project and should be addressed on two fronts:

i. In physical terms involving:

   - vertical and horizontal alignment considerations including intersection geometrics;
   - provision of roadside containment barriers where needed to reduce accident severity ;

- speed control [e.g. by the provision of physical measures in urban areas and other accident prone locations];
- appropriate installation of consistent signs and markings;
- provision of safe pedestrian facilities [e.g. segregated shoulders, raised sidewalks etc.];
- provision of safe vehicle stopping / parking areas [e.g. bus bays, taxi stands etc.].

ii. In educational and institutional terms involving:

- community safety awareness programmes delivered through the media and at particularly, at schools;
- driver training, traffic regulation and enforcement;
- vehicle and tyre condition inspection though regular testing and enforcement.

It is recognized however that, following an increase in the service level of the subject pavements through maintenance or rehabilitation works, traffic speeds invariably increase giving rise to a greater potential for speed-related accidents. The improvements should be made in conjunction with improved traffic management and regulation provisions.

Presently no formal details of accident location, frequency and severity are reported to be recorded and information is therefore largely anecdotal based on comments made by DPWT staff and community leaders. This situation should be addressed with a view to introducing an appropriately coordinated system within the MPWT and DPWT on a central and provincial level respectively. Collaboration with the Police force and insurance companies as well as with NGO's and other agencies presently active in the road safety sector, must be mandated.

2 PPTA ROAD SAFETY ASSESSMENT PROCESS

2.1 Introduction

This Road Safety Assessment completed during this PPTA process equates to 'Stage 5' of the sequence of audit stages described in the ADB's 'Operational Toolkit' for use on road projects. This stage relates specifically to the appraisal of conditions on **existing** facilities – either after construction work is complete or as in our case, before any rehabilitation commences. Later in the subsequent 'Project' implementation process, other aspects of overall road safety concern should be addressed including audits during and after the detailed design development work.

At the present Study stage, the subject roads have been assessed in conjunction with DPWT engineers who in most cases were able to describe local experiences in terms of accident frequency and severity for the subject routes falling under their particular jurisdiction. The Road Safety Assessments conducted and reported upon herein were conducted for all project roads between January 15 and 19, 2015.

2.2 Purpose

The purpose of this initial safety assessment was to identify [during the PPTA study] road safety issues and concerns along the existing roads and to present

recommendations that should be taken into account during the future detailed design effort.

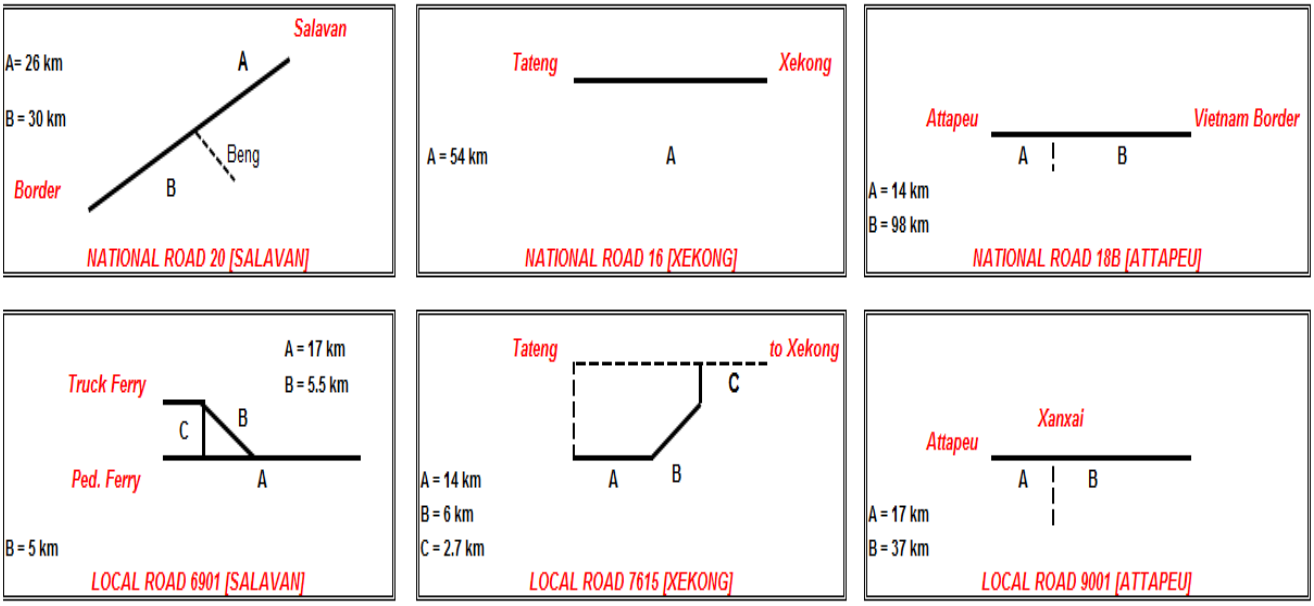
The ToR for the PPTA also contained a requirement for the Consultant to conduct a road safety 'audit' of compiled design details in order to ensure that the assessment recommendations are suitably taken into account. However, it should be noted that the scope of the work is limited to maintenance of the existing roadways only [i.e. with no changes to the horizontal or vertical alignments] and that no design drawings per se are to be prepared. This led to the conclusion that the 'audits' can only be done when the scope of the maintenance work is defined and detailed drawings become available – this will be during the future design work in Project implementation phase.

It is acknowledged that the extent of the recommended safety measures to be incorporated during detailed design will be constrained by the available budget and by the fact that 'maintenance' activities only are envisaged. The funding however is expected to contain a separate budget allocation to cover 'educational' efforts aimed at improving the general public's awareness of road safety issues. The process to be adopted is described in Section 10 below.

2.3 Study Approach

The aggregate length of the project roads is 345 km comprised of 6 individual road Sub-sections - 3 National and 3 Local roads - in 3 different Provinces. All are located in southern Lao PDR.

The breakdown of each roadway into its sub-sections is indicated below:



Each road sub-section included in the Study was reviewed by means of a drive-through inspection with notes made and photos taken to record observed safety concerns.

Findings are presented in each of a number of areas with explanatory comments and in several cases the more representative photographs are attached. The reports are not intended to be taken as an exhaustive listing of all existing safety hazards but rather as being indicative of situations likely to be present elsewhere along the routes. These must be the subject of closer inspection during detailed design when topographical survey information becomes available.

2.4 'Project' Design Stage Considerations

With due regard to scope of work and budget limitations, several features were identified as described in the individual reports below. These are summarized here in the form of a tabular aide-memoire for later use by the future detailed design consultant to be assigned.

The following series of tables outline the road safety issues identified in each corridor and that are recommended for particular attention during the detailed design stages of the future 'Project'.

2.4.1 Attapeu Province

For the two selected corridors in this Province, the main issues of concern from a road safety perspective can be summarized as follows:

Table 1 - Summary of Road Safety Concerns [NR-18B]

Concern*	Section A [West]	Section B [East]
Lack of reflective centre and edge line markings	X	X
Lack of advance warning signage [steep grades, school zones, junctions etc.]	X	X
Lack of speed advisory signage for sharp bends		X
Need to segregate pedestrians from other traffic in villages	X	X
Need to improve edge definition on curves [replace concrete posts]	X	X
Segregation of motorcycles, agricultural vehicles from other traffic	X	X
Low skid resistance on road surface	X	X
Loose material on road surface		X
Lack of roadside vehicle containment barriers		X
Possible need for arrestor beds		X
Poor treatments on bridge approaches [curb up-stands, guardrail anchorages & end treatments]	X	X
Lack of pedestrian walkways on bridge decks	X	X
Improve major junction delineation	X	X
Improve Airport access road junction layout		X
Improve minor road junction delineation, prevent tracking of loose materials	X	X
Need for directional signage	X	X

Lack of street lighting	X	
Need to clear bush to improve sight distances		X

** All horizontal and vertical signage should be made of reflective materials*

Table 2 - Summary of Road Safety Concerns [LR 9001]

Concern*	Section A [West]	Section B [East]
Lack of reflective centre and edge line markings	X	
Lack of advance warning signage [steep grades, school zones, junctions etc.]	X	X
Lack of speed advisory signage for sharp bends	X	X
Need to segregate pedestrians from other traffic in villages	X	
Need to improve edge definition on curves [replace concrete posts]	X	X
Segregation of motorcycles, agricultural vehicles from other traffic	X	
Low skid resistance on road surface	X	
Loose material on road surface	X	
Lack of roadside vehicle containment barriers		X
Possible need for arrestor beds		X
Poor treatments on bridge approaches [curb up-stands, guardrail anchorages & end treatments]	X	X
Lack of pedestrian walkways on bridge decks	X	X
Improve major junction delineation	X	
Improve minor road junction delineation, prevent tracking of loose materials	X	
Need for directional signage	X	X
Lack of street lighting	X	
Need to clear bush to improve sight distances		X
Need to eliminate encroaching retail premises	X	

** All horizontal and vertical signage should be made of reflective materials*

2.4.2 Xekong Province

For the two selected corridors in this Province, the main issues of concern from a road safety perspective can be summarized as follows:

Table 3 - Summary of Road Safety Concerns [NR 16]

Concern*	Section A
Lack of reflective centre and edge line markings	X
Lack of advance warning signage [steep grades, school zones, junctions etc.]	X
Lack of speed advisory signage for sharp bends	X
Need to segregate pedestrians from other traffic in villages	X
Need to improve edge definition on curves [replace concrete posts]	X

Need to segregate motorcycles, agricultural vehicles from other traffic	X
Low skid resistance on road surface	X
Loose material on road surface	X
Poor treatments on bridge approaches [curb up-stands, guardrail anchorages & end treatments]	X
Lack of pedestrian walkways on bridge decks	X
Improve major junction delineation	X
Improve minor road junction delineation, prevent tracking of loose materials	X
Need for directional signage	X
Lack of street lighting	X
Need to eliminate encroaching retail premises	X

** All horizontal and vertical signage should be made of reflective materials*

Table 4 - Summary of Road Safety Concerns [LR 7615]

Concern*	Section A [West]	Section B [Centre]	Section C [North]
Lack of advance warning signage [steep grades, school zones, junctions etc.]	X		X
Lack of speed advisory signage for sharp bends	X		X
Need to segregate pedestrians from other traffic in villages	X		
Need to improve edge definition on curves [replace concrete posts]	X		X
Lack of roadside vehicle containment barriers		X	X
Possible need for arrestor beds		X	
Improve major junction delineation	X		X
Need for directional signage	X		X
Need to clear bush to improve sight distances	X	X	X

** All horizontal and vertical signage should be made of reflective materials*

2.4.3 Salavan Province

For the two selected corridors in this Province, the main issues of concern from a road safety perspective can be summarized as follows:

Table 5 - Summary of Road Safety Concerns [NR 20]

Concern*	Section A [North]	Section B [South]
Lack of reflective centre and edge line markings	X	X
Lack of advance warning signage [steep grades, school zones, junctions etc.]	X	X
Lack of speed advisory signage for sharp bends		X
Need to segregate pedestrians from other traffic in villages	X	X
Need to improve edge definition on curves [replace concrete posts]	X	X
Need to segregate of motorcycles, agricultural vehicles from other traffic	X	X

Low skid resistance on road surface	X	X
Poor treatments on bridge approaches [curb up-stands, guardrail anchorages & end treatments]	X	X
Lack of pedestrian walkways on bridge decks	X	X
Improve major junction delineation	X	X
Improve minor road junction delineation, prevent tracking of loose materials	X	X
Need for directional signage	X	X
Lack of street lighting	X	
Need to clear bush to improve sight distances		X

** All horizontal and vertical signage should be made of reflective materials*

Table 6 - Summary of Road Safety Concerns [LR 6901]

Concern*	**Section A [Main access]**	**Section B [Truck Ferry Road]**	**Section C [Inter-ferry link]**
Lack of advance warning signage [steep grades, school zones, junctions etc.]	X	X	X
Lack of speed advisory signage for sharp bends	X	X	
Need to segregate pedestrians from other traffic in villages	X		
Need to improve edge definition on curves [replace concrete posts]	X	X	X
Improve major junction delineation	X		X
Need for directional signage	X		X
Need to clear bush to improve sight distances		X	X

** All horizontal and vertical signage should be made of reflective materials*

ATTAPEU PROVINCE ROAD SAFETY ASSESSMENT

3. ATTAPEU - NATIONAL ROAD 18B [Sub-sections A & B]

3.1 Route Environment

From its designated start point within the city of Attapeu, National Road 18B passes eastwards over a long multi-span river crossing and beyond to the international border with Vietnam - a distance of about 112 km in total. The route passes initially across riverside flatlands then through several kilometres of rolling terrain in the mid-section before ascending into the steeper, mountainous terrain in about the last 60 km of its length.

For this PPTA study the corridor has been divided into two parts – Sub-section A [km 0 to 14]. This is essentially urban then semi-urban in nature and contains several roadside communities each with numerous commercial premises ending at the junction with LR-9001 at Xaisettha. Sub-section B however serves more rural areas [containing several rubber and palm oil plantations] and the occasional small settlement with two larger communities. This stretch ends at the international border crossing. This Sub-section contains the site of the new Attapeu International Airport [at about km 12.4] that is due to open at the end of March, 2015.

In Sub-section A, the traffic mix contains a range of private and commercial vehicles in each of several classes and significant proportions of through traffic traveling between the international border post and the city of Attapeu - and beyond. Sub-section B however features more distinctly motorcycle traffic interspersed with cross-border related volumes of large trucks and mid-size buses.

In both Sub-sections several hazardous features were noted for which some suggested remedial actions were identified as indicated below. In Sub-section A concerns relate mainly to the disparity in operating speeds of vehicles moving within the ‘urban’ areas while in Sub-section B, they relate more to the constricted road geometry and the lack of vehicle containment features in several areas where significant longitudinal grades occur in sections with steep cross slope.

3.2 General Observations

As the proposed maintenance program is required to be undertaken within the existing RoW boundaries, horizontal and vertical alignments must be retained giving little opportunity to widen the road surface, improve sight lines, adjust junction layouts etc. Nonetheless significant benefits for road users can be gained simply through installing better signs and road markings, through the creation of ‘segregated’ shoulders [for use by pedestrians and 2-wheel vehicles] and the increased use barriers to contain errant traffic - either concrete wall types or steel beam guardrail [SBGR]. Due allowance has been made in the cost estimates prepared under the PPTA for some of these features.

The costs and the potential benefits provide by these safety measures should be reviewed during the future ‘Project’. In addition opportunities should be sought to improve road user discipline, to develop better approaches to law enforcement and particularly, to create road safety awareness programs for local communities.

Issues observed within both Sub-sections along this road are summarized below:

3.2.1 Horizontal & Vertical Alignment

The road alignment in Sub-section A is essentially flat and straight but with a few horizontal curves mainly influenced by the proximity of the river shoreline. Curve radii are considered to be generally acceptable for an assumed operating speed of 80 km/h provided that the few sharper bends are appropriately signed.

NOTE: *During the field assessment, DPWT engineers identified some areas of the national road in Sub-section A that are the subject of flooding on an annual basis. At each of those locations, staff has reportedly prepared preliminary design drawings showing proposed re-alignments [vertical only] to alleviate these problems. Funding is said not to be available and consideration of the inclusion of the necessary works in the future 'Project' has been requested.*

In many areas of Sub-section B however vertical gradients are steep and horizontal curvatures of short radius [down to 30 m radius in extreme] are common. These conditions are a result of the steep terrain and the consequent need to follow the sides of valleys and they cannot be economically modified. A large number of warning signs already exist and if cleaned/painted and supplemented by new installations where required, should prove to be adequate. Such provisions would include warning signs in advance of steep down grades, sharp bends and any areas prone to falling rocks etc. Guard railing or protective walling to keep off-the-road vehicles away from the steep drops is required in several areas as is improved road edge definition [using either paint markings or appropriate delineators.

NOTE: *During the field assessment, DPWT engineers identified some locations where steep downgrades followed by sharp horizontal curves have led to frequent 'run off the road' accidents. In one location, the provision of a new containment structure [SBGR or concrete edge walls perhaps] supplemented by additional signage and the application of an anti-skid surface should be considered.*

In the other, DPWT staff members propose that a horizontal realignment of about 300 m in length [across land said to be already in State ownership] would be the best solution. Adequate funding is again said to be unavailable at present and consideration of the inclusion of the required works in the future 'Project' could be given.

3.2.2 Cross-section

The existing road surface [paved and of width 8.0m overall in both Sub-sections] appears to be adequate for present traffic levels and the required functionality of the route. However, the presence of discontinuous and only partially paved shoulders [i.e. gravel and/or surface treated types but set at levels below that of the adjacent traffic lanes] results in motorcycle and other slow moving vehicles using the single traffic lane available in each direction.

The addition of paved shoulder surfaces of at least 0.5m in width on both sides would provide some segregation of traffic flows and would enhance road safety especially in the busy village areas. Similarly better provision for pedestrian movements in the developed sections would be highly beneficial.

In Sub-section B where many sharp radius curves [several of a 'hairpin' type] occur, it would be desirable to introduce some lane widening and on the steep gradients, to facilitate passing of large, slow moving vehicles through the provision of climbing lanes or passing bays. However, neither feature is likely to be achievable due to the nature of the terrain.

3.2.3 Intersections

Sub-section A contains several 3 leg and 4-leg junctions including a major roundabout and 'forks' at two junction including that at the start of LR-9001. Some improvement in edge demarcation and the introduction of at least painted channelization should be considered. Many other intersected roads are unpaved and the addition of surfacing on the minor roads should also be considered for a distance of from 5 to 10m back from the edge of the through traffic lanes. This would help to reduce the tracking of gravel on to the main carriageways and allow better lane edge and 'stop' line definition by means of painted markings. Similarly, the addition of 'stop' or 'yield' signs would help regulate entry to / exit from the minor roads.

Sub-section B contains a junction with the newly constructed [4-lane divided] access road to the new Attapeu International Airport facility in km 12. This occurs at a point where National Road 18B is on a long, straight alignment where operating speeds are high. However DPWT officials report that no widening of the national road is presently planned at this point. As and when turning and through traffic movements at this junction increase, serious consideration must be given to the addition of entry/exit tapers and of physical 'protection' for eastbound left-turning traffic entering the airport in the form of painted or even raised channelizing islands. In addition street lighting should be provided along the through road edges to complement that already installed on the airport access road. Depending upon the terms of any agreement reached with the developer during the planning stage, these features may have already been stipulate during the approvals process.

3.2.4 Miscellaneous Features

Sub-section A contains extensive residential and commercial properties fronting onto the road. Several schools and other institutional buildings [including health centres and temples] are also in place. This leads to concern over potential pedestrian/vehicle conflict, particularly on the predominantly straight road sections where operating speeds are high and often not regulated by speed restriction signage. In such areas safety would be enhanced by the installation of appropriate warning signs, road markings and speed reduction controls [e.g. 'rumble' strips].

Where RoW width is sufficient, paved sidewalks and stopping / parking provisions would be highly desirable. It is recognized however that nature of the proposed program of works is one of 'maintenance' interventions only and this may preclude the provision of these features due to the cost implications.
As Sub-section B is largely rural the above concerns are restricted mainly to the two major communities in this part of the route.

The several existing long-span bridges in both Sub-sections A and B have concrete wall type parapets with steel beam guard railing [SBGR] installed on the approaches. There is generally no separation of pedestrian and motorized traffic on either the approaches or the bridge decks. However, subject to more detailed inspection later the bridges at this time appear to be in good condition with only basic routine maintenance work needed.

It was noted however that the SBGR is invariably unattached to the bridge parapet structures thereby presenting a risk of 'snagging' of errant vehicles. Further, the rail ends are not adequately anchored or buried and there are invariable no 'flares' provided on either the approach or the departure ends. The bridges in Sub-section B are generally of shorter span and protection on the approaches limited to only concrete delineator posts. In some cases these are already impact damaged and in need of repair or better yet, replacement with steel beam types.

** Positive attachment does not seem to have been a feature on any of the bridges and a possible revision to the relevant Lao standard[s] should be considered. Similarly a variety of deck walkway treatments appear to have been installed on other 'Project' roads and the standard[s] might also be re-visited during the detailed design phase of the 'Project' in order to improve user safety.*

Above ground utilities are mainly restricted to electrical service pole lines [both transmission and distribution network levels] but they appear invariably to be located well clear of the traffic lanes and do not therefore, present significant risk to the safety of road users.

3.2.5 Traffic Lights & Street Lighting

No traffic signals exist or appear to be warranted for either Sub-section of this national road. Due to the rural nature of the corridor, existing street lighting provisions are strictly limited and nothing more than basic maintenance of the existing system and possible additions at the airport access road seems to be required. Arrangements in place for the maintenance of these street lighting features and for the payment of electrical energy bills should be confirmed later.

3.2.6 Regulatory & Warning Signs

As indicated above, the addition of new and/or the replacement of existing signage appears warranted throughout the corridor. This should be an issue of particular focus during the future detailed design stage.

3.2.7 Guide & Directional Signs

In both Sub-sections, village name plates are generally installed and are visible to drivers. There is however a noticeable lack of information signage giving directions and distance to the international border and to the major regional centres.

Similarly kilometre reference markers* [milestones] are in place throughout the corridor although they appear to be located at less than 1.0 from shoulder edges in many cases and as such they represent a hazard to road users. Relocation to provide more 'clear zone distance' [perhaps behind instead of in front of the drainage ditches] should be considered. In most cases, reference marker re-painting is required.

** A review of the present distance demarcation system used on reference markers should be undertaken. It was noted that distances shown on sequential markers are given to several different destinations [e.g. one marker might give the distance to Attapeu and the next to Pakse or even to Vientiane] leading to a potential for confusion among drivers. A more conventional approach might be taken where distances to / from the start / end respectively of the subject road <u>only</u> are given i.e. a marker would show the distance to Attapeu on one side and to the International Border on the other. Distances to other destinations [e.g. intermediate villages or long distance destinations] if required, would be shown on occasional directional and guide signs.*

3.2.8 Pavement Markings

In Sub-section A little evidence of a painted centreline remains due to age and the observed tendency of drivers to cross them unnecessarily. In some parts of Sub-section B painted centrelines are still present but are usually too faint to be helpful. In sections where 'maintenance' work has been recently done [invariably using DBST patches] no replacement of the removed original markings has been undertaken. As a result, maintenance work under the

'Project' is required to restore the centrelines in both Sub-sections and an appropriate estimate of the cost has been developed.

Although reportedly not a convention in Lao PDR [as confirmed by the site inspections carried out with DPWT staff] the painting of reflective edge lines is highly recommended. These have the following benefits:

- Positive delineation of road edges under both day and night conditions;
- Opportunity to remove many of the [presently concrete] post delineators currently in place - themselves representing a significant roadside hazard;
- Better delineation of lane edges on bridge approaches particularly those where segregated deck walkways suddenly 'appear';
- In conjunction with paved shoulders, visible segregation of main traffic flows from potential pedestrian / motorcycle only areas;
- Improved distinction of minor road junctions, major property access points such as fuel stations, commercial outlets etc.

In parts of Sub-section A the need for painted pedestrian crossings is evident although little evidence of any previous placement could not be found. Consideration should be given to the provision of such crossings at strategic locations in village areas [preferably in combination with adequate advance warning signage, rumble strips and centreline and edge line markings] in the vicinity of schools, clinics and other major institutional properties.

Also apparently not adopted in Lao PDR, the provision of reflective road studs [cats' eyes] should also be considered for adding emphasis to the horizontal pavement markings. These would be on centrelines and on the suggested outer edge lines – at least through sharp bends.

3.2.9 Roadside Safety & Landscaping

Indiscriminate and frequent stopping by buses on the carriageway often constitutes a serious safety hazard and interruptions to other traffic flows. If bus operations increase in future years, consideration should be given to the creation of out-of-lane stopping areas in strategic locations.

Where RoW width constraints prevent construction clear of the traffic lanes, it might be possible to utilize paved shoulders to improve clearance for through traffic. In all cases bus bays should be properly signed and marked in accordance with the relevant conventions and supplemented where required by painted pedestrian crossings and warning signs.

Neither Sub-section A or B presently contains any buildings constructed that encroach onto the shoulder areas - this is a condition that should be preserved through the enforcement of the appropriate legislation.
This road is not considered a candidate for the provision of landscaping but from a road safety viewpoint, existing planting / natural growth that encroaches onto the shoulders and restricts sight distances for road users, must be cleared – perhaps by the mobilization of village-based maintenance workers. An estimated cost for undertaking this work has been included in the PPTA study process.

3.2.10 Traffic Management Items

Traffic speeds will inevitably be higher after the surface condition of the road is improved. It will therefore be desirable to introduce some means of traffic 'calming' and speed control at the

approaches to and within the communities - particularly where pedestrian flows and vehicle stopping / turning movements are high. Painted pedestrian crossings with associated warning signage and thermoplastic 'rumble' strips* to assist in speed reduction, should also be installed where necessary.

** The use of 'speed bumps' could also be considered but the possible lack of future maintenance of the required warning signage often leads to there being no indication of the bumps ahead resulting in a major hazard. The use and the type of any speed bumps should therefore be carefully considered.*

Mandatory speed limit signs are few along this road and should be installed at all appropriate locations. There should also be corresponding speed 'de-regulation' advisory signs at village exits.

Similarly warning signs indicating advisory speed limits at sharp bends should be cleaned and supplemented as necessary.

3.2.11 Accident Black Spots

This roadway carries relatively high volumes of traffic and serves a range of vehicle classes from large, multi-axle trucks and buses down to slow moving agricultural vehicles. During the assessment trips, DPWT officials made the team aware of several dangerous areas within the designated Sub-section B particularly where accidents have occurred in the past on a fairly regular basis. These are identified below with suggested remedial actions that should be considered during the detailed design stages:

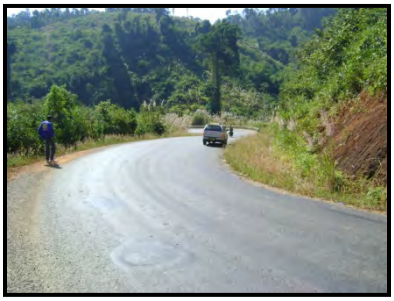
Site No. 1 at km 38.0 approx.

This site is located in steep terrain where eastbound traffic must negotiate a series of sharp 'S' bends on a gradient of around 10%. The road surface is presently very 'slick' which reduces grip significantly.

Run-off-the road accidents are reported to occur at a rate of 2-3 / year and usually involve trucks and private vehicles who travel too fast for the conditions and/or suffer from brake fade.

As geometric realignments are constrained by the topography, solutions to be investigated might include:

- advance warning signage;
- improved skid resistance;
- additional roadside containment barriers;
- installation of arrestor beds.



Downhill view – Bend 1

Downhill view – Bend 2

Site No. 2 at km 41.0 approx.

This site is located at the bottom of a steep gradient [e/b direction] with a series of sharp 'S' bends. The road surface is presently 'slick' which reduces grip significantly. Run-off-the road accidents are reported to occur at a rate of 4-5/ year and involve trucks and some smaller private vehicles. The DPWT considers a horizontal realignment to be the best solution and has a preliminary design layout in mind that would occupy only state-owned land.

Downhill view

Supplementary solutions to be investigated include:

- advance warning signage;
- improved skid resistance;
- installation of roadside containment barriers;
- provision of arrestor bed[s].

Site No. 4 at km 73.0 approx.

This is another site in steep terrain where eastbound traffic must negotiate another sharp bend in the middle of a long gradient of around 10%. The road surface is again quite 'slick' which reduces grip significantly.

Downhill view

Run-of-the road events are reported to occur sometimes - the last being in 2013. The cargo being carried at the time remains on the scene.

As geometrical realignments are constrained by the topography, solutions to be investigated should include:

- advance warning signage;
- improved skid resistance;

- provision of roadside containment barriers;
- provision of arrestor bed[s].

3.3 Road Safety Issues - Illustrative Photographs

Sub-section A – E/B view of main river bridge on east bound exit from Attapeu.

Deck has no provision for pedestrians.
SBGR on approach is not anchored to parapet and has poor mounting height.

Rail approach end is buried and has little 'flare'.

Photo NR-18B/01

Sub-section A - View of bridge deck on exit from Attapeu.

Deck has no provision pedestrians.
SBGR is at varying mounting height and wide support spacing.

Photo NR-18B/02

Sub-section A – W/B view of main river bridge east of Attapeu.

Deck has no provision for pedestrians.
Steps present 'square' end to oncoming traffic.

SBGR not anchored to parapet and wide support spacing.

Photo NR-18B/03

Sub-section A - Approach to roundabout [2 km east of Attapeu]

Entry alignments are almost tangential and contravene the 'slow-in' / 'fast-out' principle.
Layout may be improved by increasing central island radius and entry/exit road throat configurations.

Photo NR-18B/04

Sub-section A – Typical urban conditions.

Pavement needs centreline markings and ideally, reflective edge lines and paved shoulders added.

No significant or effective street lighting in evidence.

Photo NR-18B/05

Sub-section A – View or one of two major forks.

No lane markings or vertical signage in place nor any street lighting.

Directional signage for Attapeu and International Border is desirable.

Photo NR-18B/06

Sub-section B – Typical bridge end treatment.

Deck has provision for pedestrians but curb presents a 'square' end to oncoming traffic.

SBGR not anchored to parapet but has 'reducing' support spacing dimensions. Rail end is buried but not 'flared'. Length of protection needs checking.

Photo NR-18B/07

Sub-section B – Junction with International Airport Access Road [km 12.4].

New road is 4-lane divided with lighting installed – and due to open in April, 2015.

National Road needs widening to 3-lanes [min] with island protected turning lanes. Also advance signage and transitional lighting.

Photo NR-18B/08

Sub-section B – Typical village street conditions.

Pavement needs centreline markings and ideally, reflective edge lines and paved shoulders added.

No significant or effective street lighting in evidence.

Photo NR-18B/09

Sub-section B – Rural area.

Bush to be cut to improve sight distances.

No pavement markings or road edge delineators present.

Photo NR-18B/10

Sub-section B – Rural area.

Concrete posts used as edge delineators with small offset from traffic lane and should be replaced.

No pavement markings or road edge lines present

Photo NR-18B/11

Sub-section B - E/B approach to the Xesou River bridge at km 86.

Deck has no provision for pedestrians.
SBGR on approach is not anchored to parapet and has poor mounting height.
Rail approach end is buried but has no 'flare'.
Police check point [right] is 'informal' and needs advance signage etc.

Photo NR-18B/12

Sub-section B - E/B approach to Border Crossing at 111.

Parked vehicles impede driver visibility and safe passage of other traffic.
If situation is expected to continue long term, parking must be formalized.

Photo NR-18B/13

Sub-section B – Road at near border crossing.

Intermittent repairs recently completed using DBST – presently unfinished. This has created a 'patchwork' effect with loose surfaces, no paint lines etc.

Consideration might be given to full re-seal to restore surface 'uniformity' - with necessary reflective signs & markings applied.

Photo NR-18B/14

4. ATTAPEU - LOCAL ROAD 9001 [Sub-sections A & B]

4.1 Route Environment

From its junction with National Road 18B in the community of Xaisettha, this road passes initially across flat land as far as the village of Ban Pa-am before ascending into steeper, more mountainous terrain in the eastern 37 km part of its length. For PPTA study purpose, the corridor was split into two parts - Sub-section A [km 0 to 17] contains some small communities ending at Ban Pa-am while Sub-section B serves mainly scattered, small hillside settlements before reaching the village of Xanxai located at km 54.

Existing traffic conditions range from a mix of private and commercial vehicles in the first few km with predominantly motorcycles and a few service vehicles using the eastern mountainous stretches – the latter also features some pedestrian traffic accessing schools and rural work locations. Essentially, Sub-section B can be said to be very lightly trafficked which is believed to be due to the low income levels of its population as well as to the unfinished [to sub-base level only] road conditions.

In both Sub-sections several significant safety hazards were recorded for which some suggested remedial measures are listed below. In the first length concerns arise mainly from the apparent lack of effective maintenance works carried out since the road was rehabilitated. For the eastern length, there is a lack of adequate horizontal and vertical signage and an absence of guardrail protection at several steep longitudinal grades that occur in combination with steep cross slopes.

4.2 General Observations

As the proposed maintenance interventions are required take place within the existing RoW, the existing alignment geometry must be retained giving no opportunity to widen the surface or to significantly improve sight lines. However significant road safety benefits can be gained by the installation of additional signs and road markings, the creation of ‘segregated’ shoulders for use by pedestrians and/or 2-wheel vehicles in Sub-section A etc. These benefits would be enhanced under the future ‘Project’ by including programs to improve driver discipline, law enforcement and provide road safety awareness in the local communities.

Common issues observed that are applicable in both Sub-sections of this road are summarised below:

4.2.1 Horizontal & Vertical Alignment

The road alignment in Sub-section A is essentially flat and straight with the exception of 3-4 horizontal curves the sharpest being the ‘S’ bend approaches to the major bridge crossing just south of Ban Pa-am. With the exception of the latter where speed advisory signs are warranted, the radii are generally acceptable for an assumed operating speed of 80 km/h.

In many areas of Sub-section B however vertical gradients and sharp horizontal curvatures are the result of the steep terrain and neither can economically be improved. Instead a number of warning signs [some already exist from the earlier ADB intervention but are now in need of attention] should be installed. These should include warning signs to indicate steep gradients or

sharp bends ahead, the possibility of falling rocks etc. Guard railing [or protective walling] to protect vehicles from the high drop-offs is required in several areas as is improved road edge definition using either paint markings or suitable types of delineator post.

4.2.2 Cross-section

With very few exceptions, the existing road width is adequate for the road function, the traffic fleet composition and normal operating speeds. A general absence of paved shoulders contributes to carriageway edge attrition and presents risk to the safety of pedestrians, slow moving agricultural vehicles and to motorcyclists among the faster vehicle classification.

The trafficked surface width in Sub-section A is about 7.0 m overall with DBST surfacing and two, 1.0 m 'soft' shoulders. In some areas the grass side slope falls away directly from the traffic lane edge rending the shoulder unusable. The addition of a hard surface of even only 0.5-0.75m in width on each side would significantly enhance road user safety especially in the busy village areas.

The roadway in Sub-section B however is presently unfinished resulting in a very 'rocky' surface that presents much difficulty for pedestrian and motorcycle traffic and leads to almost an exclusion of other vehicle classes. The intent under the 'Project' is to place base material to a standard width of 5.5m plus shoulders [and possibly concrete surfaces in areas of gradient > 12% and some DBST within villages] which is expected to result in increased usage by other vehicles.

Lane widening in the several hairpin bends present in Sub-section B would be desirable but unlikely to be achievable economically due to the nature of the terrain. Similarly, the provision of climbing lanes is likely to be obviated by their cost.

4.2.3 Intersections

Sub-section A contains several 3 leg and 4-leg junctions with minor roads mostly within the village area while Sub-section B has none presently other than at access points to borrow areas, at a Contractor's temporary camp site and within the end village of Xanxai. Most are with un-surfaced crossing roads where improvements to be considered might include simply the extension of the main road pavement to a distance of 5-10m along the intersected road in order to reduce the 'tracking' of loose gravel onto the through lanes]. At the few paved intersection, better road edge definition could be achieved by the introduction of painted edge lines.

The placement of 'stop' or 'yield' signs would also help regulate entry to / exit from the through lanes and the addition of directional signs at the major junctions would also be of assistance to non-local drivers.

4.2.4 Miscellaneous Features

Schools and other institutions such as clinics and temples are present in Sub-section A and typically present significant risks of pedestrian / motor vehicle conflicts - particularly on straight road sections where operating speeds are high. At these sites, pedestrian safety would be enhanced by the installation of advance warning signs, painted road markings and speed reduction controls [e.g. 'rumble' strips].

In the few village locations, unregulated parking and property access movements are of concern and ideally, adequate parking lanes and pedestrian areas segregated by curbs would be desirable. However, the nature of the proposed program of interventions is 'maintenance' only and this might prohibit the addition of anything but the simplest of these measures including the placement of appropriate signage, pedestrian crossings, lane edge markings and 'rumble strips'.

It was noted that the existing bridges in both Sub-sections A and B have pipe railing types of parapet with no provision for separate walkways for enhanced pedestrian safety on decks. However, this is likely to be adequate for a 'local road'.

Generally the bridges are in good condition with only basic routine maintenance work needed [subject to more detailed inspection later] after which they can be expected to remain in service. It was noted however that while in Sub-section A steel beam guardrail has been placed on the approaches, the structures in Sub-section B have no such protection other than a few concrete delineator posts in a few cases. During the detailed design work it will be necessary to provide improved safety provisions on the approach fills - ideally with steel beam type railings having positive attachment to the bridge ends in order to prevent 'snagging' of errant vehicles.

4.2.5 Traffic Lights & Street Lighting

No traffic signals exist or appear to be warranted anywhere along this subject road. With the possible exception of the 'fork' junction with National Road 18B, the rural nature of the corridor suggests that street lighting provisions are not required. Evaluation of conditions within the main communities may be necessary later at which time additional lighting needs might be identified. At that time responsibilities for fixture maintenance and payment of related energy bills should also be defined.

4.2.6 Regulatory & Warning Signs

As indicated above, a case exists for the addition of new / replacement of old vertical regulatory and warning signage.

4.2.7 Guide & Directional Signs

Within Sub-section A in village name plates are generally installed while none exist in Sub-section B.

Kilometre reference markers [milestones] are already in place throughout the corridor although some appear to be located within 1.0 m from the edges of the traffic lanes and as such represent some hazard to road users. Relocation to a safer 'clear zone distance' [perhaps behind drainage ditches] should be considered. In most cases, re-painting of the markers is required and a review of the distance and destination place name system used [and checking of the km distances quoted] should be undertaken.

4.2.8 Pavement Markings

In Sub-section A, a painted centreline was marked during the 2009 rehabilitation work but appears to have received no maintenance since meaning that it is mostly now eroded away. Sub-section B has only a gravel surface and therefore no markings at all were able to be installed. Under the future maintenance program the placement of centreline markings will be required and a related cost included in the estimate developed during the PPTA

Although reportedly not a conventional practice in Lao PDR [as confirmed by the site inspections along with the DPWT] the painting of edge lines would be highly recommended as these have the following benefits:

- Positive delineation of road edges under both day and night conditions;
- Opportunity to remove many of the present concrete post delineators currently in place but themselves often a roadside hazard;
- Better delineation of lane edges on bridge approaches where curbed / raised walkways suddenly 'appear';
- In conjunction with paved shoulders, better segregation of traffic from pedestrian / motorcycle usage areas;
- Improved distinction of junctions, major property access points such as fuel stations, commercial outlets etc.;

In parts of Sub-section A the need for painted pedestrian crossings is clear although no evidence of any previous placement could be found. Consideration should therefore be given to the provision of such crossings at strategic locations in village areas with adequate advance warning signage, rumble strips and centreline and edge line markings – particularly in school zones and other major institutional premises.

Although apparently also not a common practice in Lao PDR, the provision of reflective road studs [cats' eyes] might also be considered to add emphasis to horizontal markings in strategic locations e.g. on the outside of bends in rural areas.

4.2.9 Roadside Safety & Landscaping

Although there appears to be only very limited bus services along this route at present, the stopping of buses within through traffic lanes constitutes a serious safety hazard and interrupts traffic flow. If bus operations increase in future years, consideration should be given to the creation of out-of-lane stopping areas in strategic locations.

Where RoW width constraints prevent construction clear of traffic lanes, it might be possible to utilize paved shoulders to improve the passage of through traffic. In all cases bus bays should be properly signed and marked in accordance with the appropriate standards and supplemented where required by painted pedestrian crossings etc.

Sub-section A contains a few locations where properties [retail outlets mostly] have been built that encroach onto shoulder areas. Some of these are of substantial rather than 'temporary' construction and therefore represent some considerable risk to road users – these should be removed expeditiously if possible.

This road is not considered a candidate for the provision of landscaping but from a road safety view point existing planting / natural growth that encroaches onto the shoulder and/or hinders road user sight lines, should be cleared. A cost for undertaking this work has been included in the PPTA cost estimation process accordingly.

4.2.10 Traffic Management Items

Traffic speeds will inevitably be higher after the surface condition of the road is improved. It will therefore be desirable to introduce some means of traffic 'calming' and speed control at the

approaches to villages and in areas of high pedestrian and vehicle stopping/turning movements. In particular in school zones and other locations where excessive speeds present a safety hazard to pedestrians.

Mandatory speed limit signs should be posted at such locations along with corresponding speed 'de-regulation' at village exits. Speed advisory signs should also be installed to warn of sharp bends and other similarly hazardous conditions. Signs could be supplemented by thermoplastic 'rumble' strips to assist in speed reduction.

4.2.11 Accident Black Spots

This roadway is strictly rural in character with resulting low traffic volumes and low operating speeds. Road accidents if and when they occur are likely to go unreported and authorities therefore largely unaware of their frequency and severity. As a result, no reports of accidents were made available to the road safety assessment team.

Judgements were made however, that in view of the likelihood of increased operating speeds after the road has been rehabilitated under the planned 'maintenance' program, the need for better segregation of the different classes of traffic will increase. Accordingly recommendations for the provision of suitable measures [including road edge treatments and vertical signage] have been included in the PPTA cost estimates.

However one typical 'potential black spot' location was discussed with DPWT staff and examined in the field and this is discussed below.

Site No. 1 at km 35.8 approx.

This site is located in an area of very steep terrain where westbound traffic must negotiate a series of sharp bends on gradients in excess of 10%. The DPWT has recently installed sections of concrete surfacing in some steep areas to help traction but the risk of run-off-the road accident remains.

Downhill view [1]

Modification of road alignments and/or the addition of arrestor beds are likely to be impractical due to the local topography but additional solutions to be investigated should include:

- advance warning signage;
- improved skid resistance;
- roadside barriers [concrete or SBGR].

Uphill view of approach

Downhill view [2]

***NOTE:** existing wall is for rainwater run-off control only and is 'non-structural'*

4.3 Road Safety Issues - Illustrative Photographs

Photo LR-9001/01

Sub-section A – Junction with NR-18B at start of road in the community of Xaisettha.

No lane markings or vertical signage in place nor any street lighting.

Directional signage for Attapeu and the International Border is desirable.

Photo LR-9001/02

Sub-section A - Typical semi-urban intersection.

No lane markings or vertical signage in place nor any street lighting.

Sub-section A - Typical rural intersection.

No lane markings or vertical signage in place.

Tracking of gravel onto main lanes could be reduced by localized surface application [10 m length] along minor road.

Photo LR-9001/03

Sub-section A - Typical village street conditions.

No lane markings in place and no segregated shoulders.

Steep, unpaved cross slopes from back of shoulders hard to use by pedestrians and for parking/access in some locations.

Photo LR-9001/04

Sub-section A - Village street junction within Ban Pa-am [km 15.6].

No lane markings or road definition in place - nor any directional / guide signing.

Photo LR-9001/05

Sub-section A – typical rural section.

Use of concrete posts for road edge delineation creates impact hazard. Should be replaced with edge lines and/or 'breakaway' post types.

Photo LR-9001/06

Sub-section B – Bridge Approach [Nam Pa 1].

No protection [SBGR] on approach fills. End of parapets only facing traffic.

Rural location, so maybe no need to segregate pedestrians on deck.

Photo LR-9001/07

Sub-section B - Typical sign installation.

Type of support appropriate but offset / location needs to be checked. Maintenance required.

Photo LR-9001/08

Photo LR-9001/09

Sub-section B – Concrete post delineator.

Post has clearly received an impact.

Likely to have caused severe damage if motorcycle or small vehicle and related injury.

Likely to have damaged but not restrained a heavy vehicle.

Photo LR-9001/10

Sub-section B – Bridge Approach [Nam Pa 2].

Parapet clearly impacted but without obvious vehicle incursion.

No protection [SBGR] on approach fills.

Rural location, so maybe no need to segregate pedestrians on deck.

Photo LR-9001/11

Sub-section B – vegetation overgrowth.

Sight distances reduced on curved sections – to be cleared under maintenance program.

Photo LR-9001/12

Sub-section B – loose surface.

Recently completed surfacing work resulting in loose surface. May need to be cleaned under program of maintenance works.

XEKONG PROVINCE ROAD SAFETY ASSESSMENT

5. XEKONG - NATIONAL ROAD 16 [Single Sub-section]

5.1 Route Environment

From its origin south of the main roundabout in Thateng, National Road 16 heads north then eastwards towards Xekong. The road surface is paved and consistently 8m in width [it is being widened to 4-lanes on both approaches to Thateng and the approach to Xekong] and is in 'good condition' throughout. It is mostly on tangential alignment with only a few easily negotiable bends.

The terrain is generally flat-to-rolling and no significant gradients are present. Travel speeds for all classes of vehicles are high and residents in the frequent villages are at some risk as a result. The route serves several large communities with private residences, commercial outlets, schools and other institutional developments close to the road and this gives rise to concern over the disparate 'through' and 'local' traffic speeds. This is exacerbated by demand for the parking / stopping of vehicles and their related turning movements. The presence of significant numbers of pedestrians, motorcycles and agricultural vehicles suggests that speed regulation [traffic calming devices] and flow segregation [i.e. marked and surfaced shoulders] should be considered.

The sections of the route within the two major towns linked by this route already contain some raised curbing to protect users of the roadside walkways but vertical signage and almost all of the required pavement markings are absent at this time.

5.2 General Observations

As the proposed maintenance interventions are required to be completed within the existing RoW, the alignment geometry must be retained giving no opportunity to widen the surface, to improve sight lines or to adjust junction layouts etc. However significant road user safety benefits can be gained by the installation of additional reflective signs and road markings, the creation of 'segregated' shoulders for use by pedestrians and 2-wheel vehicles etc. These benefits could be enhanced by a focus under the future 'Project' to increasing driver discipline, to improving law enforcement and to the creation of a road safety awareness program for the local communities.

Common issues observed that are applicable to the full length of the road are summarised below:

5.2.1 Horizontal & Vertical Alignment

The road alignment is generally flat and straight with the exception of a few horizontal curves in the central section. Some speed warning signs are installed but radii are generally acceptable for the operating speed of 80 km/h.

5.2.2 Cross-section

With very few exceptions, the existing road width is adequate for its function, the observed traffic fleet composition and normal operating speeds. A general absence of paved shoulders

contributes to carriageway edge attrition and presents some risk to pedestrians and motorcyclists.

The trafficked surface width was measured at about 8.0 m overall with DBST surfacing and 2 x 'soft' shoulders. The addition of surfacing of say, 0.5 to 0.75 m width on both sides with painted edge lines would significantly enhance road safety especially in the busy village areas.

5.2.3 Intersections

The route contains a number of 3 leg and 4-leg junctions with minor roads mostly within the village areas – some are paved and some only have gravel surfaces. The former would benefit from having edge lines and stop signs / lines added while the latter should preferably be surfaced for a distance of between 5 and 10m from the though traffic lane edge to reduce the tracking of gravel on to main roadway.

Painted stop and reflective edge lines could then also be added to further improve safe operating conditions. The placement of 'stop' or 'yield' signs where presently absent would also help regulate entry to / exit movements – the addition of directional / guide signs at the major junctions would also be beneficial.

5.2.4 Miscellaneous Features

Schools and other institutions such as clinics and temples are present in most of the communities served by this road and typically present significant risks of pedestrian / vehicular conflicts - particularly on straight road sections where traffic operating speeds were noted to be high. At such sites, pedestrian safety would be enhanced by the installation of advance warning signs, painted road markings and appropriate speed reduction controls [e.g. 'rumble' strips].

In the villages, unregulated parking and property access movements are of concern and ideally, adequate parking lanes and pedestrian areas segregated by curbs would be desirable. However, the nature of the proposed program of interventions one of 'maintenance' only and this essentially prohibits the inclusion of some of these measures. Again appropriate signage, edge markings and 'rumble' strips could be included and offer significant benefits at low expense.

5.2.5 Traffic Lights & Street Lighting

No traffic signals exist or appear to be warranted along this subject road. Due to the rural nature of the corridor, existing street lighting provisions are limited and nothing more than routine maintenance of the existing features seems to be required. Further consideration of needs and responsibilities should be re-visited during the detailed design stages, however.

5.2.6 Regulatory & Warning Signs

As indicated above, a case exists for the addition of several new / replacement of old vertical regulatory and warning signage.

5.2.7 Guide & Directional Signs

Limited directional signs exist along this road although village name plates are generally installed. A need for signage indicating directions and distances to the main regional towns would be helpful in reducing non-local driver confusion.

Similarly kilometre reference markers [milestones] are already in place through most of the corridor although many are installed within 1m from the edges of the through traffic lanes and they therefore represent some considerable hazard to road users. Relocation to a safer 'clear zone distance' behind the drainage ditches ideally should be investigated. In many cases, repainting is required and a review of the system used to indicate distances to / from relevant destinations is needed.

5.2.8 Pavement Markings

For most of its length, National road 16 still features a painted though no edge definition, lane markings in multi-lane sections or stop lines within intersections exist. These are required and within the 'maintenance' part of the works, the placement of centreline markings has been assumed.

Although apparently not a conventional practice in Lao PDR [as confirmed by the site inspections with the DPWT staff] the painting of edge lines is highly recommended as these offer the following benefits:

- Positive delineation of road edges under both day and night conditions;
- Opportunity to remove many of the present concrete post delineators currently in place but themselves often a roadside hazard;
- Better delineation of lane edges on bridge approaches where raised curbs suddenly 'appear';
- In conjunction with paved shoulders, better segregation of traffic from pedestrian / motorcycle usage areas;
- Improved distinction of junctions, major property access points such as fuel stations, commercial outlets etc.;

Within the village areas the need for painted pedestrian crossings is apparent and consideration should be given in the design stages to the provision of such crossings at strategic locations Including approaches to school zones, health centres clinics and other major institutional premises where significant crossing movement demands are involved. These should be emphasized through the installation of adequate advance warning signage, 'rumble' strips and centreline and edge line markings].

Also apparently not a common practice in Lao PDR, the provision of reflective road studs [cats' eyes] should also be considered for adding emphasis to horizontal markings.

5.2.9 Roadside Safety & Landscaping

Indiscriminate and frequent stopping by vehicles including buses on the carriageway often constitutes a serious safety hazard and a serious interruption to traffic flows. No countermeasures exist along this road but if roadside commercial activities and bus services increase in future years, consideration should be given to the creation of out-of-lane stopping areas at strategic locations.

Where RoW width constraints prevent construction clear of traffic lanes, it might be possible to utilize paved shoulders to improve clearance for through traffic. In all cases bus bays should be properly signed and marked in accordance with the relevant standards and supplemented where required by pedestrian crossings.
This road is not considered a candidate for the provision of additional landscaping but from a road safety viewpoint existing planting / natural growth that encroaches onto the shoulder and/or hinders road users' sight lines, should be cleared. A cost for undertaking this work has been included in the PPTA cost estimation process – possibly for implementation under a village-based maintenance contract program.

5.2.10 Traffic Management Items

Traffic speeds will inevitably be higher after the surface condition of the road is improved and it is likely to be desirable to introduce some means of traffic calming and speed control on the approaches to villages and other areas of high pedestrian and vehicle stopping / turning movements.

Mandatory speed limit signs should be posted at such locations along with speed 'de-regulation' signs at corresponding zone exits. Reflective signs should be supplemented by thermoplastic 'rumble' strips to assist in speed reduction measures. Speed advisory signs should also be installed to warn of sharp bends and other similarly hazardous locations.

5.2.11 Accident Black Spots

This roadway is generally on tangential alignment with a good paved surface and the standard of maintenance achieved appears to be quite high – e.g. centrelines painted, roadside grass cut etc. In some locations some yellow coloured 'sharp curve' warning and 'school zone ahead*' signs have been installed and this suggests that a good level of appreciation of road safety issues exists among the responsible staff.
** The school signs however are mostly installed in isolation and well in advance of the actual conflict zone and there are no additional signs or markings [e.g. pedestrian crossings] in place to further reinforce drivers' perceptions of the need to reduce speed.*

No significant accident 'black spots' were reported to the assessment team but the view is held however that the likelihood of higher operating speeds will exist after the road has been rehabilitated and that the need for safety measures will be justified. These could include measures to segregate pedestrians from road traffic [e.g. through the provision of painted edge lines and paved shoulders] as well as the installation of additional warning signage, 'rumble' strips and the relocation of roadside objects. Consideration might also be given to the provision of a DBST re-seal to improve skid resistance in areas of sharp curvature.

5.3 Road Safety Issues - Illustrative Photographs

Typical view of 4-lane urban section in Thateng.

Loose surface needs attention to reduce skidding.

Curbing and raised sidewalks already in place.

Photo NR-16/01

Typical view of 4-lane semi-urban section near Thateng.

Right lane not used - loose surface needs attention to encourage use and reduce skidding.

Some curb and raised sidewalks in place.

Photo NR-16/02

Typical view of rural section.

Concrete delineators used unnecessarily – might be replaced by an edge line

Shoulder effectively unusable causing 'crowding' of the single traffic lane.

Photo NR-16/03

View of rural section.

Offset for road to arch supports needs checking.
Similarly encroaching roof overhang at right.

Photo NR-16/04

View of rural section.

Isolated concrete culvert marker posts [left] with limited offset from traffic lane should be replaced with 'breakaway' types and/or railing.

Photo NR-16/05

View of rural section.

Isolated concrete delineator post [right] with limited offset from traffic lane should be removed.

Photo NR-16/06

View of typical bridge parapet and approach.

Deck has no provision for segregating pedestrians from traffic.

Concrete delineator serving as guardrail on approach to 'square ended' parapet.

Photo NR-16/07

Typical view of 4-lane semi-urban section on approach to Xekong.

Outer lanes not used - loose surface needs attention to encourage outer lane use and to reduce risk of skidding.

Photo NR-16/08

6. XEKONG - LOCAL ROAD 7615 [Sub-sections A, B & C]

6.1 Route Environment

Sub-section A - From its junction with National Road 16, the road heads eastwards across gently rolling terrain before beginning to rise at gradients approaching 6-7 % from around km 2.4. Beyond the top of the ridge lies a rural community extending from km 7 to km 7.8 approximately with many houses close to the main road which is presently un-surfaced. This creates a very dusty environment for residents and suggests that a DBST treatment would be warranted.

From km 8 to 11 the road follows a winding alignment featuring a series of 'S' bends before reaching the next village at about km 11. This community contains many roadside houses and a junior school on the northern side - the dusty conditions again mean that a DBST treatment is likely to be justified. This second village extends from km 11 to km 12.5 approximately which represents the present end of the more densely populated area in turn suggesting that this part of Sub-section A could conceivably be the limit of the planned intervention work under the 'Project'.

Beyond this point the road descends the steeply rolling terrain [estimated 5-7 % gradients] and features significant vertical drop-offs from the road edge on the right [south] side where protection - possibly SBGR – seems to be warranted.

The end of Sub-section A is reached at km 14.3 where the subject road forks left and rises into Sub-section B. The right fork drops steeply away and descends to the hydro-electric dam site where construction continues presently in the valley below.

Sub-section B - This part of the road is of narrow width [of the order of 2.5 m is some locations] and is largely overgrown with dense vegetation meaning it is usable only by pedestrian traffic and motorcycles. The terrain is steep and only a few inhabited dwellings are visible from the road – presumed to be the homes of local people who cultivate the mountain-side areas. In two of the valleys stream crossings are required [presently not negotiable by 4-wheel vehicles] where the original culvert structures have been destroyed due to the high flood levels reported to occur every wet season. Grades are steep and some bends sharp and due to the apparently low vehicular usage, this prompts the idea that this Sub-section might be omitted from the 'Project' in favor of other more beneficial works.

Sub-section C – this is the continuation of Sub-section B out to the main National Road 16 corridor and is about 2.7 km in length. The first part is steeply graded until about km 20 is reached after which the gradient is much more gentle. The road is presently un-surfaced and of the order of 3.0 to 3.5 m wide. This section serves two roadside villages the largest [500 m long and containing a junior school] lying between approximately km 20.1 to km 20.7 while the second community contains only a few roadside houses grouped at a distance of about 300-400m back from the junction with National Road 16.

During the assessment, existing traffic volumes were note to be only 2-3 trucks and about 6 motorcycles in Sub-section A, none in Sub-section B and 3-4 motorcycles in Sub-section C. Pedestrian traffic was negligible believed to be due perhaps to the schools being closed for the weekend.

6.2 General Observations

As the proposed maintenance interventions are required take place within the existing RoW, the existing alignment geometry must be retained giving no opportunity to widen the surface or to improve sight lines other than by bush clearing. However, the team member's consensus was that no major road safety issues arise at this time other than the need for the installation of additional reflective signs, pavement markings in sections where DBST exists or might be placed, pedestrian crossings with associated warning signage in school zones and the installation of safety barrier [SBGR or concrete walling] where it is warranted in the eastern end of
Sub-section A.

6.2.1 Horizontal & Vertical Alignment

The road alignment in Sub-section A is essentially flat and straight with the exception of 3-4 horizontal curves and 2-3 sharp crest curves where sight distance are somewhat limited. With the necessary trimming of roadside vegetation and the installation of suitable warning reflective signs including advisory speed messages, conditions were considered to be adequate for the function of the road and the presumed safe operating speed of 60 km/h

In the most easterly part of Sub-section A, steep gradients and some short radius curves are present but opportunities to modify either are eliminated by the steep terrain. Instead a number of warning signs [to indicate the presence of steep slopes and sharp bends] and the addition of roadside barriers [steel guard railing or concrete / masonry walls] would be advisable to keep vehicles away from the several steep drop-offs. Road edge definition using either painted lines or appropriate delineator posts would also be beneficial.

If Sub-section B is to be included in the program of works, the introduction of concrete roadway surfaces [the standard is normally applied to gradients of >12%] may be justified for added traction in wet conditions.

6.2.2 Cross-section

With the exception of Sub-section B and the first part of Sub-section C existing road widths are adequate for the road function, the anticipated traffic fleet composition and the presumed operating speeds.

The trafficked surface width in Sub-section A is about 6.0 m overall and the provision of DBST surfacing in the two main village areas at least would be very helpful. In these areas the opportunity to introduce line markings and to thereby segregate vehicular traffic from pedestrian movements would become available. These could also then be supplemented by suitable sins and markings in school zones.

6.2.3 Intersections

Sub-section A features intersections with three access roads serving a large rubber plantation and worker's community to the south all falling within the length for km 4 to km 5.

As the main road is unlikely to become surfaced at this point the addition of the prospect of gravel being 'tracked' onto the through lanes will not be a concern. The placement of 'stop' or

'yield' signs would however, help to regulate entry to / exit movements although traffic volumes are expected to remain very low.

Some minor road junctions exist within the two main villages served and if DBST is to be introduced there, it could be extended for a short distance along each of the intersected roads. Appropriate regulatory signage could also be added cheaply.

6.2.4 Miscellaneous Features

Schools are present in both Sub-sections A and C and other institutions such as health centres and temples may be present also. In these areas pedestrian safety would be enhanced by the installation of advance warning signs - as well as paint lines and speed reduction controls such as 'rumble' strips if a DBST surface is to be laid.

No significant bridge structures were recorded anywhere along this road and so no shortcomings in approach fill protection were deemed necessary. At the two main river crossing located in the middle of Sub-section B however, the DPWT staff expressed the desire to upgrade one crossing through the installation of a steel Bailey-type bridge presently stored elsewhere in the Province. If to be transported and installed under this 'Project' as DPWT have requested, appropriate provision for approach fill protection will need to be provided.

6.2.5 Traffic Lights & Street Lighting

No traffic signals or street lighting units exist in this rural road and none appear to be warranted in the foreseeable future.

6.2.6 Regulatory & Warning Signs

As indicated above, a case exists for the addition of new / replacement of old vertical signage.

6.2.7 Guide & Directional Signs

No directional signs are presently in place although if the route becomes effectively a by-pass for Ban Thateng some appropriate guide signage at the extreme ends [at National Road 16] would be useful.

Similarly kilometre reference markers [milestones] are not present and installation of the required 23 markers should be considered. Location at a safe 'clear zone' distance from the edges of the road surfaces should be mandated.

6.2.8 Pavement Markings

As the road is expected to remain for the most part without surfacing, the application of pavement markings is impossible. However, if DBST is to be provided within the village areas, centre and short lengths of edge line [to delineate junctions and pedestrian walkways etc.] would be justified. Similarly at the two main junctions with National road 16, lines to indicate lane edges and stopping points should be included.

6.2.9 Roadside Safety & Landscaping

This route presently does not features public transport services and provision for out-of-lane bus stops does not seem to be necessary at this time.

The road is also regarded as being a candidate for the provision of landscaping items although the native vegetation needs clearing in several areas to improve sight distances. A cost for carrying out this minor work has therefore been included in the PPTA cost estimates.

6.2.10 Traffic Management Items

Traffic speeds will inevitably be higher after the surface condition of the road is improved and it might therefore be desirable to introduce some means of traffic 'calming' and speed control on the approaches to the two main villages. Demarcation of significant pedestrian crossing points and the placement of mandatory speed limits should be considered together with corresponding speed 'de-regulation' at the village exits. Advisory signs should also be installed at sharp bends and other similarly hazardous locations.

6.2.11 Accident Black Spots

This roadway is strictly rural in character with resulting low traffic volumes and low operating speeds. Road accidents if and when they occur are likely to go unreported and authorities therefore largely unaware of their frequency and severity. As a result, no reports of accidents were made available to the road safety assessment team.

Judgements were made however, that in view of the likelihood of increased operating speeds after the road has been rehabilitated under the planned 'maintenance' program, the need for improved segregation of pedestrian and other traffic classes will increase. Accordingly recommendations for the provision of suitable measures [including reflective edge lines and vertical signage] have been included herein.

6.3 Road Safety Issues - Illustrative Photographs

Sub-section A - start of roadway.

Road edge delineation required and paved surface on entry [over distance of 5to 10 m] to reduce tracking of gravel on to main road.

Additional vertical signage needed on all approaches.

Photo LR-7615/01

Sub-section A - typical condition within first village.

Vertical signage required.

DBST preferred for dust nuisance reduction.
Centrelines and preferably, reflective edge lines to segregate pedestrians from traffic needed - if DBST provided.

Photo LR-7615/02

Sub-section A - typical condition within second village.

Vertical signage required.

DBST preferred for dust nuisance reduction.
Centrelines and preferably, reflective edge lines to segregate pedestrians from traffic needed - if DBST provided.

Photo LR 7615/03

Sub-section B - typical view of showing restricted road width.

Photo LR 7615/04

Sub-section B - typical view of river crossings.

Will require box culvert or bridge crossing with related warning signage and approach fill delineation.

Bush clearing is needed to increase sight distances.

Photo LR 7615/05

Sub-section C - typical condition within main village.

Vertical signage required.

DBST preferred for dust nuisance reduction.
Centrelines and preferably, reflective edge lines to segregate pedestrians from traffic needed - if DBST provided.

Photo LR 7615/06

Sub-section C – restricted road width.

Cross section dimension to be increased.
Bush clearing need to improve sight distances.

Photo LR 7615/07

SALAVAN PROVINCE ROAD SAFETY ASSESSMENT

7. SALAVAN - NATIONAL ROAD 20 [Sub-sections A & B]

7.1 Route Environment

From its start point inside Saravan the subject part of National Road 20 heads southwards through the urban and sub-urban areas of the city for the first 4-5 km. This first stretch features a 2-lane then a 4-lane sectional width [some parts presently in the process of being widened] before returning to a 2-lane cross section at km 6 approximately.

Sub-section A as designated for this PPTA study extends from the origin in Saravan over a distance of 26 km to a major junction with Road No. 1H in the community of Ban Beng. Beyond that point [designated as the start of Sub-section B] the road continues for another 26 km before ending for PPTA Study purposes at the border with Champasak Province at km 52.5.

The terrain is essentially flat with only a few moderate gradients and the horizontal alignment linear with a few bends in the central section. Nonetheless, as described below, there are several points reported by DPWT staff to be the sites of frequent accidents.

Existing traffic flows contain the full range of vehicle class from private cars to buses and light and medium size trucks. For most of its length, the larger sizes of trucks do not feature presently as a result of the several single-lane, steel bridges where load limits of 20 t still exist. Sub-section A contains 4 such structures [plus 2 concrete bridges recently installed as replacements for older bridge structures] while Sub-section B contains a further 4 including a 70 m long Bailey-type structure just south of the junction with the road to Tad Lor. Beyond the Study limits in Champasak Province lie another 9 similar steel bridges one of which has a posted load limit of only 15 tonne. This situation will continue to reduce the attractiveness of this north-south route for heavy vehicles until it is rectified.

In both Sub-sections A and B several significant safety hazards were recorded for which some suggested remedial measures are listed below. In most cases concerns arise over the lack of adequate horizontal and vertical signage [including suitable edge delineation within the several major junctions] and the absence of appropriate segregation of pedestrian and slow-moving vehicles from through traffic in the sub-urban / village areas.

7.2 General Observations

As the proposed maintenance interventions are required take place within the existing RoW, the there is no major opportunity to widen the road surfaces under the ‘Project’. However significant road safety benefits can be gained by the installation of additional reflective signs and road markings, the creation of ‘segregated’ shoulders for use by pedestrians and/or 2-wheel vehicles etc. These benefits would be enhanced by focusing during the future ‘Project’ to increasing driver discipline, improving law enforcement and creating road safety awareness programs for the local affected local communities.

Common issues observed that are applicable in both Sub-sections of this road are summarised below:

7.2.1 Horizontal & Vertical Alignment

The road alignment in Sub-section A is essentially flat and straight with the exception of 3-4 horizontal curves the sharpest being the 'S' bend north and southbound approaches to a Bailey-type bridge structure located in km 15. These curves will require speed advisory signs, sight distance improvements and ideally, the replacement of the existing steel bridge where road width is restricted to one-way operation. Likewise the other 3 steel bridges are sub-standard in cross section terms and should also be replaced.

Generally existing curve radii are acceptable for the presumed operating speed of 80 km/h.

In Sub-section B similar geometric conditions apply although there are some areas where steep down gradients coincide with horizontal curves leading to the occasional accident.

In both Sub-sections operating speeds were observed to be high [some vehicles believed to be travelling at rates in excess of 100 km/h] and passing opportunities sometimes restricted. This leads to high speed overtaking often inside village boundaries where invariably, no indication of speed limits is given and no traffic 'calming' devises are in place.

7.2.2 Cross-section

With very few exceptions, the existing road width of 8m is adequate for the function of the road function, the traffic fleet composition and for 'normal' operating speeds. As indicated above incidences of high speeds are frequent leading to a need for the provision of paved shoulders as part of a strategy to safeguard pedestrians and slow moving vehicles.

The extension of the hard surface through the addition of DBST shoulders on both sides of the main road in the village - of say, only of 1m width - would significantly improve road safety particularly if reflective edge lines were also installed.

7.2.3 Intersections

Sub-section A contains several major junctions with other major roads including the main 'fork' inside Saravan at km 3.3, the 3-leg intersection with the road to / from Napong at km 10.1 and the 3-leg junction with National Road No. 1H within the village of Ban Beng at km 26.1 – the start of Sub-section B.

All of these main junctions are presently without centre, lane or edge line definition and have only limited directional signage. Similarly, the main route intersects with several local roads inside the different communities served by it – most of which have only loose surfaces. At these points extensions of the main road pavement [for distances of 5-10m along the minor road approaches] should be considered in order to reduce the 'tracking' of gravel on to the through lanes. Associated edge definition would also then be possible and regulatory and directional signage installed to better effect.

7.2.4 Miscellaneous Features

Schools and other institutions such as clinics and temples are present in the communities within the two Sub-sections and these sites typically present significant risks of pedestrian/vehicle conflict - particularly on straight road sections where traffic operating speeds are high. At these

locations road safety would be greatly enhanced by the installation of advance warning signs, pedestrian crossing markings and speed reduction controls such as 'rumble' strips.

In some village locations, unregulated parking [as at the frequent roadside fruit stands] and property access movements are also of concern. Ideally, adequate parking bays and pedestrian areas segregated by curbs would be desirable. But the nature of the proposed interventions under a 'maintenance' only program of works really prohibits incorporation of these measures but again, appropriate signage, edge markings and 'rumble' strips would help.

Two bridges in Sub-section A have been replaced in recent times by new concrete bridges. Although the contracts appear to have been completed finished [there were no Contractor's vehicles, manpower or equipment present] the work appears to be unfinished and several road safety concerns were noted to remain. These include a lack of guard rails on all of the approach fills and 'square-end' for both the bridge parapets and the deck curb up-stands that are presented to oncoming vehicles. These are described further below.

7.2.5 Traffic Lights & Street Lighting

No traffic signals exist or appear to be warranted for this subject road. Due to the rural nature of most of the southern part of the corridor, existing street lighting provisions are limited. Some facilities are present within the major communities for which maintenance is likely to be needed. At the detailed stage of the 'Project' a review of the need for the extension of existing or installation of new lighting system should be undertaken. This should include clarification of responsibilities for future maintenance and arrangements in place for the payment of energy bills.

7.2.6 Regulatory & Warning Signs

As indicated above, a case exists for the addition of new / replacement of old vertical signage in several locations.

7.2.7 Guide & Directional Signs

Adequate directional signs for the most part are absent in both Sub-sections A and B although village name plates are generally in place on the approach to the larger communities. At the major intersections particularly this aspect should be reviewed during the design development stages and a consistent approach to signage adopted.

Similarly kilometre reference markers [milestones] are already in place in the corridor although they appear in some places to be located very close to the pavement edge – often less than 1 m away. These of course represent a hazard to road users and relocation to a safer 'clear zone distance' should be considered. In most cases, re-painting is required and a review of the system used for indicating destinations and relevant distances should be reviewed for both clarity and consistency.

7.2.8 Pavement Markings

For most of the route no centreline markings are present for which there is an urgent need. Under the maintenance part of proposed works placement of these markings is warranted and an associated cost incorporated into the PPTA estimates.

Although reportedly not a conventional practice in Lao PDR [as confirmed by the site inspections with DPWT staff] the painting of edge lines would also be highly recommended as these have the following benefits:

- Positive delineation of road edges under both day and night conditions;
- Opportunity to remove many of the present concrete post delineators currently in place but themselves often a roadside hazard;
- Better definition of lane edges on bridge approaches where curb up-stands suddenly appear;
- In conjunction with paved shoulders, better segregation of traffic from pedestrian / motorcycle usage areas;
- Improved distinction of junctions, major property access points such as fuel stations, commercial outlets etc.;

In all communities, the need for official pedestrian crossings is apparent as no evidence of any previous placement could be found. Consideration should also be given to the provision of these at all strategic locations in village areas [preferably in conjunction with advance warning signage, 'rumble' strips and centreline and edge line markings. These are required in the vicinity of schools, health centres and other major institutional premises.

Also apparently not a common practice in Lao PDR, the provision of reflective road studs [cats' eyes] should also be considered in order to add emphasis to horizontal markings e.g. on centrelines and reflective edge lines through sharp radius bends etc.

7.2.9 Roadside Safety & Landscaping

Indiscriminate and frequent stopping by vehicles including buses on the carriageway often constitutes a serious safety hazard and a serious interruption to traffic flows. No countermeasures exist along this road but if roadside commercial activities and bus services increase in future years, consideration should be given to the creation of out-of-lane stopping areas at strategic locations.

Where RoW width constraints prevent construction clear of traffic lanes, it might be possible to utilize paved shoulders to improve clearance for through traffic. In all cases bus bays should be properly signed and marked in accordance with the relevant standards and supplemented where required by pedestrian crossings.

This road is not considered a candidate for the provision of additional landscaping but from a road safety viewpoint existing planting / natural growth that encroaches onto the shoulder and/or hinders road users' sight lines, should be cleared. A cost for undertaking this work has been included in the PPTA cost estimation process – possibly for implementation under a village-based maintenance contract program.

7.2.10 Traffic Management Items

Traffic speeds will inevitably be higher after the surface condition of the road is improved. It will therefore be desirable to introduce some means of traffic 'calming' and speed control on the approaches to villages and in areas of high pedestrian and vehicle stopping/turning movements - in particular, at pedestrian crossings and other locations where excessive approach speeds present safety hazards.

Mandatory speed limit signs should be posted at such locations along with corresponding speed 'de-regulation' signs at the at village exits. Speed advisory signs should also be installed at sharp bends and other similarly dangerous locations. Reflective signs should be supplemented by thermoplastic 'rumble' strips to assist in speed reduction measures.

7.2.11 Accident Black Spots

This roadway is generally on gentle curvilinear alignment with a good paved surface and the standard of maintenance achieved appears to be quite high [e.g. with centrelines painted, roadside grass cut etc.]. In some locations some yellow coloured 'school zone' ahead warning signs have been installed to supplement the usual bend warning and speed advisory signs also in place. This suggests that a good level of appreciation of road safety issues exists among the responsible staff.

The assessment team however expresses the view that the likelihood of higher operating speeds will exist after the road has been rehabilitated and that the need for other safety measures will therefore be justified. These could include measures to segregate pedestrians from road traffic [e.g. through the provision of painted edge lines and paved shoulders] as well as the installation of additional warning signage, 'rumble' strips and the relocation of roadside objects. Consideration might also be given to the provision of a DBST re-seal to improve skid resistance – particularly in the several areas of sharp curvature.

Site No. 1 at km 3.3 approx.

This site is located in the urban area at a major 'fork' in the road. NR-20 [Sub-section A] follows the left fork and another major urban link within Saravan city branches to the right. Immediately north of the junction lies [to the immediate left in the photo] is the entry/exit point to the city bus station.

View of fork from north

There presently no warning signs for the junction or the bus terminus and no lane or dividing island markings. Despite the presence of street lighting there are frequent collisions predominantly involving buses and motorcycles it is reported.

View to south of fork

Alignment modifications seem neither necessary nor practical to introduce but lane markings and painted [or even raised] island channelization would be beneficial.

Site No. 2 at km 17.4

This is the location of frequent 'run-off-the road' accidents according to DPWT staff. The site features approaches to a narrow bridge between two sharp bends – one in each direction. Drivers of speeding vehicles are often caught unaware of the directional change and cannot negotiate the curves.

Warning signs for the bends are limited and there is no painted centreline or adequate lane edge delineation.

The proposed replacement of the steel bride with a new box culvert will improve the road width for 2-way operation.

This together with the addition of better signage would be beneficial at this point.

View of northbound approach

View of bridge on s/b approach

Site No. 3 at km 17.4

This site is located on the north side of a small community containing a series of minor road junctions and a long-span, steel bridge.

There are presently limited advance warning signs and no centre or edge line markings to warn / guide drives.

There is no street lighting and the road surface is lacking some texture for skid resistance.

Horizontal alignment modifications appear to be impractical but warning reflective signs and lane markings would be very beneficial.

View of southbound approach

View of northbound approach

Site No. 4 at km 32.3 approx.

This site is located on the northern side of a community where the northbound approach descend a moderate gradient and meets a right hand bend ahead of an overhead arch announcing the village entry.

There are presently limited advance warning signs and no centre or edge line markings to warn / guide drives – the road surface appears to have good skid resistance.

Accidents occur regularly and are due reportedly to excess approach speed on the down grade – the remains of a recent incident remain at the roadside.

Additional warning reflective signs and lane markings would be highly beneficial.

View southbound

Remains of a recent incident

Site No. 5 at km 34.9 approx.

This site is located on a down grade located near a moderate curve.

There are presently only limited advance warning signs and no centre or edge line markings to warn / guide drivers. The road surface appears to have good skid resistance.

Accidents occur regularly and are again due reportedly to excess approach speed on the down grade. The results of a recent incident remain at the roadside.

Additional warning reflective signs and lane markings would be highly beneficial.

View northbound

View southbound

7.3 Road Safety Issues - Illustrative Photographs

Sub-section A – Typical urban stretch inside the city of Saravan [at km 5 approx.].

Roadway has no centreline, edge line of lane markings giving users no guidance.

Curbing and raised sidewalks are in place but with no segregation of stopping, parking areas. There are no pedestrian crossings or refuges provided.

Photo NR-20/01

Sub-section A – Two lane semi-urban road presently being widened.

Roadway has remnants of a centreline but no edge markings or shoulder segregation - though this may be rectified by Contractor.

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Photo NR-20/02

Sub-section A – Restart of 2-lane section [km 6 approx.].

No indication of start / end of construction zone given.

Materials tracked onto road surface resulting in loss of skid resistance. Contractor should be made to clean.

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Photo NR-20/03

Sub-section A - S/B approach to major junction [Napong Rd].

No centreline, lane lines or edge delineation in place.

Minimal regulatory signage and no directional information given.

Photo NR-20/04

Sub-section A – Informal sales outlets [km 10-12].

Structures are mostly located clear of traffic lanes but the likelihood of drivers making sudden stops and starts creates hazardous situation.

Consideration might be given to creating paved shoulders with suitable entry/exit tapers and warning signage.

Photo NR-20/05

Sub-section A – S/b approach to newly reconstructed bridge [km 13.5].

Square end of curb and parapet presented to oncoming vehicles. No guardrail protection provided on any approach fills.

Contractor should be urged to install flared SBGR, add reflective edge lines and ‘slope’ concrete curb end. MPWT standard should be reviewed.

Photo NR-20/06

Sub-section A – Concrete wall 'square' to approaching traffic on all 4 bridge rail ends.

Treatment typical of Bailey Bridges at km 14.4, km 15.0, km 16.0 and km 17.4.

Minimal warning signage installed.

These bridges recommended for replacement under the 'Project'.

Photo NR-20/07

Sub-section A – Unattended animals in roadway.

Typical occurrence in several locations – avoidance should be emphasized in 'community road safety awareness' program.

Photo NR-20/08

Sub-section A – View of n/b approach to main junction [Ban Beng – km 25 approx.].

No centreline, lane lines or edge delineation in place although remnants of edge lines remain on eastern leg of 'T'.

No segregation of shoulders/ parking areas and minimal regulatory signage and no directional information given.

Photo NR-20/09

Sub-section B – S/B approach to bridge [km 27.0].

Square end of curb and parapet presented to oncoming vehicles.

Concrete delineators might be replaced with reflective edge lines.
MPWT standards should be reviewed.

Photo NR-20/10

Sub-section B - S/B approach to major junction with Tad Lor Road.

No centreline, lane lines or edge delineation in place.

Minimal regulatory signage and no directional information given.

Photo NR-20/11

Sub-section B – Concrete wall 'square' to approaching traffic on all 4 bridge rail ends.

Despite these hazards, it was noted that minimal warning signage has been installed.

This situation is typical of all of the Bailey bridges that are located within Sub-section B at km 39.7, km 46.0, km 48.0 and km. These should be considered for replacement under the 'Project'.

Photo NR-20/12

Photo NR-20/13

Sub-section B – View of village street section [km 46.5 to 47.5].

Surface has no centreline, edge line or lane markings giving road users no guidance.

No segregation of stopping, parking areas and no pedestrian facilities [crossings or refuges] provided.

8. SALAVAN - LOCAL ROAD 6901 [Sub-sections A, B & C]

8.1 Route Environment

From its junction with National Road No. 13S, this road passes across gently rolling land and heads in a westerly direction to the Lao bank of the Mekong River where the pedestrian and vehicular ferry terminal connections with Thailand are located.

For PPTA study purpose, the main 17 km long corridor from the main road to the village of Paktaphan which contains the pedestrian ferry node has been allocated as Sub-section A. At a point about midway along this sub-section [km 9] a junction marks the beginning of the road to/from the vehicle ferry – this link has been designated as Sub-section B which extends over a 5.5 km length. The two terminals are directly linked by a short section [5 km in length] of road running parallel to the river bank and this has been assigned Sub-section C for PPTA study purposes. All three sub-sections of roadway lie in flat terrain with no significant gradients or sharp bends present.

Existing traffic flows contain both private and commercial vehicles with motorcycles being the predominant form of transport for local people. There also appears also to be a public transport service featuring small and medium size vehicles [up to 20 seat sizes].

During the assessment trip along the main access route [Sub-section A] was lightly trafficked by pick-ups and motorcycles mostly but no traffic movement at all was observed during the visits to Sub-sections B and C. There was no activity at the Lao side of either of the ferry crossings or any sign of the usual immigration officials there either - but this may have been due to the fact it was Sunday.

In all Sub-sections no significant road safety hazards were recorded and the main cause for concern was the dust clouds raised by passing vehicles [greatly reducing visibility and potentially affecting health] in the several communities located along Sub-section A and part of Sub-section C. It was noted however that the presence of short lengths of road with DBST surfacing exist in some of the villages that this has notably reduced the problem. Consideration should be given to the extension of these surfaces under the future ‘Project and due allowance made in the cost estimates developed.

8.2 General Observations

As the proposed maintenance interventions are required take place within the existing RoW, the present alignment geometry can be retained. The only exceptions are at 3 locations where the roadway becomes submerged annually to a depth of less than 300-400 mm usually and where some vertical raising of the embankments should be considered. The resulting additional width of the embankments should however fit easily within the available land area [subject to confirmation when topographical survey data is available during the detailed design process].

Given the nature of the alignment no significant fills are present leading to an absence of the usual proliferation of concrete post-type edge delineators commonly used elsewhere in the southern Provinces.

The RoW width is fairly generous for this class of road and remains without any structural encroachments. Utilities consist of electrical pole lines [mostly on the right side of the RoW] and these are well removed from the traffic lanes presenting no real danger of collision.

Significant road safety benefits could be achieved through the installation of additional reflective signs and pavement markings in DBST surfaced lengths by which means 'segregated' shoulders for use by pedestrians and/or 2-wheel vehicles could be provided. As with the other subject roads, communities served by them would also benefit from the initiation of road safety awareness programs aimed at the local populations.

Common issues observed that are applicable to the different Sub-sections of this road are summarised below:

8.2.1 Horizontal & Vertical Alignment

The road alignment in Sub-section A is essentially flat and straight with the exception of a few moderate horizontal curves the sharpest being in the westerly parts of the main access road corridor. Speed advisory signs are likely to be warranted but generally radii are considered to be acceptable for the presumed operating speed of 60 km/h.

In both Sub-sections B and C horizontal curvatures are acceptable for the traffic volumes predicted and the presumed operating speeds.

8.2.2 Cross-section

Throughout the corridor the existing road width is believed to be more than adequate for the road function, the traffic fleet composition and operating speeds. In village areas where DBST surfaces exist or are proposed consideration should be given to the provision of greater cross sectional width [even narrow shoulders of less than 1m] would improve the safety of pedestrians and slow moving traffic classes.

8.2.3 Intersections

Sub-section A contains several 3-leg and 4-leg minor road junctions [including that with Sub-section B at km 9] and several more within the riverside community of Paktaphan. All minor road surfaces are presently un-surfaced and no provision of edge lines to delineate pavement edges will likely be possible – adequate vertical signage is therefore justified.

The placement of 'stop' or 'yield' signs would help regulate entry to / exit from the through lanes and the addition of directional signs at the major junctions particularly at the National Road and ferry terminal ends would also help visitors to be better oriented.

8.2.4 Miscellaneous Features

Schools and other institutional premise including health centres and temples are present in Sub-section A and typically present risks of potential pedestrian/through traffic conflicts particularly on the straight road sections where traffic operating speeds are expected to be high. At these sites, pedestrian safety would be enhanced by the installation of advance warning signs etc.

In the busier village centres stopping/parking and property access movements would be of concern and ideally, adequate additional section width may be desirable. But the nature of the

proposed interventions under a 'maintenance' only program of works may prohibit the inclusion of these measures. No existing bridges were noted in any of the Sub-sections so there is presently no problem with approach fills as occurred in other subject roads.

8.2.5 Traffic Lights & Street Lighting

These are strictly rural communities and no traffic signals exist or are likely to be needed in the foreseeable future. Further and also due to the nature of the corridors, no existing street lighting provisions were recorded. Examination of needs for future provisions in the main centres during detailed design could still be undertaken in the interests of improving the lives of the residents.

8.2.6 Regulatory & Warning Signs

As indicated above, a case exists for the addition of new and/or replacement of existing vertical signage.

8.2.7 Guide & Directional Signs

Directional signs are notably absent at the National Road end and at the major nodes within the main corridor. There would appear be justification for some appropriate sings at both ends to highlight the routes to/from the international ferry terminals.

Similarly kilometre markers [milestones] are presently missing throughout the corridor and their installation would further provide reference points for visitors to/from the ferry crossing sites. Any new installation should be placed outside an appropriate 'clear zone' measured from the edge of the traffic lanes. A rational system for designating destinations and distance should be adopted.

8.2.8 Pavement Markings

As most of the existing road surfaces in all three sub-sections are comprised of laterite materials, no painted lines are present. However there would be some considerable to safer conditions if centrelines [and reflective edge lines if possible] were placed in the existing and any proposed new DBST lengths. Under the road maintenance part of works placement of such markings has been assumed in the development of the cost estimates.

8.2.9 Roadside Safety & Landscaping

Due to the low operating speeds anticipated and the low traffic volumes predicted no other major road safety measures were deemed to be needed.
If bus public transport operations increase in future years, consideration could also be given to the eventual introduction of out-of-lane stopping areas in strategic locations.

This road is not considered a candidate for the provision of any landscaping - but from a road safety viewpoint the clearing of any existing vegetation that reduces road users' sight lines or affects drainage routes, should be cleared. A cost for undertaking this work has also been included in the PPTA cost estimation process.

8.2.10 Traffic Management Items

Traffic speeds will inevitably be higher after the surface condition of the road is improved and as a result it might be desirable to introduce some traffic 'calming' and speed control measures on the approaches to the villages – especially in areas of high pedestrian crossing demands and vehicle stopping / turning movements.

Mandatory speed limit signs should be posted in advance of at such locations along corresponding speed 'de-regulation' signs at village exits. Speed advisory reflective signs should also be installed at sharp bends and any other similarly hazardous locations.

8.2.11 Accident Black Spots

This group of three subject roadways is strictly rural in character with resulting low traffic volume predictions and low operating speeds on the mostly un-surfaced traffic lanes. Road accidents if and when they occur are likely to go unreported and authorities would therefore be expected to be unaware of their frequency and severity. As a result, no reports of accidents were made available to the road safety assessment team.

Judgements were made however, that in view of the likelihood of increased operating speeds after the road has been rehabilitated under the planned 'maintenance' program, the need for improved segregation of pedestrians from other traffic classes will increase. Accordingly recommendations for the provision of suitable measures [including edge treatments in DBST areas and related vertical warning signage] have been included herein.

8.3 Road Safety Issues - Illustrative Photographs

Photo LR-6901/01

Sub-section A – Start of road at NR-13S.

Even though both roads are surfaced, no lane markings or vertical signage [including stop or directional types] exist even though this is a route to an international border crossing.

The minor road surface is unclean and of low skid resistance.

Sub-section A – Location of annual flood impact area [km 3.6].

Inundated road surface causes both access and safety problems regularly.

Photo LR-6901/02

Sub-section A - Typical view of village area.

Loose surface causes visibility and potential health problems. The application of markings [lane lines, stop lines etc.] is precluded by surface condition.

No vertical signage present at school zones.

Photo LR-6901/03

Sub-section A – View of village road with surfacing.

Visibility and air quality noticeable better.

Opportunities exist to install horizontal signage though none presently exist.

Photo LR-6901/04

Photo LR-6901/05

Sub-section A - view of typical minor road junction within the village area.

Lack of surfacing precludes the installation of centre, edge and stop lines.

No vertical signage present.

Photo LR-6901/06

Sub-section B junction with Sub-section A.

Lack of surfacing precludes the installation of centre, edge and stop lines.

No vertical signage present.

Loose surface has led to the 'tracking' of gravel onto the through lanes.

Photo LR-6901/07

Sub-section B - Typical view.

Roadway alignment, width and surface acceptable but encroaching vegetation and drainage ditching need attention.

Photo LR-6901/08

Sub-section B – Vehicle ferry landing area. Roadway surface poor and no protection against drop-off on river edge.

No signage present to control traffic or to indicate the presence of an international border crossing.

Photo LR-6901/09

Sub-section C – the inter-ferry link.

Roadway surface in good condition but needs re-grading.

No separation in village of pedestrians from through traffic.

Photo LR-6901/10

Sub-section C - inter ferry link

Roadside areas in need of grass cutting to improve conditions.

No signage present to control traffic or to indicate either ferry terminal site.

9. Example Treatments - National Road 13S [Salavan Province]

During the road safety assessment trips attention was paid to a number of 'non-project' roads where road safety issues have clearly been embraced by the local authorities.

Some good and bad examples of these are recorded below for reference – it should be noted that very few if any of the treatments indicated are present on the 'subject' National Roads.

1. School Zone Warning Sign

Sign is large and brightly coloured and therefore highly visible.

30 km/h speed is perhaps too low and likely to be ignored.

The general concept is good but additional signage and 'traffic calming' measures are needed within the zone itself and at the actual road crossing point[s] to reinforce the message.

2. Bus Stop Sign [at Bus Bay]

Sign is clear and mounted at the rear of the 'out-of-lane' bus bay.

Passenger waiting area surface should be improved.

Edge lines around the bay and its entry/exit tapers would be helpful.

3. Sharp Bend and Directional Signs

Example of signage used to indicate sharp bend ahead and the name of the village.

Speed advisory notice also should be placed ahead of particularly for sharp curves.

4. Chevron Warning Signs

Use of brightly coloured chevron signs to indicate bend ahead is good.
There should be a minimum of 3 signs be visible to approaching drivers through the curve.

The concrete post delineators installed on the outside of the curve represent a safety hazard.

Replacement with reflective edge lines and/or embedded road stud reflectors would be preferable.

10. Community Road Safety Awareness

10.1 Background

The Government of Lao PDR has acknowledged that the nation has one of the highest road accident rates in the ASEAN region and in recent years [per 2012 statistics], has initiated measures to address this situation.

In conjunction with various donor agencies over time, audits have been made of physical conditions in different corridors, reviews conducted of institutional arrangements in place and recommendations made on the best way to improve road safety to the benefit of all. Work in this area was included in the ADB 10 project between 2006 and 2009 and led to the creation of a National Road Safety Committee (NRSC) Secretariat within the MPWT and a Road Accident Data System – accident data to be provided by the Police to a DoT / MPWT managed database.

To reinforce this initiative, a new road safety project was carried out with ADB support by a Consultant in the years 2013 and 2014 and that culminated with a final report published in June of 2014. The scope of this recent work was described as focusing on:

- Providing training in road safety initiatives;
- Conducting road safety audits of selected existing roads and design proposals;
- Arranging programs for driver training, testing and licensing practices;
- Arranging training programs for traffic police officers, for vehicle inspections.

During the project the team gave general advice and support to MPWT staff and developed manuals and handbooks on a number of issues. An important recommendation made at the end of project concerned the introduction of new a driver training and testing system to Lao PDR.

10.2 Public Awareness Campaigns

In parallel with the above, one NGO initiated a road safety program in 2004 with the intent to reduce road traffic fatalities and injuries and to improve the road safety environment in Lao PDR.

This NGO has provided support to key stakeholders at national, provincial and district levels including the National Road Safety Committee and a targeted Provincial Road Safety Committee in Savannakhet Province. This has resulted in improved overall road safety awareness and the enforcement of laws as well as the development of road safety action plans.

At the community level, the NGO has supported the development of road safety curricula for primary schools in partnership with the National Research Institute in Education Sciences (NRIES) within the Ministry of Education. Jointly, they organized a workshop in 2012 attended by staff from NRSC Secretariat, the Ministry of Education, MPWT and the Traffic Police. This saw a review of the curriculum and of teacher training needs.

Attention was paid to the level of road accidents, the degree of road safety awareness of local communities and of measures to be applied in road corridors in future.
The approach to community based road safety is to empower local actors to become engaged in the promotion of safety in their respective communities. This is achieved by inviting village

authorities and other key stakeholders from multiple villages (normally 5-10 villages per district) to collaborate in order to address common road safety issues in their districts.

The key is seen to be the education of community leaders, local police and representative of other agencies [such as the Lao Women's and Youth Unions] about key road safety issues. This is often addressed through delivery of a series of training modules on topics that include speeding, wearing of seat belts and crash helmet, drunk driving, pedestrian safety etc. Action planning workshops are also organized to identify priority safety concerns and to develop appropriate responses based on international and regional 'best practices' following assessments of existing conditions. The preparation of local road safety action plans are invariably supported in both technical and financial terms.

Practical measures taken include the promotion of road safety in local schools through lectures, hand-outs etc. and the posting of safety awareness messages on local billboards and in video presentations. Additional emphasis is often provided by the presence of random police checkpoints when road safety advice can be offered – often without the imposition of any penalties for infractions.

Community based road safety intervention programs can be carried out with durations of 3 months but ideally this is spread over a full year to allow time for communities to become more engaged in the issues and for repeat visits to be made by the supporting teams.

10.3 PPTA Findings

During the PPTA a number of interviews were convened at the community level on subjects relating to environmental and social conditions and possible impacts. At the same time, there were opportunities to discuss road safety issues and record observations made by the local people. The observations can summarized as follows:

- In the 3 target provinces most accidents occur in built up areas, while there are only a small number of accidents on the roads between the villages.

- Most commonly, accidents involve motorcycles driven by young people often under the influence of alcohol – usually in the evening or night time. The next most common incidents involve hand tractors without lights.

- Other observations made by Province:

<u>Attapeu</u>

- Road safety committees at both provincial, district and village level have been established, and with budget provided last year posters and a video were prepared.

- There are a large number of Vietnamese truck drivers and it is difficult to inform them about traffic rules and practices in Lao PDR. However it was noted that there are few reported accidents involving these classes of vehicle.

- The LWU is interested in being involved in road safety activities, and believe it would be good to combine with HIV/Aids awareness campaigns.

Xekong

- The budget allocated for Road Safety Activities is about 13MLAK / year and covers activities mainly by the police at school level.

- In the past, awareness campaigns have been carried out in some of the villages but interest and therefore attendance levels, were low.

- It was agreed that that school age children should be targeted but since the reach would be limited (pupils would mostly be under driving age and not all children attend school it would be best to also work at the village level.

- There would be a need to preparing campaign materials and secure budgets for capacity building for Provincial and District staff.

Salavan

- In the past campaigns have been coordinated between DPWT, LWU, DPH and MoE, targeting youths of between 15 and 18 years old.

- Typically the budget provided is only sufficient for 1 event / year making it difficult to cover the whole Province. Two persons are currently covering road safety aspects at the DPWT.

- LWU confirmed an interest in participating in activities and say they are able to mobilize volunteers in some cases.

- The approach should be to target both schools and the village level as not all 15-18 year olds attend school. Among the ethnic minorities especially, it is common to leave school at an early age.

- As part of any budget to be committed, the provision of a vehicle (preferably a minibus) would be welcome to facilitate the logistics.

10.4 ADB Future 'Project' Contributions

The ADB-funded program presents an opportunity to support the further development of road safety conditions in both the physical and the community awareness areas.

The proposed maintenance project defined under this PPTA contains a road rehabilitation component within which several physical safety concerns identified during the field assessment can be addressed - cost estimates for this have been included accordingly. Through their incorporation in the future detailed design stage of the 'Project', a more sustainable road safety condition should be achieved.

On the awareness side, a similar opportunity arises for which the following process could be adopted:
After discussion with the NRSC Secretariat, the various concerned Ministries, the Traffic Police NGOs and LWU [to avoid duplication of efforts], a number of issues could be addressed by

specialists in the area of road safety embedded in the Consultants' workforces during the detailed design and/or maintenance phases.

Topics for possible inclusion in future community level awareness campaigns might include:

- General Road User Education

  - Teach people [children especially] to always walk facing oncoming traffic.
    A rough survey suggests that 80-90% of pedestrians walk with their backs to traffic – too high a figure to be random – so it is likely that they are being taught incorrectly.

  - Teach pedestrians to wear bright – preferably reflective clothing - at night;

  - Teach motorists to check for non-functional lights before leaving on a journey.
    Mostly motorcycles and agricultural vehicles involved. Even old CD's attached to the back of vehicles would help.

  - Teach pedestrian to 'look left-look right-look left again' before crossing a road.

  - Advise that motorcycle passengers are just as vulnerable as drivers - and that serious head damages are often fatal.
    Very low passenger helmet usage observed by assessment team.

  - Advice that vehicles should be parked clear of traffic lanes even for short periods.

  - Teach responsible animal ownership - both herds and many individual strays noted on the subject roads.

- Traffic Regulations

  - Remind riders that crash helmets are required to be worn and that the reason is to protect the wearer not just to avoid a police fine.
    Less than 50% usage observed by assessment team in the rural areas.

  - Remind drivers that the wearing of seat belts is mandatory.

  - Teach motorcyclists to install and use rear view mirrors.

  - Remind motorcyclists that maximum 2 people can be legally carried.

  - Teach motorcyclists that cargo must be 'safely' carried.

  - Remind operators that all motor vehicles are subject to the same rules.
    [e.g. motorcycles also must stop at red lights, behind stop lines etc.;

  - Remind drivers that all vehicles are required to obey 'right turn on red' rules at signal controlled junctions.

  - Remind vehicle operators there is a legal 'convention' for entering roundabouts.

- Warn drivers of the implications of 'running' red lights at signal controlled junctions'

- Remind all operators to obey 'barrier' centreline constraints and that passing on the right and driving on the shoulder against oncoming traffic is illegal

- Advise that vehicles are required to be equipped with mirrors and blinkers.

- Stress that under age, non-licensed and uninsured driving is illegal.

- Stress that drunk driving a serious offence.

11. Suggested Review of MPWT Standards & Policies

During the assessment, the team observed that the same road safety concerns kept recurring along most of the subject roads. This suggested that MPWT standards were being applied but that they in themselves may contain some 'dangerous' features.

To address this, the team proposes that some current MPWT standards and policies be reviewed during the future detailed design stage with a view to improving them. This would be an opportunity also to bring such items in line with conventions used in neighbouring countries or as may be needed to comply with any requirements for international road transport as a result of ASEAN. Some items might even become the subject of a 'trial' installation during the multi-year project envisaged.

Items that could be included in the review include the following:

- The introduction of reflective edge lines to define lane edges and shoulders and to segregate traffic from pedestrians, slow moving vehicles and motorcycles;

- Associated with the above, consideration of the removal of many of the existing concrete delineator posts - or their replacement with less damaging types [e.g. plastic posts, 'breakaway' mountings etc.];

- Modification of the different styles of chevron marker used to delineate curves [again, perhaps using plastic posts or breakaway types] and the consistency of their application;

- The introduction of reflective road studs [cat's eyes] on centrelines and on edge lines on the outside of bends] particularly where no street lighting is installed;

- The introduction of 'rumble' strips, visible pedestrian crossings and possibly of appropriately designed 'speed humps' in school zones and high pedestrian-traffic areas;

- A more consistent approach to bridge parapet design - presently there are several types in use including concrete types [some with vertical/some with sloped profiles], steel railing types [some with 2/some with 3 members], some with/some without segregating curbs and some with/some without elevated concrete deck walkways;

- An improved method of marking culvert locations and protecting road users from entering dangerous inlet / outlet areas;

- The introduction of enclosed 'U' ditches [concrete lined with pre-cast roof slabs] in at least, sub-urban areas. This would help increase RoW land area for pedestrian use, off-road parking etc.

- A consistent and safer method of providing vehicle containment barriers on bridge approaches. Presently SBGR or concrete posts are used – in some cases no protection is in place;

- Related to the above, a consistent method of anchoring 'flexible' approach fill barriers to 'rigid' bridge parapet ends;

- For steel barrier installations, review of rail splice plate types and of rail support post spacing. Presently post separation appears to be fixed and no attempt made to vary the spacing in order to adjust beam 'stiffness';

- For steel barriers, review of rail end treatments including terminal plates, buried anchorages and the introduction of horizontal 'flares' on approaches;

- Clearer and more systematic use of directional signs at major junctions and other locations. Presently, route number, directions and distances to key destinations such as Attapeu, Xekong, Salavan, the Thai and Vietnam Borders etc. are not indicated appropriately.

- A clearer and more consistent system for km reference markers quoting city names and km distances to the relevant destinations;

- Also the location of reference markers and other roadside obstacles outside of appropriate 'clear zones' for the relevant classes and operating speeds of the roads.

- As no formal system of recording accident events by location, frequency or severity exists this should be addressed during the Project's implementation phases. Collaboration with the Police force and insurance companies is needed.

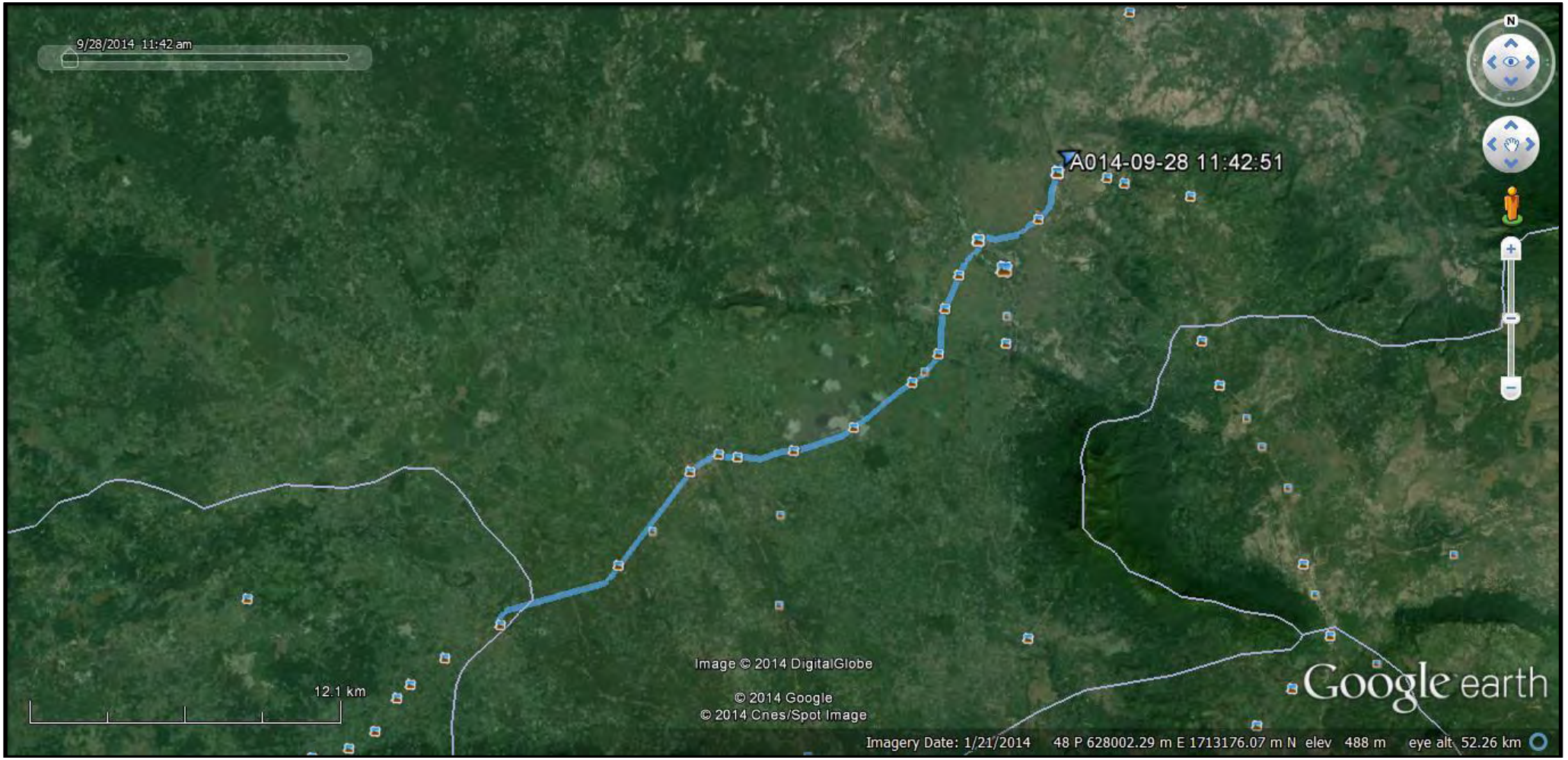
Annex D – Evaluation of Long Listed Roads

Road ID	Link ID	Existing Road Condition Factors					Regional Development Factors			Social & Environmental Safeguard Factors					
		10% Road Class	10% Surface Condition	5% Roughness Rank	5% Accessibility Rank	15% Traffic Volume Rank	5% Agricultural Potential	5% Non-Agricultural Potential	10% Proximity with Projects	5% Existing Health Services	5% Existing Primary School	5% Existing Secondary School	10% Social Env. Impact	10% Natural Env. Impact	100% Overall Score
015	A	5	1	1	1	5	5	3	1	1	1	1	5	5	3.10
015	B	5	1	1	1	5	5	3	1	1	1	1	5	5	3.10
015	C	5	1	1	1	5	5	3	1	1	1	1	5	5	3.10
015	D	5	3	2	1	5	5	3	1	1	1	1	5	5	3.35
015	E	5	3	2	1	3	5	5	1	1	1	1	5	5	3.15
015	F	5	3	2	1	3	5	5	1	1	1	1	5	5	3.15
015	G	5	3	1	1	3	5	5	1	1	1	1	5	5	3.10
015	H	5	3	2	1	3	5	5	1	1	1	1	5	3	2.95
015	I	5	3	2	1	2	5	5	1	1	1	1	5	3	2.80
01G	B	5	5	5	1	1	5	1	1	1	1	1	1	1	2.20
01G	C	5	5	5	1	1	5	1	1	1	1	1	1	1	2.20
01H	A	5	2	1	1	5	5	3	1	1	1	1	5	5	3.20
01H	B	5	2	1	1	3	5	3	1	1	1	1	5	5	2.90
020	A	5	2	2	1	5	5	5	1	1	1	1	5	5	3.35
020	B	5	2	1	1	4	5	5	1	1	1	1	5	5	3.15
13S	Z	5	2	1	1	5	5	5	1	1	1	1	5	3	3.10
13S	ZA	5	2	2	1	5	5	5	1	1	1	1	5	3	3.15
13S	ZB	5	2	2	1	5	5	5	1	1	1	1	5	3	3.15
13S	ZC	5	2	2	1	5	5	5	1	1	1	1	5	3	3.15
6901	A	3	5	5	2	2	5	5	5	5	3	5	3	1	3.50
6904	A	3	5	5	2	1	1	1	5	1	1	1	3	1	2.45
6906	A	1	5	5	2	1	1	1	1	1	1	1	3	5	2.25
6907	A	1	5	5	1	2	5	3	1	5	3	5	3	3	2.95
6907	B	1	5	5	5	2	5	5	1	3	5	5	3	3	3.25
6907	C	1	5	5	5	1	3	3	1	5	3	5	3	3	2.90
6909	A	1	5	5	2	2	5	3	3	3	5	1	3	5	3.20
6909	B	1	5	5	2	3	5	5	3	1	3	5	3	5	3.45
6913	A	1	5	5	3	2	5	3	1	5	5	3	3	5	3.25
6914	A	1	5	5	5	1	5	5	1	5	3	5	3	1	2.90
6935	A	1	5	5	1	2	1	1	1	5	3	3	3	3	2.55
016	F	5	2	1	1	4	5	5	1	1	1	1	5	5	3.15
016	G	5	2	1	1	5	5	5	1	1	1	1	5	5	3.30
016	H	5	2	2	1	5	5	5	1	1	1	1	5	5	3.35
016	I	5	1	1	1	3	5	5	1	1	1	1	5	5	2.90
016	J	5	1	1	1	3	5	5	1	1	1	1	5	5	2.90
016	K	5	1	1	1	3	5	5	1	1	1	1	5	5	2.90
016	L	5	1	1	1	3	5	5	1	1	1	1	5	5	2.90
016	M	5	1	1	1	3	5	5	1	1	1	1	5	5	2.90
01H	C	5	2	1	1	3	5	3	1	1	1	1	5	5	2.90
01I	A	5	2	1	1	4	5	3	1	1	1	1	5	5	3.05
7518	A	1	5	5	4	2	3	3	3	3	3	3	3	5	3.20
7615	A	1	5	5	4	2	5	5	5	3	3	3	3	5	3.60
01I	B	5	2	1	1	4	5	3	1	1	1	1	5	5	3.05
01I	C	5	2	1	1	5	5	3	1	1	1	1	5	5	3.20
01I	D	5	2	1	1	5	5	3	1	1	1	1	5	5	3.20
01J	A	5	5	5	5	1	5	1	1	1	1	1	1	5	2.80
18A	A	5	5	5	1	2	5	3	1	1	1	1	1	1	2.45
18A	B	5	5	5	1	1	5	3	1	1	1	1	1	1	2.30
18A	C	5	5	5	1	1	5	3	1	1	1	1	1	1	2.30
18A	D	5	5	5	1	1	5	3	1	1	1	1	1	3	2.50
18B	A	5	1	1	1	4	5	5	1	1	1	1	5	5	3.05
18B	B	5	2	1	1	4	5	5	1	1	1	1	5	5	3.15
18B	C	5	2	2	1	4	5	5	1	1	1	1	5	1	2.80
9001	A	3	2	1	1	2	3	3	5	1	3	1	5	5	2.95
9001	B	3	2	2	4	1	3	3	5	1	3	1	3	5	2.80
9001	C	3	5	5	4	1	1	1	5	1	1	1	3	5	2.95
9002	A	1	5	5	3	1	5	1	1	3	3	3	3	5	2.80
9037	A	1	5	5	1	1	5	1	1	3	3	5	3	5	2.80
9045	A	3	5	5	4	3	1	1	3	1	1	1	3	1	2.65
9045	B	3	5	5	4	1	1	1	3	1	1	1	3	1	2.35
9045	C	3	5	5	4	1	1	1	3	1	1	1	3	1	2.35
9047	A	3	5	5	5	1	1	5	1	1	1	1	3	5	2.80
9232	A	1	5	5	3	1	1	1	1	1	1	1	3	5	2.30

Road ID	Link ID	Existing Road Condition Factors					Regional Development Factors			Social & Environmental Safeguard Factors					
		5% Road Class	5% Surface Condition	5% Roughness Rank	5% Accessibility Rank	5% Traffic Volume Rank	10% Agricultural Potential	10% Non-Agricultural Potential	20% Proximity with Projects	5% Existing Health Services	5% Existing Primary School	5% Existing Secondary School	10% Social Env. Impact	10% Natural Env. Impact	100% Overall Score
015	A	5	1	1	1	5	5	3	1	1	1	1	5	5	2.80
015	B	5	1	1	1	5	5	3	1	1	1	1	5	5	2.80
015	C	5	1	1	1	5	5	3	1	1	1	1	5	5	2.80
015	D	5	3	2	1	5	5	3	1	1	1	1	5	5	2.95
015	E	5	3	2	1	3	5	5	1	1	1	1	5	5	3.05
015	F	5	3	2	1	3	5	5	1	1	1	1	5	5	3.05
015	G	5	3	1	1	3	5	5	1	1	1	1	5	5	3.00
015	H	5	3	2	1	3	5	5	1	1	1	1	5	3	2.85
015	I	5	3	2	1	2	5	5	1	1	1	1	5	3	2.80
01G	B	5	5	5	1	1	5	1	1	1	1	1	1	1	2.00
01G	C	5	5	5	1	1	5	1	1	1	1	1	1	1	2.00
01H	A	5	2	1	1	5	5	3	1	1	1	1	5	5	2.85
01H	B	5	2	1	1	3	5	3	1	1	1	1	5	5	2.75
020	A	5	2	2	1	5	5	5	1	1	1	1	5	5	3.10
020	B	5	2	1	1	4	5	5	1	1	1	1	5	5	3.00
13S	Z	5	2	1	1	5	5	5	1	1	1	1	5	3	2.85
13S	ZA	5	2	2	1	5	5	5	1	1	1	1	5	3	2.90
13S	ZB	5	2	2	1	5	5	5	1	1	1	1	5	3	2.90
13S	ZC	5	2	2	1	5	5	5	1	1	1	1	5	3	2.90
6901	A	3	5	5	2	2	5	5	5	5	3	5	3	1	3.90
6904	A	3	5	5	2	1	1	1	5	1	1	1	3	1	2.55
6906	A	1	5	5	2	1	1	1	1	1	1	1	3	5	2.05
6907	A	1	5	5	1	2	5	3	1	5	3	5	3	3	2.95
6907	B	1	5	5	5	2	5	5	1	3	5	5	3	3	3.35
6907	C	1	5	5	5	1	3	3	1	5	3	5	3	3	2.90
6909	A	1	5	5	2	2	5	3	3	3	5	1	3	5	3.40
6909	B	1	5	5	2	3	5	5	3	1	3	5	3	5	3.65
6913	A	1	5	5	3	2	5	3	1	5	5	3	3	5	3.25
6914	A	1	5	5	5	1	5	5	1	5	3	5	3	1	3.10
6935	A	1	5	5	1	2	1	1	1	5	3	3	3	3	2.25
016	F	5	2	1	1	4	5	5	1	1	1	1	5	5	3.00
016	G	5	2	1	1	5	5	5	1	1	1	1	5	5	3.05
016	H	5	2	2	1	5	5	5	1	1	1	1	5	5	3.10
016	I	5	1	1	1	3	5	5	1	1	1	1	5	5	2.90
016	J	5	1	1	1	3	5	5	1	1	1	1	5	5	2.90
016	K	5	1	1	1	3	5	5	1	1	1	1	5	5	2.90
016	L	5	1	1	1	3	5	5	1	1	1	1	5	5	2.90
016	M	5	1	1	1	3	5	5	1	1	1	1	5	5	2.90
01H	C	5	2	1	1	3	5	3	1	1	1	1	5	5	2.75
01I	A	5	2	1	1	4	5	3	1	1	1	1	5	5	2.80
7518	A	1	5	5	4	2	3	3	3	3	3	3	3	5	3.30
7615	A	1	5	5	4	2	5	5	5	3	3	3	3	5	4.10
01I	B	5	2	1	1	4	5	3	1	1	1	1	5	5	2.80
01I	C	5	2	1	1	5	5	3	1	1	1	1	5	5	2.85
01I	D	5	2	1	1	5	5	3	1	1	1	1	5	5	2.85
01J	A	5	5	5	5	1	5	1	1	1	1	1	1	5	2.60
18A	A	5	5	5	1	2	5	3	1	1	1	1	1	1	2.25
18A	B	5	5	5	1	1	5	3	1	1	1	1	1	1	2.20
18A	C	5	5	5	1	1	5	3	1	1	1	1	1	1	2.20
18A	D	5	5	5	1	1	5	3	1	1	1	1	1	3	2.40
18B	A	5	1	1	1	4	5	5	1	1	1	1	5	5	2.95
18B	B	5	2	1	1	4	5	5	1	1	1	1	5	5	3.00
18B	C	5	2	2	1	4	5	5	1	1	1	1	5	1	2.65
9001	A	3	2	1	1	2	3	3	5	1	3	1	5	5	3.30
9001	B	3	2	2	4	1	3	3	5	1	3	1	3	5	3.25
9001	C	3	5	5	4	1	1	1	5	1	1	1	3	5	3.05
9002	A	1	5	5	3	1	5	1	1	3	3	3	3	5	2.80
9037	A	1	5	5	1	1	5	1	1	3	3	5	3	5	2.80
9045	A	3	5	5	4	3	1	1	3	1	1	1	3	1	2.35
9045	B	3	5	5	4	1	1	1	3	1	1	1	3	1	2.25
9045	C	3	5	5	4	1	1	1	3	1	1	1	3	1	2.25
9047	A	3	5	5	5	1	1	5	1	1	1	1	3	5	2.70
9232	A	1	5	5	3	1	1	1	1	1	1	1	3	5	2.10

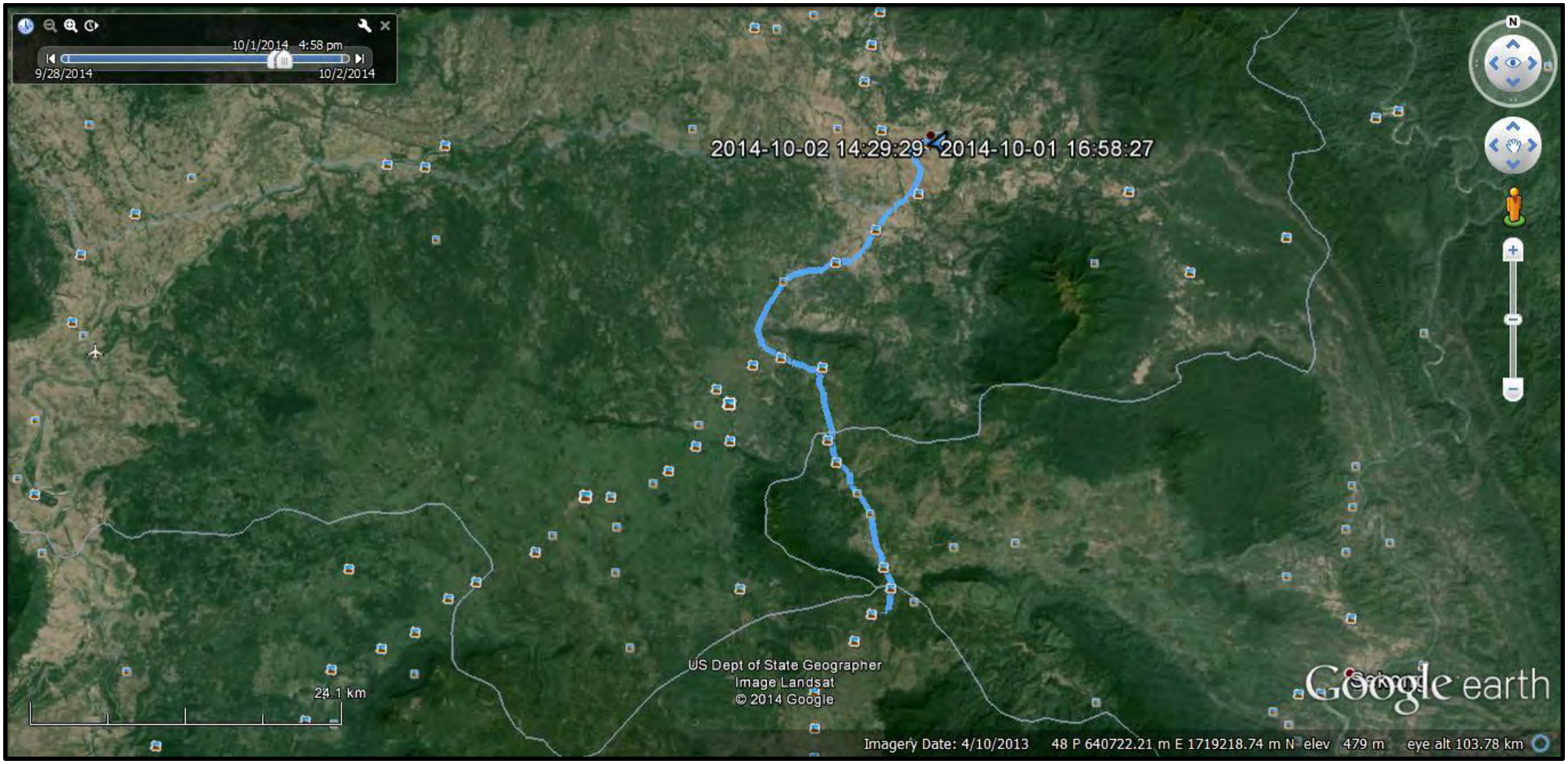
Road ID	Link ID	Existing Road Condition Factors					Regional Development Factors			Social & Environmental Safeguard Factors					
		10% Road Class	10% Surface Condition	5% Roughness Rank	5% Accessibility Rank	5% Traffic Volume Rank	5% Agricultural Potential	5% Non-Agricultural Potential	10% Proximity with Projects	9% Existing Health Services	6% Existing Primary School	6% Existing Secondary School	12% Social Env. Impact	12% Natural Env. Impact	100% Overall Score
015	A	5	1	1	1	5	5	3	1	1	1	1	5	5	2.86
015	B	5	1	1	1	5	5	3	1	1	1	1	5	5	2.86
015	C	5	1	1	1	5	5	3	1	1	1	1	5	5	2.86
015	D	5	3	2	1	5	5	3	1	1	1	1	5	5	3.11
015	E	5	3	2	1	3	5	5	1	1	1	1	5	5	3.11
015	F	5	3	2	1	3	5	5	1	1	1	1	5	5	3.11
015	G	5	3	1	1	3	5	5	1	1	1	1	5	5	3.06
015	H	5	3	2	1	3	5	5	1	1	1	1	5	3	2.87
015	I	5	3	2	1	2	5	5	1	1	1	1	5	3	2.82
01G	B	5	5	5	1	1	5	1	1	1	1	1	1	1	2.20
01G	C	5	5	5	1	1	5	1	1	1	1	1	1	1	2.20
01H	A	5	2	1	1	5	5	3	1	1	1	1	5	5	2.96
01H	B	5	2	1	1	3	5	3	1	1	1	1	5	5	2.86
020	A	5	2	2	1	5	5	5	1	1	1	1	5	5	3.11
020	B	5	2	1	1	4	5	5	1	1	1	1	5	5	3.01
13S	Z	5	2	1	1	5	5	5	1	1	1	1	5	3	2.82
13S	ZA	5	2	2	1	5	5	5	1	1	1	1	5	3	2.87
13S	ZB	5	2	2	1	5	5	5	1	1	1	1	5	3	2.87
13S	ZC	5	2	2	1	5	5	5	1	1	1	1	5	3	2.87
6901	A	3	5	5	2	2	5	5	5	5	3	5	3	1	3.66
6904	A	3	5	5	2	1	1	1	5	1	1	1	3	1	2.49
6906	A	1	5	5	2	1	1	1	1	1	1	1	3	5	2.37
6907	A	1	5	5	1	2	5	3	1	5	3	5	3	3	3.15
6907	B	1	5	5	5	2	5	5	1	3	5	5	3	3	3.39
6907	C	1	5	5	5	1	3	3	1	5	3	5	3	3	3.20
6909	A	1	5	5	2	2	5	3	3	3	5	1	3	5	3.34
6909	B	1	5	5	2	3	5	5	3	1	3	5	3	5	3.43
6913	A	1	5	5	3	2	5	3	1	5	5	3	3	5	3.49
6914	A	1	5	5	5	1	5	5	1	5	3	5	3	1	3.16
6935	A	1	5	5	1	2	1	1	1	5	3	3	3	3	2.73
016	F	5	2	1	1	4	5	5	1	1	1	1	5	5	3.01
016	G	5	2	1	1	5	5	5	1	1	1	1	5	5	3.06
016	H	5	2	2	1	5	5	5	1	1	1	1	5	5	3.11
016	I	5	1	1	1	3	5	5	1	1	1	1	5	5	2.86
016	J	5	1	1	1	3	5	5	1	1	1	1	5	5	2.86
016	K	5	1	1	1	3	5	5	1	1	1	1	5	5	2.86
016	L	5	1	1	1	3	5	5	1	1	1	1	5	5	2.86
016	M	5	1	1	1	3	5	5	1	1	1	1	5	5	2.86
01H	C	5	2	1	1	3	5	3	1	1	1	1	5	5	2.86
01I	A	5	2	1	1	4	5	3	1	1	1	1	5	5	2.91
7518	A	1	5	5	4	2	3	3	3	3	3	3	3	5	3.34
7615	A	1	5	5	4	2	5	5	5	3	3	3	3	5	3.74
01I	B	5	2	1	1	4	5	3	1	1	1	1	5	5	2.91
01I	C	5	2	1	1	5	5	3	1	1	1	1	5	5	2.96
01I	D	5	2	1	1	5	5	3	1	1	1	1	5	5	2.96
01J	A	5	5	5	5	1	5	1	1	1	1	1	1	5	2.88
18A	A	5	5	5	1	2	5	3	1	1	1	1	1	1	2.35
18A	B	5	5	5	1	1	5	3	1	1	1	1	1	1	2.30
18A	C	5	5	5	1	1	5	3	1	1	1	1	1	1	2.30
18A	D	5	5	5	1	1	5	3	1	1	1	1	1	3	2.54
18B	A	5	1	1	1	4	5	5	1	1	1	1	5	5	2.91
18B	B	5	2	1	1	4	5	5	1	1	1	1	5	5	3.01
18B	C	5	2	2	1	4	5	5	1	1	1	1	5	1	2.58
9001	A	3	2	1	1	2	3	3	5	1	3	1	5	5	3.03
9001	B	3	2	2	4	1	3	3	5	1	3	1	3	5	2.94
9001	C	3	5	5	4	1	1	1	5	1	1	1	3	5	3.07
9002	A	1	5	5	3	1	5	1	1	3	3	3	3	5	3.04
9037	A	1	5	5	1	1	5	1	1	3	3	5	3	5	3.06
9045	A	3	5	5	4	3	1	1	3	1	1	1	3	1	2.49
9045	B	3	5	5	4	1	1	1	3	1	1	1	3	1	2.39
9045	C	3	5	5	4	1	1	1	3	1	1	1	3	1	2.39
9047	A	3	5	5	5	1	1	5	1	1	1	1	3	5	2.92
9232	A	1	5	5	3	1	1	1	1	1	1	1	3	5	2.42

Annex E – Route Locations [GPS Tracks]

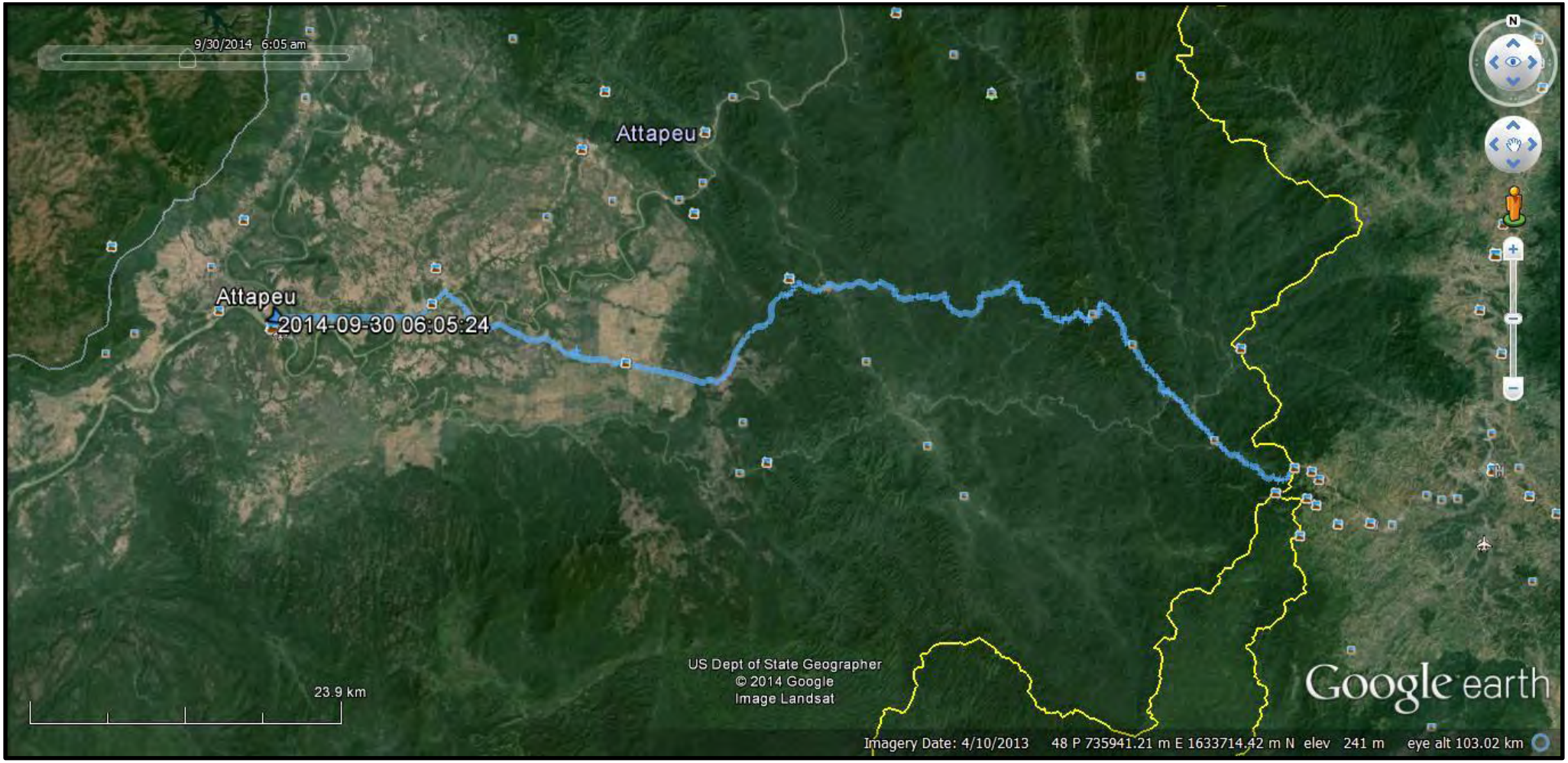


Route Location, NR-20 [GPS Tracking]

National Roads

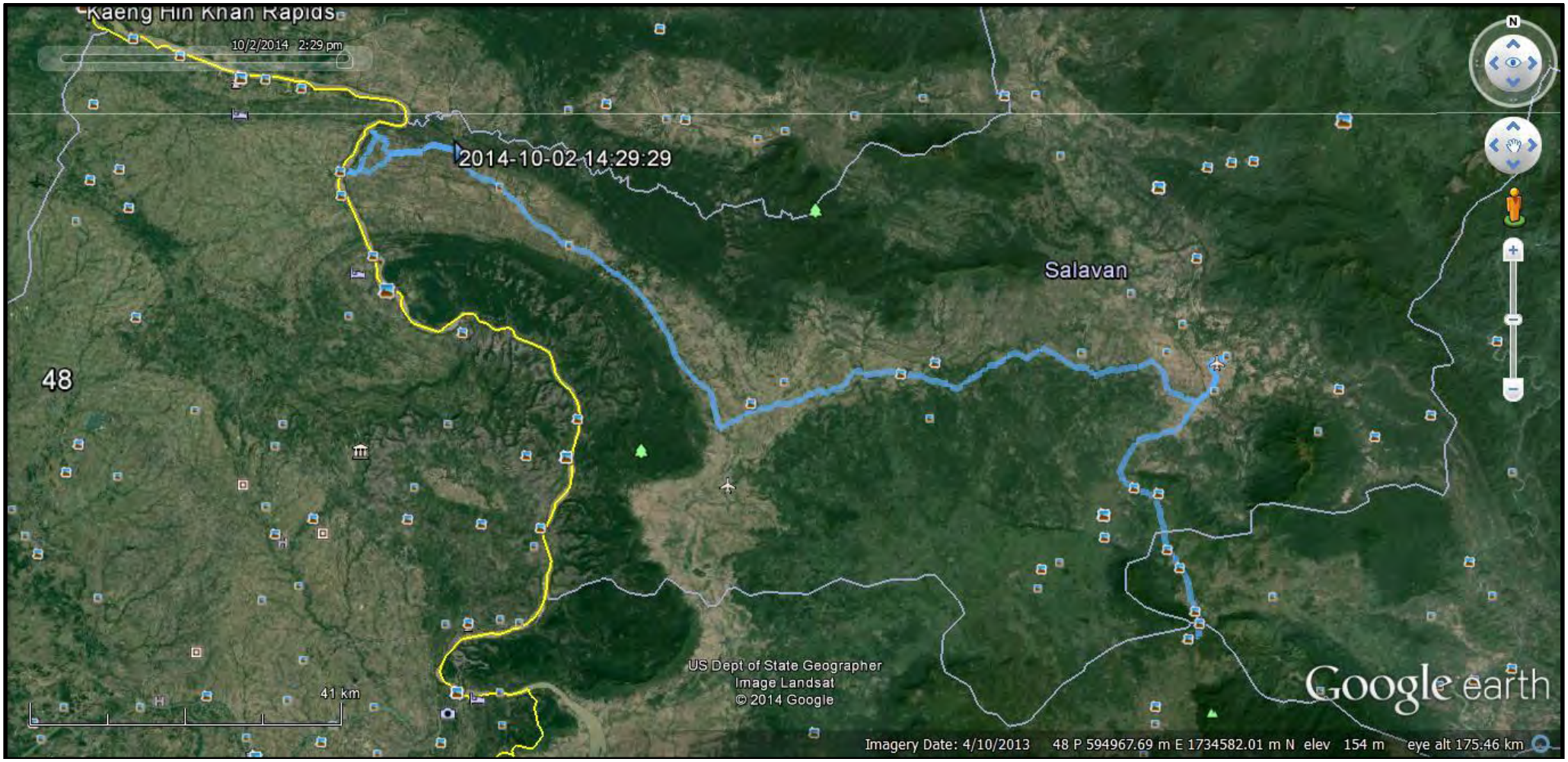


Route Location, NR-16 [GPS Tracking]

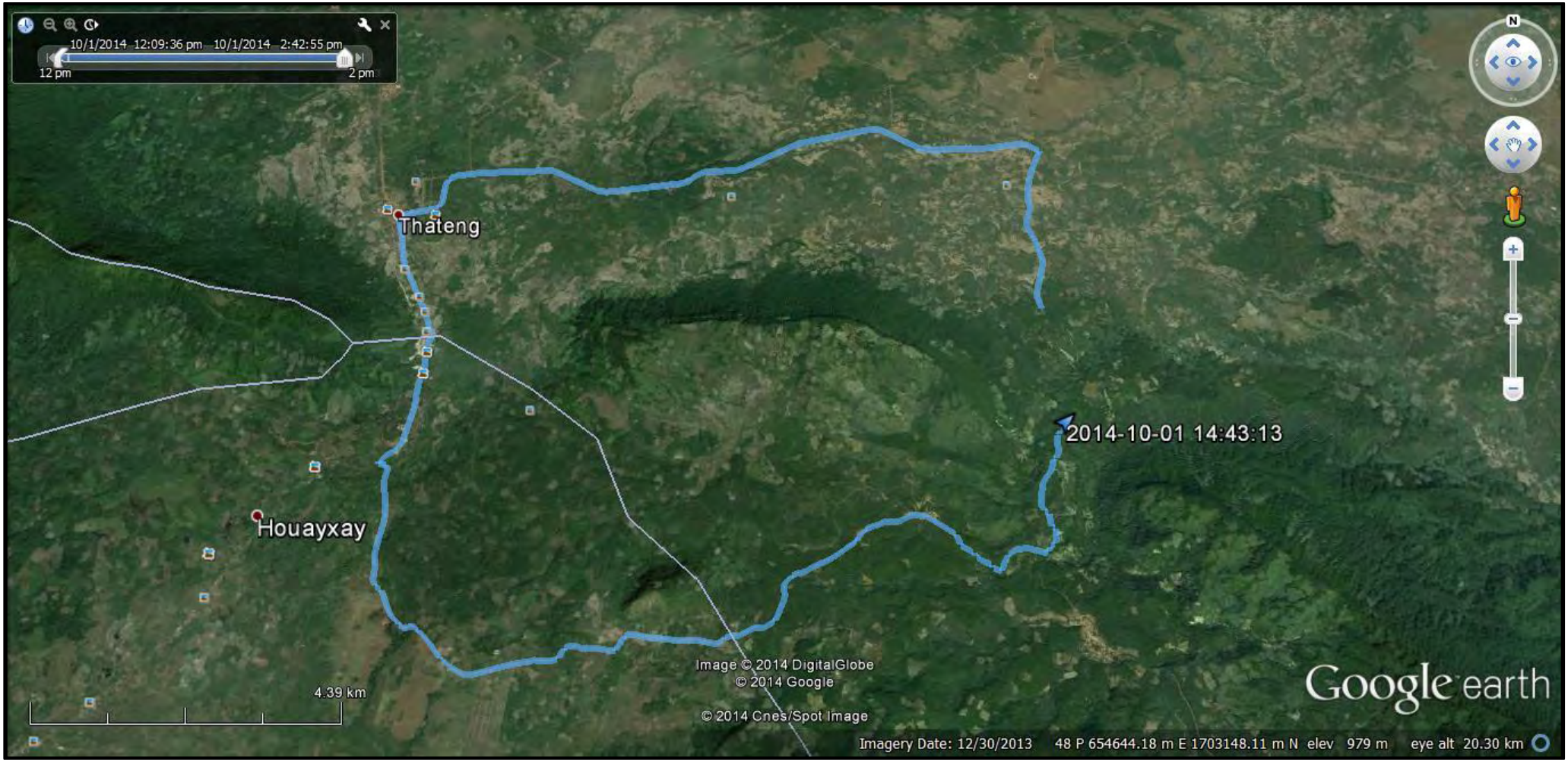


Route Location, NR-18B [GPS Tracking]

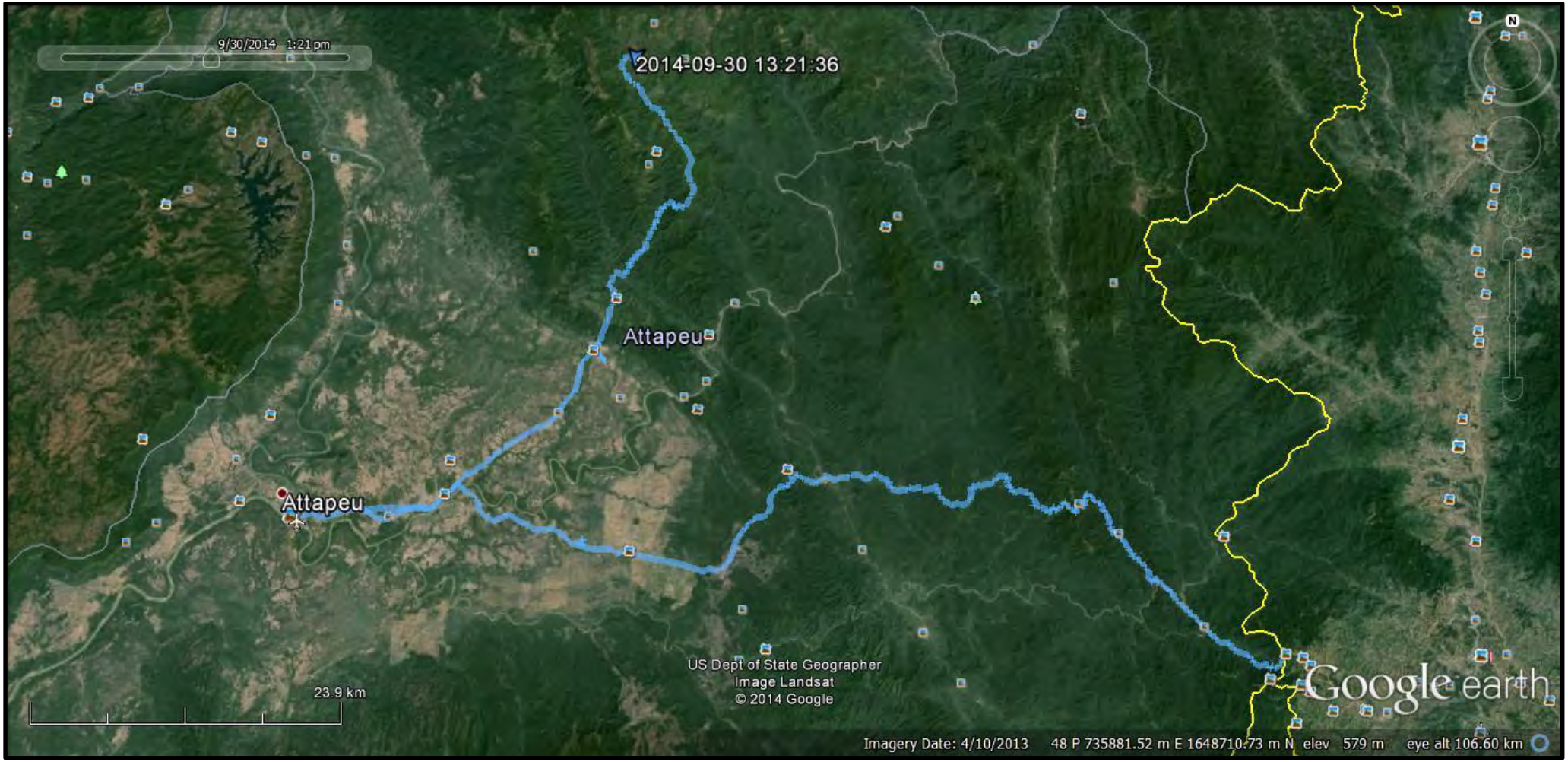
Local Roads



Route Location, LR-6901 [GPS Tracking]



Route location, LR-7615 [GPS Tracking]



Route location, LR-9001 [GPS Tracking]

Annex F – Drainage Structure Inventories

ADB TA-8492 LAO:
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT

BRIDGE & BOX CULVERT INVENTORY

							Bridge Details				Box Culvert Details				GPS Co-ords.		
Road No.	Ref. No.	Crossing Name / Sub-Section	Approx. Location	Approx. Skew (deg)	Type	Flow Direction	No. of Spans	Length [m]	Deck Width Overall [m]	Clearance Beneath Deck [m]	No. of Cells	Length [m]	Interior Width [m]	Interior Height [m]	x =	y =	REMARKS / PROPOSED ACTION
NATIONAL ROAD 20, SALAVAN																	
NR-20	BC-1	A	5+950	90	Concrete						1		1.00	1.00			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-2	A	7+420	90	Concrete						1		1.00	1.00			"
"	BC-3	A	8+040	90	Concrete						1		1.00	1.00			"
"	BC-4	A	8+580	90	Concrete						3		1.00	1.00			"
"	BC-5	A	10+350	90	Concrete						1		1.50	1.50			"
"	BC-6	A	13+180	90	Concrete						1		2.00	2.00			"
"	BC-7	A	13+400	H. Ko	Concrete		NEW BRIDGE, NOT MEASURED				-	-	-	-			Existing concrete bridge - built in 2014
"	BC-8	A	13+580	90	Concrete						1		2.00	2.00			"
"	BC-9	A	13+940	90	Concrete						1		2.00	2.00			"
"	BC-10	A	14+560	90	Concrete						1		2.00	2.00			"
"	BC-11	A	14+750	H. Pasa	Steel		1	18.80	5.60	3.00	-	-	-	-			Built 1990. Replace with twin, 5.3m x 3.5 m box culvert
"	BC-12	A	14+960	90	Concrete						1		2.00	2.00			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-13	A	15+350	H. Soung	Steel		2	30.80	6.10	3.00	-	-	-	-			Built 1990. Replace with twin, 5.3m x 4.0 m box culvert
"	BC-14	A	15+450	90	Concrete						1		2.00	2.00			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-15	A	15+800	H. Leuk	Steel		1	12.70	5.60	3.00	-	-	-	-			Built 1990. Replace with twin, 5.0m x 5.3 m box culvert
"	BC-16	A	17+200	H. Kapork	Steel		1	19.40	5.70	3.00	-	-	-	-			Built 1990. Replace with twin, 5.3m x 3.5 m box culvert
"	BC-17	A	17+500	90	Concrete						1		1.00	1.00			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-18	A	18+250	90	Concrete						1		1.00	1.00			"
"	BC-19	A	19+050	90	Concrete						1		1.00	1.00			"
"	BC-20	A	19+560	90	Concrete						1		2.00	1.00			"
"	BC-21	A	22+040	90	Concrete						1		1.00	1.00			"
"	BC-22	A	23+080	90	Concrete						1		1.00	1.00			"
"	BC-23	A	23+880	90	Concrete						1		1.50	1.50			"
"	BC-24	A	25+880	90	Concrete						1		1.00	1.00			"
"	BC-25	B	26+040	90	Concrete						1		1.00	1.00			"
"	BC-26	B	26+600	H. Tone	Concrete		NEW BRIDGE, NOT MEASURED				-	-	-	-			Existing concrete bridge - built in 2014
"	BC-27	B	27+150	90	Concrete						1		1.00	1.00			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-28	B	28+170	90	Concrete						1		1.00	1.00			"
"	BC-29	B	30+230	90	Concrete						1		1.00	1.00			"
"	BC-30	B	30+700	90	Concrete						1		1.00	1.00			"
"	BC-31	B	30+900	H. Sed	Steel		4	70.40	6.10	7.00	1		1.00	1.00			Built 1990. Allow for basic routine maintenance and deck panel replacement work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-32	B	33+440	90	Concrete						1		1.00	1.00			Allow for basic routine maintenance and deck panel replacement work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-33	B	39+900	H. Vang Peui	Steel		1	15.90	5.70	4.00	-	-	-	-			Built 1990. Allow for basic routine maintenance and wood deck replacement work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-34	B	40+500	90	Concrete						1		2.00	2.00			Allow for basic routine maintenance and deck panel replacement work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-35	B	45+300	H. Poung	Steel		2	43.30	5.10	4.00	-	-	-	-			Built 1990. Allow for basic routine maintenance and deck panel replacement work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-36	B	47+200	H. Nam San	Steel		2	24.80	8.00	4.00	-	-	-	-			Built 1990. Allow for basic routine maintenance and wood deck replacement work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-37	B	49+270	90	Concrete						1		2.00	1.00			Allow for basic routine maintenance and deck panel replacement work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-38	B	53+300	90	Concrete						1		2.00	2.00			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-39	B	56+600	H. Kapher	Concrete				8.00		-	-	-	-			"

ADB TA-8492 LAO:
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT

BRIDGE & BOX CULVERT INVENTORY

							Bridge Details				Box Culvert Details				GPS Co-ords.		
Road No.	Ref. No.	Crossing Name / Sub-Section	Approx. Location	Approx. Skew (deg)	Type	Flow Direction	No. of Spans	Length [m]	Deck Width Overall [m]	Clearance Beneath Deck [m]	No. of Cells	Length [m]	Interior Width [m]	Interior Height [m]	x =	y =	REMARKS / PROPOSED ACTION
NATIONAL ROAD 16, XEKONG																	
NR-16	BC-1	A	0+000	90	Concrete						1		2.00	1.00			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-2	A	2+180	90	Concrete						1		3.00	2.00			"
"	BC-3	A	2+625	90	Concrete						1		3.00	2.00			"
"	BC-4	A	3+300	90	Concrete						2		4.00	4.00			"
"	BC-5	A	3+800	90	Concrete						2		3.00	2.00			"
"	BC-6	A	4+650	90	Concrete						3		4.00	4.00			"
"	BC-7	A	9+100						8.00		-	-	-	-			"
"	BC-8	A	17+780	90	Concrete						1		3.00	2.00			"
"	BC-9	A	18+985	90	Concrete						2		3.00	3.00			"

ADB TA-8492 LAO:
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT

BRIDGE & BOX CULVERT INVENTORY

							Bridge Details				Box Culvert Details				GPS Co-ords.		
Road No.	Ref. No.	Crossing Name / Sub-Section	Approx. Location	Approx. Skew (deg)	Type	Flow Direction	No. of Spans	Length [m]	Deck Width Overall [m]	Clearance Beneath Deck [m]	No. of Cells	Length [m]	Interior Width [m]	Interior Height [m]	x =	y =	REMARKS / PROPOSED ACTION
NATIONAL ROAD 18-B, ATTAPEU																	
NR-18B	BC-1	A	0+315						7.00		-	-	-	-			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-2	A	2+720	90	Concrete						1		2.50	2.00			"
"	BC-3	A	3+030	90	Concrete						1		3.00	2.00			"
"	BC-4	A	4+310						7.00		-	-	-	-			"
"	BC-5	A	8+145	90	Concrete						1		3.00	2.00			"
"	BC-6	A	9+600	90	Concrete						2		3.00	3.00			"
"	BC-7	A	10+910						7.00		-	-	-	-			"
"	BC-8	A	11+350	90	Concrete						1		0.50	0.50			"
"	BC-9	A	11+780	90	Concrete						1		1.00	1.00			"
"	BC-10	A	11+880	90	Concrete						1		1.00	1.00			"
"	BC-11	A	12+060	90	Concrete						1		1.00	1.00			"
"	BC-12	Xekamaru	14+304						8.00								"
"	BC-13	B	19+140	90	Concrete						2		5.20	1.80			"
"	BC-14	Khue Kha	21+446						8.00		-	-	-	-			"
"	BC-15	Huay Rangieng	23+910						8.00		-	-	-	-			"
"	BC-16	B	28+080	90	Concrete						2		5.20	1.80			"
"	BC-17	B	30+850	90	Concrete						2		3.00	3.00			"
"	BC-18	B	35+710						9.00		-	-	-	-			"
"	BC-19	B	38+380	90	Concrete						1		1.50	1.50			"
"	BC-20	B	38+420						18.00		-	-	-	-			"
"	BC-21	B	38+500	90	Concrete						1		1.50	1.30			"
"	BC-22	B	39+930						8.00		-	-	-	-			"
"	BC-23	B	40+435	90	Concrete						1		2.00	2.00			"
"	BC-24	B	41+502						8.00		-	-	-	-			"
"	BC-25	B	43+620	90	Concrete						1		3.00	3.00			"
"	BC-26	B	45+550	90	Concrete						1		3.00	1.60			"
"	BC-27	Huay Droum	46+077						8.00		-	-	-	-			"
"	BC-28	B	52+100	90	Concrete						1		2.20	1.40			"
"	BC-29	Huay Tanied	53+450						7.00		-	-	-	-			"
"	BC-30	Huay Hai	54+240						7.00		-	-	-	-			"
"	BC-31	B	56+250	90	Concrete						4		4.00	4.00			"
"	BC-32	B	57+680	90	Concrete						1		4.00	4.00			"
"	BC-33	B	57+850	90	Concrete						1		2.00	2.00			"
"	BC-34	B	59+610						7.00		-	-	-	-			"
"	BC-35	B	60+950	90	Concrete						2		4.00	4.00			"
"	BC-36	B	61+200	90	Concrete						2		4.00	4.00			"
"	BC-37	B	61+775	90	Concrete						2		4.00	3.00			"
"	BC-38	B	63+000	90	Concrete						3		4.00	4.00			"
"	BC-39	B	63+800	90	Concrete						1		4.00	4.00			"
"	BC-40	B	64+625	90	Concrete						2		3.00	3.00			"
"	BC-41	B	66+450	90	Concrete						1		4.00	4.00			"
"	BC-42	B	67+050	90	Concrete						1		3.00	3.00			"
"	BC-43	B	68+340						8.00		-	-	-	-			"
"	BC-44	B	69+100	90	Concrete						1		4.00	4.00			"
"	BC-45	B	69+840						7.00		-	-	-	-			"
"	BC-46	B	72+625	90	Concrete						2		3.00	3.00			"
"	BC-47	B	73+050	90	Concrete						2		6.00	2.00			"
"	BC-48	B	74+015	90	Concrete						1		3.00	3.00			"

ADB TA-8492 LAO:
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT

BRIDGE & BOX CULVERT INVENTORY

							Bridge Details				Box Culvert Details				GPS Co-ords.		
Road No.	Ref. No.	Crossing Name / Sub-Section	Approx. Location	Approx. Skew (deg)	Type	Flow Direction	No. of Spans	Length [m]	Deck Width Overall [m]	Clearance Beneath Deck [m]	No. of Cells	Length [m]	Interior Width [m]	Interior Height [m]	x =	y =	REMARKS / PROPOSED ACTION
NATIONAL ROAD 18-B, ATTAPEU																	
"	BC-49	B	75+325	90	Concrete						1		3.00	3.00			"
"	BC-50	B	75+625	90	Concrete						1		1.80	1.50			"
"	BC-51	B	75+750	90	Concrete						1		3.00	3.00			"
"	BC-52	B	76+225	90	Concrete						1		2.00	2.00			"
"	BC-53	B	76+490	90	Concrete						1		3.00	2.00			"
"	BC-54	B	76+925	90	Concrete						1		3.00	2.00			"
"	BC-55	B	77+025	90	Concrete						1		3.00	2.00			"
"	BC-56	B	77+190	90	Concrete						1		3.00	2.00			"
"	BC-57	B	84+725	90	Concrete						1		2.50	2,5			"
"	BC-58	Hoay Peek	90+060						7.00		-	-	-	-			"
"	BC-59	B	90+825	90	Concrete						1		2.00	2.00			"
"	BC-60	B	91+150	90	Concrete						1		2.00	2.00			"
"	BC-61	B	91+350	90	Concrete						1		2.00	2.00			"
"	BC-62	B	91+470	90	Concrete						1		2.00	2.00			"
"	BC-63	B	91+950	90	Concrete						1		2.40	2.40			"
"	BC-64	B	93+500	90	Concrete						1						"
"	BC-65	B	97+840	90	Concrete						1		2.00	2.00			"
"	BC-66	B	98+225	90	Concrete						1		4.00	4.00			"
"	BC-67	B	99+395	90	Concrete												"
"	BC-68	B	101+305	90	Concrete						1		3.00	3.00			"
"	BC-69	B	102+705	90	Concrete						1		4.00	4.00			"
"	BC-70	B	104+572						8.00		-	-	-	-			"
"	BC-71	B	106+585	90	Concrete						2		4.00	4.00			"
"	BC-72	B	107+875	90	Concrete						1		4.00	4.00			"
"	BC-73	B	108+945	90	Concrete						1		4.00	3.00			"

ADB TA-8492 LAO:
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT

PIPE CULVERT INVENTORY

							Pipe Culvert Details								GPS Co-ords.		REMARKS / PROPOSED ACTION
Road No.	Ref. No.	Crossing Name / Sub-Section	Approx. Location	Approx. Skew (deg)	Type	Flow Direction	No. of Barrels	Length [m]	Diameter [m]	Inlet Treatment	Erosion Present	Outlet Treatment	Erosion Present	Approx. Slope [%]	x =	y =	
NATIONAL ROAD 20, SALAVAN																	
NR-20	P-1	B	35+950	90	Concrete		1		1.00								Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	P-2	B	46+350	90	Concrete		1		1.00								"
"	P-3	B	47+470	90	Concrete		1		1.50								"
																	Make allowance for replacement of some damaged pipes

ADB TA-8492 LAO:
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT

PIPE CULVERT INVENTORY

							Pipe Culvert Details								GPS Co-ords.		REMARKS / PROPOSED ACTION
Road No.	Ref. No.	Crossing Name / Sub-Section	Approx. Location	Approx. Skew (deg)	Type	Flow Direction	No. of Barrels	Length [m]	Diameter [m]	Inlet Treatment	Erosion Present	Outlet Treatment	Erosion Present	Approx. Slope [%]	x =	y =	
NATIONAL ROAD 16, XEKONG																	
NR-16	P-1	A	0+000	90	Concrete		2		1.00								Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	P-2	A	0+590	90	Concrete		1		1.00								"
"	P-3	A	1+380	90	Concrete		2		1.00								"
"	P-4	A	1+425	90	Concrete		1		1.00								"
"	P-5	A	3+600	90	Concrete		1		1.00								"
"	P-6	A	4+480	90	Concrete		1		1.00								"
"	P-7	A	5+230	90	Concrete		1		1.00								"
"	P-8	A	6+040	90	Concrete		1		1.20								"
"	P-9	A	6+540	90	Concrete		1		1.20								"
"	P-10	A	7+470	90	Concrete		1		1.00								"
"	P-11	A	7+525	90	Concrete		1		1.00								"
"	P-12	A	7+830	90	Concrete		2		1.00								"
"	P-13	A	8+170	90	Concrete		3		1.00								"
"	P-14	A	8+380	90	Concrete		2		1.00								"
"	P-15	A	8+925	90	Concrete		1		1.00								"
"	P-16	A	10+150	90	Concrete		1		1.00								"
"	P-17	A	10+875	90	Concrete		1		1.20								"
"	P-18	A	12+130	90	Concrete		1		1.20								"
"	P-19	A	12+510	90	Concrete		1		1.20								"
"	P-20	A	12+680	90	Concrete		1		1.20								"
"	P-21	A	13+080	90	Concrete		1		1.20								"
"	P-22	A	13+460	90	Concrete		1		1.20								"
"	P-23	A	13+915	90	Concrete		1		1.00								"
"	P-24	A	14+540	90	Concrete		1		1.20								"
"	P-25	A	15+690	90	Concrete		1		1.20								"
"	P-26	A	18+370	90	Concrete		1		1.20								"
"	P-27	A	18+760	90	Concrete		1		1.00								"
																	Make allowance for replacement of some damaged pipes

ADB TA-8492 LAO:
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT

PIPE CULVERT INVENTORY

							Pipe Culvert Details								GPS Co-ords.		
Road No.	Ref. No.	Crossing Name / Sub-Section	Approx. Location	Approx. Skew (deg)	Type	Flow Direction	No. of Barrels	Length [m]	Diameter [m]	Inlet Treatment	Erosion Present	Outlet Treatment	Erosion Present	Approx. Slope [%]	x =	y =	REMARKS / PROPOSED ACTION
NATIONAL ROAD 18-B, ATTAPEU																	
NR-18B	P-1	A	1+850	90	Concrete		1		1.00								Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	P-2	A	2+220	90	Concrete		1		0.60								Replace with larger size pipe
"	P-3	A	2+520	90	Concrete		1		0.60								Replace with larger size pipe
"	P-4	A	3+430	90	Concrete		1		0.60								Replace with larger size pipe
"	P-5	A	3+960	90	Concrete		1		1.50								Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	P-6	A	5+780	90	Concrete		1		1.50								"
"	P-7	A	6+810	90	Concrete		1		1.00								"
"	P-8	A	10+170	90	Concrete		1		1.00								"
"	P-9	A	10+510	90	Concrete		1		1.50								"
"	P-10	A	12+780	90	Concrete		1		1.00								"
"	P-11	A	12+880	90	Concrete		1		1.50								"
"	P-12	A	13+020	90	Concrete		1		1.50								"
"	P-13	A	13+330	90	Concrete		1		1.50								"
"	P-14	A	13+925	90	Concrete		1		1.00								"
"	P-15	B	15+450	90	Concrete		1		0.80								"
"	P-16	B	16+690	90	Concrete		1		1.00								"
"	P-17	B	17+430	90	Concrete		1		1.00								"
"	P-18	B	18+050	90	Concrete		1		1.00								"
"	P-19	B	18+190	90	Concrete		1		1.00								"
"	P-20	B	18+540	90	Concrete		1		1.20								"
"	P-21	B	18+950	90	Concrete		2		1.50								"
"	P-22	B	20+760	90	Concrete		1		0.80								"
"	P-23	B	21+880	90	Concrete		1		0.80								"
"	P-24	B	22+225	90	Concrete		1		1.00								"
"	P-25	B	22+825	90	Concrete		1		0.80								"
"	P-26	B	24+230	90	Concrete		1		1.00								"
"	P-27	B	26+060	90	Concrete		1		0.80								"
"	P-28	B	27+050	90	Concrete		1		1.00								"
"	P-29	B	27+370	90	Concrete		1		1.50								"
"	P-30	B	28+500	90	Concrete		1		1.00								"
"	P-31	B	28+930	90	Concrete		1		1.50								"
"	P-32	B	29+600	90	Concrete		1		0.80								"
"	P-33	B	30+170	90	Concrete		1		1.00								"
"	P-34	B	32+590	90	Concrete		1		1.00								"
"	P-35	B	33+105	90	Concrete		1		1.00								"
"	P-36	B	34+305	90	Concrete		1		1.00								"
"	P-37	B	34+480	90	Concrete		1		1.00								"
"	P-38	B	35+020	90	Concrete		1		1.00								"
"	P-39	B	36+110	90	Concrete		1		1.20								"
"	P-40	B	37+615	90	Concrete		1		0.80								"
"	P-41	B	37+800	90	Concrete		1		0.80								"
"	P-42	B	39+320	90	Concrete		1		0.80								"
"	P-43	B	41+700	90	Concrete		1		0.80								"
"	P-44	B	43+050	90	Concrete		1		0.80								"
"	P-45	B	44+135	90	Concrete		2		1.00								"
"	P-46	B	44+685	90	Concrete		1		1.00								"
"	P-47	B	45+025	90	Concrete		1		0.80								"
"	P-48	B	45+170	90	Concrete		2		1.00								"
"	P-49	B	45+820	90	Concrete		1		1.00								"
"	P-50	B	46+480	90	Concrete		1		1.00								"
"	P-51	B	46+580	90	Concrete		1		1.00								"
"	P-52	B	46+750	90	Concrete		1		0.80								"
"	P-53	B	46+850	90	Concrete		1		0.80								"
"	P-54	B	47+050	90	Concrete		1		0.80								"
"	P-55	B	47+290	90	Concrete		1		0.80								"
"	P-56	B	47+450	90	Concrete		1		0.80								"
"	P-57	B	47+650	90	Concrete		1		0.80								"
"	P-58	B	48+155	90	Concrete		1		0.80								"

ADB TA-8492 LAO:
ROAD SECTOR GOVERNANCE
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PIPE CULVERT INVENTORY

							Pipe Culvert Details								GPS Co-ords.		
Road No.	Ref. No.	Crossing Name / Sub-Section	Approx. Location	Approx. Skew (deg)	Type	Flow Direction	No. of Barrels	Length [m]	Diameter [m]	Inlet Treatment	Erosion Present	Outlet Treatment	Erosion Present	Approx. Slope [%]	x =	y =	REMARKS / PROPOSED ACTION
NATIONAL ROAD 18-B, ATTAPEU																	
"	P-59	B	48+275	90	Concrete		1		0.80								"
"	P-60	B	48+276	90	Concrete		1		0.80								"
"	P-61	B	49+150	90	Concrete		1		0.80								"
"	P-62	B	49+935	90	Concrete		1		0.80								"
"	P-63	B	50+315	90	Concrete		1		0.80								"
"	P-64	B	50+690	90	Concrete		1		0.80								"
"	P-65	B	51+890	90	Concrete		1		1.00								"
"	P-66	B	52+370	90	Concrete		1		1.00								"
"	P-67	B	53+911	90	Concrete		1		1.00								"
"	P-68	B	54+030	90	Concrete		2		0.80								"
"	P-69	B	54+700	90	Concrete		1		0.80								"
"	P-70	B	54+850	90	Concrete		1		0.80								"
"	P-71	B	55+015	90	Concrete		1		1.00								"
"	P-72	B	55+350	90	Concrete		1		1.00								"
"	P-73	B	55+820	90	Concrete		1		1.00								"
"	P-74	B	55+910	90	Concrete		1		1.00								"
"	P-75	B	56+025	90	Concrete		1		1.00								"
"	P-76	B	56+175	90	Concrete		1		1.00								"
"	P-77	B	57+100	90	Concrete		1		1.00								"
"	P-78	B	57+200	90	Concrete		1		1.00								"
"	P-79	B	57+400	90	Concrete		1		1.00								"
"	P-80	B	58+050	90	Concrete		1		1.00								"
"	P-81	B	58+700	90	Concrete		1		1.00								"
"	P-82	B	60+500	90	Concrete		1		1.00								"
"	P-83	B	63+450	90	Concrete		1		1.00								"
"	P-84	B	67+180	90	Concrete		2		1.50								"
"	P-85	B	67+550	90	Concrete		1		1.00								"
"	P-86	B	67+850	90	Concrete		1		1.00								"
"	P-87	B	69+400	90	Concrete		1		1.00								"
"	P-88	B	70+325	90	Concrete		1		1.50								"
"	P-89	B	70+500	90	Concrete		1		1.00								"
"	P-90	B	71+015	90	Concrete		1		1.00								"
"	P-91	B	71+315	90	Concrete		1		1.00								"
"	P-92	B	71+410	90	Concrete		1		1.00								"
"	P-93	B	71+620	90	Concrete		2		1.50								"
"	P-94	B	71+960	90	Concrete		1		1.50								"
"	P-95	B	72+100	90	Concrete		2		1.50								"
"	P-96	B	72+350	90	Concrete		1		1.00								"
"	P-97	B	73+150	90	Concrete		1		1.00								"
"	P-98	B	73+430	90	Concrete		1		1.00								"
"	P-99	B	73+850	90	Concrete		1		1.00								"
"	P-100	B	74+325	90	Concrete		1		1.00								"
"	P-101	B	74+850	90	Concrete		1		1.00								"
"	P-102	B	74+950	90	Concrete		1		1.00								"
"	P-103	B	77+350	90	Concrete		1		1.00								"
"	P-104	B	77+725	90	Concrete		1		1.00								"
"	P-105	B	78+400	90	Concrete		1										"
"	P-106	B	79+125	90	Concrete		1		1.00								"
"	P-107	B	79+900	90	Concrete		1										"
"	P-108	B	80+150	90	Concrete		1										"
"	P-109	B	80+350	90	Concrete		1		1.00								"
"	P-110	B	80+690	90	Concrete		1		1.00								"
"	P-111	B	81+280	90	Concrete		1		1.00								"
"	P-112	B	81+710	90	Concrete		1		1.00								"
"	P-113	B	82+290	90	Concrete		1		1.00								"
"	P-114	B	82+750	90	Concrete		1		1.00								"
"	P-115	B	82+950	90	Concrete		1		1.00								"
"	P-116	B	83+180	90	Concrete		1		1.00								"
"	P-117	B	83+350	90	Concrete		1		1.00								"

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PIPE CULVERT INVENTORY

							Pipe Culvert Details								GPS Co-ords.		
Road No.	Ref. No.	Crossing Name / Sub-Section	Approx. Location	Approx. Skew (deg)	Type	Flow Direction	No. of Barrels	Length [m]	Diameter [m]	Inlet Treatment	Erosion Present	Outlet Treatment	Erosion Present	Approx. Slope [%]	x =	y =	REMARKS / PROPOSED ACTION
NATIONAL ROAD 18-B, ATTAPEU																	
"	P-118	B	84+090	90	Concrete		1		1.00								"
"	P-119	B	84+200	90	Concrete		1		1.00								"
"	P-120	B	86+510	90	Concrete		1		1.50								"
"	P-121	B	86+845	90	Concrete		1		1.50								"
"	P-122	B	86+950	90	Concrete		1		1.50								"
"	P-123	B	87+430	90	Concrete		1		1.50								"
"	P-124	B	87+510	90	Concrete		1		1.50								"
"	P-125	B	87+610	90	Concrete		1		1.50								"
"	P-126	B	87+735	90	Concrete		1		1.50								"
"	P-127	B	87+955	90	Concrete		1		1.50								"
"	P-128	B	88+095	90	Concrete		1		1.50								"
"	P-129	B	88+410	90	Concrete		1		1.50								"
"	P-130	B	88+505	90	Concrete		1		1.50								"
"	P-131	B	88+704	90	Concrete		1										"
"	P-132	B	89+095	90	Concrete		1		1.50								"
"	P-133	B	89+320	90	Concrete		1		1.00								"
"	P-134	B	89+525	90	Concrete		1		1.50								"
"	P-135	B	90+300	90	Concrete		1		1.50								"
"	P-136	B	90+475	90	Concrete		1		1.50								"
"	P-137	B	90+705	90	Concrete		1		1.50								"
"	P-138	B	92+220	90	Concrete		1		1.00								"
"	P-139	B	92+950	90	Concrete		1		1.50								"
"	P-140	B	95+140	90	Concrete		2		1.50								"
"	P-141	B	95+960	90	Concrete		1		0.80								"
"	P-142	B	96+315	90	Concrete		1		1.50								"
"	P-143	B	98+605	90	Concrete		1		1.00								"
"	P-144	B	98+705	90	Concrete		1		1.00								"
"	P-145	B	98+775	90	Concrete		1		1.00								"
"	P-146	B	98+920	90	Concrete		1		1.00								"
"	P-147	B	99+995	90	Concrete		1		1.20								"
"	P-148	B	100+465	90	Concrete		1		1.00								"
"	P-149	B	100+790	90	Concrete		1		1.00								"
"	P-150	B	101+500	90	Concrete		2		2.00								"
"	P-151	B	103+060	90	Concrete		1		1.20								"
"	P-152	B	103+825	90	Concrete		1		1.00								"
"	P-153	B	104+350	90	Concrete		1		2.00								"
"	P-154	B	105+540	90	Concrete		1		1.00								"
"	P-155	B	105+720	90	Concrete		1		1.00								"
"	P-156	B	105+900	90	Concrete		1		1.00								"
"	P-157	B	106+200	90	Concrete		1		1.50								"
"	P-158	B	106+360	90	Concrete		1		1.50								"
"	P-159	B	107+375	90	Concrete		1		1.50								"
"	P-160	B	107+675	90	Concrete		1		1.50								"
"	P-161	B	108+060	90	Concrete		1		1.20								"
"	P-162	B	109+825	90	Concrete		2		1.00								"
"	P-163	B	110+605	90	Concrete		1		1.00								"
"	P-164	B	110+925	90	Concrete		1		2.00								"
																	Make allowance for replacement of some damaged pipes

ADB TA-8492 LAO:
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT

BRIDGE & BOX CULVERT INVENTORY

							Bridge Details				Box Culvert Details				GPS Co-ords.		
Road No.	Ref. No.	Disrict / Name of Crossing	Approx. Location	Skew (deg)	Type	Flow Direction	No. of Spans	Length [m]	Deck Width Overall [m]	Clearance Beneath Deck [m]	No. of Cells	Length [m]	Interior Width [m]	Interior Height [m]	x =	y =	REMARKS / PROPOSED ACTION
LOCAL ROAD 6901, SALAVAN																	
LR-6901	BC-1		0+108								1		1.00	1.00			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-2		0+449								1		1.00	1.00			"
"	BC-3		7+758								1		2.00	2.00			"

Road No.	Ref. No.	Disrict / Name of Crossing	Approx. Location	Skew (deg)	Type	Flow Direction	No. of Spans	Length [m]	Deck Width Overall [m]	Clearance Beneath Deck [m]	No. of Cells	Length [m]	Interior Width [m]	Interior Height [m]	x =	y =	
LOCAL ROAD 7615, XEKONG																	
LR-7615	BC-1		0+175								2		2.00	2.00			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-2		1+807								2		2.00	2.00			"
"	BC-3	Huay	18+161				?										Replace old bridge with Bailey Bridge in DPWT storage
"	BC-4	Old Bridge	19+409				?										Replace with twin cell, 5.3 m x 3.5 m box culvert
"	BC-5		22+429								1		1.00	1.00			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.

Road No.	Ref. No.	Disrict / Name of Crossing	Approx. Location	Skew (deg)	Type	Flow Direction	No. of Spans	Length [m]	Deck Width Overall [m]	Clearance Beneath Deck [m]	No. of Cells	Length [m]	Interior Width [m]	Interior Height [m]	x =	y =	
LOCAL ROAD 9001, ATTAPEU																	
LR-9001	BC-1		17+960								1		3.00	3.00			Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	BC-2	Nam Pa II	18+800				1										"
"	BC-3		20+400								1		3.00	2.00			"
"	BC-4		20+780								3		3.00	3.00			"
"	BC-5		22+040								1		3.00	3.00			"
"	BC-6		22+530								3		3.00	3.00			"
"	BC-7	Nam Pa III	23+080				1										"
"	BC-8	Nam Thouay	25+800				1										"
"	BC-9		27+300								1		2.00	2.00			"
"	BC-10		27+555								1		3.00	2.00			"
"	BC-11		28+360								1		3.00	2.00			"
"	BC-12		28+480								2		3.00	2.00			"
"	BC-13		29+415								1		3.00	3.00			"
"	BC-14		29+795								1		3.00	3.00			"
"	BC-15	BC08P	30+600				?										"
"	BC-16	BC09P	31+960				?										"
"	BC-17		35+400								1	25.00	3.50	5.00			Replace with new box structure

ADB TA-8492 LAO:
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT

PIPE CULVERT INVENTORY

							Pipe Culvert Details								GPS Co-ords.		
Road No.	Ref. No.	District	Approx. Location	Skew (deg)	Type	Flow Direction	No. of Barrels	Length [m]	Diameter [m]	Inlet Treatment	Erosion Present	Outlet Treatment	Erosion Present	Approx. Slope [%]	x =	y =	REMARKS / PROPOSED ACTION
LOCAL ROAD 6901, SALAVAN																	
LR-6901	P-1		0+016				1		0.60								Replace with larger size pipe
"	P-2		1+884				1		1.00								Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	P-3		2+492				1		0.80								"
"	P-4		2+948				1		1.00								"
"	P-5		3+825				2		1.00								"
"	P-6		5+826				1		0.60								Replace with larger size pipe
"	P-7		5+842				1		0.80								Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	P-8		7+035				1		0.60								Replace with larger size pipe
"	P-9		10+303				1		0.60								Replace with larger size pipe
"	P-10		11+385				1		0.60								"
"	P-11		12+238				1		1.00								Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	P-12		16+408				1		1.00								"

Road No.	Ref. No.	District	Approx. Location	Skew (deg)	Type	Flow Direction	No. of Barrels	Length [m]	Diameter [m]	Inlet Treatment	Erosion Present	Outlet Treatment	Erosion Present	Approx. Slope [%]	x =	y =	
LOCAL ROAD 7615, XEKONG																	
LR-7615	P-1		2+725				2		1.00								Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	P-2		3+559				1		1.00								"
"	P-3		3+858				1		1.00								"
"	P-4		6+562				1		1.00								"
"	P-5		8+668				2		1.00								"
"	P-6		13+367				1		1.00								"
"	P-7		13+782				1		1.00								"
"	P-8		14+098				1		1.00								"
"	P-9		19+918				1		0.80								"
"	P-10		20+556				1		1.00								"
"	P-11		20+775				1		1.00								"
"	P-12		20+856				1		1.50								"
"	P-13		21+278				1		0.60								Replace with larger size pipe
"	P-14		21+494				2		1.00								Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	P-15		22+034				1		0.80								"

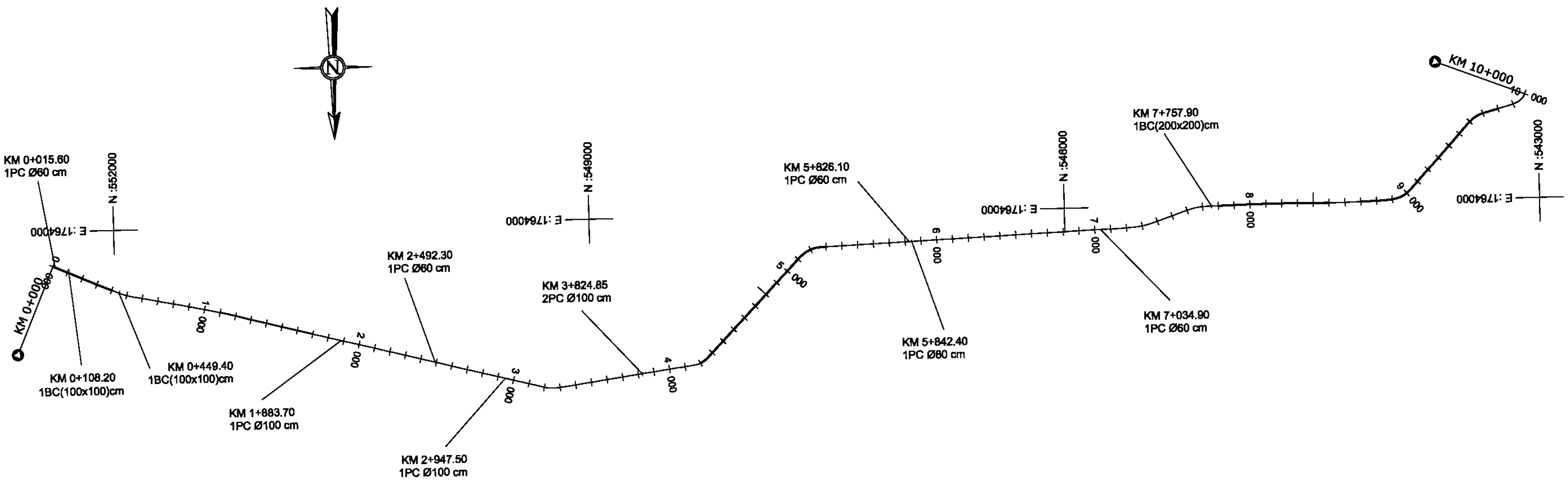
Road No.	Ref. No.	District	Approx. Location	Skew (deg)	Type	Flow Direction	No. of Barrels	Length [m]	Diameter [m]	Inlet Treatment	Erosion Present	Outlet Treatment	Erosion Present	Approx. Slope [%]	x =	y =	
LOCAL ROAD 9001, ATTAPEU																	
LR-9001	P-1		17+115				1		1.00								Allow for basic routine maintenance work in estimate. Must be confirmed in 2015-16 detailed design.
"	P-2		17+305				1		1.00								"
"	P-3		17+710				1		1.00								"
"	P-4		17+805				1		1.00								"
"	P-5		18+290				1		1.00								"
"	P-6		18+550				1		1.00								"
"	P-7		18+690				1		1.00								"
"	P-8		19+190				1		1.00								"
"	P-9		19+860				1		1.00								"
"	P-10		20+000				1		1.00								"
"	P-11		20+180				1		1.00								"
"	P-12		20+200				1		1.00								"

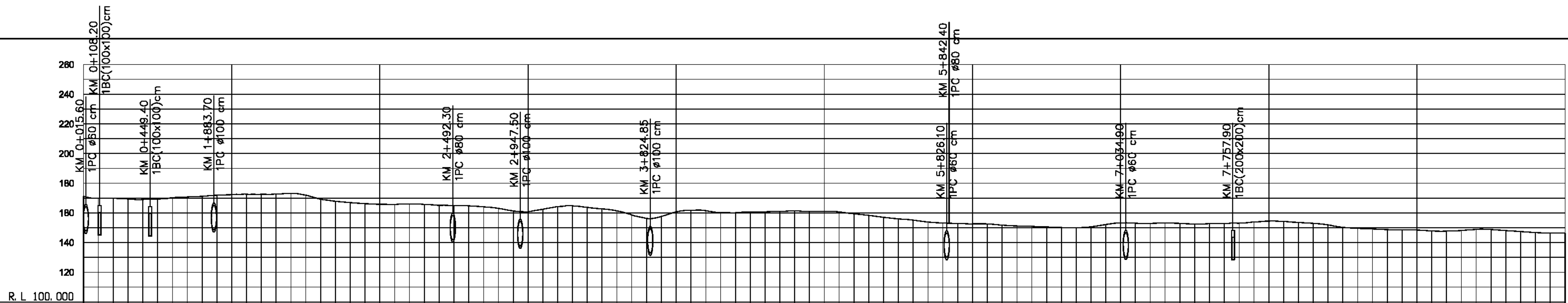
ADB TA-8492 LAO:
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT

PIPE CULVERT INVENTORY

							Pipe Culvert Details								GPS Co-ords.		
Road No.	Ref. No.	District	Approx. Location	Skew (deg)	Type	Flow Direction	No. of Barrels	Length [m]	Diameter [m]	Inlet Treatment	Erosion Present	Outlet Treatment	Erosion Present	Approx. Slope [%]	x =	y =	REMARKS / PROPOSED ACTION
"	P-13		20+450				1		1.00								"
"	P-14		21+070				1		1.00								"
"	P-15		21+550				1		1.00								"
"	P-16		21+640				1		1.00								"
"	P-17		22+700				1		1.00								"
"	P-18		23+300				1		1.00								"
"	P-19		23+750				1		1.00								"
"	P-20		23+905				1		1.00								"
"	P-21		24+005				1		1.00								"
"	P-22		24+100				1		1.00								"
"	P-23		24+180				1		1.00								"
"	P-24		24+330				1		1.00								"
"	P-25		24+510				1		1.00								"
"	P-26		24+800				1		1.00								"
"	P-27		25+090				1		1.00								"
"	P-28		25+230				1		1.00								"
"	P-29		25+500				1		1.00								"
"	P-30		26+110				1		1.00								"
"	P-31		26+850				1		1.00								"
"	P-32		27+110				1		1.00								"
"	P-33		27+960				2		1.00								"
"	P-34		28+670				1		1.00								"
"	P-35		28+950				1		1.00								"
"	P-36		29+580				1		1.00								"
"	P-37		30+150				1		1.00								"
"	P-38		30+205				1		1.00								"
"	P-39		31+110				1		1.00								"
"	P-40		31+415				1		1.00								"
"	P-41		31+730				1		1.00								"
"	P-42		31+800				1		1.00								"
"	P-43		3+100				1		1.00								"
"	P-44		32+315				1		1.00								"
"	P-45		32+805				1		1.00								"
"	P-46		33+080				1		1.00								"
"	P-47		33+700				1		1.00								"
"	P-48		34+155				1		1.00								"
"	P-49		34+495				1		1.00								"
"	P-50		34+610				1		1.00								"
"	P-51		35+590				1		1.00								"
"	P-52		36+720				1		1.00								"
"	P-53		37+350				1		1.00								"
"	P-54		37+690				1		1.00								"
"	P-55		40+360				1		1.00								"
"	P-56		46+480				1		1.00								"

Annex G – Local Road Plans / Profiles





GRADIENT
- >15%
- 15%> >12%

CHAINAGE	EXISTING LEVEL
0+000	171.134
0+100	169.884
0+200	169.836
0+300	169.341
0+400	169.022
0+500	169.308
0+600	170.215
0+700	170.718
0+800	171.161
0+900	171.864
1+000	172.262
1+100	172.541
1+200	172.496
1+300	172.659
1+400	173.102
1+500	171.945
1+600	169.227
1+700	167.908
1+800	166.886
1+900	166.214
2+000	165.794
2+100	165.720
2+200	165.871
2+300	165.732
2+400	165.097
2+500	164.970
2+600	164.746
2+700	164.067
2+800	163.006
2+900	161.320
3+000	160.803
3+100	162.439
3+200	164.191
3+300	164.732
3+400	163.697
3+500	162.715
2+600	161.360
3+700	158.666
3+800	156.310
3+900	157.575
4+000	160.674
4+100	161.695
4+200	161.459
4+300	160.212
4+400	160.066
4+500	160.496
4+600	160.708
4+700	161.010
4+800	161.277
4+900	161.012
5+000	161.080
5+100	160.635
5+200	159.404
5+300	158.310
5+400	156.979
5+500	156.001
5+600	155.107
5+700	153.869
5+800	153.154
5+900	152.856
6+000	152.594
6+100	152.530
6+200	151.743
6+300	151.159
6+400	150.960
6+500	150.488
6+600	150.164
6+700	149.918
6+800	150.615
6+900	152.159
7+000	153.153
7+100	153.020
7+200	152.961
7+300	153.132
7+400	152.915
7+500	152.448
7+600	152.777
7+700	152.725
7+800	153.052
7+900	153.888
8+000	154.459
8+100	154.203
8+200	153.544
8+300	152.927
8+400	151.942
8+500	150.242
8+600	149.605
8+700	149.160
8+800	148.645
8+900	148.629
9+000	148.444
9+100	147.840
9+200	147.693
9+300	148.126
9+400	148.930
9+500	148.788
9+600	148.042
9+700	147.449
9+800	146.710
9+900	146.536
10+000	146.405

WIDTH [m]	6.0	6.0	5.5	5.5	5.5
SURFACE TYPE [DBST, Laterite, Base or Sub-base]	EXIST. DBST 0+000 TO 0+300 APPROX.	SECTION A, LATERITE SURFACE	SECT. A- LATERITE	SECTION A, LATERITE SURFACE. EXISTING DBST 4+400 TO 4+600, 8+000 TO 8+400 AND 8+900 TP 9+300 APPROX.	SECT. A, LATERITE

2014 CONDITION [Good, Fair, Poor]	FAIR	FAIR DUE TO REGULAR MAINTENANCE WORK	FAIR - FLOOD PRONE	FAIR	FLOOD PRONE	FAIR

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MINISTRY OF PUBLIC WORKS AND TRANSPORT

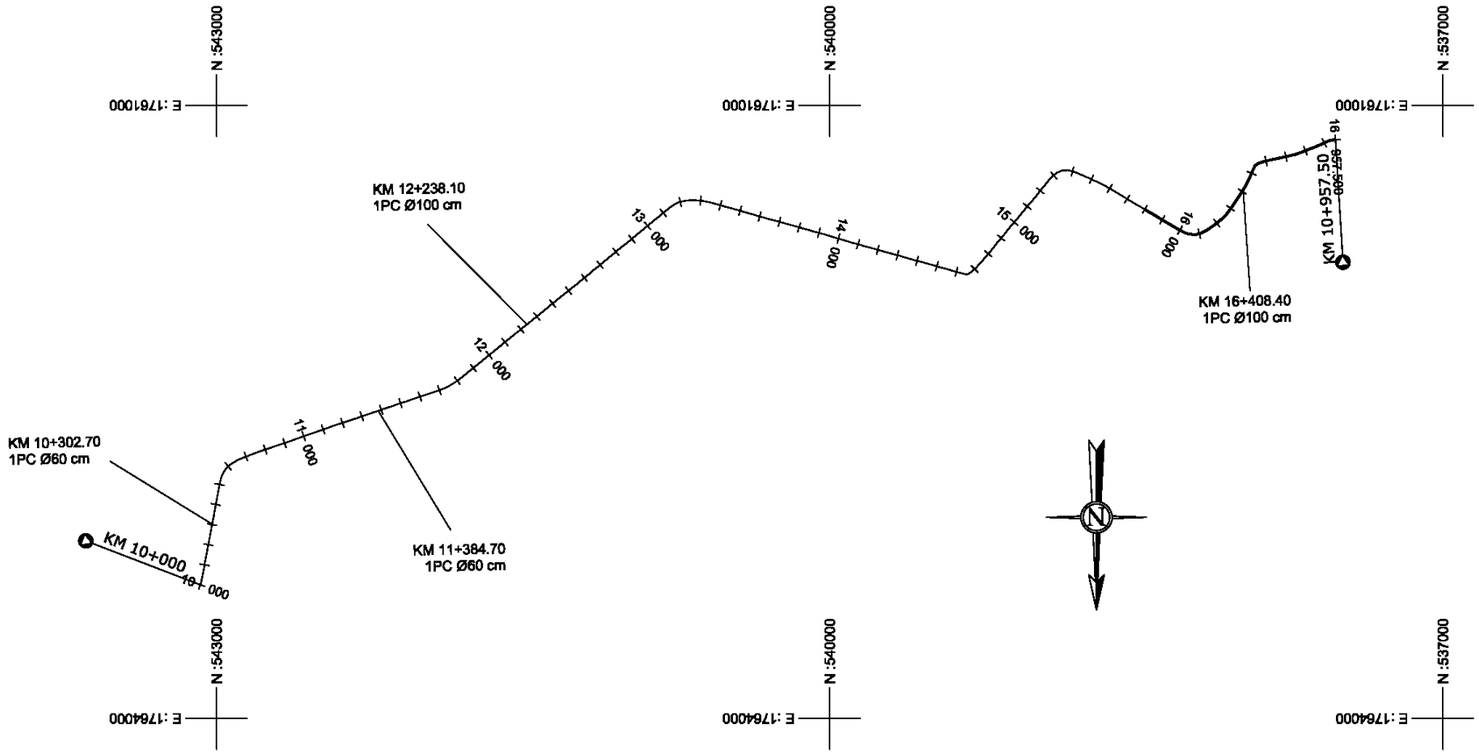
ADB TA - 8492 LAO
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT (47085 - 001)

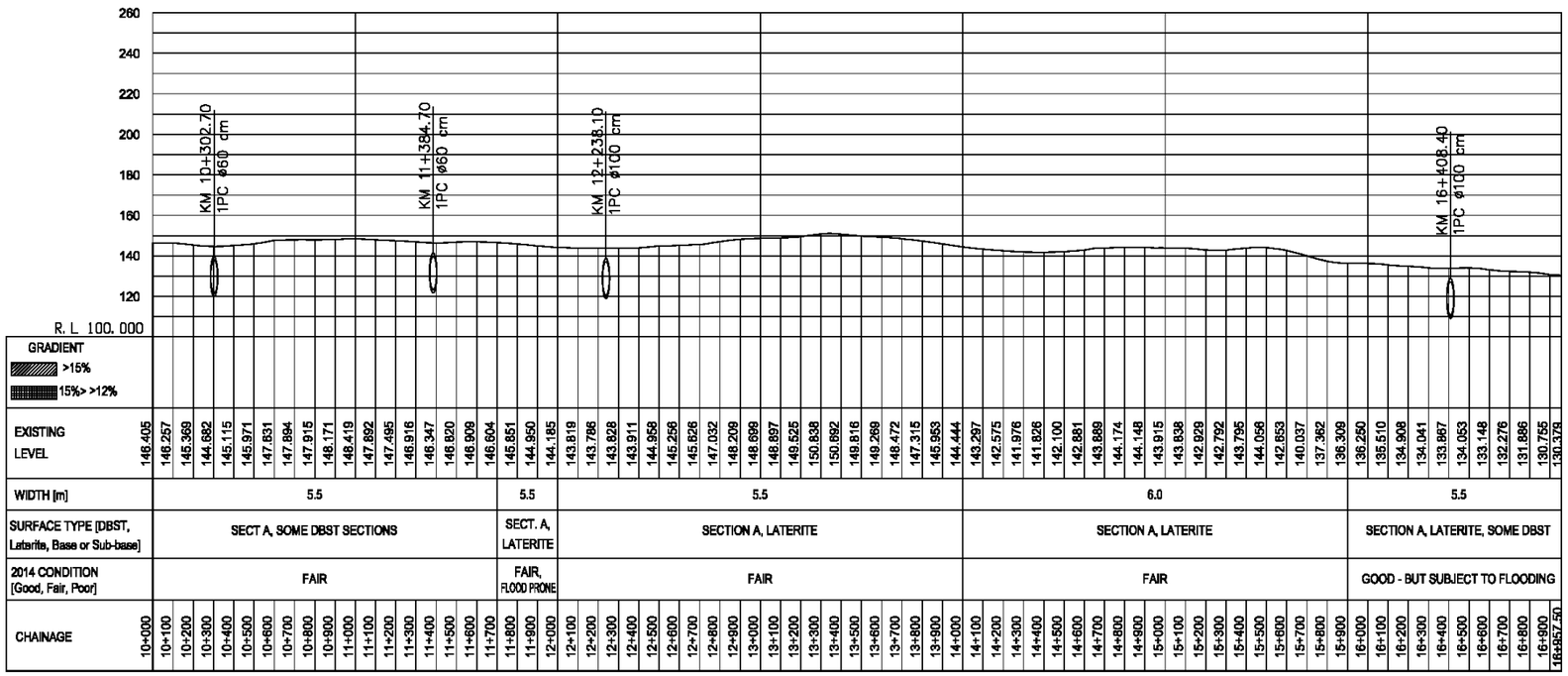
DRAWING TITLE: PLAN - PROFILE ROAD 6901 KM 0+000 - 10+000

REV. No.	DATE	DESCRIPTION
A	29-OCT-2014	
B	21-APR-2015	
-		
-		

SCALE: 1/30 000

DRAWING No.: 01





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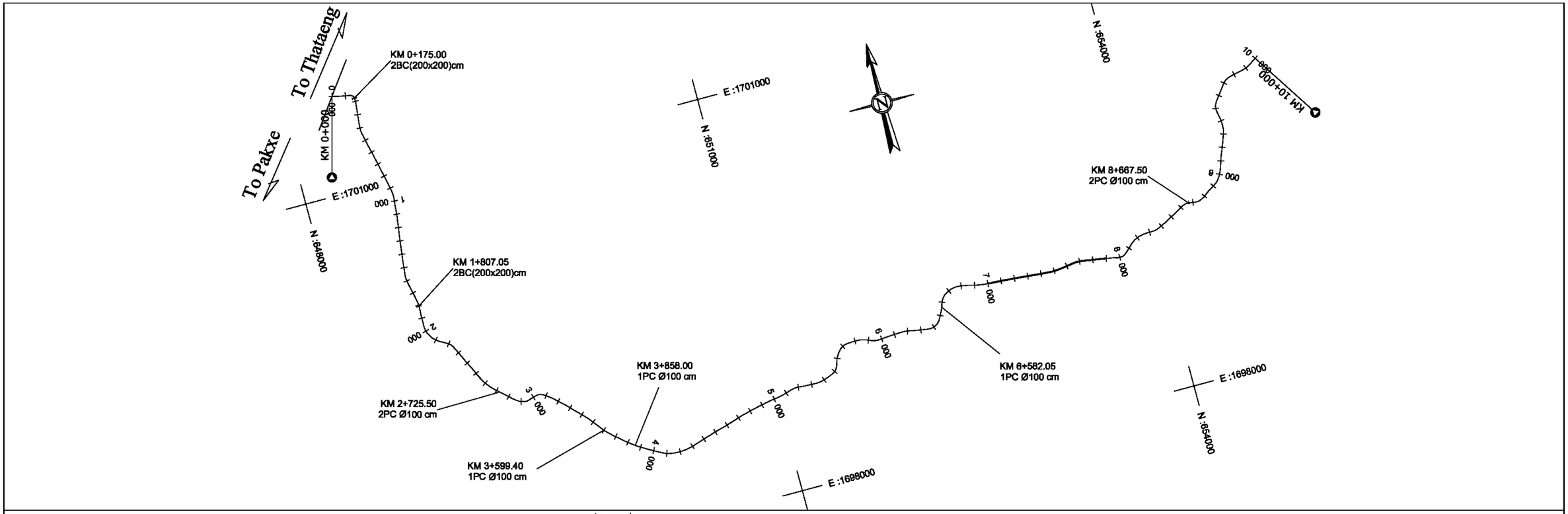
ADB TA - 8492 LAO
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT (47085 - 001)

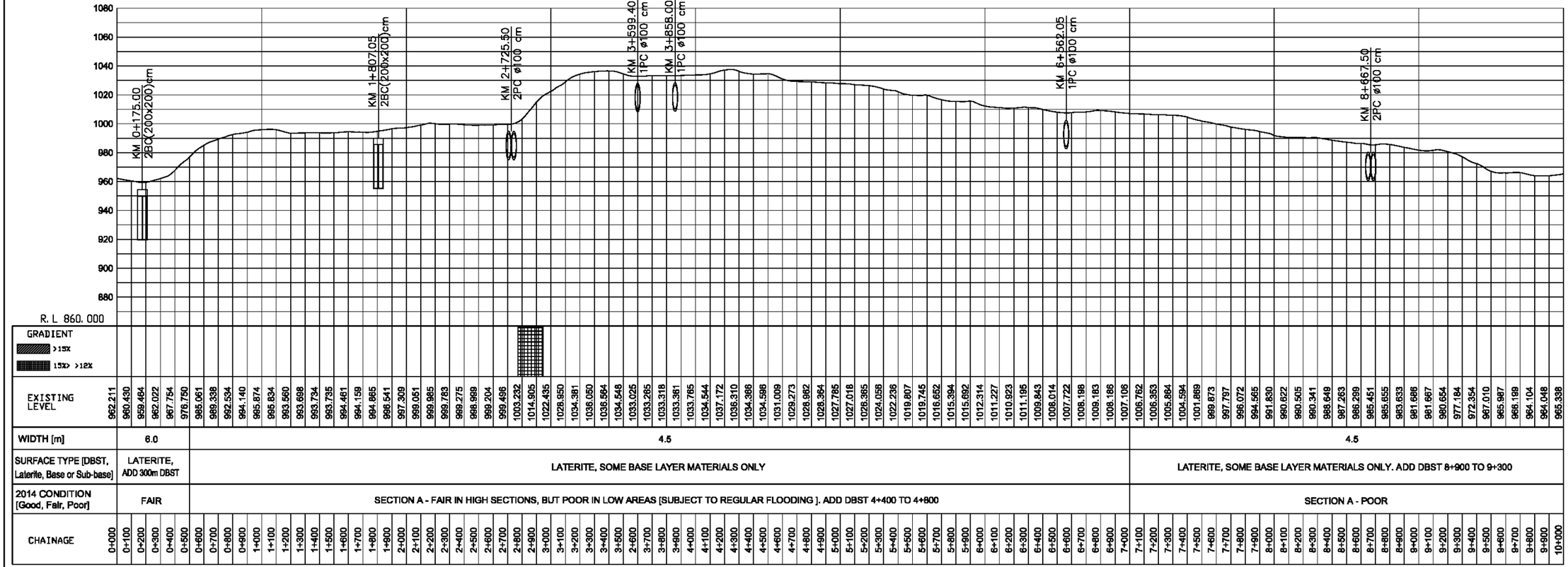
DRAWING TITLE: **PLAN - PROFILE ROAD 6901 KM 10+000 - 16+957.50**

REV. No.	DATE	DESCRIPTION
A	29-OCT-2014	
B	21-APR-2015	
-		
-		

SCALE: 1/30 000

DRAWING No.: 02





GRADIENT
>15%
15%> >12%

CHAINAGE	EXISTING LEVEL
0+000	962.211
0+100	960.430
0+200	959.464
0+300	962.022
0+400	967.754
0+500	976.750
0+600	985.061
0+700	989.338
0+800	992.534
0+900	994.140
1+000	995.874
1+100	995.834
1+200	993.560
1+300	993.698
1+400	993.734
1+500	993.735
1+600	994.461
1+700	994.159
1+800	994.865
1+900	996.541
2+000	997.309
2+100	999.051
2+200	999.985
2+300	999.783
2+400	999.275
2+500	998.999
2+600	999.204
2+700	999.496
2+800	1003.232
2+900	1014.905
3+000	1022.435
3+100	1028.950
3+200	1034.381
3+300	1036.050
3+400	1036.564
3+500	1034.548
3+600	1033.025
3+700	1033.265
3+800	1033.318
3+900	1033.381
4+000	1033.765
4+100	1034.544
4+200	1037.172
4+300	1036.310
4+400	1034.366
4+500	1034.598
4+600	1031.009
4+700	1029.273
4+800	1028.982
4+900	1028.364
5+000	1027.785
5+100	1027.018
5+200	1028.385
5+300	1024.058
5+400	1022.236
5+500	1019.807
5+600	1019.745
5+700	1016.652
5+800	1015.394
5+900	1015.692
6+000	1012.314
6+100	1011.227
6+200	1010.923
6+300	1011.195
6+400	1009.843
6+500	1008.014
6+600	1007.722
6+700	1008.198
6+800	1009.183
6+900	1008.186
7+000	1007.106
7+100	1006.762
7+200	1006.353
7+300	1005.864
7+400	1004.594
7+500	1001.869
7+600	999.873
7+700	997.797
7+800	996.072
7+900	994.565
8+000	991.830
8+100	990.622
8+200	990.505
8+300	990.341
8+400	988.649
8+500	987.263
8+600	986.299
8+700	985.451
8+800	985.655
8+900	983.633
9+000	981.686
9+100	981.667
9+200	980.654
9+300	977.184
9+400	972.354
9+500	967.010
9+600	965.987
9+700	966.189
9+800	964.104
9+900	964.048
10+000	965.338

WIDTH [m]	6.0	4.5	4.5
SURFACE TYPE [DBST, Laterite, Base or Sub-base]	LATERITE, ADD 300m DBST	LATERITE, SOME BASE LAYER MATERIALS ONLY	LATERITE, SOME BASE LAYER MATERIALS ONLY. ADD DBST 8+900 TO 9+300
2014 CONDITION [Good, Fair, Poor]	FAIR	SECTION A - FAIR IN HIGH SECTIONS, BUT POOR IN LOW AREAS [SUBJECT TO REGULAR FLOODING]. ADD DBST 4+400 TO 4+800	SECTION A - POOR

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THE LAO PEOPLE'S DEMOCRATIC REPUBLIC
MINISTRY OF PUBLIC WORKS AND TRANSPORT

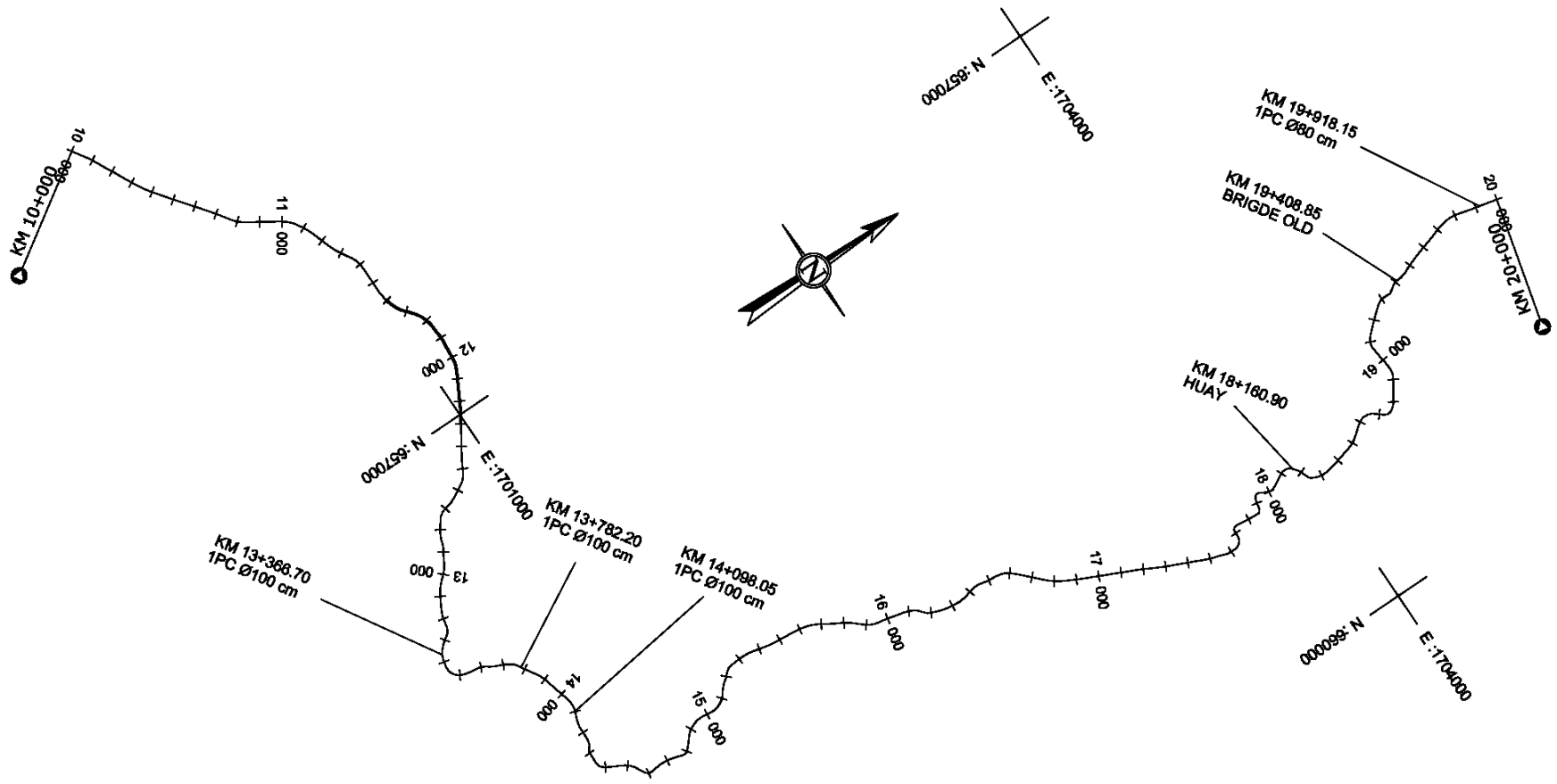
ADB TA - 8492 LAO
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT (47085 - 001)

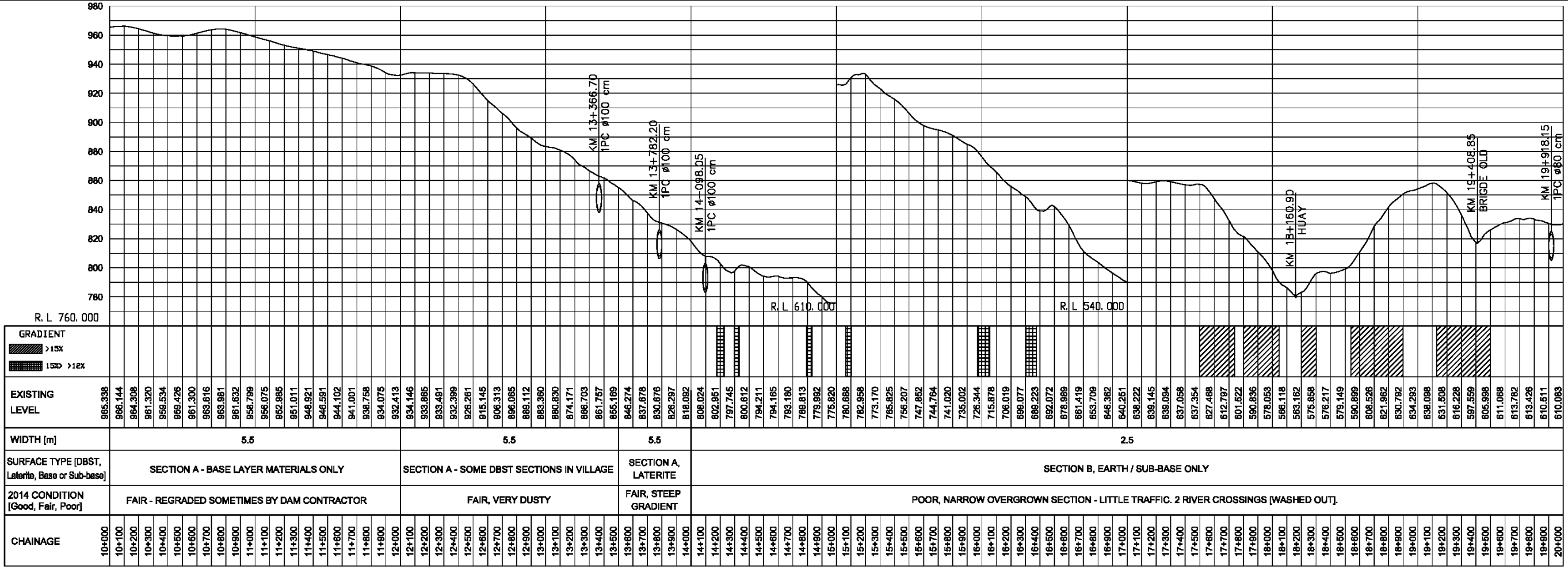
DRAWING TITLE: **PLAN - PROFILE ROAD 7615 KM 0+000 - 10+000**

REV. No.	DATE	DESCRIPTION
A	29-OCT-2014	
B	21-APR-2015	
-		
-		

SCALE: 1/30 000

DRAWING No.: 01





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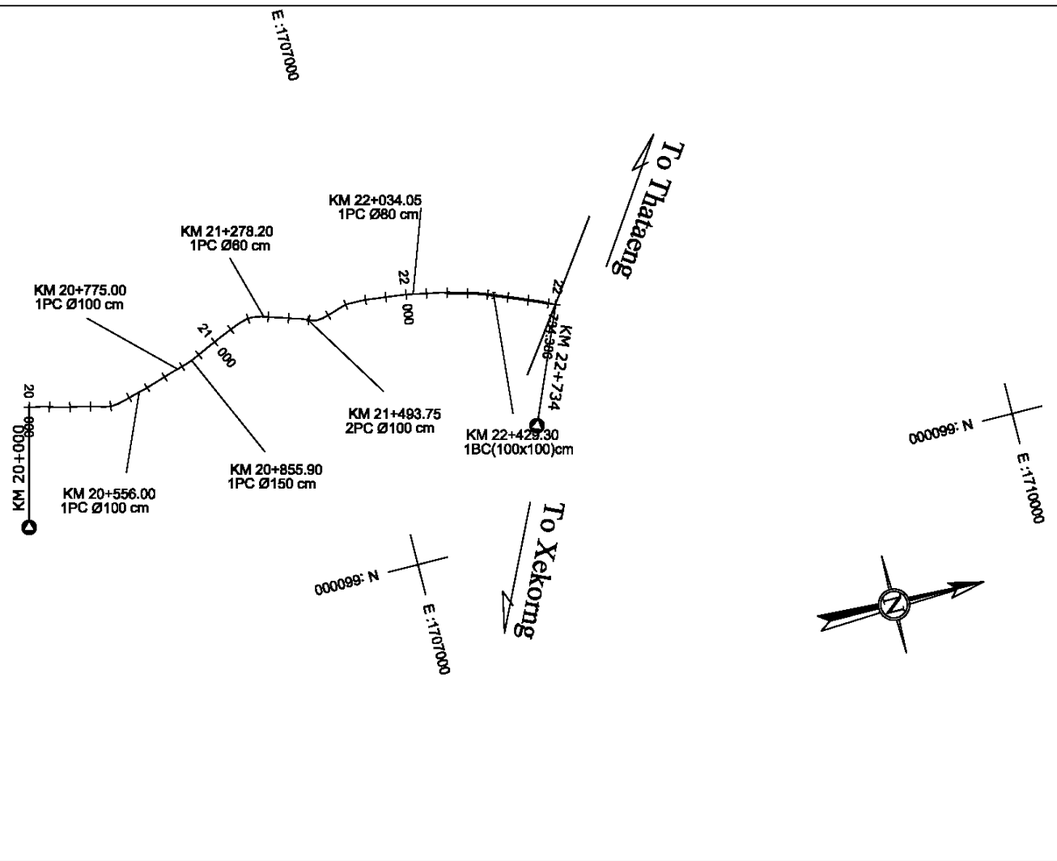
AND MAINTENANCE PROJECT (47085 - 001)

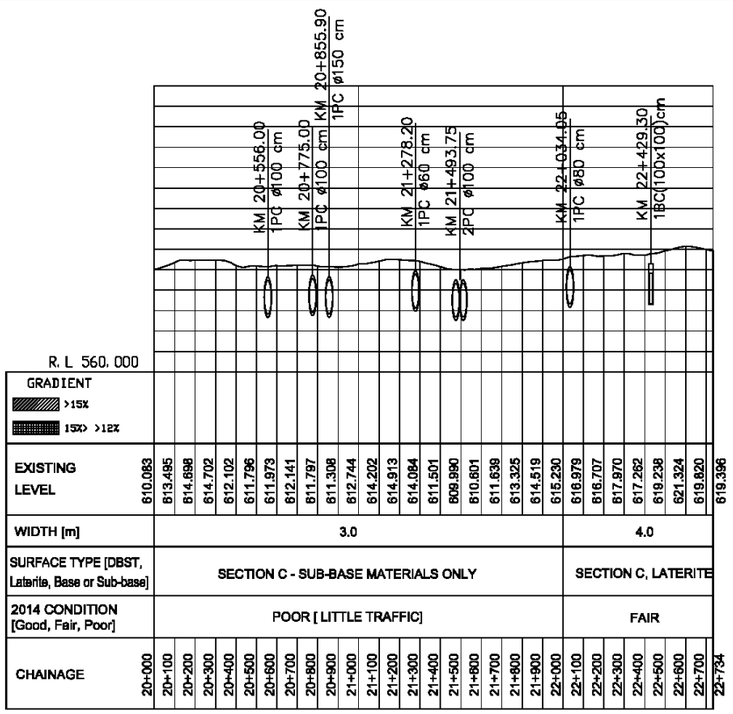
DRAWING TITLE: PLAN - PROFILE ROAD 7615 KM 10+000 - 20+000

REV. No.	DATE	DESCRIPTION
A	29-OCT-2014	
B	21-APR-2015	
-		
-		

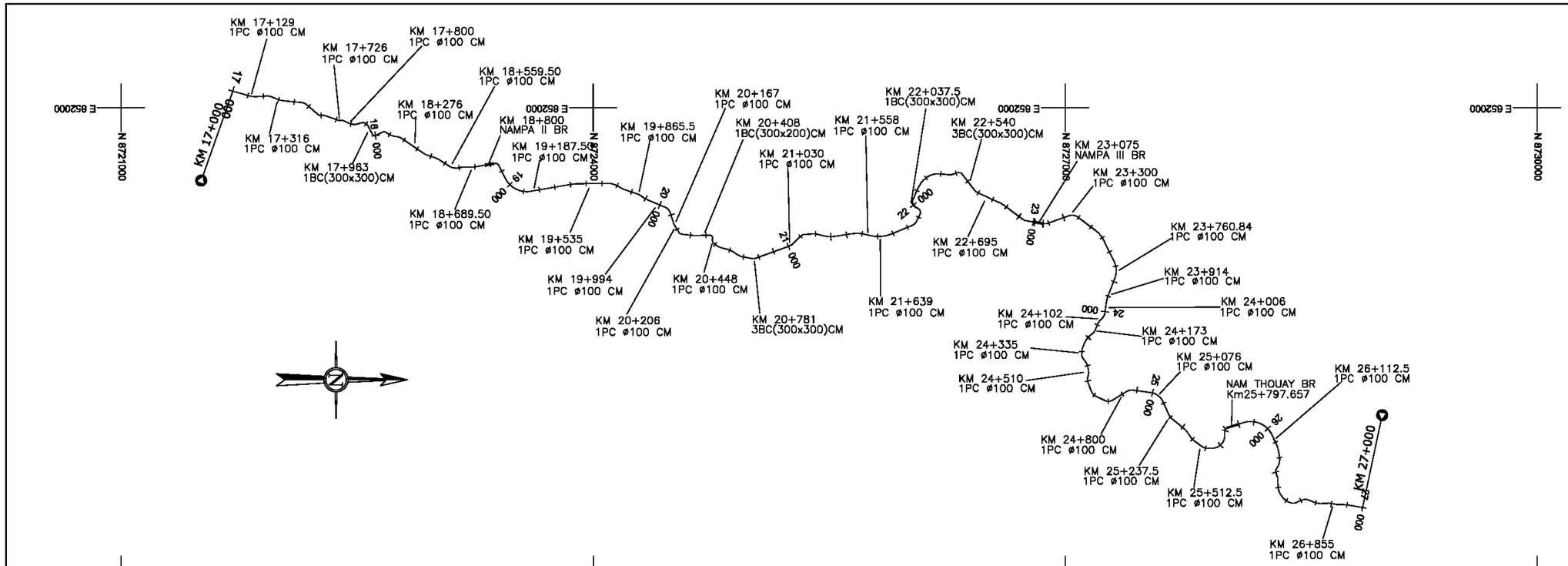
SCALE: 1/30 000

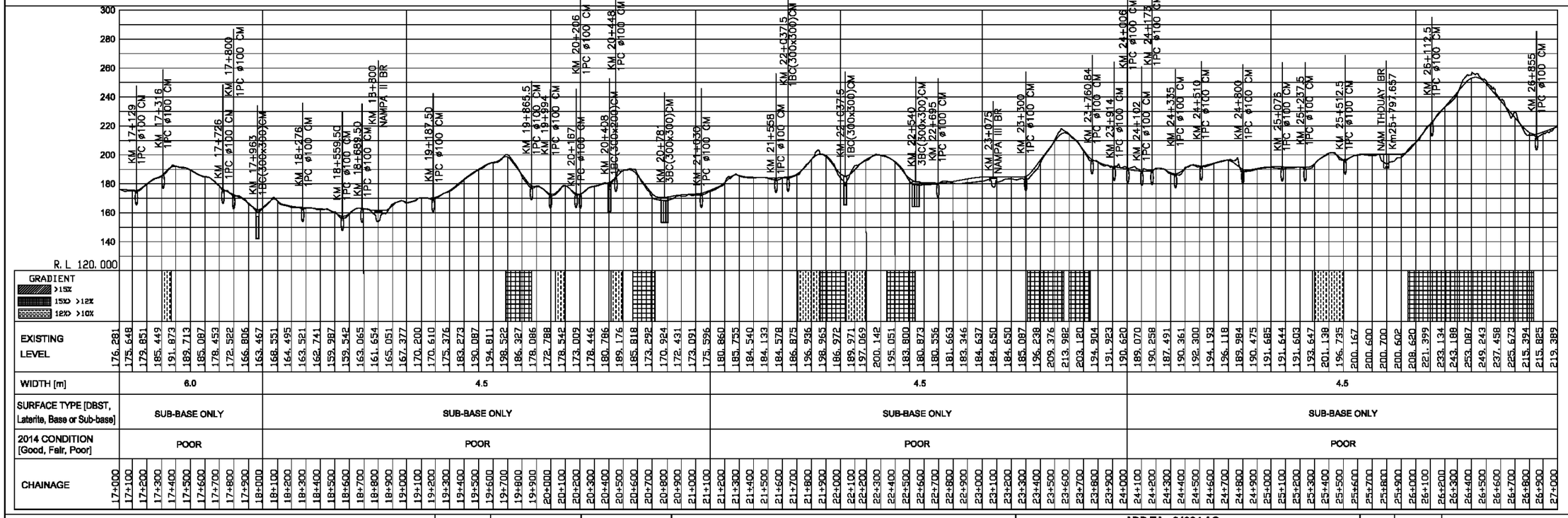
DRAWING No.: 02





ORIENTAL CONSULTANTS GLOBAL CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085 - 001)	REV. No.	DATE	DESCRIPTION	SCALE: 1/30 000
	PREPARED BY				DRAWING TITLE: PLAN - PROFILE ROAD 7615 KM 20+000 - 22+734	A	29-OCT-2014		
	CHECKED BY					B	21-APR-2015		DRAWING No.: 03
	APPROVED BY					-			
						-			





ORIENTAL CONSULTANTS GLOBAL CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085 - 001)

TITLE	NAME	SIGNATURE
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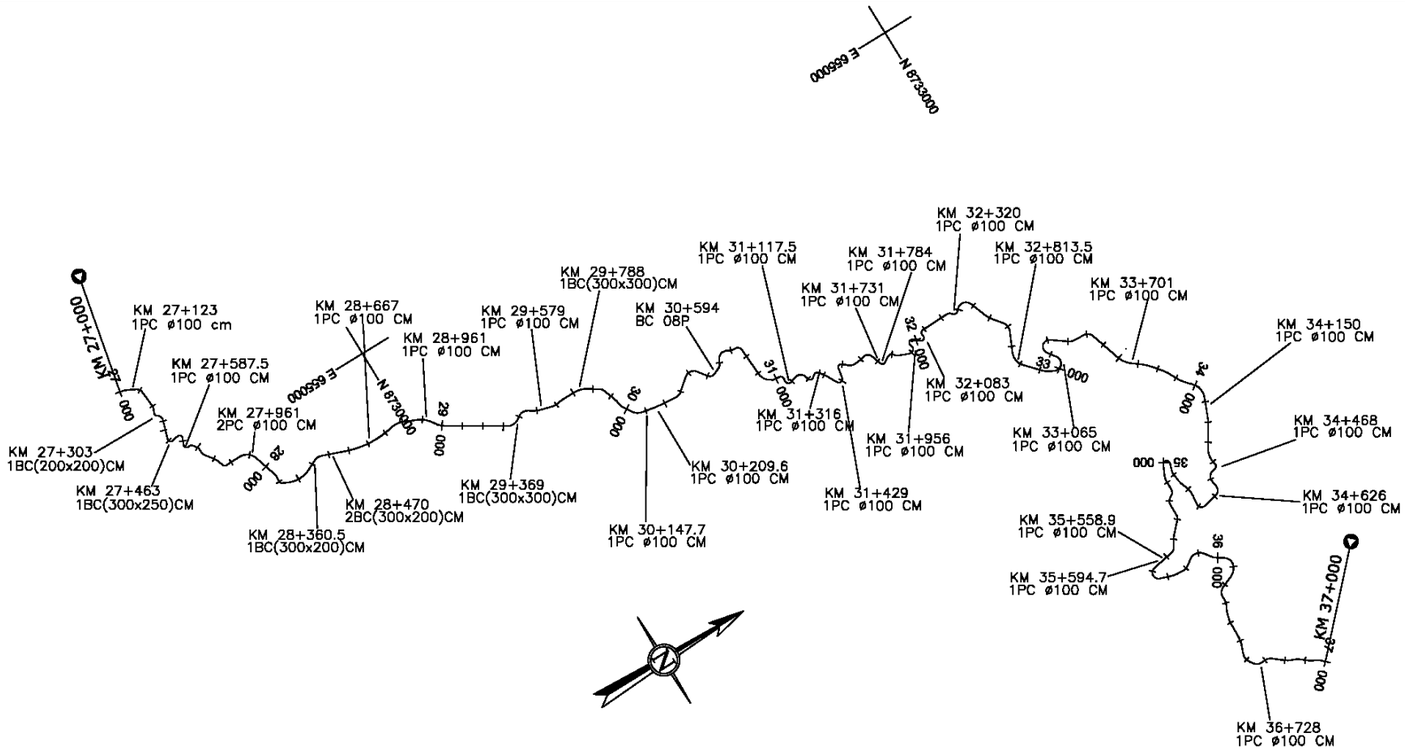
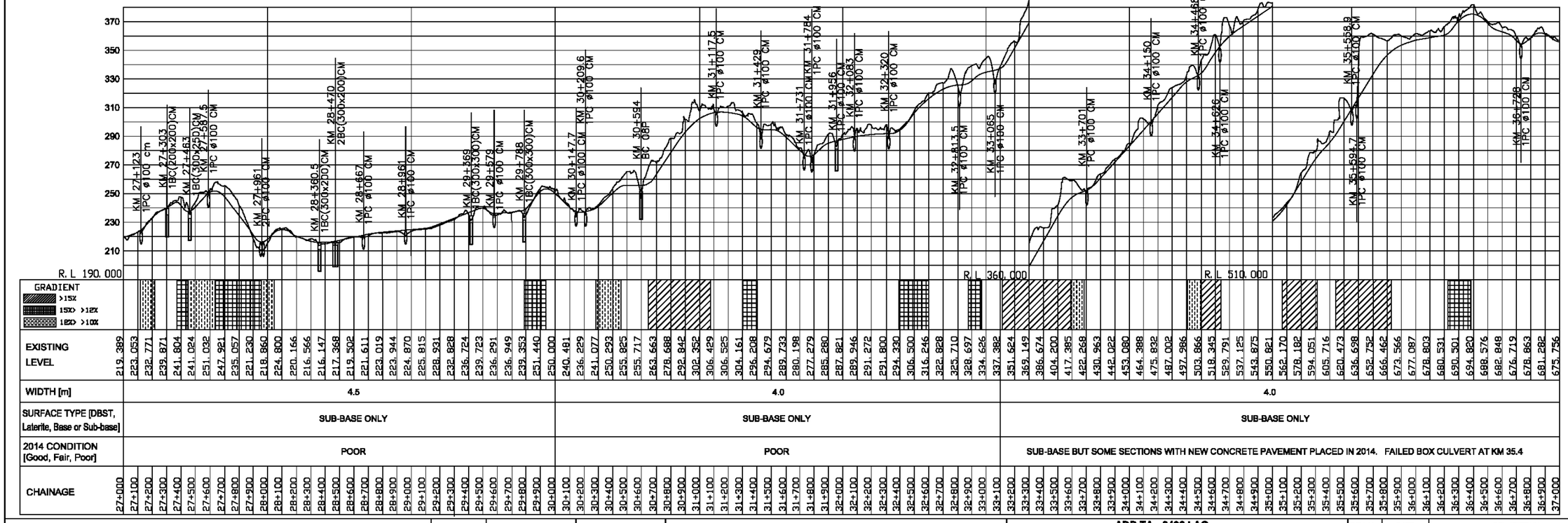
DRAWING TITLE: PLAN - PROFILE ROAD 9001 KM 17+000 - 27+000

REV. No.	DATE	DESCRIPTION
A	02-OCT-2014	
B	29-OCT-2014	
C	21-APR-2015	
-		

SCALE: 1/30 000

DRAWING No.: 01





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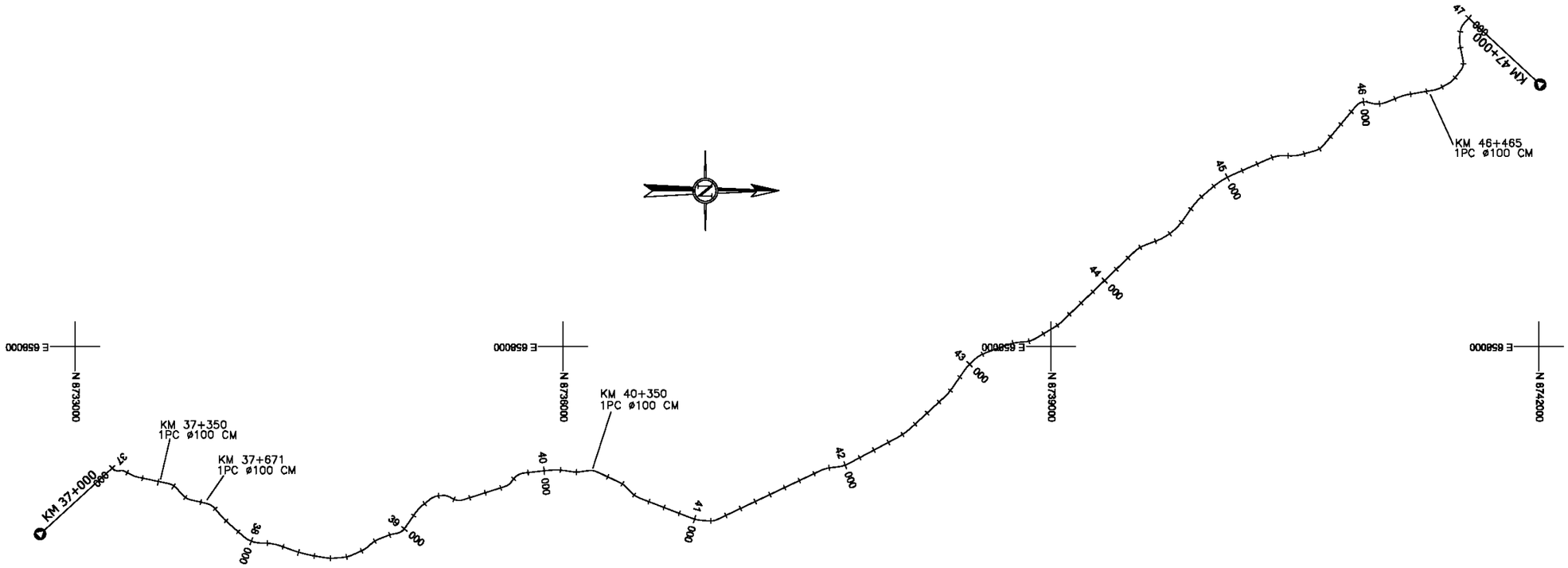
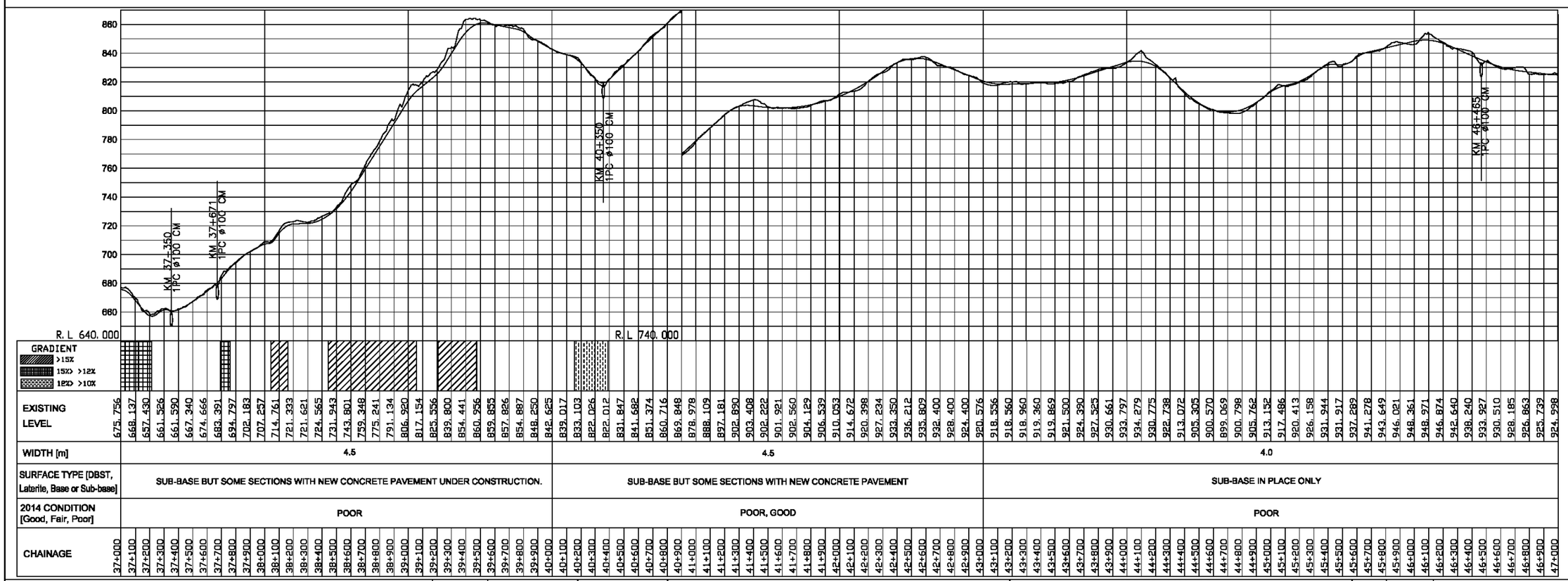
DRAWING TITLE: PLAN - PROFILE ROAD 9001 KM 27+000 - 37+000

REV. No.	DATE	DESCRIPTION
A	02-OCT-2014	
B	29-OCT-2014	
C	21-APR-2015	
-		

SCALE: 1/30 000

DRAWING No.: 02





CHAINAGE	EXISTING LEVEL	WIDTH [m]	SURFACE TYPE [DBST, Laterite, Base or Sub-base]	2014 CONDITION [Good, Fair, Poor]
37+000	675.756	4.5	SUB-BASE BUT SOME SECTIONS WITH NEW CONCRETE PAVEMENT UNDER CONSTRUCTION.	POOR
37+100	668.137			
37+200	657.430			
37+300	661.526			
37+400	661.590			
37+500	667.340			
37+600	674.666			
37+700	683.391			
37+800	694.797			
37+900	702.183			
38+000	707.257			
38+100	714.761			
38+200	721.333			
38+300	721.621			
38+400	724.565			
38+500	731.943			
38+600	743.801			
38+700	759.348			
38+800	775.241			
38+900	791.134			
39+000	806.920			
39+100	817.154			
39+200	825.556			
39+300	839.800			
39+400	854.441			
39+500	860.956			
39+600	859.855			
39+700	857.826			
39+800	854.897			
39+900	848.250			
40+000	842.625			
40+100	839.017	4.5	SUB-BASE BUT SOME SECTIONS WITH NEW CONCRETE PAVEMENT	POOR, GOOD
40+200	833.103			
40+300	822.026			
40+400	822.012			
40+500	831.847			
40+600	841.682			
40+700	851.374			
40+800	860.716			
40+900	869.848			
41+000	878.978			
41+100	888.109			
41+200	897.181			
41+300	902.890			
41+400	903.408			
41+500	902.222			
41+600	901.921			
41+700	902.560			
41+800	904.129			
41+900	906.539			
42+000	910.053			
42+100	914.672			
42+200	920.398			
42+300	927.234			
42+400	933.350			
42+500	936.212			
42+600	935.809			
42+700	932.400			
42+800	928.400			
42+900	924.400			
43+000	920.576			
43+100	918.556	4.0	SUB-BASE IN PLACE ONLY	POOR
43+200	918.560			
43+300	918.960			
43+400	919.360			
43+500	919.869			
43+600	921.500			
43+700	924.390			
43+800	927.525			
43+900	930.661			
44+000	933.797			
44+100	934.279			
44+200	930.775			
44+300	922.738			
44+400	913.072			
44+500	905.305			
44+600	900.570			
44+700	899.069			
44+800	900.798			
44+900	905.762			
45+000	913.152			
45+100	917.486			
45+200	920.413			
45+300	926.158			
45+400	931.944			
45+500	931.917			
45+600	937.289			
45+700	941.278			
45+800	943.649			
45+900	946.021			
46+000	948.361			
46+100	948.971			
46+200	946.874			
46+300	942.640			
46+400	938.240			
46+500	933.927			
46+600	930.510			
46+700	928.185			
46+800	926.863			
46+900	925.739			
47+000	924.998			

ORIENTAL CONSULTANTS GLOBAL CO., LTD.
INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC.
MEKONG CONSULTANTS CO. LTD

TITLE	NAME	SIGNATURE
PREPARED BY		
CHECKED BY		
APPROVED BY		

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC
MINISTRY OF PUBLIC WORKS AND TRANSPORT

ADB TA - 8492 LAO
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT (47085 - 001)

DRAWING TITLE: PLAN - PROFILE ROAD 9001 KM 37+000 - 47+000

REV. No.	DATE	DESCRIPTION
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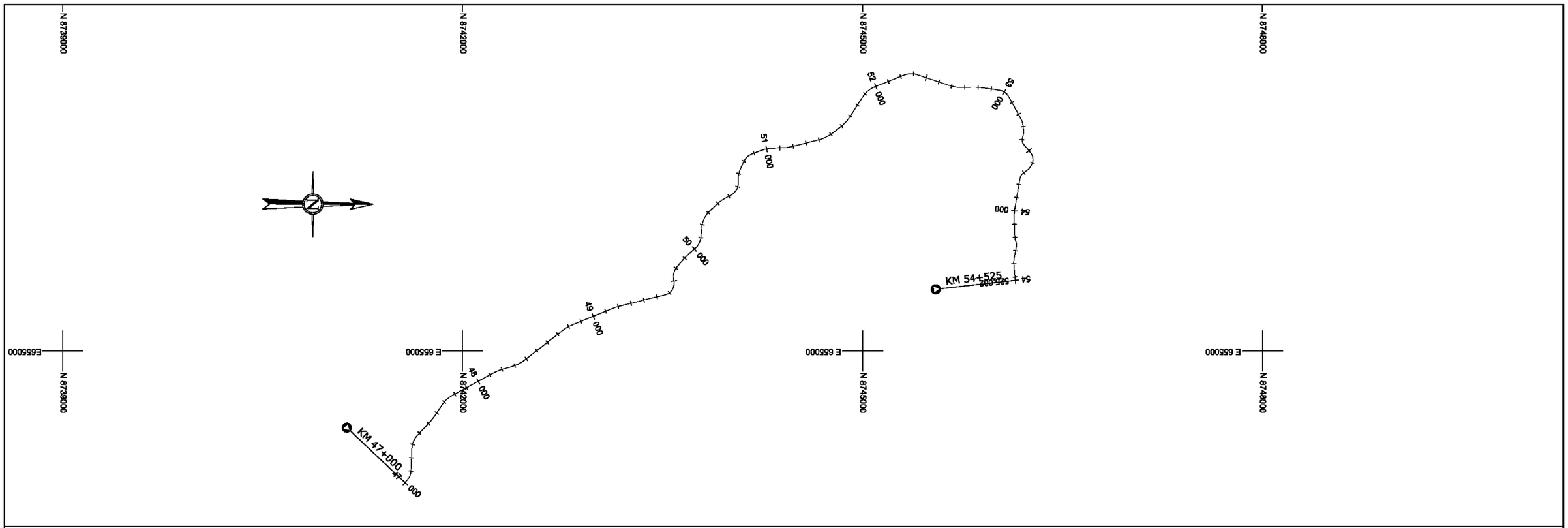
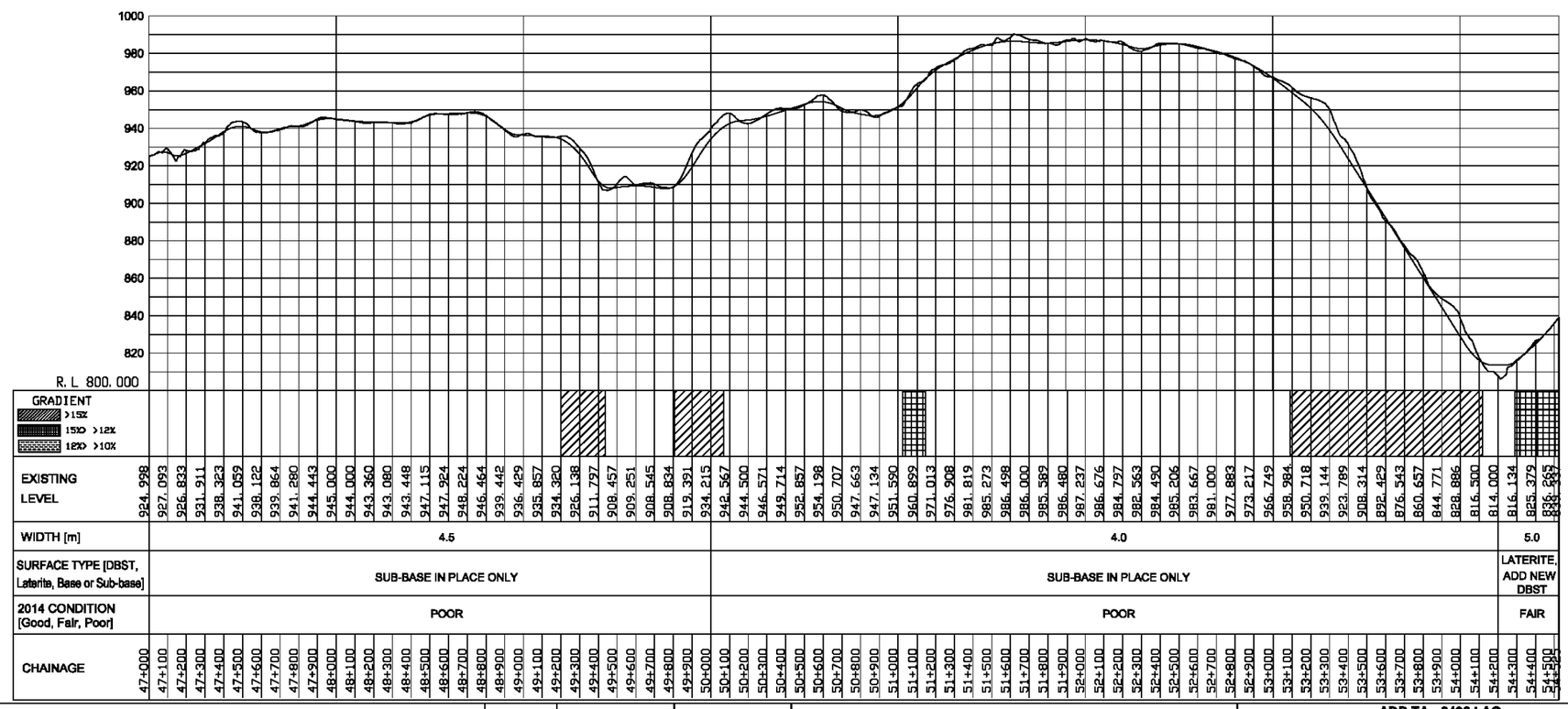
B	29-OCT-2014	
C	21-APR-2015	
-		

SCALE: 1/30 000

DRAWING No.: 03





ORIENTAL CONSULTANTS GLOBAL CO., LTD.
INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC.
MEKONG CONSULTANTS CO. LTD

TITLE	NAME	SIGNATURE
PREPARED BY		
CHECKED BY		
APPROVED BY		

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC
MINISTRY OF PUBLIC WORKS AND TRANSPORT

ADB TA - 8492 LAO
ROAD SECTOR GOVERNANCE
AND MAINTENANCE PROJECT (47085 - 001)

DRAWING TITLE: PLAN - PROFILE ROAD 9001 KM 47+000 - 54+525

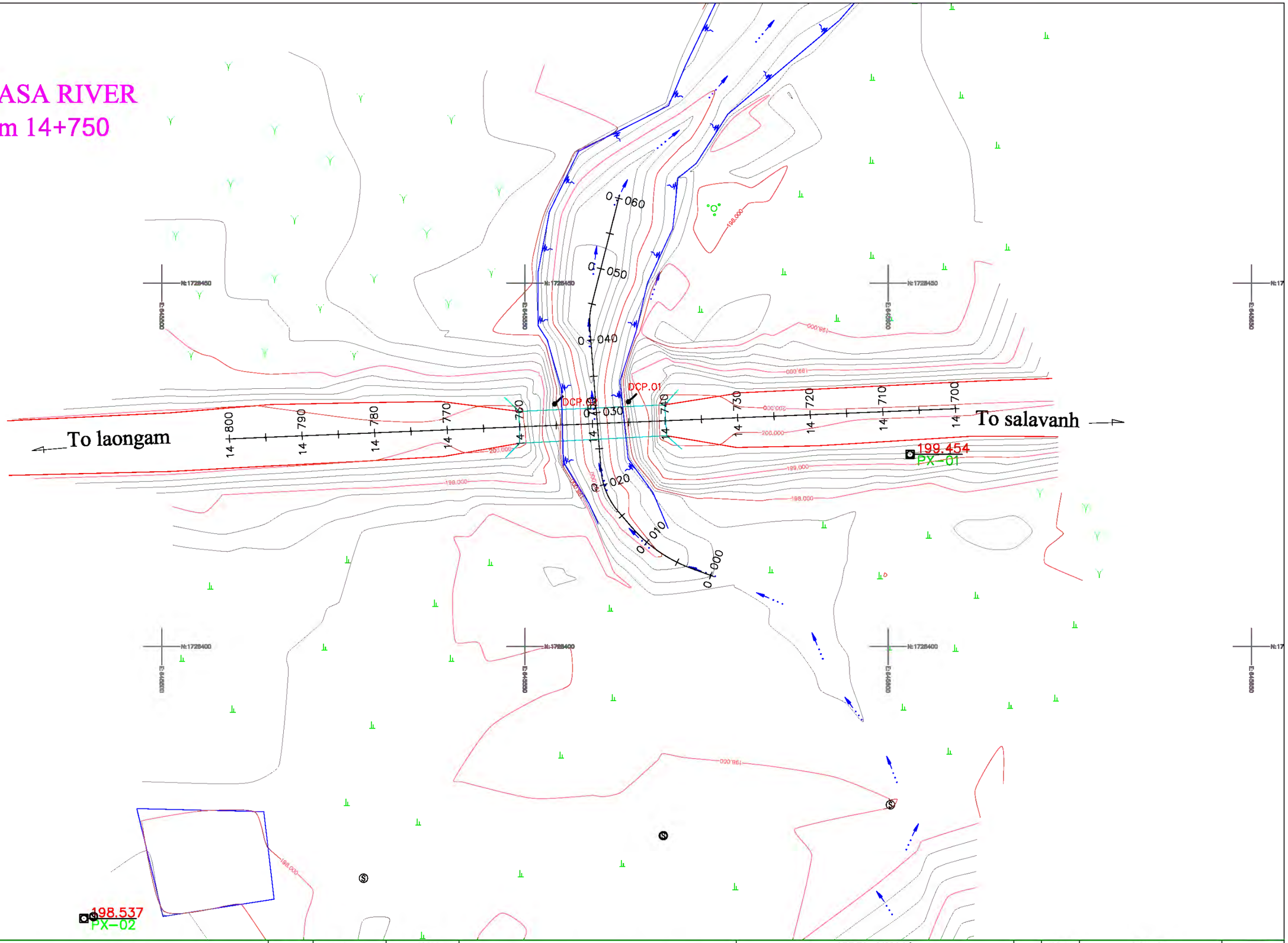
REV. No.	DATE	DESCRIPTION
A	02-OCT-2014	
B	29-OCT-2014	
C	21-APR-2015	
-		

SCALE: 1/30 000

DRAWING No.: 04

Annex H – Bridge Site Surveys

PASA RIVER
km 14+750



ORIENTAL CONSULTANTS GLOBAL CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085 - 001)	REV. No.	DATE	DESCRIPTION	SCALE: 1/ 500
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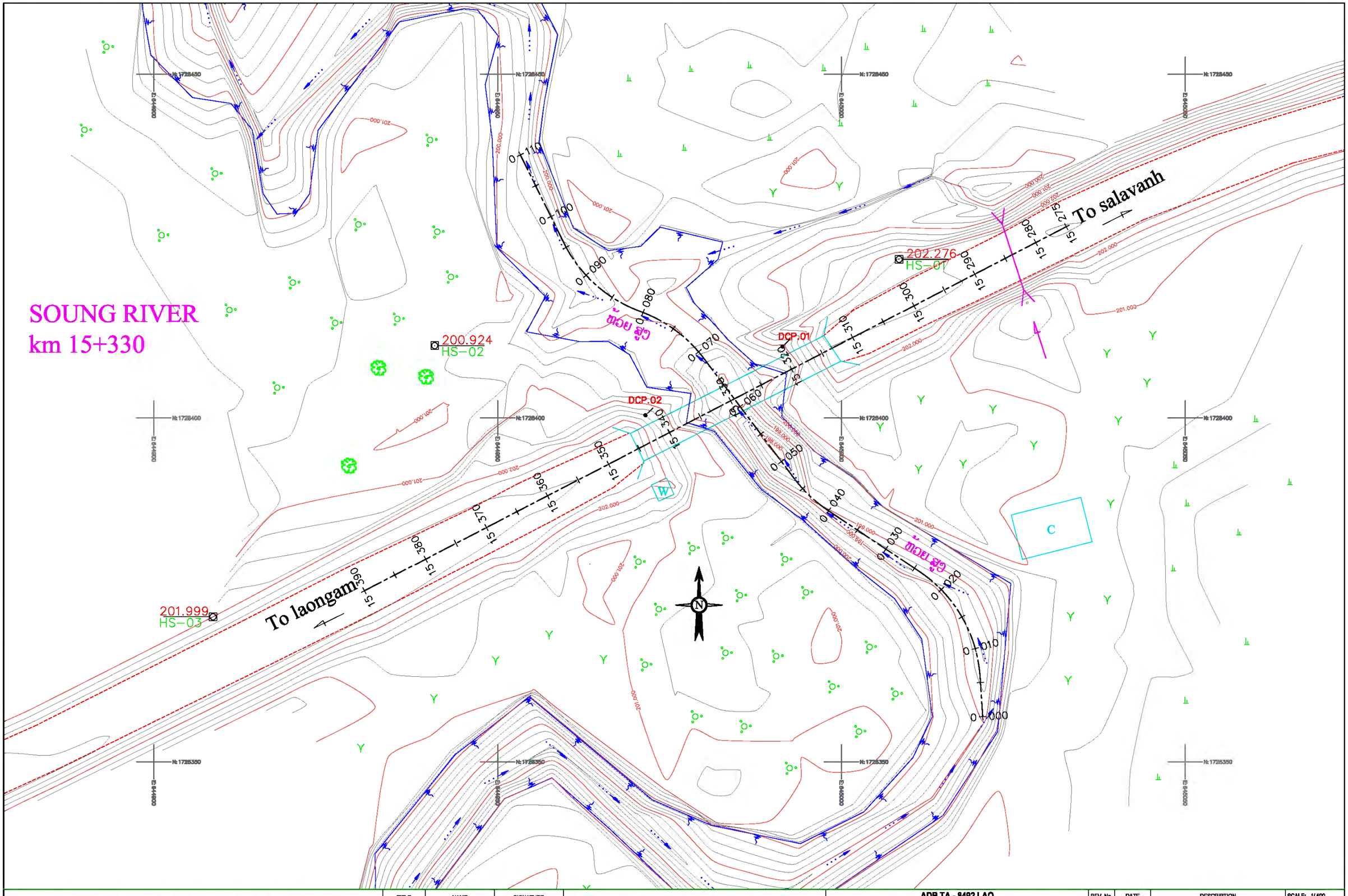
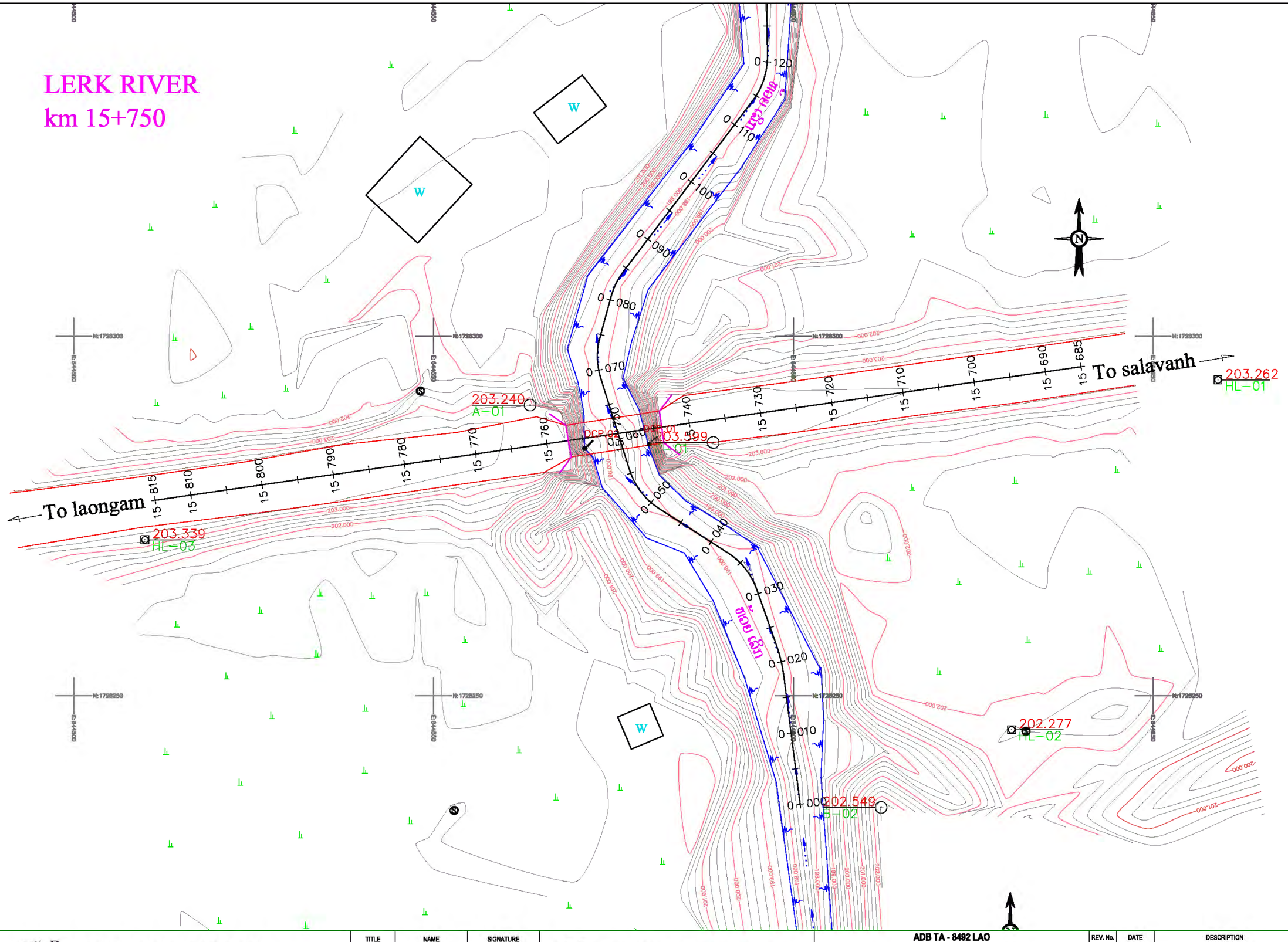
	CHECKED BY					B	21-APR-2015		DRAWING No.: 01
	APPROVED BY					-			
						-			



ORIENTAL CONSULTANTS GLOBAL CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085 - 001)	REV. No.	DATE	DESCRIPTION	SCALE: 1/ 500
	PREPARED BY				DRAWING TITLE: PLAN SOUNG RIVER	A	29-OCT-2014		
	CHECKED BY					B	21-APR-2015		DRAWING No.: 01
	APPROVED BY					-			

LERK RIVER
km 15+750



ORIENTAL CONSULTANTS GLOBAL CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085 - 001)	REV. No.	DATE	DESCRIPTION	SCALE: 1/ 500
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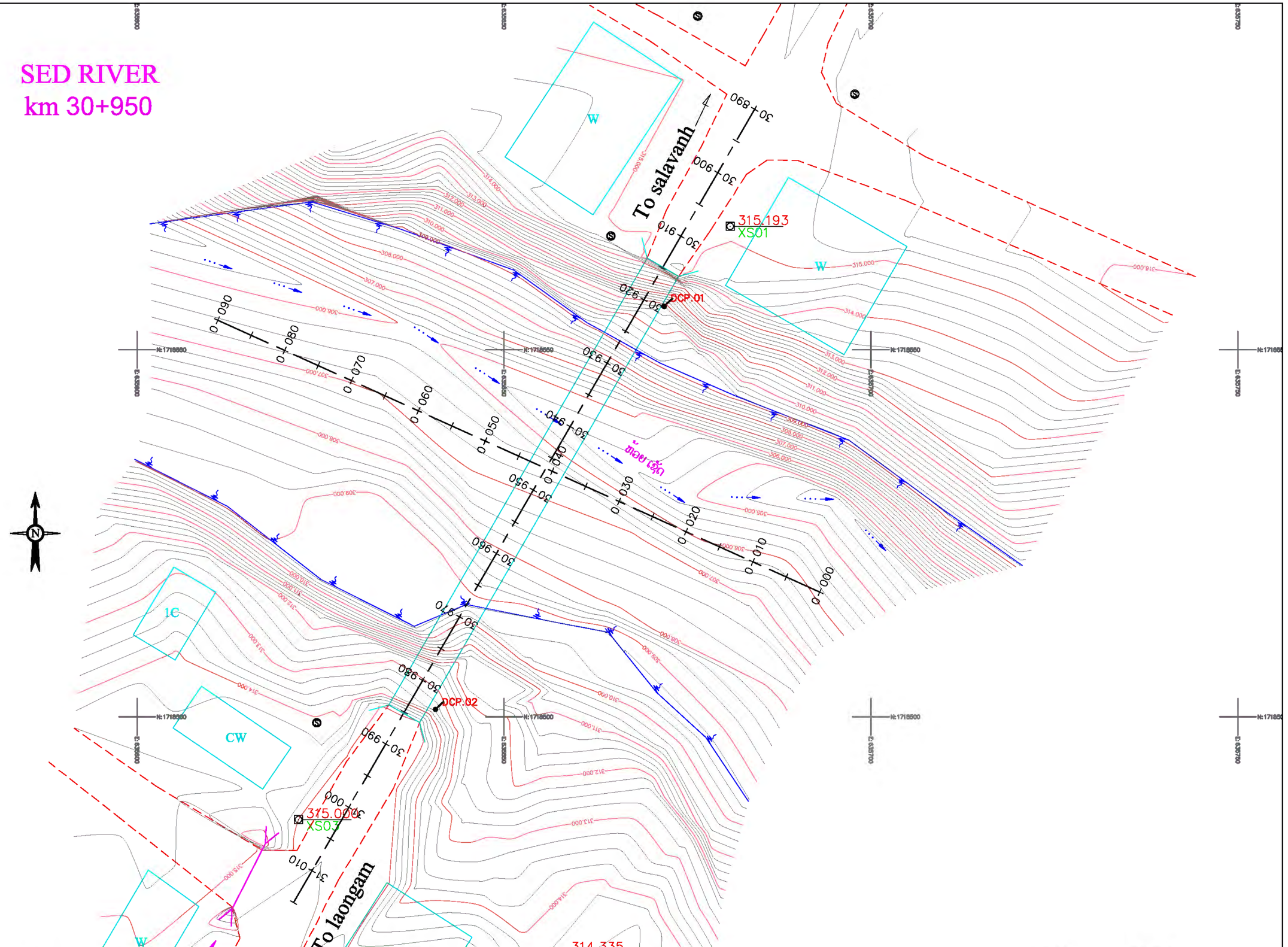
	APPROVED BY					-			
						-			

SED RIVER
km 30+950



ORIENTAL CONSULTANTS GLOBAL CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085 - 001)	REV. No.	DATE	DESCRIPTION	SCALE: 1/ 500
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	APPROVED BY					-			
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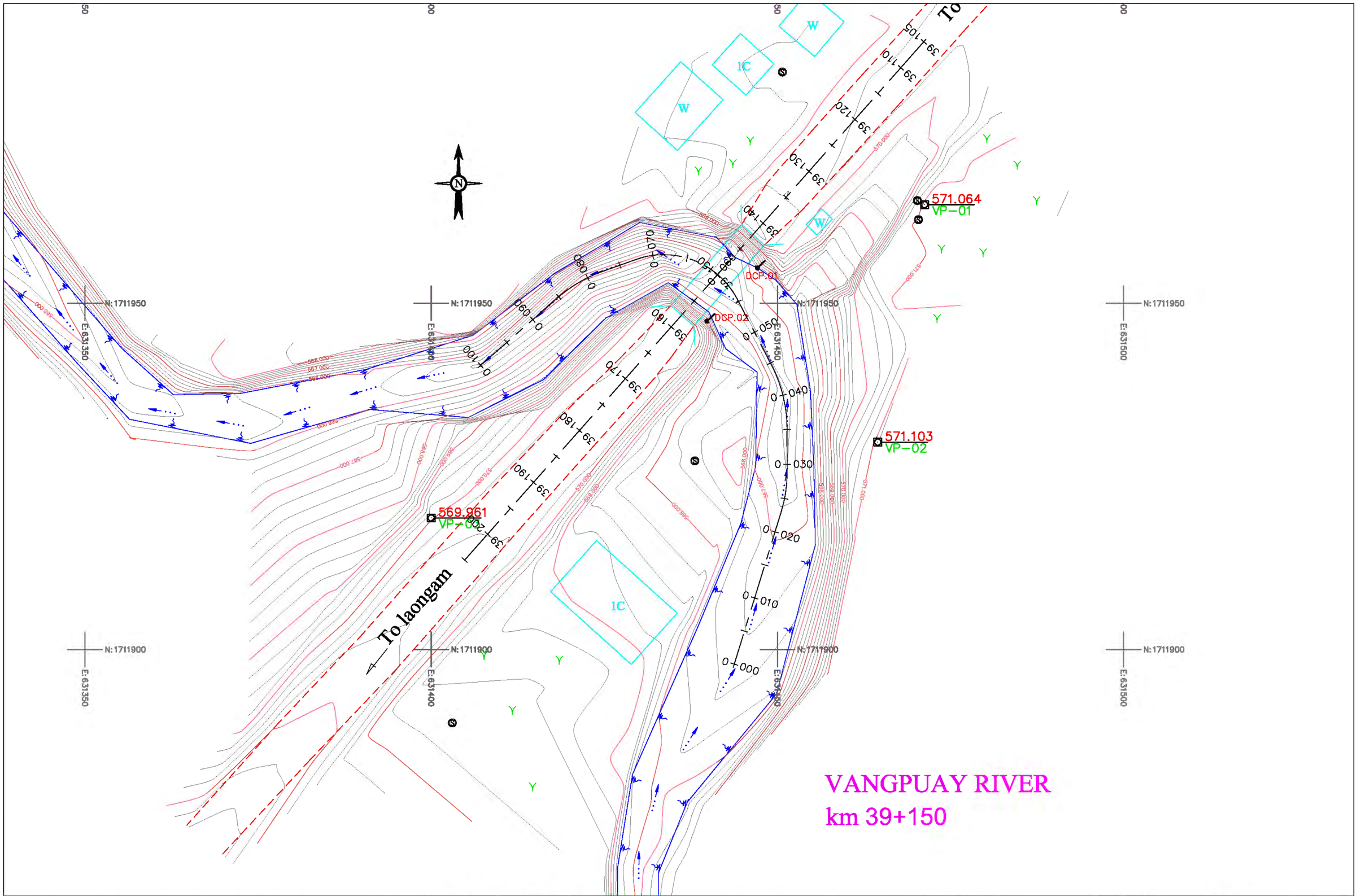

ORIENTAL CONSULTANTS GLOBAL CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085 - 001)	REV. No.	DATE	DESCRIPTION	SCALE: 1/ 500
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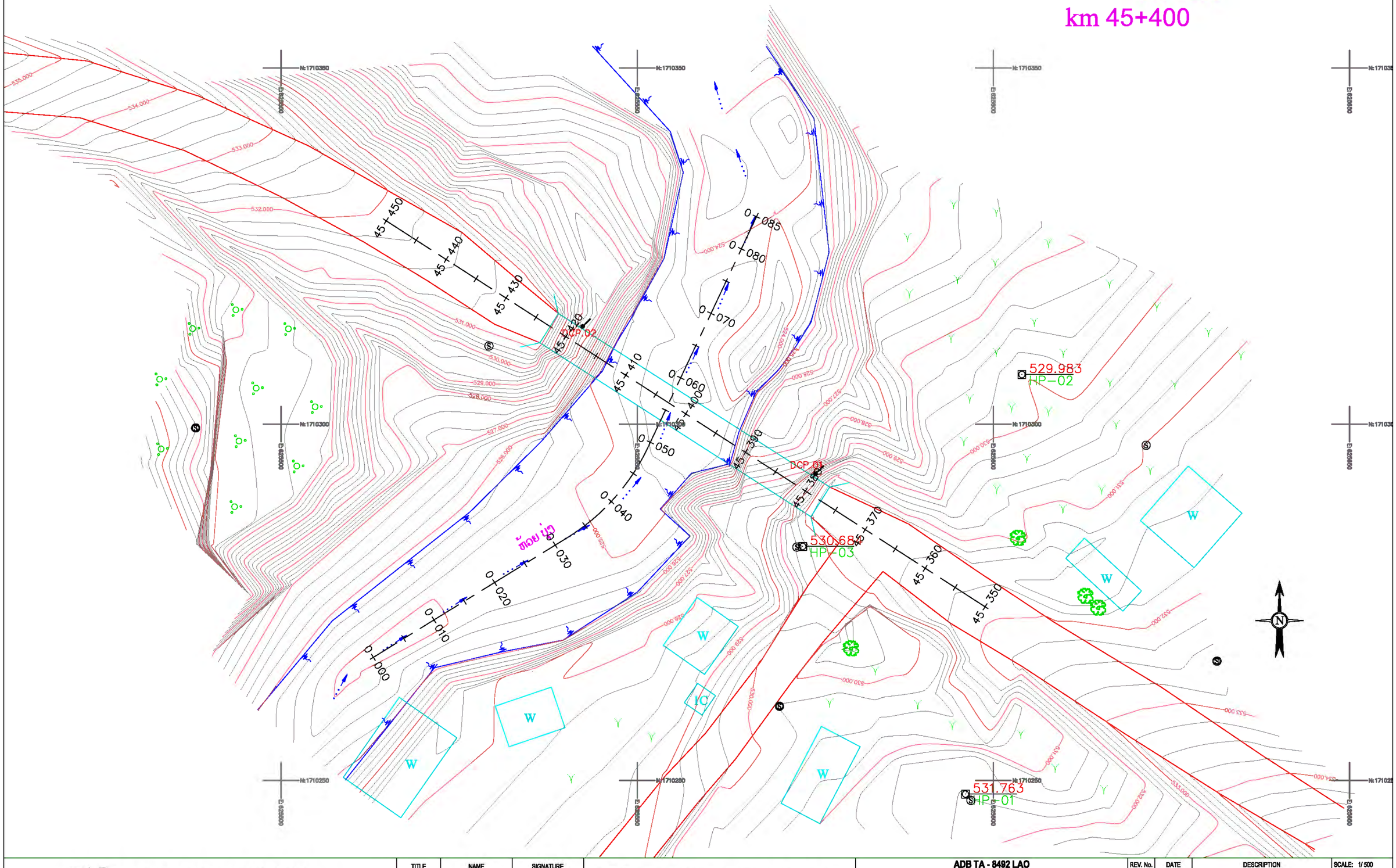
	CHECKED BY					B	21-APR-2015		DRAWING No.: 01
	APPROVED BY				DRAWING TITLE: PLAN VANGPUAY RIVER	-			
						-			

POUNG RIVER
km 45+400



ORIENTAL CONSULTANTS GLOBAL CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085 - 001)	REV. No.	DATE	DESCRIPTION	SCALE: 1/ 500
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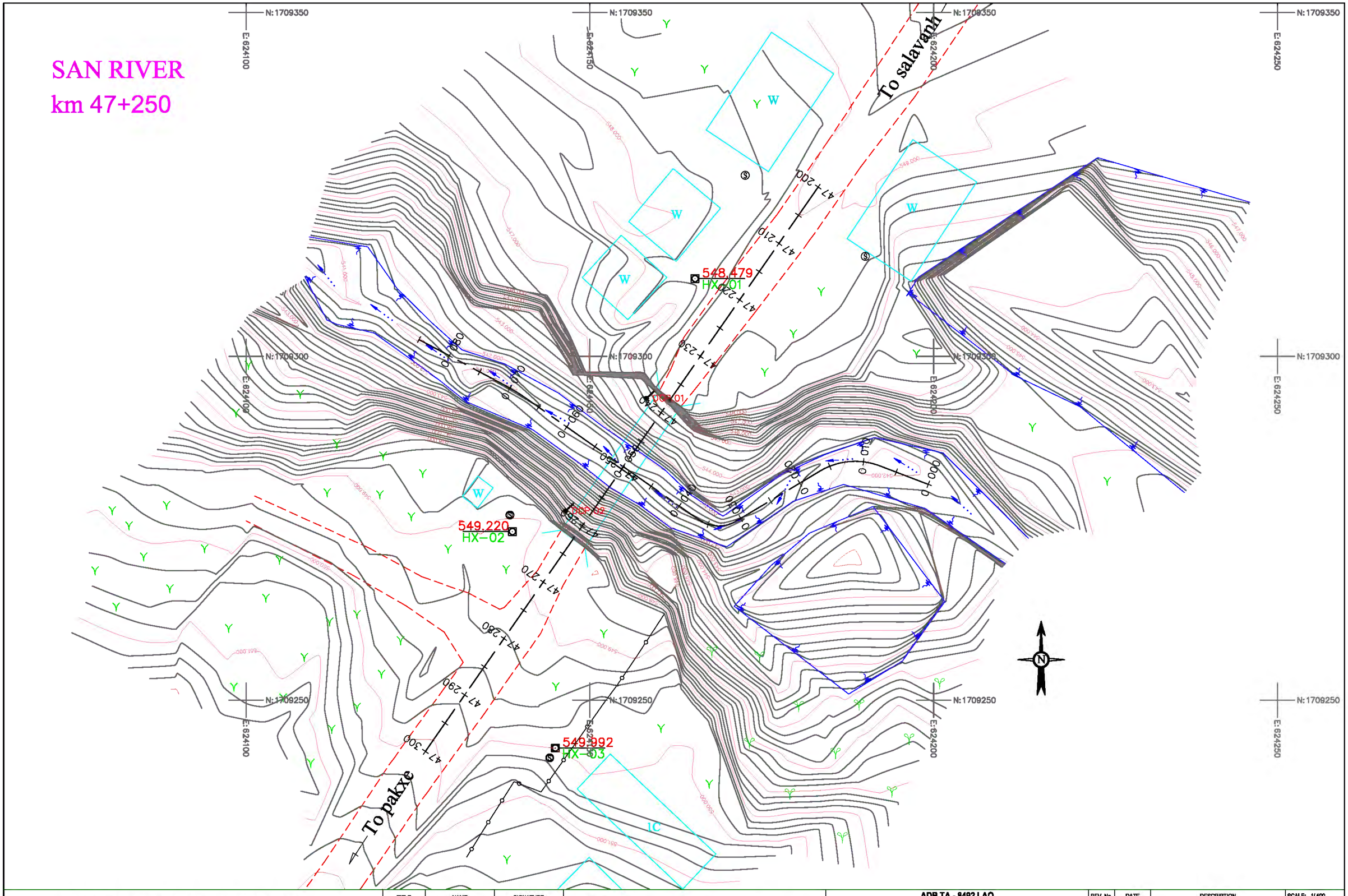
SAN RIVER
km 47+250



ORIENTAL CONSULTANTS GLOBAL CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085 - 001)	REV. No.	DATE	DESCRIPTION	SCALE: 1/ 500
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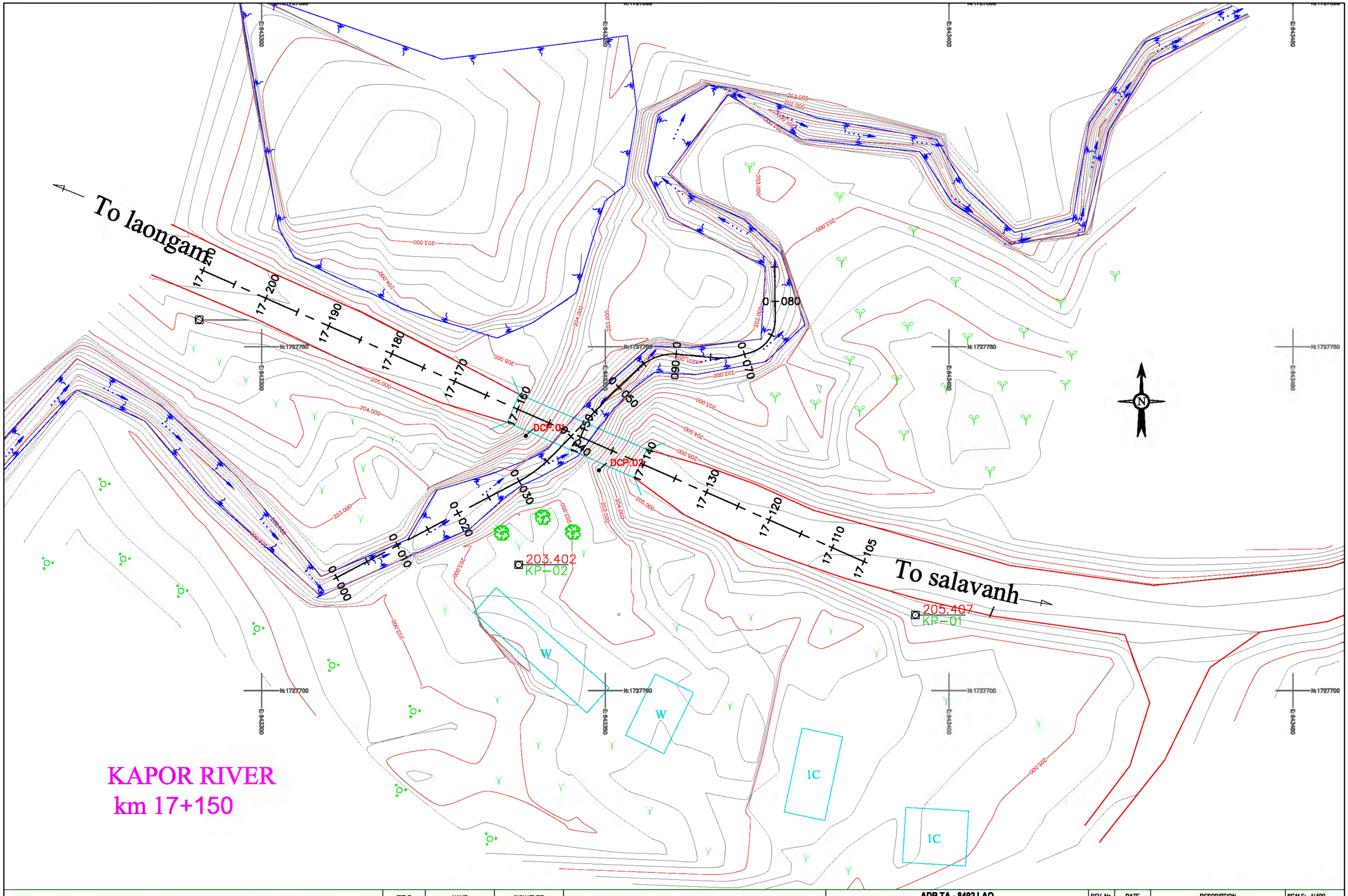

ORIENTAL CONSULTANTS GLOBAL CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085 - 001)	REV. No.	DATE	DESCRIPTION	SCALE: 1/ 500
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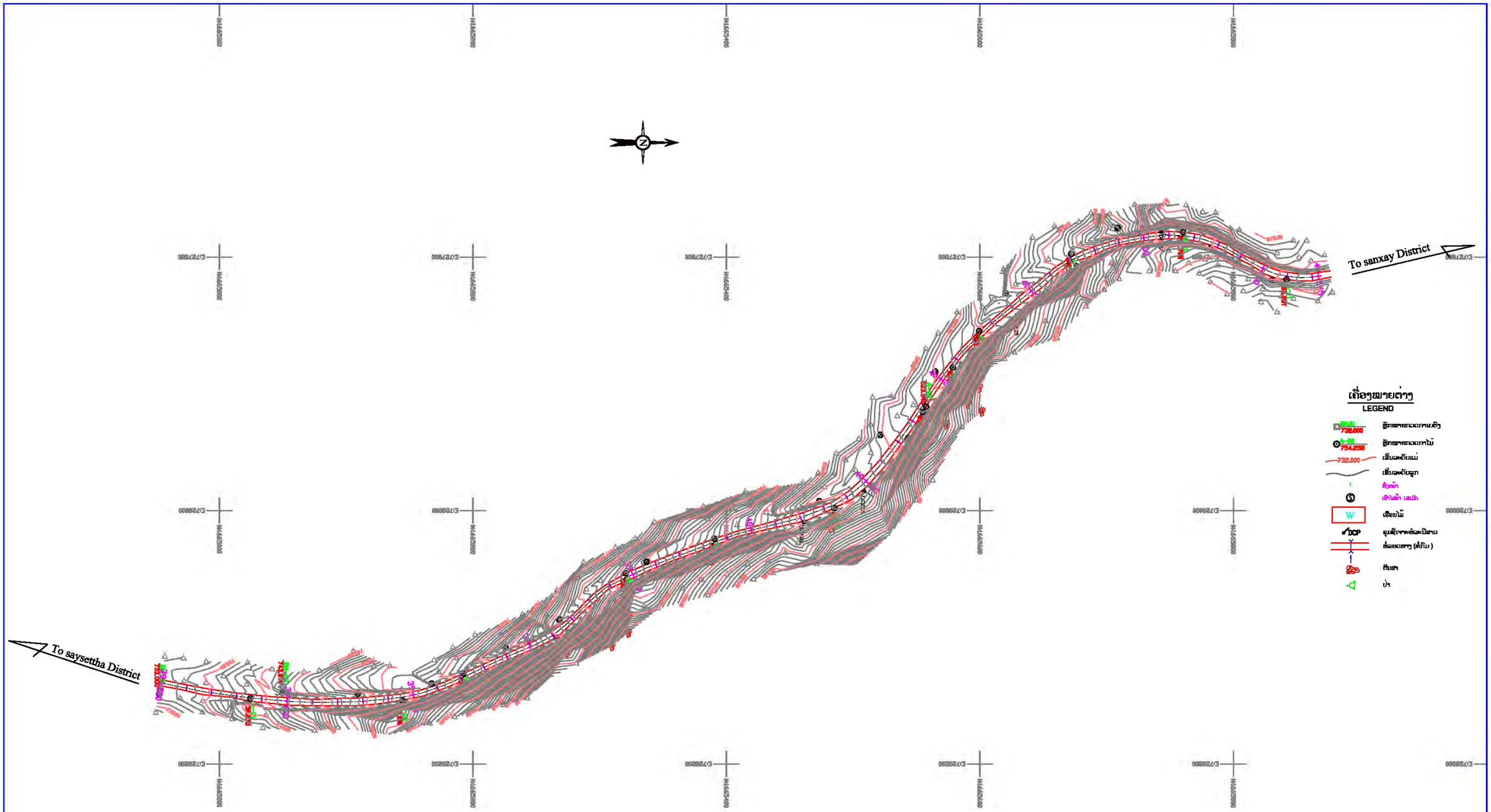
Annex I – Unstable Side Slope Surveys



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	PREPARED BY				DRAWING TITLE: PLAN SLOPE ROAD 9001 KM 39+500 - 40+545	A	29-OCT-2014		
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	APPROVED BY					-			
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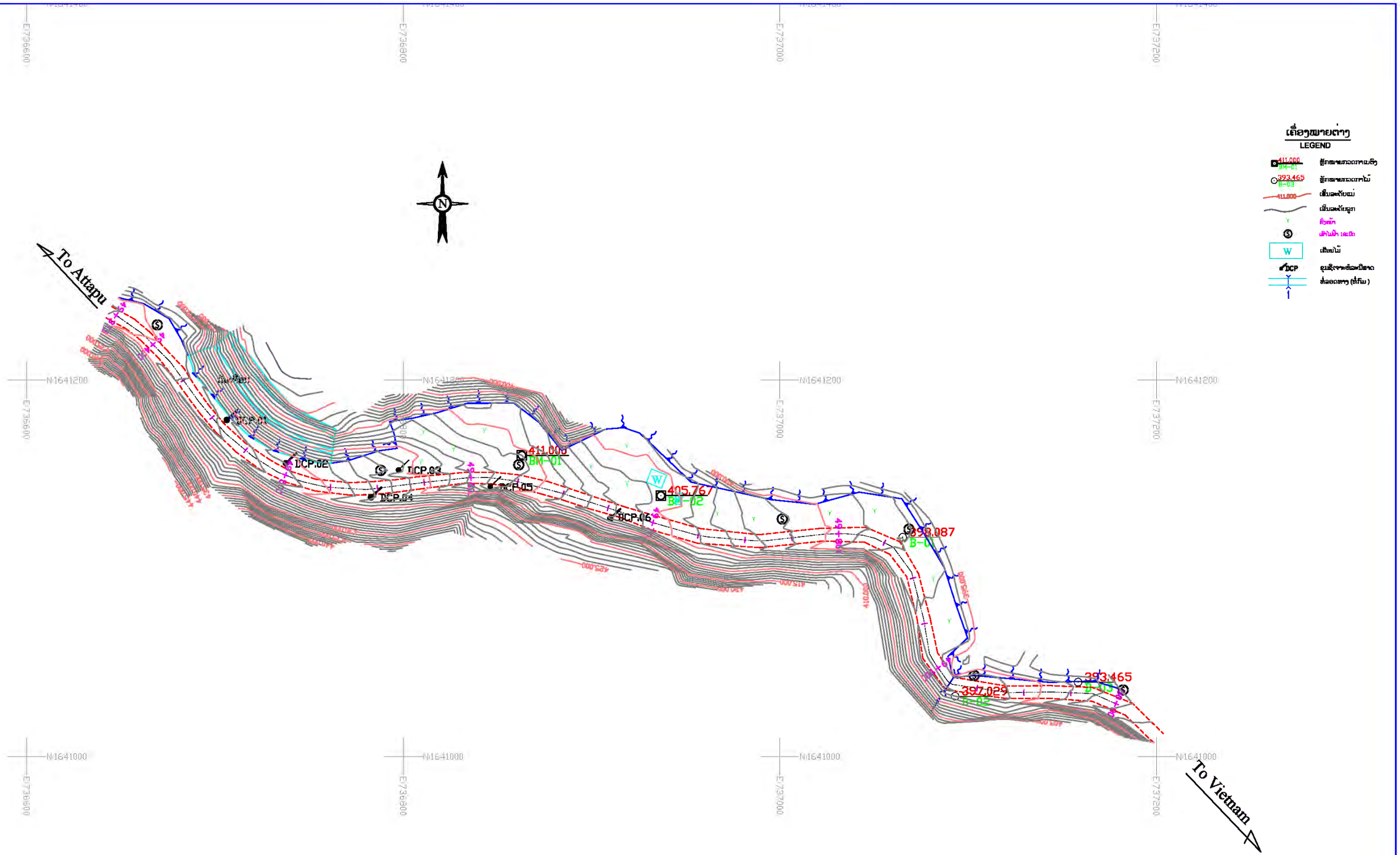

ORIENTAL CONSULTANTS GLOBAL CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD SECTOR GOVERNANCE AND MAINTENANCE PROJECT (47085 - 001)	REV. No.		DESCRIPTION	SCALE: 1/2000
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	CHECKED BY					B	21-APR-2015		DRAWING No.:
	APPROVED BY					-			
						-			

Annex J – Geotechnical Investigations [Side Slopes]

SITE ACTIVITY PHOTOGRAPHS

DCP No. 1 (Left 5m)

DCP No. 2 (Left 4m)

DCP No. 3 (Left 4m)

DCP No. 4 (Right 4m)

DCP No. 5 (Right5m)

DCP No. 6 (Right 4m)

Dynamic Cone Penetration Test

DCP-No.1

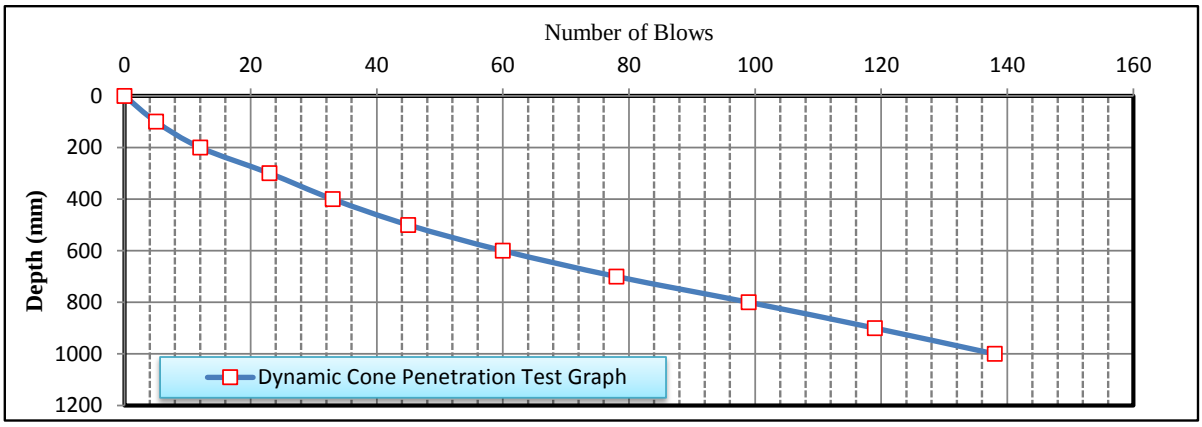
Project : ADB TA-8492 LAO: Road Sector Governance & Maintenance Project

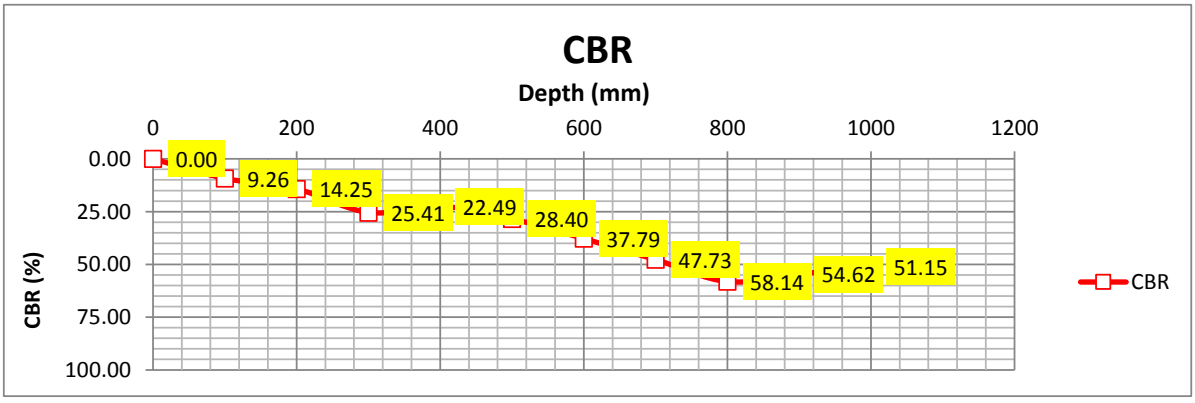
Consultant : Mekong Consultants Co., LTD Date: 10-01-14

Location : (NR-18B) Erision , Attapeu Province Coordinates

Chainage : DCP-No.1 (Left 5m) Km 48+500 Ground Elv : N: E:

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
5	5	-100	20.00	9.26	
7	12	-200	14.29	14.25	
11	23	-300	9.09	25.41	
10	33	-400	10.00	22.49	DCP of the Slop Inspection, every point is for from each other 25 Km , start from point No. 01
12	45	-500	8.33	28.40	
15	60	-600	6.67	37.79	
18	78	-700	5.56	47.73	
21	99	-800	4.76	58.14	
20	119	-900	5.00	54.62	
19	138	-1000	5.26	51.15	





Checked by : Test by:

Dynamic Cone Penetration Test

DCP-No.2

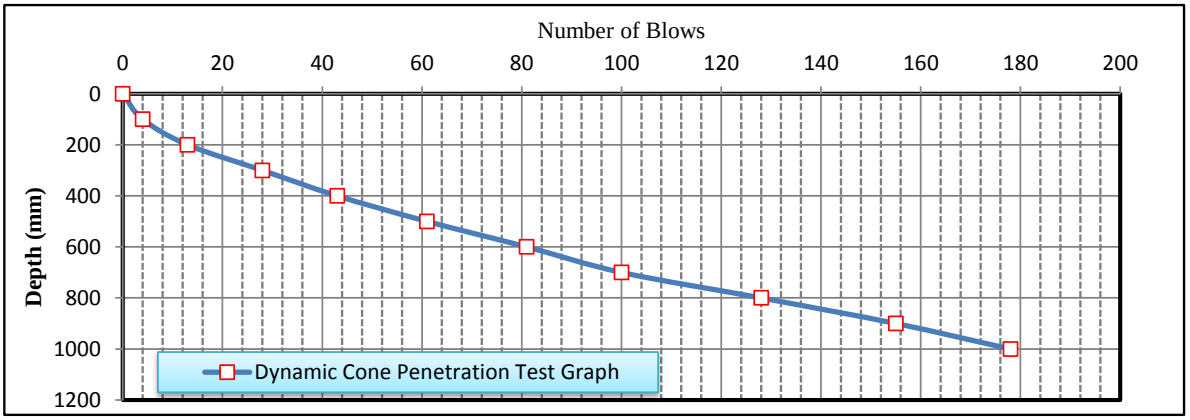
Project : ADB TA-8492 LAO: Road Sector Governance & Maintenance Project

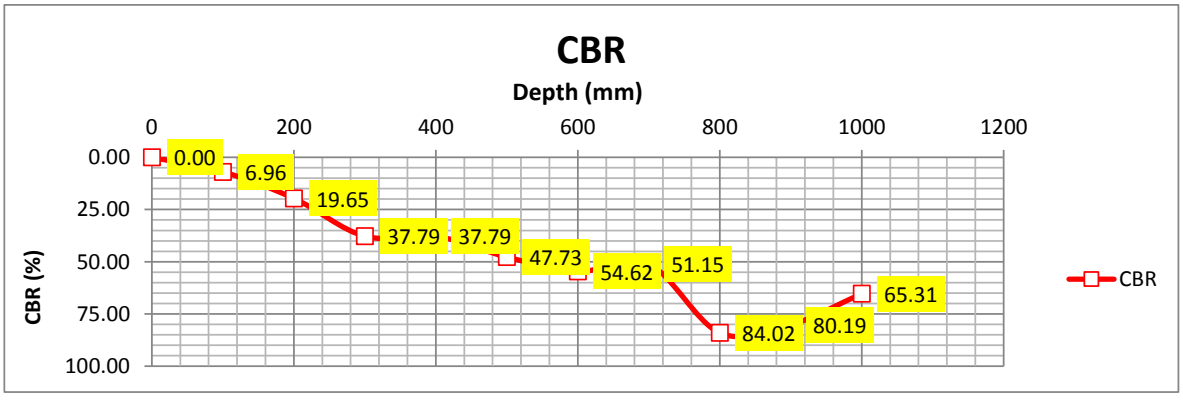
Consultant : Mekong Consultants Co., LTD Date: 10-01-14

Location : (NR-18B) Erision , Attapeu Province Coordinates

Chainage : DCP-No.2 (Left 4m) Km 48+500 Ground Elv : N: E:

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
4	4	-100	25.00	6.96	
9	13	-200	11.11	19.65	
15	28	-300	6.67	37.79	
15	43	-400	6.67	37.79	
18	61	-500	5.56	47.73	
20	81	-600	5.00	54.62	
19	100	-700	5.26	51.15	
28	128	-800	3.57	84.02	
27	155	-900	3.70	80.19	
23	178	-1000	4.35	65.31	





Checked by : Test by:

Dynamic Cone Penetration Test

DCP-No.3

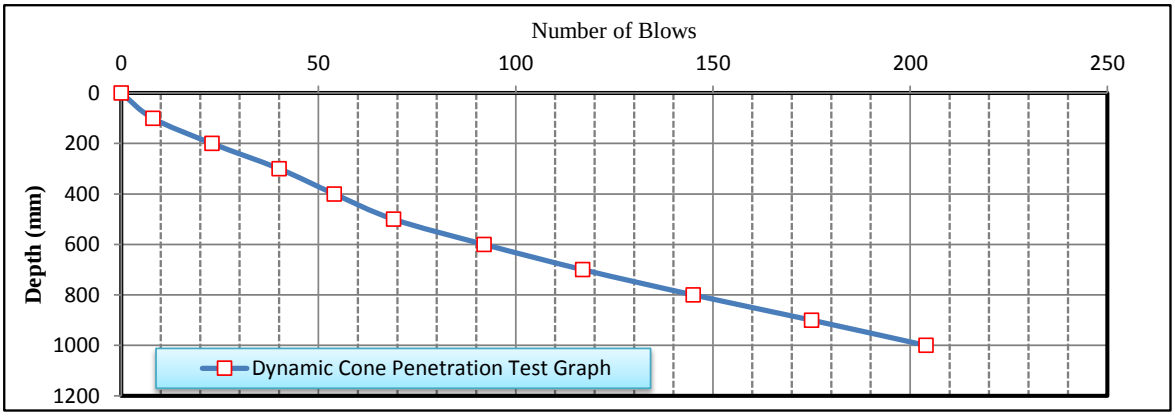
Project : ADB TA-8492 LAO: Road Sector Governance & Maintenance Project

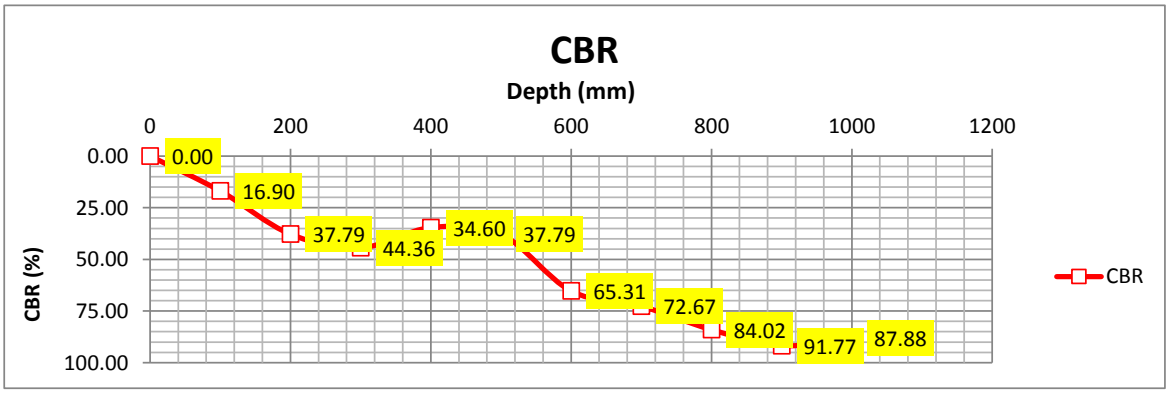
Consultant : Mekong Consultants Co., LTD Date: 10-01-14

Location : (NR-18B) Erision , Attapeu Province Coordinates

Chainage : DCP-No.3 (Left 4m) Km 48+500 Ground Elv : N: E:

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
8	8	-100	12.50	16.90	
15	23	-200	6.67	37.79	
17	40	-300	5.88	44.36	
14	54	-400	7.14	34.60	
15	69	-500	6.67	37.79	
23	92	-600	4.35	65.31	
25	117	-700	4.00	72.67	
28	145	-800	3.57	84.02	
30	175	-900	3.33	91.77	
29	204	-1000	3.45	87.88	





Checked by : Test by:

Dynamic Cone Penetration Test

DCP-No.4

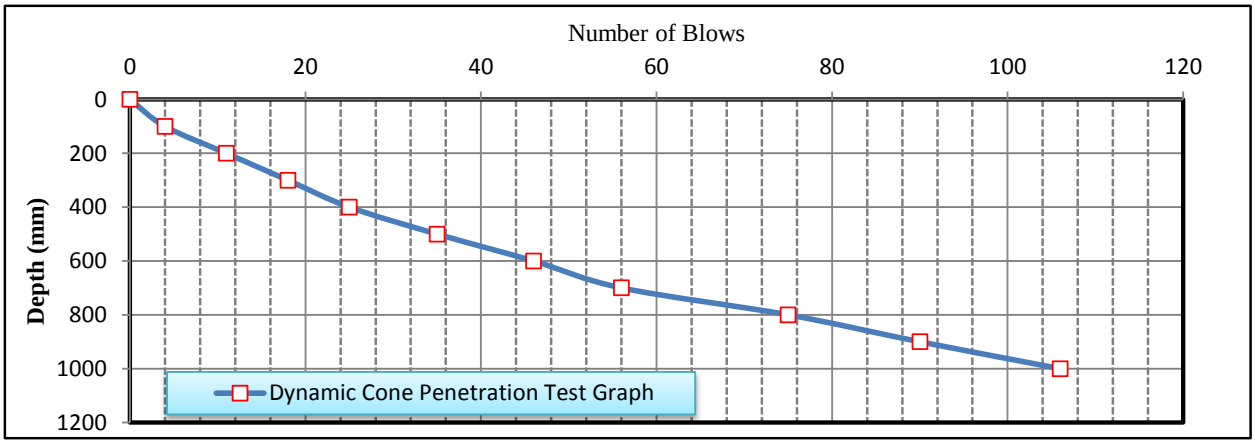
Project : ADB TA-8492 LAO: Road Sector Governance & Maintenance Project

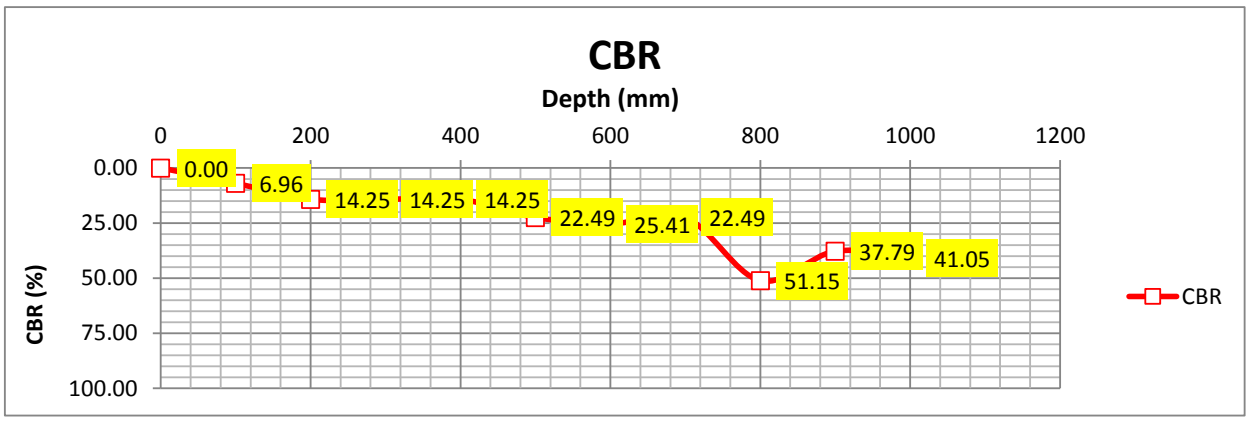
Consultant : Mekong Consultants Co., LTD Date: 10-01-14

Location : (NR-18B) Erision , Attapeu Province Coordinates

Chainage : DCP-No.4 (Right 5[m]) Km 48+500 Ground Elv : N: E:

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
4	4	-100	25.00	6.96	
7	11	-200	14.29	14.25	
7	18	-300	14.29	14.25	
7	25	-400	14.29	14.25	
10	35	-500	10.00	22.49	
11	46	-600	9.09	25.41	
10	56	-700	10.00	22.49	
19	75	-800	5.26	51.15	
15	90	-900	6.67	37.79	
16	106	-1000	6.25	41.05	





Checked by : Test by:

Dynamic Cone Penetration Test

DCP-No.5

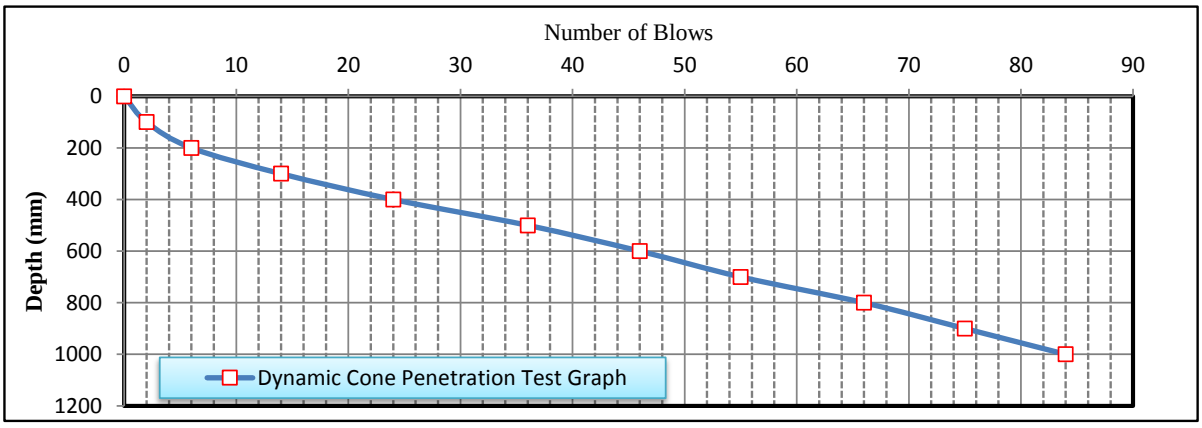
Project : ADB TA-8492 LAO: Road Sector Governance & Maintenance Project

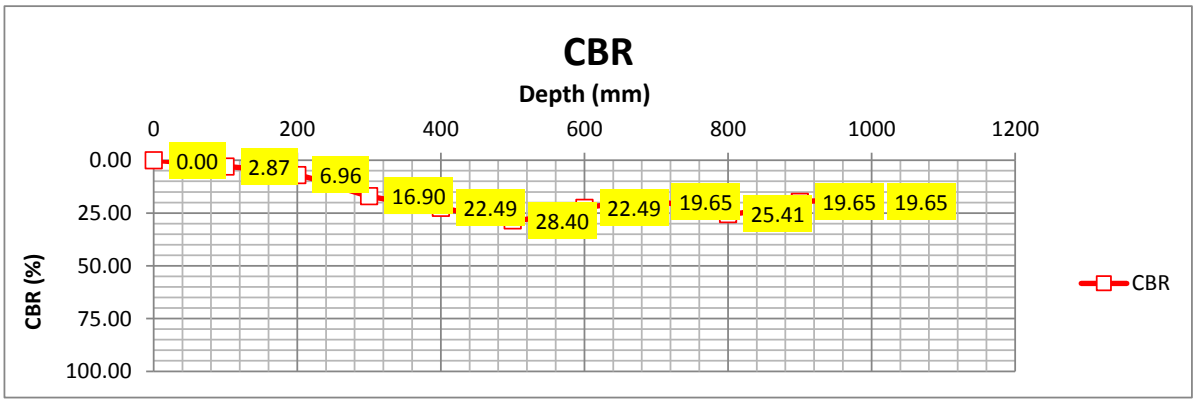
Consultant : Mekong Consultants Co., LTD Date: 10-01-14

Location : (NR-18B) Erision , Attapeu Province Coordinates

Chainage : DCP-No.5 (Right 5^{m}) Km 48+500 Ground Elv : N: E:

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
2	2	-100	50.00	2.87	
4	6	-200	25.00	6.96	
8	14	-300	12.50	16.90	
10	24	-400	10.00	22.49	
12	36	-500	8.33	28.40	
10	46	-600	10.00	22.49	
9	55	-700	11.11	19.65	
11	66	-800	9.09	25.41	
9	75	-900	11.11	19.65	
9	84	-1000	11.11	19.65	





Checked by : Test by:

Dynamic Cone Penetration Test

DCP-No.6

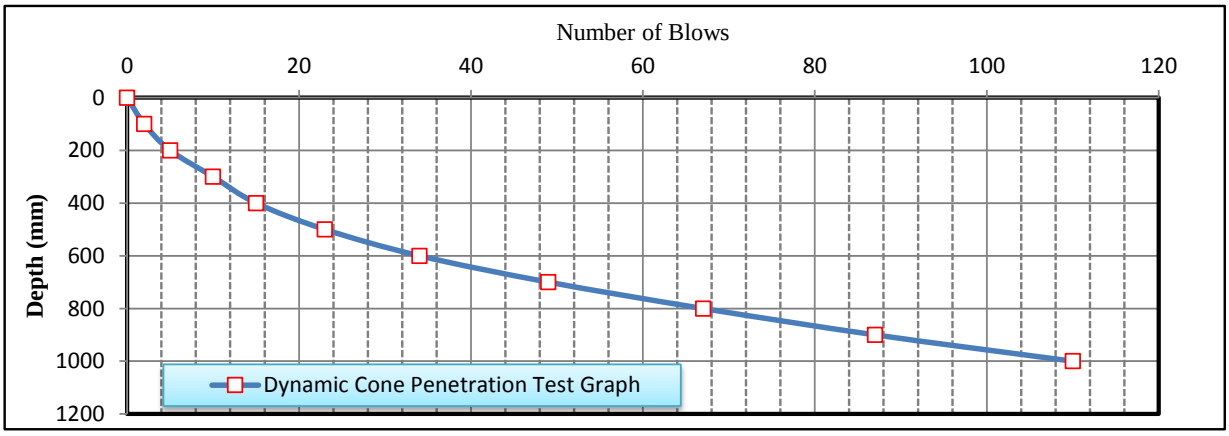
Project : ADB TA-8492 LAO: Road Sector Governance & Maintenance Project

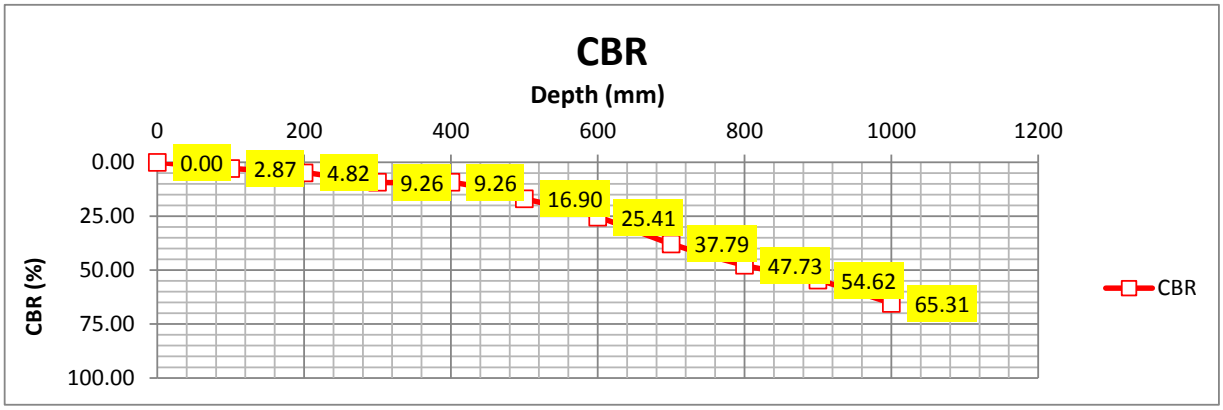
Consultant : Mekong Consultants Co., LTD Date: 10-01-14

Location : (NR-18B) Erision , Attapeu Province Coordinates

Chainage : DCP-No.6 (Right 4m) Km 48+500 Ground Elv : N: E:

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
2	2	-100	50.00	2.87	
3	5	-200	33.33	4.82	
5	10	-300	20.00	9.26	
5	15	-400	20.00	9.26	
8	23	-500	12.50	16.90	
11	34	-600	9.09	25.41	
15	49	-700	6.67	37.79	
18	67	-800	5.56	47.73	
20	87	-900	5.00	54.62	
23	110	-1000	4.35	65.31	





Checked by : Test by:

Annex K – Pavement Conditions [National Roads]

■Pavement Conditions Survey (NR-20)

Route Name	KM	Station From		Station To		Section Length	Paved Width of Road	Unworkable dicth (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)			
			920		930																	10	2	20	CL
				49	000	1000	8																	130	
National Road 20		50	230		231		8															1	1	1	CL
				50	000	1000	8																	1	
National Road 20		51	040		55		8															15	1	1	CL
			405		407																	2	1	2	CL
			805		807										2	1	2	0.2	0.175	0.35	LHS				
	KM 53	51	830																						
				51	000	1000	8										2		0.175	0.35				3	
National Road 20		52					8																		
				52	000	1000	8																		
National Road 20		53	230		235		8								5	1	5	0.2	0.175	0.875	CL				
	1 Box (2*2)	53	300																						
	KM 55	54	750																						
				53	000	1000	8										5		0.175	0.875					
National Road 20		54	790		792		8								2	2	4	0.2	0.175	0.7	CL				
	KM 56	55	730																						
			920		931																	11	3	33	LHS
				54	000	1000	8										4		0.175	0.7				33	
National Road 20		55	105		120		8															8	4	32	LHS
			710		730					20	3	60	28.8	RHS											
			850		852																	2	1	2	CL
			880		883																	3	1	3	CL
				55	000	1000	8					60	28.8											37	
National Road 20		56																							
	KM 57	56	450																						
	Bridge H.Kapher	56	600																						
				56	000	1000	8																		
												6,088.50	2,922.48				62.50			10.94				3,077.25	

Date 30 / 09 / 2014

■ Pavement Conditions Survey (NR-20)

Route Name	KM	Station From		Station To		Section Length	Paved Width of Road	Unworkable ditch (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)			
				39	000	1000	8					128	61.44												
National Road 20		40					8																		
	KM 41	40	80																						
			180		206					26	1	26	12.48	RHS											
	1 Box (2*2)	40	500																						
				40	000	1000	8					26	12.48												
National Road 20		41					8																		
				41	000	1000	8																		
National Road 20		42					8																		
	KM 43	42	80																						
				42	000	1000	8																		
National Road 20		43	730		743		8			13	3	39	18.72	RHS											
	KM 44	43	780																						
				43	000	1000	8					39	18.72												
National Road 20		44					8/																		
				44	000	1000	8																		
National Road 20		45					8																		
	Bridge H.Poung	45	400																						
				45	000	1000	8																		
National Road 20		46	000		028		8			28	3	84	40.32	LHS											
			030		032					2	2	4	1.92	LHS											
			300		306					6	2	12	5.76	LHS											
	1 Pipe (D=1)	46	350																						
			400		405																	5	2	10	LHS
			500		518																	18	1	18	LHS
			680		718					38	2	76	36.48	RHS											
				46	000	1000	8					176	84.48											28	
National Road 20		47					8																		
	Bridge H.San	47	230																						
			240		242										2	1	2	0.2	0.175	0.35	LHS				
			250		252										2	1	2	0.2	0.175	0.35	LHS				
			450		460																	10	2	20	RHS
	1 Pipe (D=1.5)	47	470																						
	KM 49	47	500																						
				47	000	1000	8										4		0.35	0.7				20	
National Road 20		48	410				8								1	1	1	0.2	0.175	0.175	CL				
			630		635																	5	2	10	CL
	KM 50	48	000																						
				48	000	1000	8										1		0.175	0.175				10	
National Road 20		49	190		205		8															15	1	15	CL
	1 Box (2*1)	47	270																						
			290		313																	23	1	23	CL
			330		394																	64	1	64	CL
			710		714																	4	2	8	LHS

■Pavement Conditions Survey (NR-20)

Route Name	KM	Station From		Station To		Section Length	Paved Width of Road	Unworkable dicth (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)			
			310		311																	1	1	1	LHS
	1 Box (1*1)	33	440																						
				33	000	1000	8																	1	
National Road 20		34					8																		
	KM 35	34	280																						
			400		459					19	4	76	36.48	RHS											
			500		523					23	4	92	44.16	RHS											
			550		612					62	4	248	119.04	RHS											
			650		715					65	8	520	249.6	FULL											
			810		910					108	8	864	414.72	FULL											
			940		975					35	4	140	67.2	LHS											
				34	000	1000	8					1940	931.2												
National Road 20		35	060		061		8															1	1	1	CL
			090		129					39	8	312	149.76	FULL											
			150		196					46	8	368	176.64	FULL											
	KM 36	35	220																						
			410		482					72	8	576	276.48	RHS											
			460		510					50	8	400	192	FUL											
			650		660					10	8	80	38.4	RHS											
			660		665										5	1	5	0.2	0.175	0.875	LHS				
			750		755										5	3	15	0.2	0.175	2.625	LHS				
			760		763										3	2	6	0.2	0.175	1.05	RHS				
	1 Pipe (D=1)	35	950																						
				35	000	1000	8					1736	833.28				26		0.525	4.55				1	
National Road 20		36					8																		
	KM 37	36	200																						
				36	000	1000	8																		
National Road 20		37					8																		
	KM 38		250																						
			300		312																	12	2	24	LHS
			350		652																	2	2	4	LHS
			360		362																	2	2	4	LHS
			370		371																	2	1	2	LHS
			410		412																	2	2	4	LHS
			440		441																	1	1	1	LHS
			520		521																	1	2	2	LHS
				37	000	1000	8																	41	
National Road 20		38					8																		
			30		36																	6	1	6	LHS
	KM 39	38	140																					0	LHS
			510		511																	1	1	1	LHS
				38	000	1000	8																	7	
National Road 20		39	50		66		8			16	8	128	61.44	LHS											
	Bridge Vangpeua	39	140																						

■Pavement Conditions Survey (NR-20)

Route Name	KM	Station From		Station To		Section Length	Paved Width of Road	Unworkable ditch (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)			
	1 Box (1*1)	27	150																						
			170		176																	7	2	14	LHS
			350		352																	2	2	4	CL
			430		446																	16	4	64	LHS
	KM 28	27	520																						
			530		548																	18	2	36	CL
			670		708																	38	2	76	CL
			750		772																	22	3	66	RHS
				27	000	1000	8																	292	
National Road 20		28	030		031																	1	1	1	LHS
			080		081																	1	1	1	LHS
			150		158																	8	2	16	LHS
	1 Box (1*1)	28	170																						
			250		251																	1	1	1	CL
	KM 29	28	480																						
				28	000	1000	8																	19	
National Road 20		29	280		286		8															6	1	6	CL
	KM 30		440																						
			440		443																	3	1	3	CL
			505		506																	1	1	1	CL
			810		820																	10	3	30	LHS
			850		858																	8	1	8	LHS
			860		865																	5	2	10	LHS
			900		910																	10	2	20	RHS
				29	000	1000	8																	78	
National Road 2	1 Box (1*1)	30	230																						
		30	260		262		8															2	2	4	RHS
	1 Box (1*1)	30	700																						
			860		887					27	2	54	25.92												
	1 Box (1*1)	30	880																						
	Bridge Xeset	30	950																						
				30	000	1000	8					54	25.92											4	
National Road 20		31	330		331		8															1	3	3	LHS
	KM 32	31	380																						
			410		412																	2	1	2	RHS
			620		623																	3	2	6	LHS
				30	000	1000	8																	11	
National Road 20		32	130		135																	5	2	10	LHS
			240		242																	2	1	2	CL
			470		476																	6	3	18	CL
			480		481																	1	1	1	LHS
				32	000	1000	8																	31	
National Road 20		33	000				8																		
	KM 34	33	280																						

■ Pavement Conditions Survey (NR-20)

Route Name	KM	Station From		Station To		Section Length (m)	Paved Width of Road	Unworkable ditch (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)			
National Road 1	1 Box (1*1)	22	040																						
		22	150		152		8								2	1	2	0.2	0.175	0.35	CL				
			170		171										1	1	1	0.2	0.175	0.175	RHS				
			230		240																	10	3	30	LHS
			410		480																	70	3.5	245	LHS
			500		566																	16	3	48	RHS
			510		511.5										1.5	1	1.5	0.2	0.175	0.2625	LHS				
			610		617																	7	2	14	LHS
			680		711																	31	1	31	LHS
			690		721																	31	1	31	LHS
			700		705																	5	2	10	RHS
			710		720																	10	2	20	RHS
				22	000	1000	8										4.5		0.525	0.7875				429	
National Road 20		23	010		025		8															14	4	56	LHS
	1 Box (1*1)	23	080																						
			100		115																	15	4	60	RHS
			410		433																	23	4	92	LHS
			420		430																	10	2	20	RHS
			505		507																	2	1	2	LHS
			570		573																	3	1	3	LHS
			820		832																	12	2	24	RHS
	1 Box (1.5*1.5)	23	880																						
			930		932																	2	1.5	3	RHS
				23	000	1000	8																	260	
National Road 20		24	000		010		8															10	2	20	RHS
	KM 25	24	650																						
				24	000	1000	8																	20	
National Road 20		25	005		007																	2	1	2	CL
			030		036																	6	2	12	CL
			070		072																	2	2	4	LHS
			150		158																	8	1	8	LHS
			350		351																	1	1	1	CL
			400		453																	13	2	26	LHS
			470		525																	55	2	110	LHS
			760		763																	3	2	6	RHS
	1 Box (1*1)	25	880																						
			920		935																	15	2	30	RHS
				25	000	1000	8																	199	
National Road 2	1 Box (1*1)	26	040				8																		
	Bridge Concrete	26	350																						
	KM 27	26	580																						
			860		866																	6	2	12	LHS
				26	000	1000	8																	12	
National Road 20		27	120		128		8															8	4	32	LHS

■Pavement Conditions Survey (NR-20)

Route Name	KM	Station From		Station To		Section Length	Paved Width of Road	Unworkable ditch (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)			
		16	700		737		8															37	1.5	55.5	RHS
	KM 16	16	960																						
				16	000	1000	8																	55.5	
National Road 20		17	060		64		8															4	1	4	RHS
	Bridge H.Lagoon	17	150																						
	1 Box (1*1)	17	500																						
			610		611										1	1	1	0.2	0.175	0.175					
	KM 18	17	890																						
				17	000	1000	8										1		0.175	0.175				4	
National Road 20		18	0		10		8															4	1	4	LHS
	1 Box (1*1)	18	280																						
			405		423																	18	3	54	RHS
	KM 19	18	890																						
				18	000	1000	8																	58	
National Road 2	1 Box (1*1)	19	080																						
		19	400		424																	24	2	48	CL
			405		438																	32	1	32	LHS
			440		445																	5	2	10	RHS
			480		482																	2	1	2	LHS
	1 Box (2*1)	19	560																						
			620		624																	4	2	8	RHS
				19	000	1000	8																	100	
National Road 20		20	0		12		8															12	3	36	RHS
			120		142																	22	1.5	33	RHS
			160		182					22	3	66	31.68	RHS											
			920		921																	1	1	1	LHS
			950		951																	1	1	1	LHS
				20	000	1000	8					66	31.68											71	
National Road 20		21	0		11		8															11	1.5	16.5	RHS
			100		105																	5	2	10	RHS
			250		252																	2	2	4	RHS
			340		342																	2	2	4	CL
			350		355																	5	1	5	RHS
			400		407																	7	2	14	RHS
			405		420					15	4	60	28.8	LHS											
			450		458					8	3	24	11.52	RHS											
			495		496										1	1	1	0.2	0.175	0.175	CL	8	2	16	RHS
			720		746					26	3	78	37.44	RHS											
			810		818																				
			840		841										1	1	1	0.2	0.175	0.175	LHS				
			850		851										1	1	1	0.2	0.175	0.175	CL				
			860		863															0		3	1.5	4.5	LHS
			960		961										1	1	1	0.2	0.175	0.175	RHS				
				21	000	1000	8					162	77.76				4		0.7	0.7				74	

■ Pavement Conditions Survey (NR-20)

Route Name	KM	Station From		Station To		Section Length (m)	Paved Width of Road	Unworkable dicth (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)			
			040		050																	10	2	20	RHS
	1 Box (2*2)	13	180																						
	Bridge Concrete	13	350																						
			530		532																	2	1	2	CL
	1 Box (2*2)	13	580																						
			600		605										5	1	5	0.2	0.175	0.875	RHS				
			605		607																	2	1	2	LHS
			640		642																	2	1	2	RHS
			650		656																	6	1	6	LHS
			705		731																	26	2	52	RHS
			710		714																	4	1	4	LHS
			750		754																	4	1	4	LHS
			760		767																	7	1	7	RHS
			800		835					35	2	70	33.6	LHS											
			810		811																	1	1	1	RHS
			850		851																	1	1	1	RHS
	1 Box (2*2)	13	940																						
				13	000	1000	8					70	33.6				5		0.175	0.875				115	
National Road 20		14	000				8																		
	KM 14	14	040																						
			120		126																	6	2	12	RHS
			200		215																	15	1.5	22.5	RHS
			205		226																	21	2	42	LHS
			240		277					37	8	296	142.08	FULL											
			280		295																	15	2	30	RHS
			300		301																	1	1	1	RHS
			305		308																	3	2	6	LHS
			330		353																	23	2	46	RHS
			350		351																	1	1	1	RHS
			370		380					10	3	30	14.4	RHS											
			395		398																	3	2	6	RHS
			400		416					16	1	16	7.68	LHS											
			450		451										1	1	1	0.2	0.175	0.175	LHS				
			480		495																	15	1	15	LHS
	1 Box (2*2)	14	580																						
	Bridge H.Pasa	14	750																						
	1 Box (2*2)	14	960																						
				14	000	1000	8					342	164.16				1		0.175	0.175				181.5	
National Road 20		15					8																		
	Bridge H.Soung	15	330																						
	1 Box (2*2)	15	430																						
	Bridge H.Leuk	15	750																						
	KM 15	15	960																						
				15	000	1000	8																		

■Pavement Conditions Survey (NR-20)

Route Name	KM	Station From		Station To		Section Length (m)	Paved Width of Road	Unworkable dicth (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)			
			540		542.5																	2.5	2	5	LHS
	3 Box (1*1)	8	580																						
			720		724																	4	3	12	RHS
				8	000	1000	8																	35	
National Road 20		9	440		441		8								1	1	1	0.2	0.175	0.175	RHS				
			830		835																	5	2	10	LHS
			930		955																	25	4	100	RHS
				9	000	1000	8										1		0.175	0.175				110	
National Road 20		10	10		42		8			32	2	64	30.72	LHS											
	KM 10	10	80																						
			220		222					2	1	2	0.96	RHS											
	1 Box (1.5*1.5)	10	350																						
			420	425						5	2	10	4.8	RHS											
			460		461										1	1	1	0.2	0.175	0.175	RHS				
			550		552																	2	1	2	RHS
			660		666					6	3	18	8.64	RHS											
				10	000	1000	8					94	45.12				1		0.175	0.175				2	
National Road 20		11	250		255		8			5	1.5	7.5	3.6	LHS											
			320		325					5	2	10	4.8	LHS											
			350		355																	14	2	28	LHS
			410		425																	15	2.5	37.5	LHS
			410		419																	9	2	18	RHS
			450		459																	9	2	18	LHS
			460		471																	11	2.5	27.5	RHS
			470		481																	11	2.5	27.5	LHS
			530		546																	16	2	32	LHS
			540		552																	12	3	36	RHS
			730		731										1	1	1	0.2	0.175	0.175	RHS				
				11	000	1000	8					17.5	8.4				1		0.175	0.175				224.5	
National Road 20		12	010		024		8															14	2	28	LHS
			020		027																	7	1.5	10.5	RHS
			040		043																	3	3	9	LHS
			070		073																	3	2	6	RHS
			080		081																	1	1	1	LHS
			100		107																	7	1.5	10.5	RHS
			140		148																	8	3	24	RHS
			160		175					15	8	120	57.6	FULL											
			190		197																	7	3	21	RHS
			690		718					28	2	56	26.88	LHS											
			910		915					5	2.5	12.5	6	RHS											
			950		951										1	1	1	0.2	0.175	0.175					
				12	000	1000	8					188.5	90.48				1		0.175	0.175				110	
National Road 20		13	000		004		8															4	2	8	RHS
			030		033																	3	2	6	CL

■Pavement Conditions Survey (NR-20)

Route Name	KM	Station From (km,m)		Station To (km,m)		Section Length (m)	Paved Width of Road (m)	Unworkable ditch (m) L	Unworkable ditch (m) R	Multiple Crack (Replacement) (A) Length (m)	(B) Width (m)	(C) Area (m2)	(D) Volume (m2):(C)*0.48m	Note	Pothole(Patching) (A) Length (m)	(B) Width (m)	(C) Area (m2)	(D) Depth (m)	(E) Aggregate Depth (m): (D)-0.025m	(F) Aggregate Volume	Note	Crack (Sealing) (A) Length (m)	(B) Width (m)	(C) Area (m2)	Note
National Road 20		0	000		009		8															20	9	180	RHS
			050		52																	10	2	20	LHS
			630		638																	8	2	16	LHS
				1	0	1000	8																	216	
National Road 20		1	200		203.5		8															3.5	2	7	CL
			310		312																	2	1	2	CL
			820		825																	5	2	10	CL
			850		854																	4	1	4	LHS
				2	000	1000	8																	23	
National Road 20		2	220		223		8															3	1	3	RHS
			320		329																	9	2	18	LHS
			930		931																	1	1	1	CL
			950		951																	3	1	3	RHS
				3	000	1000	8																	25	
National Road 20		3	310		368		8			58	12	696	334.08	CL											
			410		452					42	5	210	100.8	CL											
			530		532.5																	2.5	2	5	CL
			620		632					12	5	60	28.8	RHS											
			640		643					3	4	12	5.76	CL											
			650		651					1	1	1	0.48	RHS											
			660		663					3	2	6	2.88	RHS											
			720		710.5																	0.5	0.5	0.25	RHS
			730		730.5																	0.5	0.5	0.25	RHS
			840		840.5																	0.5	0.5	0.25	RHS
			900		4000									Contraction											
				4	000	1000	8					985	472.8											5.75	
		4					11							Contraction											
		5			950		11							Contraction											
	1 Box (1*1)	5	950																						
			960		961					1	4.5	4.5	2.16												
				5	000	1000	8					4.5	2.16												
National Road 20		6					8																		
	KM 06	6	125																						
			930		931										1	1	1	0.2	0.175	0.175	RHS				
				6	000	1000	8										1		0.175	0.175					
National Road 20		7					8																		
	KM 07	7	300																						
	1 Box (1*1)	7	420																						
				7	000	1000	8																		
National Road 20		8					8																		
	1 Box (1*1)	8	040																						
	KM 08	8	200																						
			430		439																	9	2	18	RHS

Pavement Conditions Survey (NR-16)

Route Name	KM	Station				Section Length (m)	Paved Width of Road (m)	Unworkable ditch (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)				Total Required Repair Ratio (%)
		From (km,m)		To (km,m)				L	R	(A) Length (m)	(B) Width (m)	(C) Area (m2)	(D) Volume (m3):(C)*0.48m	Note	(A) Length (m)	(B) Width (m)	(C) Area (m2)	(D) Depth (m)	(E) Aggregate Depth (m): (D)-0.025m	(F) Aggregate Volume (m): (C)*(E)	Note	(A) Length (m)	(B) Width (m)	(C) Area (m2)	Note	
National Road 16		0	000																							
	2xPipe.100cm	0	000				20																			
	1B_200x100 cm	0	000				20																			
	Rd Width Change	0	440				8																			
		0	448	0	450		8																2	1	2	LHS	
		0	450	0	457		8																7	2	14	RHS	
		0	550	0	562		8																12	1	12	RHS	
		0	560	0	593		8																33	1	33	LHS	
		0	575	0	581		8																6	1	6	RHS	
	1xPipe.100cm	0	590																							
		0	625	0	630		8																5	1	5	LHS	
		0	660	0	661		8																1	1	1	LHS	
				1	000	1000	8					0	0				0		0	0					73		0.91%
		1	000																							
		1	125	1	128																		3	1	3	RHS	
	KM 43	1	220																							
		1	250	1	480					230	8	1840	883.2	FULL												
	2xPipe.100cm	1	380																							
	1xPipe.100cm	1	425																							
				2	000	1000	8					1840	883.2				0		0	0					3		23.04%
		2	000																							
		2	005	2	007										2	1	2	0.2	0.175	0.35	LHS					
	1B_300x200 cm	2	180																							
	KM 42	2	275																							
	1B_300x200 cm	2	625																							
		2	665	2	675																		10	2	20	RHS	
		2	750	2	782					32	8	256	122.88	FULL												
		2	850	2	854										4	1	4	0.15	0.125	0.5	RHS					
				3	000	1000	8					256	122.88				6		0.3	0.85					20		3.53%
		3	000																							
		3	050	3	052																		2	1	2	LHS	
	2B_400x400 cm	3	300																							
	KM 41	3	310																							
		3	350	3	351										0.5	0.5	0.25	0.1	0.075	0.01875	CENTER					
		3	380	3	381																		1	1	1	CENTER	
		3	440	3	448																		8	1.5	12	CENTER	
	1xPipe.100cm	3	600																							
		3	625	3	629																		4	1	4	CENTER	
		3	640	3	642																		2	2	4	LHS	
		3	705	3	707																		2	1	2	CENTER	
		3	755	3	756																		0.5	0.5	0.25	CENTER	
	2B_300x200 cm	3	800																							

Pavement Conditions Survey (NR-16)

Route Name	KM	Station				Section Length	Paved Width of	Unworkable ditch (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)				Total Required
		3	899	3	999																	100	4	400	LHS	
				4	000	1000	8					0	0				0.25		0.075	0.01875				425.25		5.32%
		4	000																							
		4	000	4	007																	7	4	28	LHS	
		4	050	4	072																	22	4	88	RHS	
	KM 40	4	325																							
	1xPipe.100cm	4	480																							
	3B_400x400 cm	4	650																							
		4	905	4	920																	15	5	75	RHS	
				5	000	1000	8					0	0				0		0	0				191		2.39%
		5	000																							
		5	000	5	014					14	8	112	53.76	FULL												
		5	075	5	077																	2	1	2	LHS	
	1xPipe.100cm	5	230																							
	KM 39	5	325																							
		5	400	5	417																	17	4	68	RHS	
		5	505	5	522																	17	2	34	LHS	
		5	595	5	605																	10	1	10	LHS	
		5	640	5	650																	10	2	20	LHS	
		5	660	5	661																	0.5	0.5	0.25	CENTER	
		5	675	5	681																	6	1	6	LHS	
		5	850	5	855																	5	1	5	CENTER	
		5	880	5	910																	30	8	240	FULL	
		5	950	5	980																	30	2	60	CENTER	
		5	960	5	962																	2	2	4	RHS	
				6	000	1000	8					112	53.76				0		0	0				449.25		7.02%
		6	000																							
	1xPipe.120cm	6	040																							
		6	140	6	140.5					0.5	0.5	0.25	0.12	FULL												
		6	150	6	155					5	1	5	2.4	RHS												
		6	315	6	333					18	1	18	8.64	LHS												
		6	340	6	351																	11	1	11	LHS	
		6	360	6	362																	2	1	2	LHS	
		6	365	6	366																	1	1	1	CENTER	
	1xPipe.120cm	6	540																							
		6	620	6	622																	2	2	4	CENTER	
		6	625	6	628										3	1	3	0.1	0.075	0.225	LHS					
		6	740	6	742																	1.5	1.5	2.25	CENTER	
				7	000	1000	8					23.25	11.16				3		0.075	0.225				20.25		0.6%
		7	000																							
		7	010	7	043																	33	2	66	LHS	
		7	040	7	055																	15	2	30	LHS	
		7	060	7	190																	130	1	130	LHS	
		7	060	7	061																	1	1	1	CENTER	

Pavement Conditions Survey (NR-16)

		Station				Section Length	Paved Width of	Unworkable ditch (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)				Total Required
		7	064	7	065																	1	1	1	CENTER	
	KM 37	7	340																							
	1xPipe.100cm	7	470																							
	1xPipe.100cm	7	525																							
	2xPipe.100cm	7	830																							
				8	000	1000	8					0	0				0		0	0				228		2.9%
		8	000																							
		8	010	8	092					82	8	656	314.88	FULL												
		8	110	8	112																	2	1	2	RHS	
		8	120	8	133										13	1	13	0.1	0.075	0.975	LHS					
	3xPipe.100cm	8	170																							
	KM 36	8	350																							
	2xPipe.100cm	8	380																							
		8	475	8	480																	5	1	5	CENTER	
		8	610	8	762					152	8	1216	583.68	FULL												
	1xPipe.100cm	8	925																							
				9	000	1000	8					1872	898.56				13		0.075	0.975				7		23.7%
		9	000																							
	Brigde	9	100																							
	KM 35	9	325																							
		9	925	9	940										15	2	30	0.1	0.075	2.25	LHS					
		9	950	9	951										0.5	0.5	0.25	0.1	0.075	0.01875	CENTER					
		9	960	9	998																	38	2.5	95	RHS	
				10	000	1000	8					0	0				30.25		0.15	2.26875				95		1.6%
		10	000																							
		10	110	10	120					10	2	20	9.6	LHS												
	1xPipe.100cm	10	150																							
		10	180	10	182																	2	1	2	RHS	
		10	205	10	377					172	8	1376	660.48	FULL												
		10	380	10	395																	15	4	60	RHS	
	KM 34	10	415																							
		10	410	10	445																	35	4	140	RHS	
		10	475	10	482										7	4	28	0.1	0.075	2.1	RHS					
		10	700	10	947					247	8	1976	948.48	FULL												
	1xPipe.120cm	10	875																							
		10	940	10	941										0.5	0.5	0.25	0.1	0.075	0.01875	CENTER					
		10	980	10	981										0.5	0.5	0.25	0.1	0.075	0.01875	CENTER					
				11	000	1000	8					3372	1618.56				28.5		0.225	2.1375				202		45.0%
		11	000	11	004																	4	4	16	LHS	
		11	100	11	118					18	3	54	25.92	RHS												
		11	290	11	490					200	8	1600	768	FULL												
		11	820	11	824																	4	2	8	LHS	
		11	930	11	933										3	3	9	0.1	0.075	0.675	RHS					
		11	940	11	943																	3	1	3	CENTER	

Pavement Conditions Survey (NR-16)

Route Name	KM	Station				Section Length	Paved Width of	Unworkable ditch (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)				Total Required
		11	960	11	990																	30	8	240	FULL	
				12	000	1000	8					1654	793.92				9		0.075	0.675				267		24.1%
		12	000	12	026																	26	4	104	RHS	
	1xPipe.120cm	12	130																							
		12	310	12	310.5										0.5	0.5	0.25	0.1	0.075	0.01875	LHS					
		12	315	12	316										0.5	0.5	0.25	0.1	0.075	0.01875	LHS					
		12	380	12	382										2	1	2	0.1	0.075	0.15	LHS					
		12	420	12	421										0.5	0.5	0.25	0.1	0.075	0.01875	LHS					
	KM 32	12	450																							
		12	451	12	452										1	1	1	0.1	0.075	0.075	RHS					
		12	470	12	475										5	1	5	0.1	0.075	0.375	LHS					
	1xPipe.120cm	12	510																							
		12	550	12	552																	2	2	4	CENTER	
		12	552	12	553										0.5	0.5	0.25	0.1	0.075	0.01875	CENTER					
	1xPipe.120cm	12	680																							
		12	820	12	829										9	1	9	0.1	0.075	0.675	LHS					
		12	880	12	887										7	1	7	0.1	0.075	0.525	LHS					
		12	930	12	931										1	0.5	0.5	0.1	0.075	0.0375	CENTER					
		12	960	12	969																	9	2	18	LHS	
				13	000	1000	8					0	0				25.5		0.75	1.9125				126		1.9%
		13	000																							
	1xPipe.120cm	13	080																							
		13	120	13	146										26	0.5	13	0.1	0.075	0.975	LHS					
		13	180	13	185																	5	2	10	LHS	
		13	225	13	238										13	0.5	6.5	0.1	0.075	0.4875	LHS					
	1xPipe.120cm	13	460																							
	KM 31	13	490																							
		13	510	13	705																	195	8	1560	FULL	
		13	705	13	712																	7	8	56	FULL	
		13	750	13	758																	8	4	32	RHS	
		13	750	13	784																	34	4	136	LHS	
		13	785	13	795																	10	8	80	FULL	
		13	800	13	835																	35	4	140	LHS	
	1xPipe.100cm	13	915																							
		13	950	13	951										1	1	1	0.1	0.075	0.075	LHS					
		13	950	13	958																	8	4	32	RHS	
		13	955	13	958										3	1	3	0.1	0.075	0.225	LHS					
		13	980	13	983																	3	2	6	RHS	
				14	000	1000	8					0	0				23.5		0.3	1.7625				2052		25.9%
		14	000																							
		14	005	14	008																	3	4	12	LHS	
		14	050	14	86																	36	8	288	FULL	
		14	100	14	170																	70	8	560	FULL	
		14	160	14	205																	45	4	180	LHS	

Pavement Conditions Survey (NR-16)

		Station				Section Length	Paved Width of	Unworkable ditch (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)				Total Required
	KM 30	14	465																							
		14	470	14	471										1	1	1	0.1	0.075	0.075	LHS					
	1xPipe.120cm	14	540																							
		14	910	14	948										38	1	38	0.1	0.075	2.85	LHS					
				15	000	1000	8					0	0				39		0.15	2.925				1040		13.5%
		15	000																							
		15	340	15	341										1	0.5	0.5	-0.9	-0.925	-0.4625	LHS					
	KM 29	15	455																							
	1xPipe.120cm	15	690																							
				16	000	1000	8					0	0				0.5		-0.925	-0.4625				0		0.0%
		16	000																							
	KM 28	16	475																							
		16	780	16	805					25	3	75	36	RHS												
		16	840	16	875					35	3	105	50.4	RHS												
		16	880	16	882										2	1	2	0.1	0.075	0.15	LHS					
				17	000	1000	8					180	86.4				2		0.075	0.15				0		2.3%
		17	000																							
		17	005	17	007					2	0.5	1	0.48	LHS												
		17	125	17	145																	20	2	40	RHS	
		17	190	17	191					0.5	0.5	0.25	0.12	LHS												
		17	210	17	240																	30	3	90	LHS	
		17	260	17	265																	5	2	10	LHS	
		17	290	17	291										1	1	1	0.1	0.075	0.075	LHS					
		17	340	17	356																	16	2	32	LHS	
		17	360	17	365																	5	2	10	LHS	
		17	510	17	516																	6	3	18	LHS	
		17	520	17	570																	50	2	100	RHS	
		17	620	17	633																	13	3	39	RHS	
		17	630	17	636																	6	3	18	LHS	
		17	680	17	683																	3	3	9	RHS	
		17	720	17	742																	22	3	66	LHS	
	1Box_300x200 cm	17	780																							
		17	990	18	000																	10	8	80	CENTER	
				18	000	1000	8					1.25	0.6				1		0.075	0.075				512		6.4%
		18	000																							
		18	000	18	027																	27	8	216	CENTER	
		18	105	18	150										45	8	360	0.1	0.075	27	LHS					
		18	160	18	171																	11	3	33	LHS	
	1xPipe.120cm	18	370																							
		18	430	18	435																	5	1	5	LHS	
	KM 26	18	525																							
		18	625	18	631																	6	2	12	LHS	
		18	690	18	691										0.5	0.5	0.25	0.1	0.075	0.01875	LHS					
	1xPipe.100cm	18	760																							

Pavement Conditions Survey (NR-16)

Route Name	KM	Station				Section Length	Paved Width of	Unworkable ditch (m)		Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)				Total Required
		18	810	18	838																	28	4	112	LHS	
		18	840	18	898																	58	4	232	LHS	
		18	950	18	951										0.5	0.5	0.25	0.1	0.075	0.01875	LHS					
	2Box_300x300 cm	18	985																							
				19	000	1000	8					0	0				360.5		0.225	27.0375				610		12.1%
		19	000																							
		19	040	19	048																	8	1	8	RHS	
		19	060	19	75																	15	1	15	RHS	
		19	140	19	141																	1	1	1	RHS	
		19	210	19	211										1	0.5	0.5	0.1	0.075	0.0375	CENTER					
		19	240	19	242										2	1	2	0.1	0.075	0.15	RHS					
		19	250	19	268																	18	4	72	LHS	
	KM 25	19	510																							
		19	560	19	570																	10	3	30	LHS	
		19	715	19	717																	2	1	2	LHS	
		19	720	19	895																	175	8	1400	FULL	
		19	920	19	980																	60	8	480	FULL	
				20	000	1000	8					0	0				2.5		0.15	0.1875				2008		25.1%
		20	000																							
		20	050	20	055																	5	2	10	CENTER	
		20	205	20	209																	4	1	4	CENTER	
		20	270	20	277																	7	2	14	RHS	
		20	370	20	371																	1	1	1	LHS	
		20	380	20	383																	3	1	3	CENTER	

■Pavement Conditions Survey (NR-18B)

Route Name	Note	Kilometer				Section Length (m)	Paved Width of Road (m)	Multiple Crack (Replacement)					Pothole(Patching)							Crack (Sealing)				Total Required Repair Rate (%)
		From (km,m)		To (km,m)				(A) Length (m)	(B) Width (m)	(C) Area (m2)	(D) Volume (=(A)*(C)*0.48m)	Note	(A) Length (m)	(B) Width (m)	(C) Area (m2)	(D) Depth (m)	(E) Aggregate Depth (m): (D)-0.025m	(F) Aggregate Volume (m): (C)*(E)	Note	(A) Length (m)	(B) Width (m)	(C) Area (m2)	Note	
National Road 18B	Km00	0	000				15																	
National Road 18B		0	020	0	021		15						1	1	1	0.15	0.125	0.125	LHS					
National Road 18B		0	050	0	051		15						1	1	1	0.1	0.075	0.075	LHS					
National Road 18B	Nokong Brigde	0	315	0	590		7																	
National Road 18B		0	810	0	811		7						1	1	1	0.1	0.075	0.075	LHS					
National Road 18B				1	000	1000	7			0	0				3							0		0.04%
National Road 18B	Km01	1	000																					
National Road 18B		1	350	1	353								3	1	3	0.2	0.175	0.525	LHS					
National Road 18B		1	380	1	383															3	2	6	CENTER	
National Road 18B	COMPASSES	1	510	1	735																			
National Road 18B		1	750	1	751															7	1	7	CENTER	
National Road 18B	1xPipe.100cm	1	850																					
National Road 18B				2	000	1000	7			0	0				3							13		0.23%
National Road 18B	Km02	2	000																					
National Road 18B	1xPipe.60cm	2	220																					
National Road 18B		2	460	2	470															10	1	10	RHS	
National Road 18B	1xPipe.60cm	2	520																					
National Road 18B		2	540	2	555															15	2	30	LHS	
National Road 18B		2	640	2	675															35	2	70	LHS	
National Road 18B	1B_250x200 cm	2	720																					
National Road 18B				3	000	1000	7			0	0				0							110		1.57%
National Road 18B		3	000																					
National Road 18B	1B_300x200 cm	3	030																					
National Road 18B	1xPipe.60cm	3	430																					
National Road 18B	1xPipe.150cm	3	960																					
National Road 18B				4	000	1000	7			0	0				0							0		0.00%
National Road 18B		4	000																					
National Road 18B		4	010	4	021															11	1	11	LHS	
National Road 18B		4	105	4	111															6	2	12	LHS	
National Road 18B	Concrete Brigde	4	310	4	365																			
National Road 18B		4	615	4	617															2	1	2	LHS	
National Road 18B		4	705	4	706															1	1	1	LHS	
National Road 18B		4	725	4	730															5	2	10	RHS	
National Road 18B		4	760	4	763															3	2	6	RHS	
National Road 18B		4	820	4	826															6	1	6	RHS	
National Road 18B				5	000	1000	7			0	0				0							48		0.69%
National Road 18B		5	000																					
National Road 18B		5	105	5	107															2	1	2	LHS	
National Road 18B		5	160	5	163															2.5	1	2.5	LHS	
National Road 18B		5	410	5	412															2	1	2	RHS	
National Road 18B		5	455	5	458															3	1	3	LHS	
National Road 18B		5	505	5	507															2	1	2	LHS	
National Road 18B		5	550	5	555															5	1	5	LHS	
National Road 18B		5	550	5	552															2	1	2	LHS	
National Road 18B		5	605	5	621															16	1	16	LHS	
National Road 18B		5	640	5	642															2	1	2	LHS	
National Road 18B	1xPipe.150cm	5	780																					
National Road 18B		5	820	5	838															18	2	36	CENTER	
National Road 18B		5	870	5	872															2	2	4	CENTER	
National Road 18B		5	920	5	923															3	2	6	CENTER	

National Road 18B		5	955	5	970														15	2	30	CENTER	
National Road 18B		5	980	5	983														3	3	9	CENTER	
National Road 18B				6	000	1000	7			0	0				0						121.5		1.74%
National Road 18B		6	000																				
National Road 18B		6	003	6	007														4	2	8	CENTER	
National Road 18B		6	015	6	021														6	2	12	LHS	
National Road 18B		6	040	6	041														1	1	1	RHS	
National Road 18B		6	203	6	209														6	2	12	CENTER	
National Road 18B		6	250	6	258														8	2	16	CENTER	
National Road 18B		6	285	6	288														3	1	3	CENTER	
National Road 18B		6	520	6	531														11	3	33	CENTER	
National Road 18B		6	560	6	562														2	1	2	LHS	
National Road 18B		6	605	6	613														8	4	32	LHS	
National Road 18B		6	606	6	609														3	2	6	CENTER	
National Road 18B	1xPipe.100cm	6	810																				
National Road 18B				7	000	1000	7			0	0				0						125		1.79%
National Road 18B		7	000																				
National Road 18B		7	075	7	076														1	1	1	CENTER	
National Road 18B		7	120	7	123														3	1	3	CENTER	
National Road 18B		7	150	7	153									3	2	6	0.1	0.075	0.45	CENTER				
National Road 18B		7	260	7	263														3	2	6	CENTER	
National Road 18B		7	275	7	295														20	3	60	LHS	
National Road 18B				8	000	1000	7			0	0				6						70		1.1%
National Road 18B		8	000																				
National Road 18B	1B_200x300 cm	8	145																				
National Road 18B		8	845	8	848														7	3	21	CENTER	
National Road 18B				9	000	1000	7			0	0				0						21		0.3%
National Road 18B		9	000																				
National Road 18B		9	350	9	352														2	1	2	CENTER	
National Road 18B		9	420	9	422														2	1	2	RHS	
National Road 18B	2B_300x300 cm	9	600																				
National Road 18B		9	825	9	840														15	5	75	CENTER	
National Road 18B		9	915	9	969														54	7	378	FULL	
National Road 18B				10	000	1000	7			0	0				0						457		6.5%
National Road 18B		10	000																				
National Road 18B		10	010	10	050														40	7	280	FULL	
National Road 18B		10	033	10	040														7	2	14	LHS	
National Road 18B		10	044	10	098														54	2	108	LHS	
National Road 18B		10	075	10	095														20	1	20	RHS	
National Road 18B	1xPipe.100cm	10	170																				
National Road 18B		10	360	10	390														30	3.5	105	LHS	
National Road 18B		10	420	10	433														13	3.5	45.5	LHS	
National Road 18B	1xPipe.150cm	10	510																				
National Road 18B	Brigde	10	910	10	938																		
National Road 18B				11	000	1000	7			0	0				0						572.5		8.2%
National Road 18B		11	000																				
National Road 18B	1B_50x50 cm	11	350																				
National Road 18B	1B_100x100 cm	11	780																				
National Road 18B	1B_100x100 cm	11	880																				
National Road 18B				12	000	1000	7			0	0				0						0		0.0%
National Road 18B		12	000																				
National Road 18B	1B_100x100 cm	12	060																				
National Road 18B	1xPipe.100cm	12	780																				
National Road 18B	1xPipe.150cm	12	880																				
National Road 18B				13	000	1000	7			0	0				0						0		0.0%
National Road 18B		13	000																				
National Road 18B	1xPipe.150cm	13	020																				

National Road 18B		13	095	13	105															10	2	20	LHS	
National Road 18B		13	140	13	180															40	2	80	LHS	
National Road 18B		13	260	13	262															2	1	2	LHS	
National Road 18B	1xPipe.150cm	13	330																					
National Road 18B		13	430	13	433															3	1	3	LHS	
National Road 18B		13	810	13	825															15	1	15	LHS	
National Road 18B		13	860	13	872															12	1	12	LHS	
National Road 18B	1xPipe.100cm	13	925																					
National Road 18B				14	000	1000	7			0	0				0							132		1.9%
National Road 18B		14	000																					
National Road 18B	Xekamarn Brigde	14	304	14	468		8																	
National Road 18B				15	000	1000	7			0	0				0							0		0.0%
National Road 18B		15	000																					
National Road 18B	1xPipe.80cm	15	450																					
National Road 18B				16	000	1000	7			0	0				0							0		0.0%
National Road 18B		16	000																					
National Road 18B	1xPipe.100cm	16	690																					
National Road 18B				17	000	1000	7			0	0				0							0		0.0%
National Road 18B		17	000																					
National Road 18B	1xPipe.100cm	17	430																					
National Road 18B				18	000	1000	7			0	0				0							0		0.0%
National Road 18B		18	000																					
National Road 18B	1xPipe.100cm	18	050																					
National Road 18B	1xPipe.100cm	18	190																					
National Road 18B	1xPipe.120cm	18	540																					
National Road 18B	2xPipe.150cm	18	950																					
National Road 18B				19	000	1000	7			0	0				0							0		0.0%
National Road 18B		19	000																					
National Road 18B	2B_180x520 cm	19	140																					
National Road 18B				20	000	1000	7			0	0				0							0		0.0%
National Road 18B		20	000																					
National Road 18B	1xPipe.80cm	20	760																					
National Road 18B				21	000	1000	7			0	0				0							0		0.0%
National Road 18B		21	000																					
National Road 18B	KhueKha Brigde	21	446	21	472		8																	
National Road 18B	1xPipe.80cm	21	880																					
National Road 18B				22	000	1000	7			0	0				0							0		0.0%
National Road 18B		22	000																					
National Road 18B	1xPipe.100cm	22	225																					
National Road 18B	1xPipe.80cm	22	825																					
National Road 18B				23	000	1000	7			0	0				0							0		0.0%
National Road 18B		23	000																					
National Road 18B		23	810	23	814															7	3	21	RHS	
National Road 18B	Huay rangieng Brigde	23	910	23	943		8																	
National Road 18B				24	000	1000	7			0	0				0							21		0.3%
National Road 18B		24	000																					
National Road 18B	1xPipe.100cm	24	230																					
National Road 18B				25	000	1000	7			0	0				0							0		0.0%
National Road 18B		25	000																					
National Road 18B				26	000	1000	7			0	0				0							0		0.0%
National Road 18B		26	000																					
National Road 18B	1xPipe.80cm	26	060																					
National Road 18B				27	000	1000	7			0	0				0							0		0.0%
National Road 18B		27	000																					
National Road 18B	1xPipe.100cm	27	050																					
National Road 18B	1xPipe.150cm	27	370																					
National Road 18B				28	000	1000	7			0	0				0							0		0.0%

National Road 18B		28	000																					
National Road 18B	2B_180x520 cm	28	080																					
National Road 18B	1xPipe.100cm	28	500																					
National Road 18B	1xPipe.150cm	28	930																					
National Road 18B				29	000	1000	7			0	0				0							0		0.0%
National Road 18B		29	000																					
National Road 18B	1xPipe.80cm	29	600																					
National Road 18B				30	000	1000	7			0	0				0							0		0.0%
National Road 18B		30	000																					
National Road 18B	1xPipe.100cm	30	170																					
National Road 18B		30	620	30	625															5	2	10	LHS	
National Road 18B		30	625	30	627															2	2	4	RHS	
National Road 18B		30	650	30	658															8	2.5	20	RHS	
National Road 18B		30	705	30	721															16	7	112	FULL	
National Road 18B	2B_300x300 cm	30	850																					
National Road 18B		30	940	30	963															23	2	46	CENTER	
National Road 18B				31	000	1000	7			0	0				0							192		2.7%
National Road 18B		31	000																					
National Road 18B		31	005	31	020															15	3.5	52.5	RHS	
National Road 18B		31	405	31	408															3	2	6	RHS	
National Road 18B		31	410	31	413															3	2	6	LHS	
National Road 18B		31	460	31	463															3	1	3	RHS	
National Road 18B		31	480	31	490															10	1	10	RHS	
National Road 18B		31	680	31	684															4	2	8	RHS	
National Road 18B		31	690	31	695															5	1	5	RHS	
National Road 18B		31	710	31	722															12	1	12	RHS	
National Road 18B		31	750	31	765															15	3.5	52.5	RHS	
National Road 18B		31	803	31	813															10	3.5	35	RHS	
National Road 18B				32	000	1000	7			0	0				0							190		2.7%
National Road 18B		32	000																					
National Road 18B		32	020	32	025															5	2	10	LHS	
National Road 18B		32	310	32	321															11	2	22	RHS	
National Road 18B	1xPipe.100cm	32	590																					
National Road 18B				33	000	1000	7			0	0				0							32		0.5%
National Road 18B		33	000																					
National Road 18B	1xPipe.100cm	33	105																					
National Road 18B		33	320	33	327															7	3.5	24.5	RHS	
National Road 18B		33	350	33	362															12	1	12	CENTER	
National Road 18B		33	405	33	431															26	3.5	91	RHS	
National Road 18B		33	605	33	615															10	2	20	RHS	
National Road 18B		33	650	33	657															7	2	14	RHS	
National Road 18B		33	703	33	778															75	3	225	LHS	
National Road 18B		33	903	33	913															10	3.5	35	RHS	
National Road 18B		33	970	33	980															10	3.5	35	RHS	
National Road 18B		33	980	33	990															10	3.5	35	LHS	
National Road 18B				34	000	1000	7			0	0				0							491.5		7.0%
National Road 18B		34	000																					
National Road 18B		34	015	34	023															8	3	24	LHS	
National Road 18B		34	050	34	060															10	3	30	LHS	
National Road 18B		34	090	34	115															25	7	175	FULL	
National Road 18B		34	150	34	158															8	2	16	CENTER	
National Road 18B		34	202	34	213															11	2	22	LHS	
National Road 18B		34	230	34	295															65	3	195	RHS	
National Road 18B	1xPipe.100cm	34	305																					
National Road 18B	1xPipe.100cm	34	480																					
National Road 18B		34	660	34	675															15	2	30	RHS	
National Road 18B		34	710	34	720															10	2	20	RHS	

National Road 18B		34	780	34	787																7	2	14	RHS	
National Road 18B		34	880	34	882																2	2	4	LHS	
National Road 18B				35	000	1000	7			0	0				0								530		7.6%
National Road 18B		35	000																						
National Road 18B	1xPipe.100cm	35	020																						
National Road 18B		35	305	35	320																15	2	30	RHS	
National Road 18B	Concrete Brigde	35	710	35	735		9																		
National Road 18B		35	780	35	790																10	2	20	RHS	
National Road 18B		35	902	35	917																15	3.5	52.5	RHS	
National Road 18B		35	950	35	980																30	3.5	105	RHS	
National Road 18B				36	000	1000	7			0	0				0								207.5		3.0%
National Road 18B		36	000																						
National Road 18B	1xPipe.120cm	36	110																						
National Road 18B		36	160	36	167																7	1	7	RHS	
National Road 18B		36	179	36	180							1	1	1	0.1	0.075	0.075	CENTER							
National Road 18B				37	000	1000	7			0	0				1								7		0.1%
National Road 18B		37	000																						
National Road 18B	1xPipe.80cm	37	615																						
National Road 18B		37	640	37	655																15	2	30	CENTER	
National Road 18B		37	675	37	688																13	2	26	RHS	
National Road 18B		37	650	37	670																20	2	40	CENTER	
National Road 18B	1xPipe.80cm	37	800																						
National Road 18B		37	850	37	870																20	2	40	LHS	
National Road 18B		37	903	37	926																23	3.5	80.5	RHS	
National Road 18B		37	930	37	990																60	6	360	CENTER	
National Road 18B				38	000	1000	7			0	0				0								576.5		8.2%
National Road 18B		38	000																						
National Road 18B		38	010	38	012																2	2	4	RHS	
National Road 18B		38	060	38	065																5	2	10	RHS	
National Road 18B		38	105	38	110																5	1	5	CENTER	
National Road 18B		38	205	38	220																15	3.5	52.5	RHS	
National Road 18B		38	230	38	250																20	2.5	50	LHS	
National Road 18B		38	305	38	325																20	4	80	CENTER	
National Road 18B	1B_150x150 cm	38	380																						
National Road 18B	Concrete Brigde	38	420	38	453		18																		
National Road 18B	1B_150x130 cm	38	500																						
National Road 18B		38	780	38	830																50	3.5	175	RHS	
National Road 18B				39	000	1000	7			0	0				0								376.5		5.4%
National Road 18B		39	000																						
National Road 18B	1xPipe.80cm	39	320																						
National Road 18B		39	797	39	803																6	2	12	CENTER	
National Road 18B	Concrete Brigde	39	930	39	951		8																		
National Road 18B				40	000	1000	7			0	0				0								12		0.2%
National Road 18B		40	000																						
National Road 18B		40	003	40	006																3	2	6	RHS	
National Road 18B		40	030	40	040																10	3	30	CENTER	
National Road 18B		40	105	40	110																5	1	5	RHS	
National Road 18B		40	170	40	195																25	2	50	LHS	
National Road 18B		40	210	40	220																10	2	20	LHS	
National Road 18B		40	245	40	271																26	2	52	LHS	
National Road 18B		40	273	40	298																25	3.5	87.5	RHS	
National Road 18B		40	301	40	331																30	3.5	105	RHS	
National Road 18B		40	350	40	370																20	3.5	70	RHS	
National Road 18B	1B_200x200 cm	40	435																						
National Road 18B		40	585	40	600																15	3.5	52.5	RHS	
National Road 18B				41	000	1000	7			0	0				0								478		6.8%
National Road 18B		41	000																						

National Road 18B		41	005	41	015															10	3.5	35	RHS	
National Road 18B		41	450	41	455															5	2	10	RHS	
National Road 18B	Concrete Brigde	41	502	41	532		8																	
National Road 18B		41	550	41	560															10	2	20	CENTER	
National Road 18B		41	592	41	600															8	2	16	CENTER	
National Road 18B		41	602	41	610															8	2	16	RHS	
National Road 18B		41	650	41	670															20	3.5	70	RHS	
National Road 18B	1xPipe.80cm	41	700																					
National Road 18B		41	725	41	790															65	7	455	FULL	
National Road 18B		41	890	41	905															15	3.5	52.5	LHS	
National Road 18B		41	910	41	925															15	3.5	52.5	RHS	
National Road 18B		41	955	42	000															45	3.5	157.5	RHS	
National Road 18B				42	000	1000	7			0	0				0							884.5		12.6%
National Road 18B		42	000																					
National Road 18B		42	000	42	070															70	3.5	245	RHS	
National Road 18B		42	130	42	167															37	3.5	129.5	RHS	
National Road 18B		42	205	42	225															20	3.5	70	RHS	
National Road 18B		42	260	42	263			3	2	6	2.88	RHS												
National Road 18B		42	410	42	415															5	3.5	17.5	RHS	
National Road 18B		42	450	42	453															3	2	6	RHS	
National Road 18B		42	602	42	609															7	3.5	24.5	RHS	
National Road 18B		42	640	42	750															110	7	770	FULL	
National Road 18B		42	765	42	802															37	1.5	55.5	CENTER	
National Road 18B		42	915	42	918															3	2	6	LHS	
National Road 18B				43	000	1000	7			6	2.88				0							1324		19.0%
National Road 18B		43	000																					
National Road 18B		43	002	43	010															8	3.5	28	RHS	
National Road 18B	1xPipe.80cm	43	050																					
National Road 18B		43	060	43	090															30	3	90	CENTER	
National Road 18B		43	105	43	125															20	3.5	70	RHS	
National Road 18B		43	140	43	145															5	2	10	CENTER	
National Road 18B		43	150	43	160															10	2	20	RHS	
National Road 18B		43	180	43	183															3	1.5	4.5	CENTER	
National Road 18B		43	203	43	213															10	2	20	LHS	
National Road 18B		43	450	43	457								7	2	14	0.15	0.125	1.75	RHS					
National Road 18B	1B_300x300 cm	43	620																					
National Road 18B		43	703	43	705															2	1	2	LHS	
National Road 18B		43	705	43	707															2	1	2	RHS	
National Road 18B		43	935	43	965															30	3.5	105	RHS	
National Road 18B		43	985	43	995															10	2	20	RHS	
National Road 18B				44	000	1000	7			0	0				14							371.5		5.5%
National Road 18B		44	000																					
National Road 18B	2xPipe.100cm	44	135																					
National Road 18B		44	515	44	522															7	1	7	CENTER	
National Road 18B		44	545	44	550															5	2	10	RHS	
National Road 18B		44	592	44	602															10	2	20	RHS	
National Road 18B	1xPipe.100cm	44	685																					
National Road 18B				45	000	1000	7			0	0				0							37		0.5%
National Road 18B		45	000																					
National Road 18B	1xPipe.80cm	45	025																					
National Road 18B	2xPipe.100cm	45	170																					
National Road 18B	1B_160x300 cm	45	550																					
National Road 18B	1xPipe.100cm	45	820																					
National Road 18B				46	000	1000	7			0	0				0							0		0.0%
National Road 18B		46	000																					
National Road 18B		46	010	46	015															4.5	1.8	8.1	RHS	
National Road 18B	Huay Droum Brigde	46	077	46	103																			

National Road 18B		46	120	46	128															8	1.5	12	RHS	
National Road 18B	1xPipe.100cm	46	480																					
National Road 18B	1xPipe.100cm	46	580																					
National Road 18B		46	590	46	596															6	1.5	9	RHS	
National Road 18B	1xPipe.80cm	46	750																					
National Road 18B	1xPipe.80cm	46	850																					
National Road 18B		46	880	46	881															1	1	1	RHS	
National Road 18B		46	885	46	886															1	0.6	0.6	RHS	
National Road 18B				47	000	1000	7			0	0				0							30.7		0.4%
National Road 18B		47	000																					
National Road 18B	1xPipe.80cm	47	050																					
National Road 18B		47	075	47	097															22	2	44	RHS	
National Road 18B		47	120	47	128															8	3	24	RHS	
National Road 18B	1xPipe.80cm	47	290																					
National Road 18B	1xPipe.80cm	47	450																					
National Road 18B	1xPipe.80cm	47	650																					
National Road 18B		47	670	47	678															8	2	16	CENTER	
National Road 18B		47	697	47	703															6	4	24	RHS	
National Road 18B		47	703	47	711															8	3	24	RHS	
National Road 18B		47	730	47	733															3	3	9	RHS	
National Road 18B		47	903	47	909															6	2	12	RHS	
National Road 18B		47	920	47	923															3	2	6	RHS	
National Road 18B		47	960	47	966															6	2	12	RHS	
National Road 18B				48	000	1000	7			0	0				0							171		2.4%
National Road 18B		48	000																					
National Road 18B		48	060	48	064															4	2	8	LHS	
National Road 18B		48	150	48	160															10	3.5	35	RHS	
National Road 18B	1xPipe.80cm	48	155																					
National Road 18B		48	200	48	203															3	2	6	RHS	
National Road 18B		48	250	48	300															50	3.5	175	RHS	
National Road 18B	1xPipe.80cm	48	275																					
National Road 18B	1xPipe.80cm	48	475																					
National Road 18B		48	545	48	575															30	4	120	LHS	
National Road 18B		48	630	48	708															78	7	546	FULL	
National Road 18B		48	760	48	764															4	2.5	10	RHS	
National Road 18B		48	815	48	830															15	3.5	52.5	RHS	
National Road 18B		48	865	48	867															2	1.2	2.4	RHS	
National Road 18B				49	000	1000	7			0	0				0							954.9		13.6%
National Road 18B		49	000																					
National Road 18B	1xPipe.80cm	49	150																					
National Road 18B		49	590	49	640															50	2	100	CENTER	
National Road 18B		49	700	49	950															250	7	1750	FULL	
National Road 18B	1xPipe.80cm	49	935																					
National Road 18B				50	000	1000	7			0	0				0							1850		26.4%
National Road 18B		50	000																					
National Road 18B		50	210	50	237								27	2	54	0.3	0.275	14.85	RHS					
National Road 18B	1xPipe.80cm	50	315																					
National Road 18B		50	400	50	420															20	1	20	RHS	
National Road 18B		50	550	50	570															20	3.5	70	RHS	
National Road 18B		50	600	50	640								40	3.5	140	0.3	0.275	38.5	RHS					
National Road 18B	1xPipe.80cm	50	690																					
National Road 18B		50	715	50	745															30	3	90	RHS	
National Road 18B				51	000	1000	7			0	0				194							180		5.3%
National Road 18B		51	000																					
National Road 18B		51	705	51	714															9	1.5	13.5	RHS	
National Road 18B	1xPipe.100cm	51	890																					
National Road 18B				52	000	1000	7			0	0				0							13.5		0.2%

National Road 18B		52	000																					
National Road 18B	1B_140x220 cm	52	100																					
National Road 18B		52	230	52	233														3	1	3	RHS		
National Road 18B		52	305	52	365														60	7	420	FULL		
National Road 18B	1xPipe.100cm	52	370																					
National Road 18B		52	410	52	430			20	3.5	70	33.6	RHS												
National Road 18B				53	000	1000	7			70	33.6				0						423		7.0%	
National Road 18B		53	000																					
National Road 18B	Huay tanied Brigde	53	450	53	468																			
National Road 18B		53	715	53	745			30	7	210	100.8	FULL												
National Road 18B		53	775	53	781														6	3	18	RHS		
National Road 18B		53	805	53	811														6	3	18	LHS		
National Road 18B		53	910	53	912								2	1	2	0.3	0.275	0.55	LHS					
National Road 18B	1xPipe.100cm	53	911																					
National Road 18B				54	000	1000	7			210	100.8				2						36		3.5	
National Road 18B		54	000																					
National Road 18B	2xPipe.80cm	54	030																					
National Road 18B		54	203	54	206								3	2	6	0.3	0.275	1.65	LHS					
National Road 18B	Huay hai Brigde	54	240	54	258																			
National Road 18B		54	420	54	423														3	2	6	LHS		
National Road 18B	1xPipe.80cm	54	700																					
National Road 18B	1xPipe.80cm	54	850																					
National Road 18B				55	000	1000	7			0	0				6						6		0.2%	
National Road 18B		55	000																					
National Road 18B	1xPipe.100cm	55	015																					
National Road 18B		55	080	55	082														2	2	4	RHS		
National Road 18B		55	105	55	145														40	3.5	140	LHS		
National Road 18B		55	180	55	320														140	7	980	FULL		
National Road 18B	1xPipe.100cm	55	350																					
National Road 18B		55	380	55	387														7	2	14	LHS		
National Road 18B		55	430	55	464														34	7	238	FULL		
National Road 18B		55	464	55	604														140	3.5	490	RHS		
National Road 18B		55	604	56	000														396	7	2772	FULL		
National Road 18B	1xPipe.100cm	55	820																					
National Road 18B	1xPipe.100cm	55	910																					
National Road 18B				56	000	1000	7			0	0				0						4638		66.3%	
National Road 18B		56	000																					
National Road 18B		56	000	56	200														200	7	1400	FULL		
National Road 18B	1xPipe.100cm	56	025																					
National Road 18B	1xPipe.100cm	56	175																					
National Road 18B	4B_400x400 cm	56	250																					
National Road 18B		56	280	56	295														15	3.5	52.5	RHS		
National Road 18B		56	350	56	355														5	2	10	RHS		
National Road 18B		56	405	56	455														50	3.5	175	RHS		
National Road 18B				57	000	1000	7			0	0				0						1637.5		23.4%	
National Road 18B		57	000																					
National Road 18B		57	050	57	070														20	3	60	CENTER		
National Road 18B	1xPipe.100cm	57	100																					
National Road 18B		57	135	57	152														17	2	34	RHS		
National Road 18B	1xPipe.100cm	57	200																					
National Road 18B		57	210	57	225														15	7	105	FULL		
National Road 18B		57	230	57	245														15	7	105	FULL		
National Road 18B		57	260	57	290														30	7	210	FULL		
National Road 18B		57	315	57	320														5	1.5	7.5	RHS		
National Road 18B	1xPipe.100cm	57	400																					
National Road 18B		57	430	57	436														6	2.5	15	LHS		
National Road 18B		57	502	57	503								1	1	1	0.15	0.125	0.01875	LHS					

National Road 18B	1B_400x400 cm	57	680																					
National Road 18B		57	710	57	735																25	7	175	FULL	
National Road 18B		57	740	57	790																50	3.5	175	RHS	
National Road 18B		57	805	57	845																40	7	280	FULL	
National Road 18B	1B_200x200 cm	57	850																						
National Road 18B		57	850	57	890																40	3.5	140	RHS	
National Road 18B		57	910	57	990																80	4.5	360	RHS	
National Road 18B				58	000	1000	7			0	0				1								1666.5		23.8%
National Road 18B		58	000																						
National Road 18B		58	005	58	015																10	3	30	RHS	
National Road 18B	1xPipe.100cm	58	050																						
National Road 18B		58		58																	0		0	CENTER	
National Road 18B		58	100	58	180																80	3.5	280	RHS	
National Road 18B		58	500	58	550																50	3.5	175	LHS	
National Road 18B		58	595	58	610																15	3.5	52.5	RHS	
National Road 18B	1xPipe.100cm	58	700																						
National Road 18B		58	710	58	820																110	5	550	RHS	
National Road 18B				59	000	1000	7			0	0				2								3884		55.5%
National Road 18B		59	000																						
National Road 18B		59	005	59	015																10	2	20	CENTER	
National Road 18B		59	105	59	125																20	3.5	70	RHS	
National Road 18B		59	150	59	163																13	3	39	RHS	
National Road 18B		59	180	59	240																60	3	180	RHS	
National Road 18B		59	415	59	565																150	7	1050	FULL	
National Road 18B	Concrete Brigde	59	610	59	675																				
National Road 18B		59	687	59	704																17	7	119	FULL	
National Road 18B		59	740	59	755																15	3.5	52.5	RHS	
National Road 18B		59	810	59	814																4	1	4	CENTER	
National Road 18B		59	980	59	995																15	2	30	LHS	
National Road 18B				60	000	1000	7			0	0				0								1564.5		22.4%
National Road 18B		60	000																						
National Road 18B	1xPipe.100cm	60	500																						
National Road 18B		60	810	60	816																6	1	6	RHS	
National Road 18B		60	885	60	905																20	2	40	RHS	
National Road 18B	2B_400x400 cm	60	950																						
National Road 18B		60	975	60	990																15	3	45	RHS	
National Road 18B				61	000	1000	7			0	0				0								91		1.3%
National Road 18B		61	000																						
National Road 18B		61	000	61	010																10	3	30	LHS	
National Road 18B		61	015	61	022																7	2.5	17.5	RHS	
National Road 18B		61	090	61	140																50	2.5	125	RHS	
National Road 18B	2B_400x400 cm	61	200																						
National Road 18B		61	305	61	330																25	2	50	RHS	
National Road 18B		61	340	61	368																28	1	28	CENTER	
National Road 18B		61	480	61	486																6	1	6	RHS	
National Road 18B		61	690	61	715																25	2	50	CENTER	
National Road 18B	2B_300x400 cm	61	775																						
National Road 18B		61	790	61	800																10	1	10	CENTER	
National Road 18B		61	805	61	855																50	7	350	FULL	
National Road 18B		61	875	61	890																15	2	30	CENTER	
National Road 18B		61	905	61	915																10	2	20	LHS	
National Road 18B		61	960	61	961									1	1	1	0.1	0.075	0.075	RHS					
National Road 18B				62	000	1000	7			0	0				1								716.5		10.3%
National Road 18B		62	000																						
National Road 18B		62	460	62	475																15	3	45	RHS	
National Road 18B		62	500	62	530																30	3	90	RHS	
National Road 18B		62	590	62	650																60	4	240	RHS	

National Road 18B		62	715	62	725															10	2	20	RHS	
National Road 18B		62	765	62	795															30	2	60	RHS	
National Road 18B		62	925	62	975															50	3	150	RHS	
National Road 18B	3B_400x400 cm	63	000																					
National Road 18B				63	000	1000	7			0	0				0							605		8.6%
National Road 18B		63	000																					
National Road 18B		63	003	63	009															6	2	12	LHS	
National Road 18B		63	033	63	040															7	2	14	CENTER	
National Road 18B		63	060	63	068															8	3	24	RHS	
National Road 18B		63	150	63	600															450	7	3150	FULL	
National Road 18B	1xPipe.100cm	63	450																					
National Road 18B		63	600	63	750															150	3.5	525	RHS	
National Road 18B		63	750	63	800															50	7	350	FULL	
National Road 18B	1B_400x400 cm	63	800																					
National Road 18B		63	800	63	890															90	3.5	315	RHS	
National Road 18B		63	890	63	950															60	7	420	FULL	
National Road 18B		63	950	63	985															35	3.5	122.5	RHS	
National Road 18B				64	000	1000	7			0	0				0							4932.5		70.5%
National Road 18B		64	000																					
National Road 18B		64	000	64	050															50	7	350	FULL	
National Road 18B		64	050	64	075															25		0	LHS	
National Road 18B		64	075	64	600			525	7	3675	1764	FULL												
National Road 18B	2B_300x300 cm	64	625																					
National Road 18B		64	610	64	690															80	7	560	FULL	
National Road 18B		64	710	64	760															50	2	100	RHS	
National Road 18B		64	770	64	771								1	1	1	0.08	0.055	0.055	RHS					
National Road 18B		64	805	64	815															10	2	20	LHS	
National Road 18B		64	810	64	820															10	3	30	RHS	
National Road 18B		64	830	64	910															80	3	240	RHS	
National Road 18B		64	910	64	935															25	7	175	FULL	
National Road 18B		64	950	65	000															50	7	350	FULL	
National Road 18B				65	000	1000	7			3675	1764				1							1825		78.6%
National Road 18B		65	000																					
National Road 18B		65	000	65	060															60	7	420	FULL	
National Road 18B		65	060	65	220															160	3.5	560	RHS	
National Road 18B		65	220	65	240															20	7	140	FULL	
National Road 18B		65	240	65	320															80	2	160	RHS	
National Road 18B		65	370	65	430															60	3.5	210	RHS	
National Road 18B		65	430	65	510															80	7	560	FULL	
National Road 18B		65	530	65	700															170	7	1190	FULL	
National Road 18B		65	710	65	730															20	3.5	70	RHS	
National Road 18B		65	805	65	850															45	7	315	FULL	
National Road 18B		65	860	65	960															100	3.5	350	LHS	
National Road 18B		65	985	66	000															15	7	105	FULL	
National Road 18B				66	000	1000	7			0	0				0							4080		58.3%
National Road 18B		66	000																					
National Road 18B		66	000	66	020															20	7	140	FULL	
National Road 18B		66	020	66	050															30	3.5	105	LHS	
National Road 18B		66	060	66	180															120	3.5	420	RHS	
National Road 18B		66	320	66	340															20	3.5	70	RHS	
National Road 18B		66	405	66	435															30	4	120	RHS	
National Road 18B		66	440	66	460															20	2	40	LHS	
National Road 18B	1B_400x400 cm	66	450																					
National Road 18B				67	000	1000	7			0	0				0							895		12.8%
National Road 18B		67	000																					
National Road 18B	1B_300x300 cm	67	050																					
National Road 18B	2xPipe.150cm	67	180																					

National Road 18B	1xPipe.100cm	67	550																					
National Road 18B	1xPipe.100cm	67	850																					
National Road 18B				68	000	1000	7			0	0				0							0		0.0%
National Road 18B		68	000																					
National Road 18B		68	305	68	320															15	7	105	FULL	
National Road 18B	Concrete Brigde	68	340	68	373		8																	
National Road 18B		68	380	68	385															5	2	10	RHS	
National Road 18B		68	405	68	423															18	4	72	RHS	
National Road 18B		68	485	68	505															20	3.5	70	RHS	
National Road 18B		68	540	68	555															15	3	45	RHS	
National Road 18B		68	680	68	690															10	3	30	RHS	
National Road 18B		68	770	68	795															25	3.5	87.5	RHS	
National Road 18B		68	860	68	890															30	7	210	FULL	
National Road 18B				69	000	1000	7			0	0				0							629.5		9.0%
National Road 18B		69	000																					
National Road 18B	1B_400x400 cm	69	100																					
National Road 18B	1xPipe.100cm	69	400																					
National Road 18B		69	580	69	595															15	2	30	RHS	
National Road 18B		69	760	69	762															2	2.5	5	RHS	
National Road 18B		69	805	69	835															30	7	210	FULL	
National Road 18B	Concrete Brigde	69	840	69	855																			
National Road 18B		69	855	69	895															40	7	280	FULL	
National Road 18B		69	920	69	930															10	1.5	15	RHS	
National Road 18B				70	000	1000	7			0	0				0							540		7.7%
National Road 18B		70	000																					
National Road 18B	1xPipe.150cm	70	325																					
National Road 18B		70	345	70	365															20	3	60	RHS	
National Road 18B		70	370	70	395															25	3	75	RHS	
National Road 18B		70	440	70	460															20	3	60	RHS	
National Road 18B		70	480	70	500															20	2	40	RHS	
National Road 18B	1xPipe.100cm	70																						
National Road 18B		70	560	70	740															180	3	540	RHS	
National Road 18B		70	810	70	910															100	3.5	350	RHS	
National Road 18B		70	970	70	981															11	2.5	27.5	RHS	
National Road 18B				71	000	1000	7			0	0				0							1152.5		16.5%
National Road 18B		71	000																					
National Road 18B	1xPipe.100cm	71	015																					
National Road 18B		71	020	71	110															90	3.5	315	RHS	
National Road 18B		71	140	71	300			160	7	1120	537.6	FULL												
National Road 18B	1xPipe.100cm	71	315																					
National Road 18B		71	350	71	375			25	3.5	87.5	42	LHS												
National Road 18B	1xPipe.100cm	71	410																					
National Road 18B		71	405	71	419															14	7	98	FULL	
National Road 18B		71	490	71	580			90	7	630	302.4	FULL												
National Road 18B	2xPipe.150cm	71	620																					
National Road 18B		71	705	71	735															30	3.5	105	LHS	
National Road 18B		71	771	71	773								2	1	2	0.15	0.125	0.25	RHS					
National Road 18B		71	920	71	944															24	7	168	FULL	
National Road 18B	1xPipe.150cm	71	960																					
National Road 18B				72	000	1000	7			1837.5	882				2							686		36.1%
National Road 18B		72	000																					
National Road 18B	2xPipe.150cm	72	100																					
National Road 18B		72	105	72	178															73	7	511	FULL	
National Road 18B	1xPipe.100cm	72	350																					
National Road 18B		72	415	72	442															27	3.5	94.5	RHS	
National Road 18B		72	460	72	463															3	1.5	4.5	RHS	
National Road 18B		72	500	72	513															13	2	26	RHS	

National Road 18B	2B_300x300 cm	72	625																					
National Road 18B		72	695	72	730																35	7	245	FULL	
National Road 18B		72	730	72	794																64	3.5	224	RHS	
National Road 18B		72	895	72	945																50	2	100	LHS	
National Road 18B				73	000	1000	7			0	0				0								1205		17.2%
National Road 18B		73	000																						
National Road 18B		73	002	73	025																23	3.5	80.5	RHS	
National Road 18B	2B_200x600 cm	73	050																						
National Road 18B	1xPipe.100cm	73	150																						
National Road 18B		73	197	73	200																3	1	3	LHS	
National Road 18B		73	205	73	217																12	2.5	30	CENTER	
National Road 18B	1xPipe.100cm	73	430																						
National Road 18B		73	480	73	486																6	3.5	21	RHS	
National Road 18B	1xPipe.100cm	73	850																						
National Road 18B		73	910	73	975																65	7	455	FULL	
National Road 18B		73	985	73	993																8	1.2	9.6	RHS	
National Road 18B				74	000	1000	7			0	0				0								599.1		8.6%
National Road 18B		74	000																						
National Road 18B	1B_300x300 cm	74	015																						
National Road 18B		74	140	74	170																30	1	30	LHS	
National Road 18B	1xPipe.100cm	74	325																						
National Road 18B	1xPipe.100cm	74	850																						
National Road 18B	1xPipe.100cm	74	950																						
National Road 18B				75	000	1000	7			0	0				0								30		0.4%
National Road 18B		75	000																						
National Road 18B	1B_200x300 cm	75	325																						
National Road 18B		75	360	75	366																6	2.7	16.2	LHS	
National Road 18B		75	505	75	508																3	1.3	3.9	RHS	
National Road 18B		75	545	75	580																35	7	245	FULL	
National Road 18B	1B_150x180 cm	75	625																						
National Road 18B		75	630	75	710			80	7	560	268.8	FULL													
National Road 18B	1B_200x300 cm	75	750																						
National Road 18B				76	000	1000	7			560	268.8				0								265.1		11.8%
National Road 18B		76	000																						
National Road 18B	1B_200x200 cm	76	225																						
National Road 18B		76	445	76	477																32	5	160	LHS	
National Road 18B	1B_200x300 cm	76	490																						
National Road 18B		76	750	76	850																100	3	300	CENTER	
National Road 18B	1B_200x300 cm	76	925																						
National Road 18B				77	000	1000	7			0	0				0								460		6.6%
National Road 18B		77	000																						
National Road 18B	1B_200x300 cm	77	025																						
National Road 18B		77	090	77	180																90	7	630	FULL	
National Road 18B	1B_200x300 cm	77	190																						
National Road 18B	1xPipe.100cm	77	350																						
National Road 18B	1xPipe.100cm	77	725																						
National Road 18B		77	750	77	760																10	3	30	RHS	
National Road 18B				78	000	1000	7			0	0				0								660		9.4%
National Road 18B		78	000																						
National Road 18B	0xPipe.000cm	78	400																						
National Road 18B		78	915	78	987																72	4	288	RHS	
National Road 18B				79	000	1000	7			0	0				0								288		4.1%
National Road 18B		79	000																						
National Road 18B		79	005	79	040			35	5	175	84	CENTER													
National Road 18B	1xPipe.100cm	79	125																						
National Road 18B		79	805	79	855			50	7	350	168	FULL													
National Road 18B	0xPipe.000cm	79	900																						

National Road 18B		79	910	80	000															90	7	630	FULL	
National Road 18B				80	000	1000	7			525	252				0							630		16.5%
National Road 18B		80	000																					
National Road 18B		80	110	80	115															5	2	10	RHS	
National Road 18B	0xPipe.000cm	80	150																					
National Road 18B	1xPipe.100cm	80	350																					
National Road 18B		80	387	80	412															25	4	100	RHS	
National Road 18B	1xPipe.100cm	80	690																					
National Road 18B		80	797	80	820															23	2.1	48.3	RHS	
National Road 18B				81	000	1000	7			0	0				0							158.3		2.3%
National Road 18B		81	000																					
National Road 18B	1xPipe.100cm	81	280																					
National Road 18B	1xPipe.100cm	81	710																					
National Road 18B		81	950	81	955															5	1.3	6.5	LHS	
National Road 18B				82	000	1000	7			0	0				0							6.5		0.1%
National Road 18B		82	000																					
National Road 18B	1xPipe.100cm	82	290																					
National Road 18B		82	605	82	607															2	1	2	RHS	
National Road 18B		82	695	82	720															25	7	175	FULL	
National Road 18B	1xPipe.100cm	82	750																					
National Road 18B	1xPipe.100cm	82	950																					
National Road 18B				83	000	1000	7			0	0				0							177		2.5%
National Road 18B		83	000																					
National Road 18B	1xPipe.100cm	83	180																					
National Road 18B	1xPipe.100cm	83	350																					
National Road 18B				84	000	1000	7			0	0				0							0		0.0%
National Road 18B		84	000																					
National Road 18B	1xPipe.100cm	84	090																					
National Road 18B		84	170	84	186															16	2.8	44.8	CENTER	
National Road 18B	1xPipe.100cm	84	200																					
National Road 18B		84	250	84	270															20	7	140	FULL	
National Road 18B		84	285	84	295															10	7	70	FULL	
National Road 18B		84	510	84	550			40	7	280	134.4	FULL												
National Road 18B		84	686	84	698															12	7	84	FULL	
National Road 18B	1B_250x250 cm	84	725																					
National Road 18B		84	815	84	885															70	3.5	245	RHS	
National Road 18B		84	910	84	990			80	7	560	268.8	FULL												
National Road 18B				85	000	1000	7			840	403.2				0							583.8		20.3%
National Road 18B	KM85	85	000				7																	
National Road 18B		85	040	85	080															40	7	280	FULL	
National Road 18B		85	103	85	120															17	7	119	FULL	
National Road 18B		85	150	85	250															100	7	700	FULL	
National Road 18B		85	275	85	330															55	7	385	FULL	
National Road 18B		85	405	85	475															70	7	490	FULL	
National Road 18B		85	500	85	506															6	7	42	FULL	
National Road 18B		85	550	85	587															37	3.5	129.5	RHS	
National Road 18B		85	605	85	625															20	3.5	70	RHS	
National Road 18B		85	678	85	695															17	7	119	FULL	
National Road 18B		85	805	85	867															62	7	434	LHS	
National Road 18B		85	920	85	990															70	7	490	LHS	
National Road 18B				86	000	1000	7			0	0				0		0	0				2159.5		30.85%
National Road 18B	KM86	86	000	86	050															50	7	350	FULL	
National Road 18B		86	055	86	195															140	4.5	630	RHS	
National Road 18B		86	220	86	310			90	7	630	302.4	FULL												
National Road 18B		86	320	86	390															70	2	140	RHS	
National Road 18B		86	460	86	570															110	7	770	FULL	
National Road 18B	1xPipe.150cm	86	510																					

National Road 18B		86	780	86	910			130	7	910	436.8	FULL												
National Road 18B	1xPipe.150cm	86	845																					
National Road 18B	1xPipe.150cm	86	950																					
National Road 18B				87	000	1000	7			1540	739.2				0		0	0				1890		49.00%
National Road 18B		87	000																					
National Road 18B		87	210	87	310															100	4	400	RHS	
National Road 18B		87	400	87	460															60	5	300	CENTER	
National Road 18B	1xPipe.150cm	87	430																					
National Road 18B	1xPipe.150cm	87	510																					
National Road 18B		87	520	87	557															37	3.5	129.5	LHS	
National Road 18B		87	560	87	650															90	3.5	315	RHS	
National Road 18B	1xPipe.150cm	87	610																					
National Road 18B	1xPipe.150cm	87	735																					
National Road 18B		87	710	87	800															90	6	540	LHS	
National Road 18B		87	800	87	850															50	7	350	FULL	
National Road 18B	1xPipe.150cm	87	955																					
National Road 18B				88	000	1000	7			0	0				0		0	0				2034.5		29.06%
National Road 18B	KM 88	88	000																					
National Road 18B	1xPipe.150cm	88	095																					
National Road 18B		88	105	88	245															140	7	980	FULL	
National Road 18B		88	250	88	280															30	3.5	105	RHS	
National Road 18B		88	408	88	415															7	2.3	16.1	CENTER	
National Road 18B	1xPipe.150cm	88	410																					
National Road 18B	1xPipe.150cm	88	505																					
National Road 18B		88	570	88	800															230	7	1610	FULL	
National Road 18B	The Pipe No of Size	88	704																					
National Road 18B		88	975	88	995															20	4	80	CENTER	
National Road 18B				89	000	1000	7			0	0				0		0	0				2791.1		39.87%
National Road 18B	KM 89	89	000	89	200															200	7	1400	FULL	
National Road 18B	1xPipe.150cm	89	095																					
National Road 18B		89	290	89	340															50	7	350	FULL	
National Road 18B	1xPipe.100cm	89	320																					
National Road 18B		89	400	89	401								1	1	1	0.1	0.075	0.075	CENTER					
National Road 18B		89	490	89	580															90	3.5	315	RHS	
National Road 18B	1xPipe.150cm	89	525																					
National Road 18B		89	640	89	820															180	3.5	630	RHS	
National Road 18B		89	850	89	900			50	7	350	168	FULL								50		0	RHS	
National Road 18B	ROAD CONCRETE	89	900	89	1000			100	7	700	336	FULL								100		0	RHS	
National Road 18B				90	000	1000	7			1050	504				1		0.075	0.075				2695		53.51%
National Road 18B	ROAD CONCRETE	90	000	90	060			60	7	420	201.6	FULL												
National Road 18B	Houaypeek Brigde	90	060	90	093	33																		
National Road 18B	1xPipe.150cm	90	300																					
National Road 18B		90	340	90	344															4	1.7	6.8	LHS	
National Road 18B		90	420	90	500															80	3.5	280	LHS	
National Road 18B	1xPipe.150cm	90	475																					
National Road 18B		90	510	90	516															6	2	12	RHS	
National Road 18B		90	550	90	551								1	1	1	0.1	0.075	0.075	LHS					
National Road 18B		90	645	90	647								1.5	1.5	2.25	0.1	0.075	0.16875	RHS					
National Road 18B	1xPipe.150cm	90	705																					
National Road 18B		90	715	90	745															30	3	90	RHS	
National Road 18B	1Box_200x200 cm	90	825																					
National Road 18B		90	828	90	829								1	1	1	0.1	0.075	0.075	RHS					
National Road 18B		90	830	90	836								6	1	6	0.1	0.075	0.45	LHS					
National Road 18B				91	000	1000	7			420	201.6				10.25		0.3	0.76875				388.8		11.7%
National Road 18B	KM 91	91	000																					
National Road 18B		91	005	91	006															1	1	1	LHS	
National Road 18B		91	050	91	240			190	7	1330	638.4	FULL												

National Road 18B	1Box_200x200 cm	91	150																					
National Road 18B		91	345	91	348																3	3	9	RHS	
National Road 18B	1Box_200x200 cm	91	350																					
National Road 18B		91	370	91	430			60	3.5	210	100.8	LHS												
National Road 18B		91	435	91	437																1.5	1.5	2.25	RHS	
National Road 18B	1Box_200x200 cm	91	470																					
National Road 18B		91	505	91	506								1	1	1	0.1	0.075	0.075	LHS					
National Road 18B		91	540	91	541								1	1	1	0.1	0.075	0.075	LHS					
National Road 18B		91	860	91	900																40	3.5	140	RHS	
National Road 18B	1Box_240x240 cm	91	950																					
National Road 18B		91	920	91	1000			80	7	560	268.8	FULL												
National Road 18B				92	000	1000	7			2100	1008				2		0.15	0.15					152.25		32.2%
National Road 18B	KM 92	92	000	92	040			40	7	280	134.4	FULL												
National Road 18B		92	065	92	100			35	7	245	117.6	FULL												
National Road 18B		92	125	92	140																15	3.5	52.5	RHS	
National Road 18B	1xPipe.100cm	92	220																					
National Road 18B		92	345	92	352																7	1	7	LHS	
National Road 18B		92	490	92	515																25	1.5	37.5	LHS	
National Road 18B		92	730	92	740																10	7	70	FULL	
National Road 18B		92	820	92	880																60	3.5	210	CENTER	
National Road 18B		92	930	92	940																10	2.5	25	LHS	
National Road 18B	1xPipe.150cm	92	950																					
National Road 18B		92	955	92	957																2	2	4	CENTER	
National Road 18B				93	000	1000	7			525	252				0		0	0					406		13.3%
National Road 18B	KM 93	93	000																					
National Road 18B		93	007	93	020																13	1	13	LHS	
National Road 18B		93	050	93	70																20	3.5	70	RHS	
National Road 18B		93	080	93	430			350	7	2450	1176	FULL												
National Road 18B		93	435	93	443																8	2	16	RHS	
National Road 18B		93	450	93	454																4	1	4	LHS	
National Road 18B		93	460	93	462																1.5	1.5	2.25	RHS	
National Road 18B		93	500	93	502																2	2	4	LHS	
National Road 18B	The BOX No of Size	93	500																					
National Road 18B		93	510	93	600			90	7	630	302.4	FULL												
National Road 18B		93	750	93	940			190	7	1330	638.4	FULL												
National Road 18B				94	000	1000	7			4410	2116.8				0		0	0					109.25		64.6%
National Road 18B	KM 94	94	000	94	250			250	7	1750	840	FULL												
National Road 18B		94	270	94	500			230	7	1610	772.8	FULL												
National Road 18B		94	520	94	527																7	2	14	LHS	
National Road 18B		94	570	94	580																10	1.5	15	RHS	
National Road 18B		94	605	94	855			250	7	1750	840	FULL												
National Road 18B		94	870	94	873																3	3	9	LHS	
National Road 18B		94	970	94	988																18	3	54	RHS	
National Road 18B				95	000	1000	7			5110	2452.8				0		0	0					92		74.3%
National Road 18B	KM 95	95	000																					
National Road 18B		95	095	95	120																25	7	175	FULL	
National Road 18B	2xPipe.150cm	95	140																					
National Road 18B		95	192	95	202																10	2	20	RHS	
National Road 18B		95	480	95	492																12	3	36	RHS	
National Road 18B		95	550	95	551								1	1	1	0.1	0.075	0.075	RHS					
National Road 18B		95	690	95	693																3	2	6	RHS	
National Road 18B		95	920	95	950																30	4	120	LHS	
National Road 18B	1xPipe.80cm	95	960																					
National Road 18B		95	990	95	994																4	2	8	RHS	
National Road 18B				96	000	1000	7			0	0				1		0.075	0.075					365		5.2%
National Road 18B	KM 96	96	000																					
National Road 18B		96	005	96	017																12	3	36	RHS	

National Road 18B		96	140	96	210			70	7	490	235.2	FULL												
National Road 18B		96	230	96	242															12	2	24	RHS	
National Road 18B		96	260	96	264															4	1	4	RHS	
National Road 18B	1xPipe.150cm	96	315																					
National Road 18B		96	340	96	360															20	7	140	FULL	
National Road 18B		96	365	96	367															2	1	2	RHS	
National Road 18B		96	699	96	702															3	3	9	RHS	
National Road 18B		96	720	96	743															23	2	46	RHS	
National Road 18B				97	000	1000	7			490	235.2				0		0	0				261		10.7%
National Road 18B	KM 97	97	000				7																	
National Road 18B		97	005	97	007		7													2	3	6	RHS	
National Road 18B		97	550	97	556		7													6	3.5	21	RHS	
National Road 18B		97	805	97	815		7													10	3.5	35	RHS	
National Road 18B	1Box_200x200 cm	97	840				7																	
National Road 18B		97	880	97	888		7													8	6	48	LHS	
National Road 18B				98	000	1000	7			0	0				0		0	0				110		1.6%
National Road 18B	Rd Width Change	98	000				6																	
National Road 18B		98	105	98	115		6													10	2	20	RHS	
National Road 18B		98	200	98	260		6													60	6	360	FULL	
National Road 18B	1Box_400x400 cm	98	225				6																	
National Road 18B		98	280	98	293		6													13	3	39	LHS	
National Road 18B		98	560	98	567		6													7	2	14	RHS	
National Road 18B	1xPipe.100cm	98	605				6																	
National Road 18B	1xPipe.100cm	98	705				6																	
National Road 18B		98	745	98	755		6													10	4	40	CENTER	
National Road 18B	1xPipe.100cm	98	775				6																	
National Road 18B	1xPipe.100cm	98	920				6																	
National Road 18B		98	945	98	960		6													15	2	30	CENTER	
National Road 18B		98	985	98	1000		6													15	6	90	FULL	
National Road 18B				99	000	1000	6			0	0				0		0	0				593		9.9%
National Road 18B	KM 99	99	000	99	025															25	3	75	RHS	
National Road 18B		99	085	99	100															15	1	15	LHS	
National Road 18B		99	175	99	177															2	1	2	RHS	
National Road 18B		99	203	99	206															3	1	3	CENTER	
National Road 18B		99	207	99	210															3	2	6	RHS	
National Road 18B		99	210	99	220															10	2	20	RHS	
National Road 18B		99	235	99	295															60	6	360	FULL	
National Road 18B		99	310	99	326															16	6	96	FULL	
National Road 18B		99	345	99	350															5	2	10	RHS	
National Road 18B	Brigde 175m	99	395	99	570																			
National Road 18B		99	610	99	730															120	6	720	FULL	
National Road 18B		99	730	99	748															18	3	54	RHS	
National Road 18B		99	760	99	770															10	3	30	LHS	
National Road 18B		99	860	99	887															27	3	81	FULL	
National Road 18B		99	887	99	910															23	6	138	CENTER	
National Road 18B		99	950	99	951								1	1	1	0.1	0.075	0.075	RHS					
National Road 18B	1xPipe.120cm	99	995																					
National Road 18B				100	000	1000	6			0	0				1		0.075	0.075				1610		26.9%
National Road 18B	KM 100	100	000																					
National Road 18B		100	230	100	235															5	2	10	LHS	
National Road 18B		100	245	100	295															50	2	100	CENTER	
National Road 18B		100	340	100	353															13	2	26	CENTER	
National Road 18B		100	370	100	376															6	2.5	15	RHS	
National Road 18B		100	380	100	384															4	2.5	10	LHS	
National Road 18B	1xPipe.100cm	100	465																					
National Road 18B		100	465	100	500															35	6	210	FULL	
National Road 18B		100	545	100	560															15	2	30	CENTER	

National Road 18B		100	580	100	610															30	6	180	FULL	
National Road 18B		100	650	100	652															2	6	12	FULL	
National Road 18B		100	680	100	682															2	3	6	RHS	
National Road 18B		100	690	100	880															190	6	1140	FULL	
National Road 18B	1xPipe.100cm	100	790																					
National Road 18B		100	900	100	960															60	3	180	RHS	
National Road 18B		100	990	100	996															6	2.5	15	RHS	
National Road 18B				101	000	1000	6			0	0				0		0	0				1934		32.2%
National Road 18B	KM 101	101	000	101	004															4	3	12	RHS	
National Road 18B		101	050	101	150															100	6	600	FULL	
National Road 18B		101	180	101	190															10	6	60	FULL	
National Road 18B		101	215	101	225															10	3	30	RHS	
National Road 18B		101	227	101	230															3	2	6	LHS	
National Road 18B		101	270	101	272															2	2	4	LHS	
National Road 18B		101	294	101	300															6	3	18	RHS	
National Road 18B	1Box_300x300 cm	101	305																					
National Road 18B		101	310	101	320															10	3	30	RHS	
National Road 18B		101	325	101	330															5	2	10	LHS	
National Road 18B		101	380	101	420															40	6	240	FULL	
National Road 18B		101	450	101	453															3	1	3	CENTER	
National Road 18B		101	490	101	507															17	6	102	FULL	
National Road 18B	2xPipe.200cm	101	500																					
National Road 18B		101	560	101	590															30	3	90	RHS	
National Road 18B		101	670	101	710															40	6	240	FULL	
National Road 18B		101	715	101	835															120	6	720	FULL	
National Road 18B		101	840	101	890															50	3	150	RHS	
National Road 18B		101	895	101	898															3	2	6	RHS	
National Road 18B		101	915	101	930															15	3	45	LHS	
National Road 18B		101	930	101	1000															70	3	210	RHS	
National Road 18B		101	988	101	1000															12	3	36	LHS	
National Road 18B				102	000	1000	6			0	0				0		0	0				2612		43.5%
National Road 18B	KM 102	102	000	102	110															110	6	660	FULL	
National Road 18B		102	130	102	134															4	2	8	RHS	
National Road 18B		102	155	102	200															45	6	270	FULL	
National Road 18B		102	220	102	223															3	2	6	LHS	
National Road 18B		102	250	102	253															3	2	6	LHS	
National Road 18B		102	270	102	272															2	2	4	RHS	
National Road 18B		102	290	102	298															8	2	16	RHS	
National Road 18B		102	350	102	352									2	2	4	0.1	0.075	0.3	CENTER				
National Road 18B		102	360	102	362															2	2	4	RHS	
National Road 18B		102	380	102	395															15	6	90	FULL	
National Road 18B		102	400	102	418															18	3	54	LHS	
National Road 18B		102	420	102	440															20	3	60	RHS	
National Road 18B		102	460	102	461									1	1	1	0.1	0.075	0.075	RHS				
National Road 18B		102	480	102	485															5	2	10	LHS	
National Road 18B		102	596	102	600															4	2	8	RHS	
National Road 18B		102	605	102	745															140	6	840	FULL	
National Road 18B	1Box_400x400 cm	102	705																					
National Road 18B		102	790	102	800															10	3	30	RHS	
National Road 18B		102	800	102	820															20	6	120	FULL	
National Road 18B		102	830	102	860															30	6	180	FULL	
National Road 18B		102	865	102	895															30	2	60	CENTER	
National Road 18B		102	940	102	958															18	2	36	CENTER	
National Road 18B		102	960	102	961									1	1	1	0.08	0.055	0.055	LHS				
National Road 18B		102	970	102	971									1	1	1	0.08	0.055	0.055	LHS				
National Road 18B		102	970	102	971									1	1	1	0.08	0.055	0.055	RHS				
National Road 18B		102	975	102	976									0.5	0.5	0.25	0.08	0.055	0.01375	RHS				

National Road 18B				103	000	1000	6			0	0				8.25		0.37	0.55375				2462		41.2%
National Road 18B	KM 103	103	000																					
National Road 18B		103	004	103	008								4	1	4	0.1	0.075	0.3	CENTER					
National Road 18B		103	009	103	010								1	1	1	0.1	0.075	0.075	CENTER					
National Road 18B		103	039	103	040								1	1	1	0.1	0.075	0.075	LHS					
National Road 18B		103	040	103	050															10	4	40	CENTER	
National Road 18B	1xPipe.120cm	103	060																					
National Road 18B		103	073	103	080															7	2	14	RHS	
National Road 18B		103	100	103	260															160	6	960	FULL	
National Road 18B		103	300	103	320															20	3	60	RHS	
National Road 18B		103	320	103	335															15	6	90	FULL	
National Road 18B		103	345	103	350															5	6	30	FULL	
National Road 18B		103	384	103	390															6	2.5	15	RHS	
National Road 18B		103	395	103	465															70	3	210	RHS	
National Road 18B		103	490	103	495															5	2.5	12.5	RHS	
National Road 18B		103	500	103	560															60	6	360	FULL	
National Road 18B		103	595	103	605															10	3	30	LHS	
National Road 18B		103	605	103	627															22	6	132	FULL	
National Road 18B		103	650	103	654															4	1	4	RHS	
National Road 18B		103	670	103	690															20	6	120	FULL	
National Road 18B		103	750	103	763															13	1	13	CENTER	
National Road 18B		103	780	103	782								2	2	4	0.1	0.075	0.3	RHS					
National Road 18B		103	815	103	835															20	3	60	LHS	
National Road 18B	1xPipe.100cm	103	825																					
National Road 18B		103	874	103	890															16	3	48	RHS	
National Road 18B		103	890	103	920															30	6	180	FULL	
National Road 18B		103	950	103	967															17	6	102	FULL	
National Road 18B		103	967	103	992															25	3	75	RHS	
National Road 18B		103	994	103	999															5	2	10	RHS	
National Road 18B				104	000	1000	6			0	0				10		0.3	0.75				2565.5		42.9%
National Road 18B	KM103	104	000																					
National Road 18B		104	029	104	035															6	6	36	FULL	
National Road 18B		104	035	104	050															15	3	45	RHS	
National Road 18B		104	140	104	150															10	2	20	RHS	
National Road 18B		104	160	104	170															10	2	20	RHS	
National Road 18B		104	184	104	190															6	6	36	FULL	
National Road 18B		104	198	104	215															17	3	51	LHS	
National Road 18B		104	220	104	230															10	3	30	LHS	
National Road 18B		104	234	104	240															6	2	12	RHS	
National Road 18B		104	275	104	290															15	3	45	LHS	
National Road 18B		104	290	104	295															5	6	30	FULL	
National Road 18B		104	305	104	385															80	6	480	FULL	
National Road 18B	1xPipe.200cm	104	350																					
National Road 18B		104	405	104	425															20	3	60	RHS	
National Road 18B		104	425	104	455															30	6	180	FULL	
National Road 18B		104	455	104	475															20	3	60	RHS	
National Road 18B		104	500	104	503															3	2	6	LHS	
National Road 18B		104	505	104	565															60	6	360	FULL	
National Road 18B	Brigde 33m	104	572	104	605	33	8																	
National Road 18B		104	610	104	620															10	2	20	LHS	
National Road 18B		104	650	104	655															5	2	10	RHS	
National Road 18B		104	660	104	673															13	2	26	LHS	
National Road 18B		104	690	104	710															20	2.5	50	LHS	
National Road 18B		104	705	104	715															10	3.5	35	RHS	
National Road 18B		104	720	104	725															5	2	10	RHS	
National Road 18B		104	770	104	772															2	1	2	LHS	
National Road 18B		104	770	104	780															10	2	20	RHS	

National Road 18B		104	790	104	810															20	3	60	RHS	
National Road 18B		104	970	104	975															5	2	10	RHS	
National Road 18B		104	975	104	980															5	2	10	LHS	
National Road 18B				105	000	1000	6			0	0				0		0	0				1724		28.7%
National Road 18B	KM 105	105	000																					
National Road 18B		105	170	105	172															2	2	4	RHS	
National Road 18B		105	280	105	283							3	2	6	0.13	0.105	0.63	RHS						
National Road 18B		105	390	105	392															2	2	4	RHS	
National Road 18B		105	490	105	493															3	1	3	RHS	
National Road 18B		105	515	105	545															30	6	180	FULL	
National Road 18B	1xPipe.100cm	105	540																					
National Road 18B		105	580	105	586															6	3	18	LHS	
National Road 18B		105	605	105	615															10	3	30	LHS	
National Road 18B		105	610	105	615															5	2	10	RHS	
National Road 18B		105	660	105	675															15	3	45	RHS	
National Road 18B		105	688	105	689															1	2	2	LHS	
National Road 18B		105	680	105	695															15	3	45	RHS	
National Road 18B		105	705	105	750															45	6	270	FULL	
National Road 18B	1xPipe.100cm	105	720																					
National Road 18B		105	770	105	775															5	2	10	LHS	
National Road 18B		105	780	105	795															15	1	15	RHS	
National Road 18B		105	840	105	880															40	6	240	FULL	
National Road 18B	1xPipe.100cm	105	900																					
National Road 18B		105	920	105	995															75	6	450	FULL	
National Road 18B				106	000	1000	6			0	0				6		0.105	0.63				1326		22.2%
National Road 18B	KM 106	106	000	106	007															7	6	42	FULL	
National Road 18B		106	010	106	080															70	6	420	FULL	
National Road 18B		106	100	106	117															17	6	102	FULL	
National Road 18B		106	120	106	150															30	3	90	RHS	
National Road 18B		106	150	106	170															20	6	120	FULL	
National Road 18B		106	180	106	190															10	3	30	RHS	
National Road 18B	1xPipe.150cm	106	200																					
National Road 18B		106	210	106	240															30	6	180	FULL	
National Road 18B		106	280	106	284															4	2	8	RHS	
National Road 18B		106	310	106	350															40	3	120	LHS	
National Road 18B	1xPipe.150cm	106	360																					
National Road 18B		106	365	106	370															5	2	10	RHS	
National Road 18B		106	390	106	400															10	3	30	LHS	
National Road 18B		106	510	106	520															10	3	30	LHS	
National Road 18B		106	570	106	574															4	2	8	CENTER	
National Road 18B	2Box_400x400 cm	106	585																					
National Road 18B		106	605	106	610															5	1	5	LHS	
National Road 18B		106	680	106	682															2	2	4	RHS	
National Road 18B		106	695	106	696															1	3	3	RHS	
National Road 18B		106	700	106	715															15	2	30	RHS	
National Road 18B		106	720	106	723															3	2	6	RHS	
National Road 18B		106	750	106	770															20	2	40	RHS	
National Road 18B		106	790	106	791															1	1	1	RHS	
National Road 18B		106	810	106	825															15	2	30	RHS	
National Road 18B		106	860	106	865															5	1	5	RHS	
National Road 18B		106	890	106	895															5	2	10	RHS	
National Road 18B		106	905	106	935															30	3	90	LHS	
National Road 18B		106	935	106	945															10	6	60	FULL	
National Road 18B		106	970	106	975															5	2	10	LHS	
National Road 18B		106	980	106	985															5	2	10	RHS	
National Road 18B				107	000	1000	6			0	0				0		0	0				1494		24.9%
National Road 18B	KM 107	107	000																					

National Road 18B		107	050	107	053																3	2	6	RHS	
National Road 18B		107	090	107	091																1	1	1	LHS	
National Road 18B		107	175	107	176								0.5	0.5	0.25	0.1	0.075	0.01875	RHS						
National Road 18B		107	180	107	181								0.5	0.5	0.25	0.2	0.175	0.04375	CENTER						
National Road 18B		107	240	107	260																20	2	40	RHS	
National Road 18B		107	270	107	271																1	1	1	RHS	
National Road 18B		107	280	107	281																1	1	1	RHS	
National Road 18B		107	303	107	310																7	2	14	RHS	
National Road 18B		107	310	107	325																15	2	30	LHS	
National Road 18B		107	320	107	327																7	2	14	RHS	
National Road 18B		107	350	107	352																2	2	4	LHS	
National Road 18B		107	370	107	383																13	3	39	RHS	
National Road 18B	1xPipe.150cm	107	375			13	6																		
National Road 18B		107	400	107	415																15	2	30	RHS	
National Road 18B		107	405	107	410																5	2	10	LHS	
National Road 18B		107	430	107	436																6	2	12	RHS	
National Road 18B		107	436	107	440																4	2	8	LHS	
National Road 18B		107	450	107	550																100	6	600	FULL	
National Road 18B		107	557	107	560																3	1	3	RHS	
National Road 18B		107	593	107	600																7	3	21	RHS	
National Road 18B		107	610	107	680																70	6	420	FULL	
National Road 18B	1xPipe.150cm	107	675																						
National Road 18B		107	770	107	783																13	2.5	32.5	LHS	
National Road 18B		107	830	107	860																30	6	180	FULL	
National Road 18B		107	860	107	880																20	3	60	RHS	
National Road 18B	1Box_400x400 cm	107	875			14	6																		
National Road 18B		107	955	107	973																18		0	RHS	
National Road 18B		107	979	107	999																20		0	FULL	
National Road 18B				108	000	1000	6			0	0				0.5		0.25	0.0625					1526.5		25.5%
National Road 18B	KM 108	108	000																						
National Road 18B		108	005	108	010								5	2	10	0.15	0.125	1.25	FULL						
National Road 18B		108	030	108	035																5	2	10	RHS	
National Road 18B	1xPipe.120cm	108	060			14	6																		
National Road 18B		108	065	108	095																30	2.5	75	RHS	
National Road 18B		108	120	108	122																2	1	2	RHS	
National Road 18B		108	170	108	180																10	3	30	RHS	
National Road 18B		108	205	108	208																3	1	3	RHS	
National Road 18B		108	290	108	295																5	2	10	RHS	
National Road 18B		108	380	108	385																5	2	10	RHS	
National Road 18B		108	440	108	446																6	1	6	LHS	
National Road 18B		108	684	108	690								6	1	6	0.1	0.075	0.45	CENTER						
National Road 18B		108	710	108	711								1	1	1	0.1	0.075	0.075	RHS						
National Road 18B		108	745	108	752																7	2	14	RHS	
National Road 18B		108	785	108	795																10	2	20	RHS	
National Road 18B		108	810	108	820																10	3	30	RHS	
National Road 18B		108	850	108	855																5	3	15	RHS	
National Road 18B		108	880	108	898																18	6	108	FULL	
National Road 18B		108	900	108	930																30	2	60	RHS	
National Road 18B		108	935	108	955																20	6	120	FULL	
National Road 18B	1Box_400x300 cm	108	945																						
National Road 18B		108	960	108	975																15	2	30	RHS	
National Road 18B		108	984	108	999																15	6	90	FULL	
National Road 18B				109	000	1000	6			0	0				17		0.275	1.775					633		10.8%
National Road 18B	KM 109	109	000	109	030																30	6	180	FULL	
National Road 18B		109	220	109	290																70	2	140	LHS	
National Road 18B		109	305	109	306								1	1	1	0.2	0.175	0.175	RHS						
National Road 18B		109	385	109	386								0.5	0.5	0.25	0.1	0.075	0.01875	CENTER						

National Road 18B		109	390	109	393																3	2.5	7.5	LHS	
National Road 18B		109	401	109	402								1	1	1	0.1	0.075	0.075	RHS					
National Road 18B		109	480	109	483			3	1	3	1.44	CENTER												
National Road 18B		109	510	109	515																5	2	10	LHS	
National Road 18B		109	750	109	751								1	1	1	0.1	0.075	0.075	LHS					
National Road 18B		109	770	109	791																21	3	63	RHS	
National Road 18B	2xPipe.100cm	109	825			12	6																		
National Road 18B		109	830	109	870																40	3	120	RHS	
National Road 18B		109	875	109	890																15	3	45	RHS	
National Road 18B		109	905	109	945																40	6	240	FULL	
National Road 18B		109	950	109	970																20	3	60	RHS	
National Road 18B		109	989	109	999																10	2.5	25	RHS	
National Road 18B				110	000	1000	6			3	1.44				3.25		0.4	0.34375					890.5		14.9%
National Road 18B	KM 110	110	000	110	007																7	2.5	17.5	RHS	
National Road 18B		110	115	110	150																35	3	105	RHS	
National Road 18B		110	180	110	182																2	1	2	RHS	
National Road 18B		110	408	110	410																2	1	2	LHS	
National Road 18B	1xPipe.100cm	110	605			14	6																		
National Road 18B	ROAD CONCRETE	110	625	110	795	170																			
National Road 18B		110	685	110	710																25	3	75	LHS	
National Road 18B		110	770	110	772								2	2	4	0.1	0.075	0.3	CENTER					
National Road 18B		110	805	110	840								35	2.5	87.5	0.3	0.275	24.0625	LHS					
National Road 18B		110	845	110	875								30	2.5	75	0.3	0.275	20.625	RHS					
National Road 18B		110	880	110	895																15	6	90	FULL	
National Road 18B	1xPipe.200cm	110	925			12	6																		
National Road 18B		110	970	110	990																20	3	60	RHS	
National Road 18B				111	000	1000	6			0	0				166.5		0.625	44.9875					351.5		8.6%
National Road 18B	KM 111	111	000																						
National Road 18B		111	010	111	040																30	2	60	CENTER	
National Road 18B	ROAD CONCRETE	111	105	111	130	25															25	6	150	FULL	
National Road 18B				112	000	1000	6			0	0				0		0	0					210		3.5%
National Road 18B	Total=					112000	6			21540.00	10339.20				460.75		3.00	50.25					78372.80		14.9%

Annex L – Bridge Inspection Reports

FINAL REPORT

for

Geo – Technical Survey On DCP Test

and

Bridge Soundness Survey

PREPARED BY: LAYVANH ROAD AND BRIDGE CONTRUCTION CO., Ltd
VIENTIANE CAPITAL

OCTOBER 2014

I. DCP Test Survey

1. Preface

DCP Test is designed tool for data test of soil running layers in site without pick up soil sample. This test can be done continuously to 0.80m depth of layers and when link drill rod it can be tested to 1.20m. Data from test can indicate the characteristic of soil layers that how strength, thickness and depth are there in each soil layers, all values strength from test should be CBR by Graph of Van Kuuuren 1969, Kleyn and Van Heerden 1983, and Smith and Pratt 1983 that depends on character of cone tip are used. Survey surface way of this project is surveyed in following fracture character points for check back CBR value.

2. Survey Location

Targets of the Survey are all bridges (Except Reconstructed Bridges) along National Road No. 20 in Saravan Province, which is shown in **Figure 1**. DCP tests were carried out at both side of abutment of the bridge.

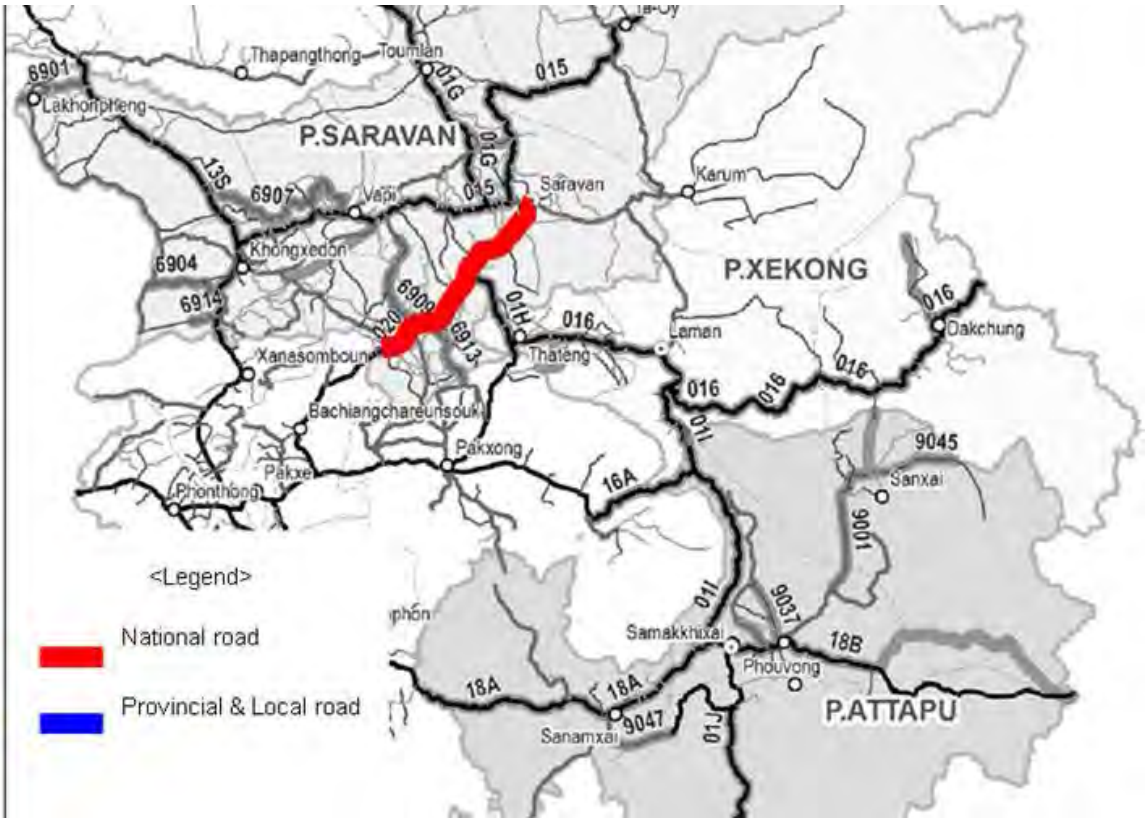


Figure 1: Project Location Map

Table 1 Location of Targeted bridges

No.	Location (KM)	Bridge Name
2	14+700	Houay Pasa
3	15+300	Houay Sung
4	15+800	Houay Phad
5	17+200	Houay Kapok
7	30+900	Houay Sed
8	39+900	Houay Vang Peui
9	45+300	Houay Ta Pung
10	47+200	Houay Nam San

3. Methodology

DCP Test is basically divided into three Parts as (1) Vertical holder, (2) Lift up and free fall by hummer tester, and (3) Take note.

Steps of test method bellow.

(1) Select point setting up tool in vertical than read value on tape measure before Beginning test.

(2) Lift the hummer to touch with handle and then free ball falling alone to impact with amid that is linked with separate rod and hardened cone tiptoe deepens in soil layer.

(3) Take note the depth value of cone is deepen and number times in impact of hummer by noting every 10 mm or by setting number times such as of every 5 time or 10 time and then read depth value of cone tiepin tape measure. In case soil layer have more read maybe have to read depth value of cone tip every 1 or 2 time of impact hummer.

(4) Connection of separate rod can be done by hummer impact to separate rod deepen until its length less about 40-50 cm and then connect amid by screw rod and lift tape measure.

(5) In case there have founded more harden soil layer or stone. Big hard stone breaks cone tip depth less than 0.5/time or impact hummer 20 times that cannot read change value of depth, the test should be stopped.

(6) When finish test and collect data, method of keep tool rod and cone should take hummer impact lightly, more time in handle until rod and cone rise up don't impact hardly because it case to handle have damaged

Formula for calculation and edition value CBR as:

$Log_{10}(CBR) = 2.632\text{-}1.28 x Log_{10}(DCP)$

where, CBR = California Bearing Ratio test

DCP = Dynamic Cone Penetration Test

4. Tools and materials

Tools and materials are consisted various sets bellow :

- Hummer weight 8 kg
- Separate rod length 57.5 cm
- Hardened Cone tip, sharp angle 60°, size ∅2 cm
- Amid for link with hardened con tip size ∅5/8 inch, 1 piece with length 40 cm and 2 pieces with length 90 cm
- Hummer-rod for tray weight hummer down
- Tape measure length 1 m

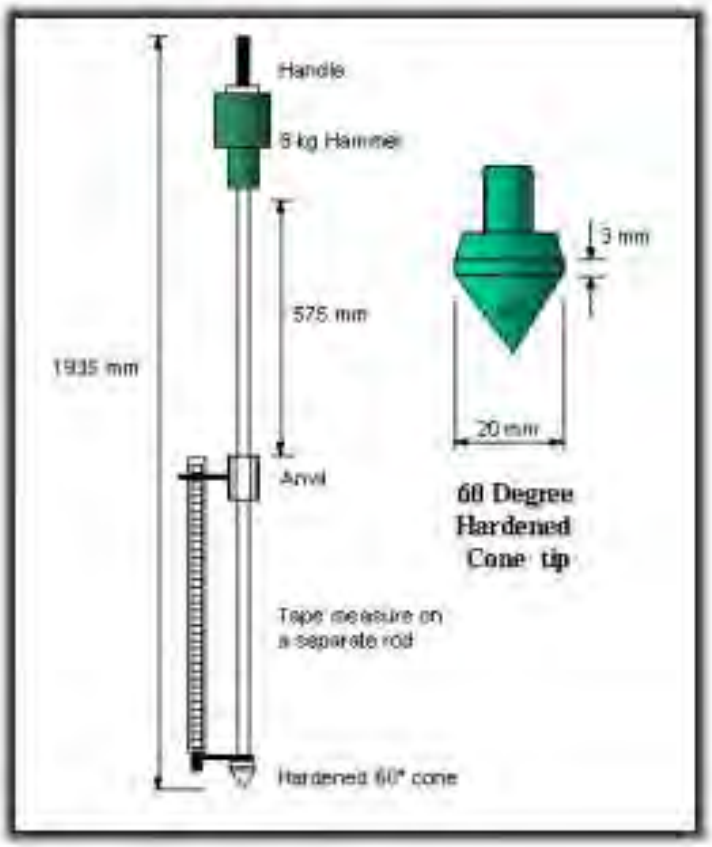


Figure 2: Tool for test

5. Summary of Test results (DCP and CBR Values)

Field DCP test result and CRB calculation results were summarize in Table 3, which the detail were shown in Appendix I.

Table 3 Summary DCP Test results And CBR values

Bridge Name	Direction	DCP (Max)	CBR (Max)	DCP (Min)	CBR (Min)	DCP (Ave)	CBR (Ave)
Houay Pasa	To Salavan	100.00	84.02	3.57	1.18	19.53	30.55
	To Pakse	100.00	58.14	4.76	1.18	38.20	16.03
Houay Sung	To Salavan	100.00	31.47	25.00	1.18	65.16	6.28
	To Pakse	100.00	19.65	20.00	1.18	50.99	5.79
Houay Phad	To Salavan	100.00	87.88	3.45	1.18	43.50	30.86
	To Pakse	33.33	84.02	3.57	4.82	16.27	23.97
Houay Kapok	To Salavan	100.00	6.96	25.00	1.18	76.33	2.17
	To Pakse	100.00	19.65	11.11	1.18	57.46	4.80
Houay Sed	To Salavan	100.00	95.71	3.23	1.18	22.91	27.84
	To Pakse	100.00	99.68	3.13	1.18	22.81	28.18
Houay Pao	To Salavan	100.00	111.79	2.86	1.18	28.52	22.65
	To Pakse	50.00	99.68	3.143	2.87	18.36	36.57
Houay Ta Pung	To Salavan	100.00	16.90	20.00	1.18	43.01	5.83
	To Pakse	100.00	11.70	20.00	1.18	57.94	4.22
Houay Nam San	To Salavan	100.00	11.70	16.67	1.18	57.67	4.37
	To Pakse	50.00	11.70	20.00	2.87	33.93	5.39

II. Bridge Soundness Survey

1. Preface

Bridges Soundness Survey was conducted to estimate the current condition of bridges along National Road No. 20 by visual inspection. The Inspection will concentrate on the condition of bridge structure, bridge facilities and approach road etc.

2. Survey Location

Targets of the Survey are all bridges along National Road No. 20 in Saravan Province, which is shown in **Figure 1**.

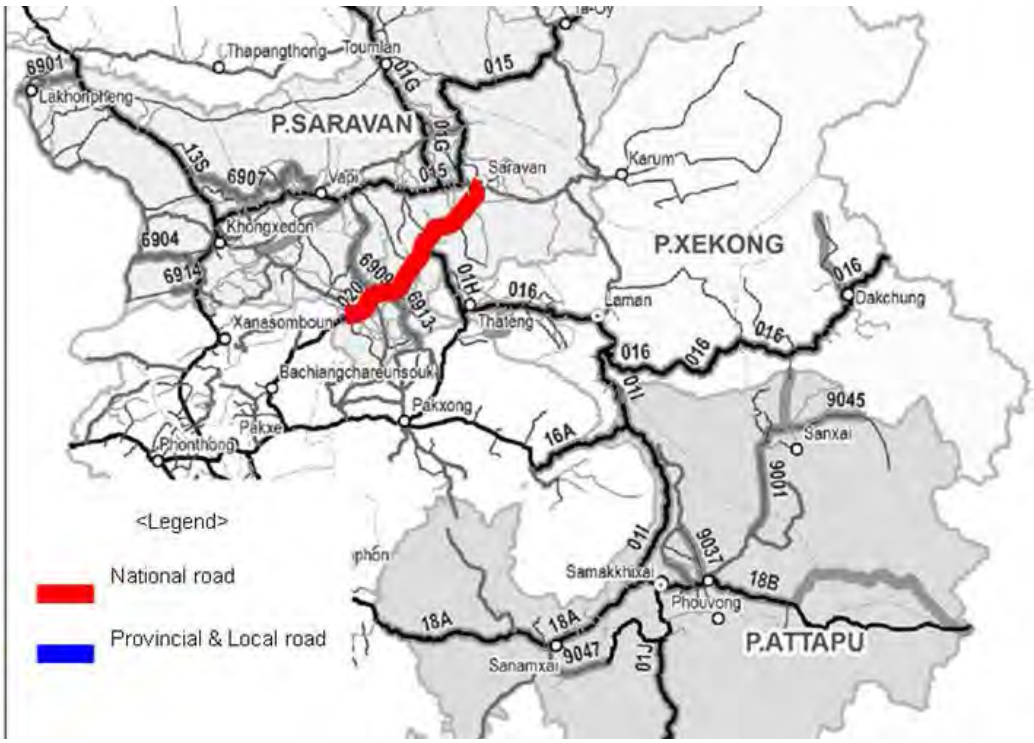


Figure 1: Project Location Map

Table 1 Location of Targeted bridges

No.	Location (KM)	Bridge Name
1	13+400	Houay Ko
2	14+700	Houay Pasa
3	15+300	Houay Sung
4	15+800	Houay Phad
5	17+200	Houay Kapok
6	26+600	Houay Tone
7	30+900	Houay Sed
8	39+900	Houay Vang Peui
9	45+300	Houay Ta Pung
10	47+200	Houay Nam San

3. Methodology

Bridge Soundness Survey was conducted by visual inspection in all bridges (10 bridges) along road No. 20 in Saravan Province to indicate the condition of those bridges. Bridge inventory of National Road No.20 will be updated. Bridge current condition was identify by using bridge inspection sheet prepared by expert teams.

4. Tools and Material

The following Tools and Material were prepared for Visual Inspection survey.

- Digital Camera
- Inspection Sheet
- Drawing Kits
- Safety tools (Belts, helmet, boots, etc.)

5. Survey Results

(1) Bridge Inventory

Bridge inventory of National Road No.20 in Saravan Province was updated and shown in Table 4.

Table 4. Bridge Inventory

Road No.	Bridge No.	Location of Bridge (KM)	River Name	Bridge Name	District Name	No. of Span	Longest Span (m)	Shortest Span (m)	Bridge Length (m)	Bridge Width (m)	Type of Bridge Surface	Load Capacity (ton)	Year of Construction	Year of Maintenance	Type of Bridge
(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
National Road															
20	1	13+400	Houay Ko	Houay Ko	Saravan	1	37.20	37.20	37.20	11.50	Concrete	20	2014	-	PC-I
20	2	14+700	Houay Pasa	Pasa	Saravan	1	18.80	18.80	18.80	5.60	Steel Plate	20	1990	2006	Bailey
20	3	15+300	Houay Sung	Sung	Saravan	2	15.50	15.30	30.80	6.10	Steel Plate	20	1990	2007	Bailey
20	4	15+800	Houay Phad	Phad	Saravan	1	12.70	12.70	12.70	5.60	Steel Plate	20	1990	-	Bailey
20	5	17+200	Houay Kapok	Kapok	Saravan	1	19.40	19.40	19.40	5.70	Woods	20	1990	-	Bailey
20	6	26+600	Houay Tone	Tone	Saravan	1	36.80	36.80	36.80	11.70	Concrete	20	2014	-	PC-I
20	7	30+900	Houay Sed	Sed	Saravan	4	12.36	27.50	70.40	6.10	Steel Plate	20	1990	-	Bailey
20	8	39+900	Houay Pao	Vang Puei	Lao Ngam	1	15.90	15.90	15.90	5.70	Woods	20	1990	-	Bailey
20	9	45+300	Houay Ta Pung	Ta Pung	Lao Ngam	2	21.90	21.40	43.30	5.10	Steel Plate	20	1990		Bailey
20	10	47+200	Houay Nam San	Nam San	Lao Ngam	2	12.40	12.40	24.80	5.70	Woods	20	1990	-	Bailey

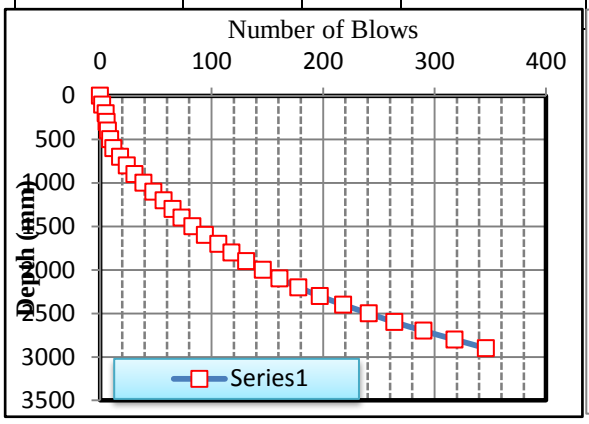
(2) Bridge Soundness Survey Results

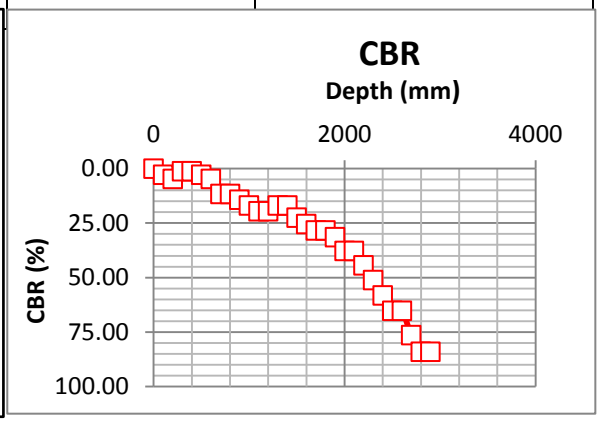
Current Conditions of bridges along National Road No. 20 in Saravan Province based on Bridge Soundness Survey was Summarize in Appendix II.

Appendix I

	Dynamic Cone Penetration Test	DCP-No.1
Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project	
Consultant:	Layvanh Road and Bridge Construction Co., Ltd	Date: 10-03-14
Location:	(NR-20) Bridge No. 2 Houay Pasa	Coordinates
Direction:	DCP-No.1 Right (To Salavan) Ground El:	N: E:

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
2	2	-100	50.00	2.87	
3	5	-200	33.33	4.82	
1	6	-300	100.00	1.18	
1	7	-400	100.00	1.18	
2	9	-500	50.00	2.87	
3	12	-600	33.33	4.82	
6	18	-700	16.67	11.70	
6	24	-800	16.67	11.70	
7	31	-900	14.29	14.25	
8	39	-1000	12.50	16.90	
9	48	-1100	11.11	19.65	
9	57	-1200	11.11	19.65	
8	65	-1300	12.50	16.90	
8	73	-1400	12.50	16.90	
10	83	-1500	10.00	22.49	
11	94	-1600	9.09	25.41	
12	106	-1700	8.33	28.40	
12	118	-1800	8.33	28.40	
13	131	-1900	7.69	31.47	
15	146	-2000	6.67	37.79	
15	161	-2100	6.67	37.79	
17	178	-2200	5.88	44.36	
19	197	-2300	5.26	51.15	
21	218	-2400	4.76	58.14	
23	241	-2500	4.35	65.31	
23	264	-2600	4.35	65.31	
26	290	-2700	3.85	76.41	
28	318	-2800	3.57	84.02	
28	346	-2900	3.57	84.02	



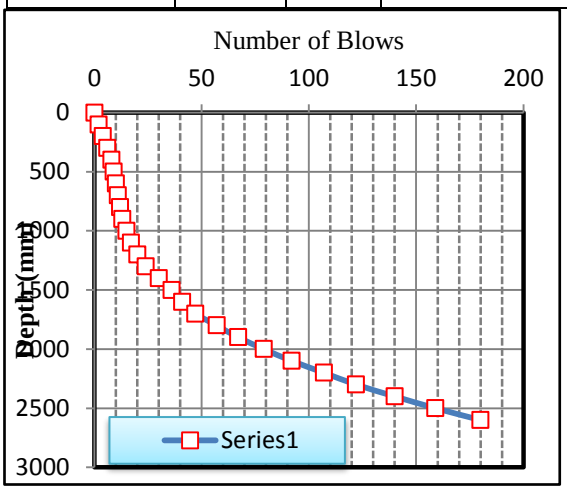


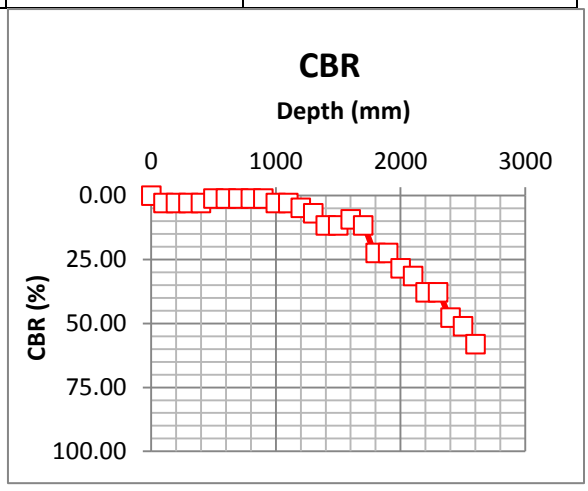
Dynamic Cone Penetration Test

DCP-No.2

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-03-14
Location:	(NR-20) Bridge No. 2 Houay Pasa
Direction:	DCP-No.2 Right (To Pakse)
Ground El:	
Coordinates N:	
Coordinates E:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
2	2	-100	50.00	2.87	
2	4	-200	50.00	2.87	
2	6	-300	50.00	2.87	
2	8	-400	50.00	2.87	
1	9	-500	100.00	1.18	
1	10	-600	100.00	1.18	
1	11	-700	100.00	1.18	
1	12	-800	100.00	1.18	
1	13	-900	100.00	1.18	
2	15	-1000	50.00	2.87	
2	17	-1100	50.00	2.87	
3	20	-1200	33.33	4.82	
4	24	-1300	25.00	6.96	
6	30	-1400	16.67	11.70	
6	36	-1500	16.67	11.70	
5	41	-1600	20.00	9.26	
6	47	-1700	16.67	11.70	
10	57	-1800	10.00	22.49	
10	67	-1900	10.00	22.49	
12	79	-2000	8.33	28.40	
13	92	-2100	7.69	31.47	
15	107	-2200	6.67	37.79	
15	122	-2300	6.67	37.79	
18	140	-2400	5.56	47.73	
19	159	-2500	5.26	51.15	
21	180	-2600	4.76	58.14	



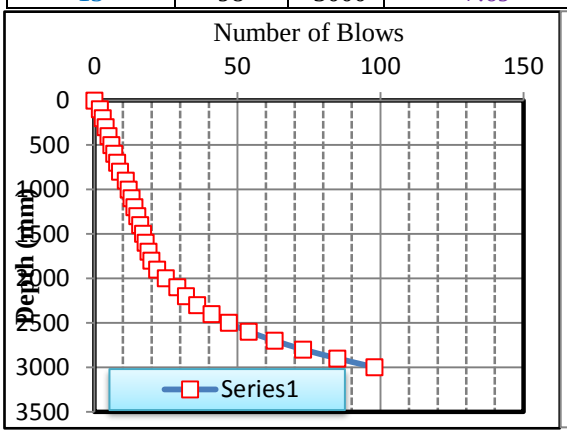


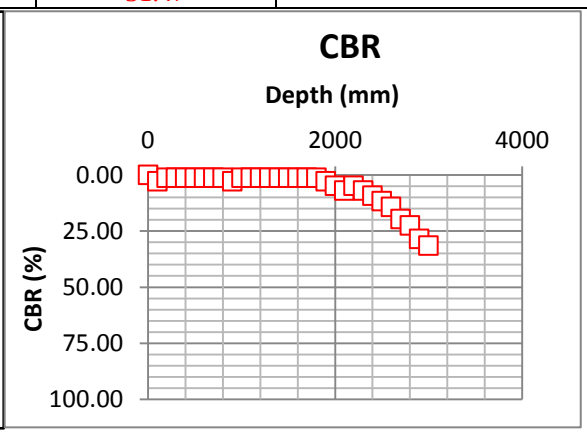
Dynamic Cone Penetration Test

DCP-No.3

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-03-14
Location:	(NR-20) Bridge No. 3 Houay Sung
Direction:	DCP-No.3 Left (To Salavan)
Ground El:	
Coordinates N:	
Coordinates E:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
2	2	-100	50.00	2.87	
1	3	-200	100.00	1.18	
1	4	-300	100.00	1.18	
1	5	-400	100.00	1.18	
1	6	-500	100.00	1.18	
1	7	-600	100.00	1.18	
1	8	-700	100.00	1.18	
1	9	-800	100.00	1.18	
2	11	-900	50.00	2.87	
1	12	-1000	100.00	1.18	
1	13	-1100	100.00	1.18	
1	14	-1200	100.00	1.18	
1	15	-1300	100.00	1.18	
1	16	-1400	100.00	1.18	
1	17	-1500	100.00	1.18	
1	18	-1600	100.00	1.18	
1	19	-1700	100.00	1.18	
1	20	-1800	100.00	1.18	
2	22	-1900	50.00	2.87	
3	25	-2000	33.33	4.82	
4	29	-2100	25.00	6.96	
3	32	-2200	33.33	4.82	
4	36	-2300	25.00	6.96	
5	41	-2400	20.00	9.26	
6	47	-2500	16.67	11.70	
7	54	-2600	14.29	14.25	
9	63	-2700	11.11	19.65	
10	73	-2800	10.00	22.49	
12	85	-2900	8.33	28.40	
13	98	-3000	7.69	31.47	



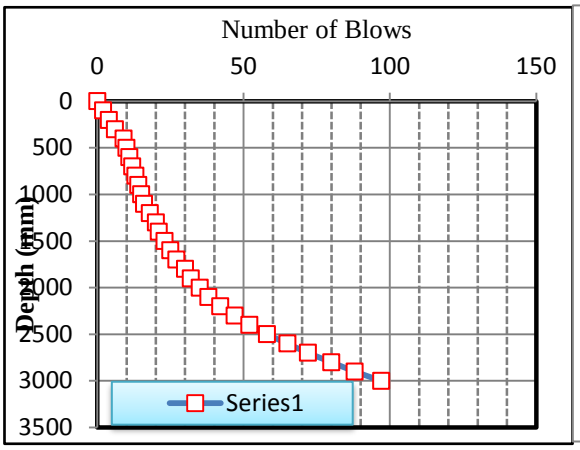


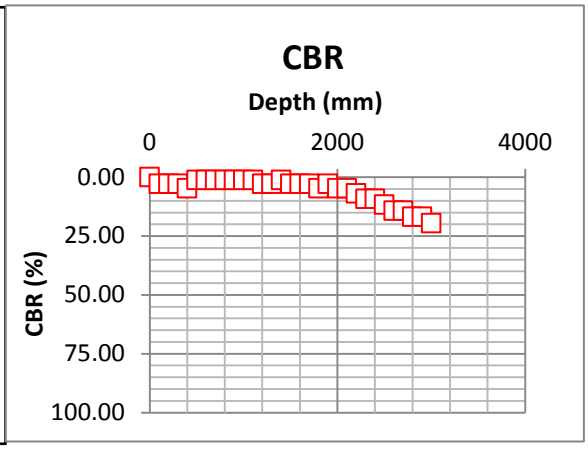
Dynamic Cone Penetration Test

DCP-No.4

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-03-14
Location:	(NR-20) Bridge No. 3 Houay Sung
Direction:	DCP-No.4 (To Pakse)
Ground El:	
Coordinates N:	
Coordinates E:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
2	2	-100	50.00	2.87	
2	4	-200	50.00	2.87	
2	6	-300	50.00	2.87	
3	9	-400	33.33	4.82	
1	10	-500	100.00	1.18	
1	11	-600	100.00	1.18	
1	12	-700	100.00	1.18	
1	13	-800	100.00	1.18	
1	14	-900	100.00	1.18	
1	15	-1000	100.00	1.18	
1	16	-1100	100.00	1.18	
2	18	-1200	50.00	2.87	
2	20	-1300	50.00	2.87	
1	21	-1400	100.00	1.18	
2	23	-1500	50.00	2.87	
2	25	-1600	50.00	2.87	
2	27	-1700	50.00	2.87	
3	30	-1800	33.33	4.82	
2	32	-1900	50.00	2.87	
3	35	-2000	33.33	4.82	
3	38	-2100	33.33	4.82	
4	42	-2200	25.00	6.96	
5	47	-2300	20.00	9.26	
5	52	-2400	20.00	9.26	
6	58	-2500	16.67	11.70	
7	65	-2600	14.29	14.25	
7	72	-2700	14.29	14.25	
8	80	-2800	12.50	16.90	
8	88	-2900	12.50	16.90	
9	97	-3000	11.11	19.65	



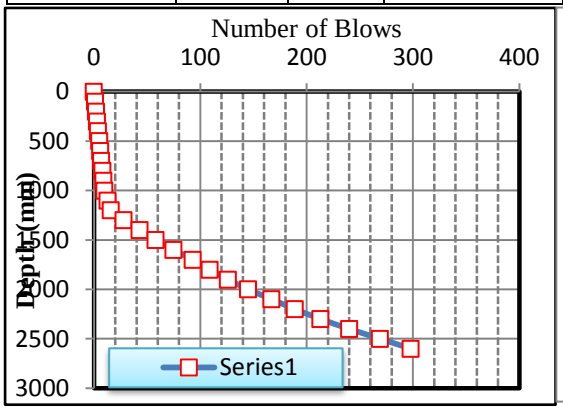


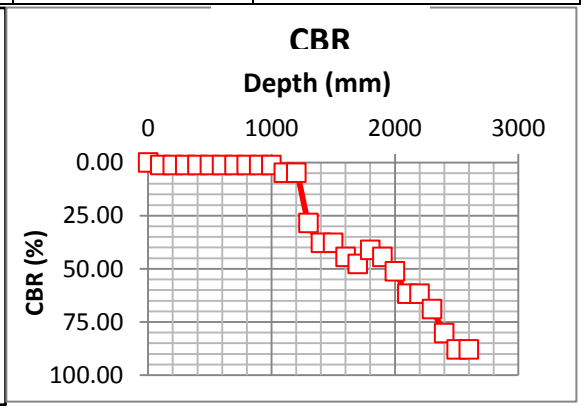
Dynamic Cone Penetration Test

DCP-No.5

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-03-14
Location:	(NR-20) Bridge No.4 Hong Phad
Coordinates	N: E:
Direction:	DCP-No.5 (To Salavan)
Ground El:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
1	1	-100	100.00	1.18	
1	2	-200	100.00	1.18	
1	3	-300	100.00	1.18	
1	4	-400	100.00	1.18	
1	5	-500	100.00	1.18	
1	6	-600	100.00	1.18	
1	7	-700	100.00	1.18	
1	8	-800	100.00	1.18	
1	9	-900	100.00	1.18	
1	10	-1000	100.00	1.18	
3	13	-1100	33.33	4.82	
3	16	-1200	33.33	4.82	
12	28	-1300	8.33	28.40	
15	43	-1400	6.67	37.79	
15	58	-1500	6.67	37.79	
17	75	-1600	5.88	44.36	
18	93	-1700	5.56	47.73	
16	109	-1800	6.25	41.05	
17	126	-1900	5.88	44.36	
19	145	-2000	5.26	51.15	
22	167	-2100	4.55	61.70	
22	189	-2200	4.55	61.70	
24	213	-2300	4.17	68.97	
27	240	-2400	3.70	80.19	
29	269	-2500	3.45	87.88	
29	298	-2600	3.45	87.88	



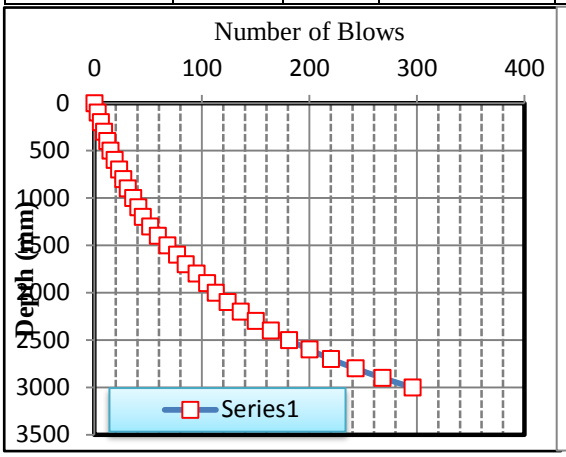


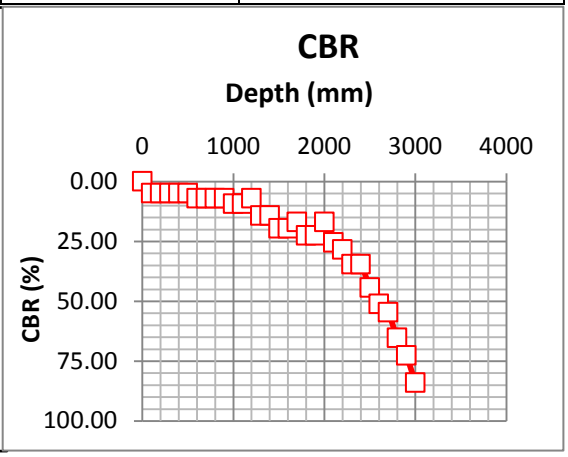
Dynamic Cone Penetration Test

DCP-No.6

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-03-14
Location:	(NR-20) Bridge No.3 Hong Phad
Coordinates	N: E:
Direction:	DCP-No.6 (To Pakse)
Ground El:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
3	3	-100	33.33	4.82	
3	6	-200	33.33	4.82	
3	9	-300	33.33	4.82	
3	12	-400	33.33	4.82	
3	15	-500	33.33	4.82	
4	19	-600	25.00	6.96	
4	23	-700	25.00	6.96	
4	27	-800	25.00	6.96	
4	31	-900	25.00	6.96	
5	36	-1000	20.00	9.26	
5	41	-1100	20.00	9.26	
4	45	-1200	25.00	6.96	
7	52	-1300	14.29	14.25	
7	59	-1400	14.29	14.25	
9	68	-1500	11.11	19.65	
9	77	-1600	11.11	19.65	
8	85	-1700	12.50	16.90	
10	95	-1800	10.00	22.49	
10	105	-1900	10.00	22.49	
8	113	-2000	12.50	16.90	
11	124	-2100	9.09	25.41	
12	136	-2200	8.33	28.40	
14	150	-2300	7.14	34.60	
14	164	-2400	7.14	34.60	
17	181	-2500	5.88	44.36	
19	200	-2600	5.26	51.15	
20	220	-2700	5.00	54.62	
23	243	-2800	4.35	65.31	
25	268	-2900	4.00	72.67	
28	296	-3000	3.57	84.02	



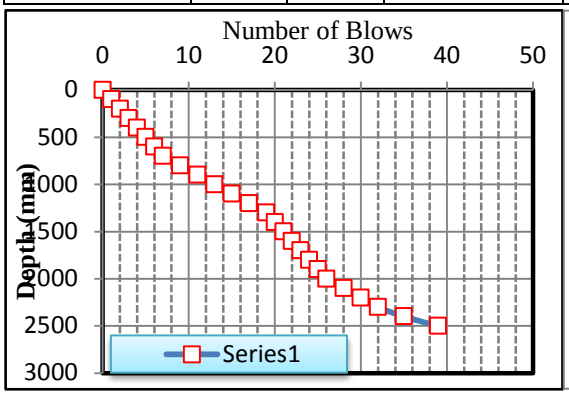


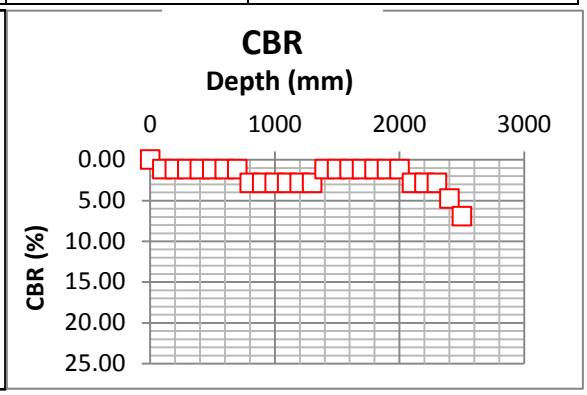
Dynamic Cone Penetration Test

DCP-No.7

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-03-14
Location:	(NR-20) Bridge No.5 Houay Ka Pok
Coordinates	N: E:
Direction:	DCP-No.7 (To Salavan)
Ground El:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
1	1	-100	100.00	1.18	
1	2	-200	100.00	1.18	
1	3	-300	100.00	1.18	
1	4	-400	100.00	1.18	
1	5	-500	100.00	1.18	
1	6	-600	100.00	1.18	
1	7	-700	100.00	1.18	
2	9	-800	50.00	2.87	
2	11	-900	50.00	2.87	
2	13	-1000	50.00	2.87	
2	15	-1100	50.00	2.87	
2	17	-1200	50.00	2.87	
2	19	-1300	50.00	2.87	
1	20	-1400	100.00	1.18	
1	21	-1500	100.00	1.18	
1	22	-1600	100.00	1.18	
1	23	-1700	100.00	1.18	
1	24	-1800	100.00	1.18	
1	25	-1900	100.00	1.18	
1	26	-2000	100.00	1.18	
2	28	-2100	50.00	2.87	
2	30	-2200	50.00	2.87	
2	32	-2300	50.00	2.87	
3	35	-2400	33.33	4.82	
4	39	-2500	25.00	6.96	



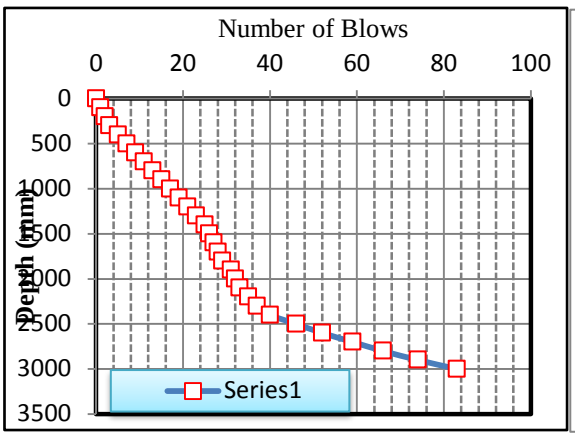


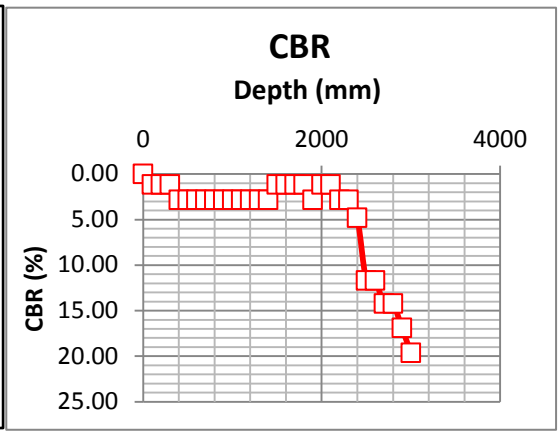
Dynamic Cone Penetration Test

DCP-No.8

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-03-14
Location:	(NR-20) Bridge No.5 Houay Ka Pok
Coordinates	N: E:
Direction:	DCP-No.8 (To Pakse)
Ground El:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
1	1	-100	100.00	1.18	
1	2	-200	100.00	1.18	
1	3	-300	100.00	1.18	
2	5	-400	50.00	2.87	
2	7	-500	50.00	2.87	
2	9	-600	50.00	2.87	
2	11	-700	50.00	2.87	
2	13	-800	50.00	2.87	
2	15	-900	50.00	2.87	
2	17	-1000	50.00	2.87	
2	19	-1100	50.00	2.87	
2	21	-1200	50.00	2.87	
2	23	-1300	50.00	2.87	
2	25	-1400	50.00	2.87	
1	26	-1500	100.00	1.18	
1	27	-1600	100.00	1.18	
1	28	-1700	100.00	1.18	
1	29	-1800	100.00	1.18	
2	31	-1900	50.00	2.87	
1	32	-2000	100.00	1.18	
1	33	-2100	100.00	1.18	
2	35	-2200	50.00	2.87	
2	37	-2300	50.00	2.87	
3	40	-2400	33.33	4.82	
6	46	-2500	16.67	11.70	
6	52	-2600	16.67	11.70	
7	59	-2700	14.29	14.25	
7	66	-2800	14.29	14.25	
8	74	-2900	12.50	16.90	
9	83	-3000	11.11	19.65	



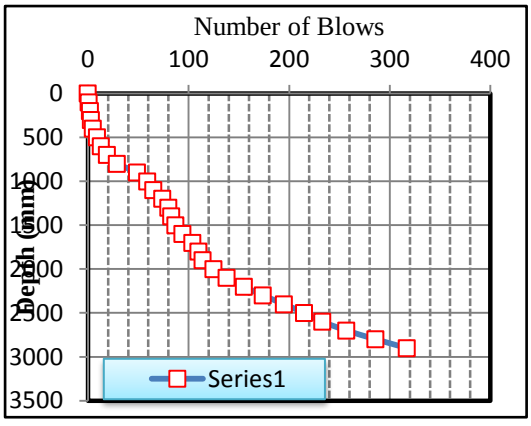


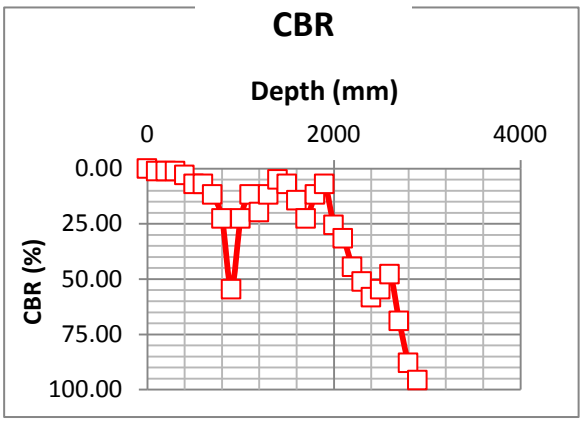
Dynamic Cone Penetration Test

DCP-No.9

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-03-14
Location:	(NR-20) Bridge No. 7 Houay Sed
Direction:	DCP-No.9 (To Salavan)
Ground El:	
Coordinates N:	
Coordinates E:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
1	1	-100	100.00	1.18	
1	2	-200	100.00	1.18	
1	3	-300	100.00	1.18	
2	5	-400	50.00	2.87	
4	9	-500	25.00	6.96	
4	13	-600	25.00	6.96	
6	19	-700	16.67	11.70	
10	29	-800	10.00	22.49	
20	49	-900	5.00	54.62	
10	59	-1000	10.00	22.49	
6	65	-1100	16.67	11.70	
9	74	-1200	11.11	19.65	
6	80	-1300	16.67	11.70	
3	83	-1400	33.33	4.82	
4	87	-1500	25.00	6.96	
7	94	-1600	14.29	14.25	
10	104	-1700	10.00	22.49	
6	110	-1800	16.67	11.70	
4	114	-1900	25.00	6.96	
11	125	-2000	9.09	25.41	
13	138	-2100	7.69	31.47	
17	155	-2200	5.88	44.36	
19	174	-2300	5.26	51.15	
21	195	-2400	4.76	58.14	
20	215	-2500	5.00	54.62	
18	233	-2600	5.56	47.73	
24	257	-2700	4.17	68.97	
29	286	-2800	3.45	87.88	
31	317	-2900	3.23	95.71	



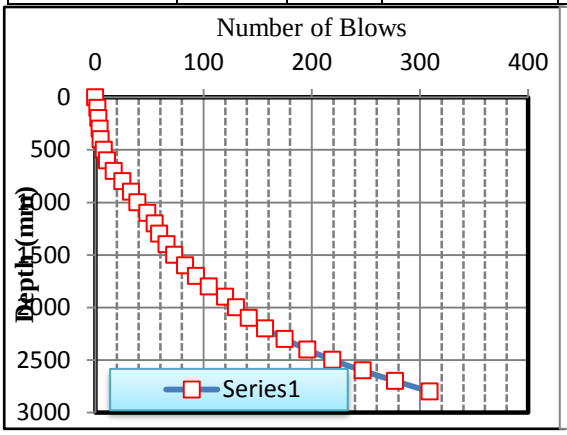


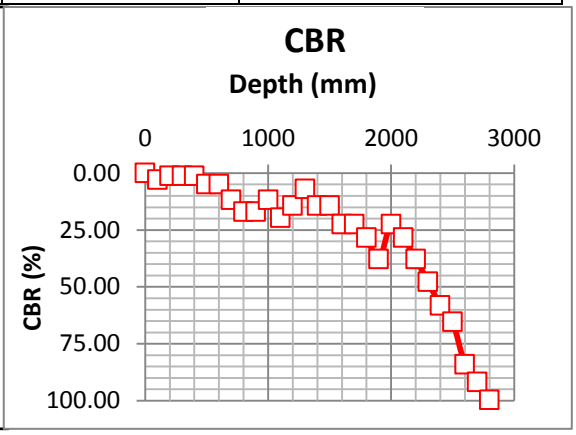
Dynamic Cone Penetration Test

DCP-No.10

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-03-14
Location:	(NR-20) Bridge No. 7 Houay Sed
Direction:	DCP-No.10 (To Pakse)
Ground El:	
Coordinates N:	
Coordinates E:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
2	2	-100	50.00	2.87	
1	3	-200	100.00	1.18	
1	4	-300	100.00	1.18	
1	5	-400	100.00	1.18	
3	8	-500	33.33	4.82	
3	11	-600	33.33	4.82	
6	17	-700	16.67	11.70	
8	25	-800	12.50	16.90	
8	33	-900	12.50	16.90	
6	39	-1000	16.67	11.70	
9	48	-1100	11.11	19.65	
7	55	-1200	14.29	14.25	
4	59	-1300	25.00	6.96	
7	66	-1400	14.29	14.25	
7	73	-1500	14.29	14.25	
10	83	-1600	10.00	22.49	
10	93	-1700	10.00	22.49	
12	105	-1800	8.33	28.40	
15	120	-1900	6.67	37.79	
10	130	-2000	10.00	22.49	
12	142	-2100	8.33	28.40	
15	157	-2200	6.67	37.79	
18	175	-2300	5.56	47.73	
21	196	-2400	4.76	58.14	
23	219	-2500	4.35	65.31	
28	247	-2600	3.57	84.02	
30	277	-2700	3.33	91.77	
32	309	-2800	3.13	99.68	



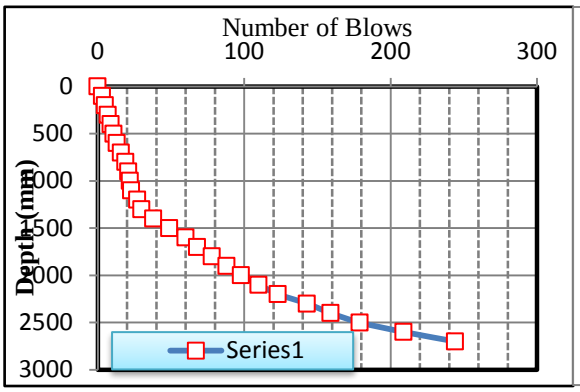


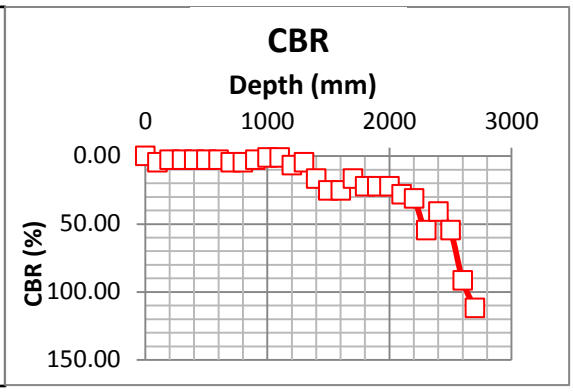
Dynamic Cone Penetration Test

DCP-No.11

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-03-14
Location:	(NR-20) Bridge No. 8 Houay Pao
Coordinates	N: E:
Direction:	DCP-No.11 (To Salavan)
Ground El:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
3	3	-100	33.33	4.82	
2	5	-200	50.00	2.87	
2	7	-300	50.00	2.87	
2	9	-400	50.00	2.87	
2	11	-500	50.00	2.87	
2	13	-600	50.00	2.87	
3	16	-700	33.33	4.82	
3	19	-800	33.33	4.82	
2	21	-900	50.00	2.87	
1	22	-1000	100.00	1.18	
1	23	-1100	100.00	1.18	
4	27	-1200	25.00	6.96	
3	30	-1300	33.33	4.82	
8	38	-1400	12.50	16.90	
11	49	-1500	9.09	25.41	
11	60	-1600	9.09	25.41	
8	68	-1700	12.50	16.90	
10	78	-1800	10.00	22.49	
10	88	-1900	10.00	22.49	
10	98	-2000	10.00	22.49	
12	110	-2100	8.33	28.40	
13	123	-2200	7.69	31.47	
20	143	-2300	5.00	54.62	
16	159	-2400	6.25	41.05	
20	179	-2500	5.00	54.62	
30	209	-2600	3.33	91.77	
35	244	-2700	2.86	111.79	



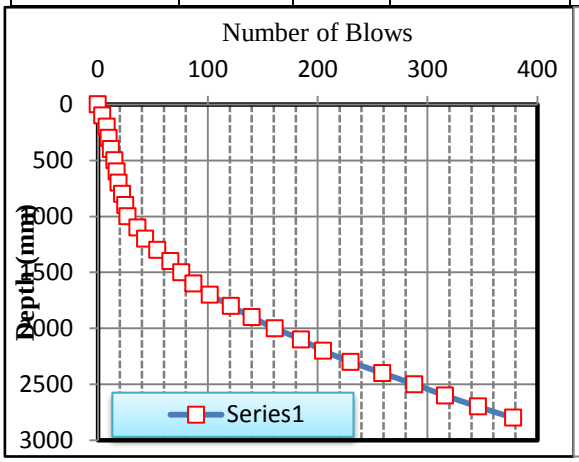


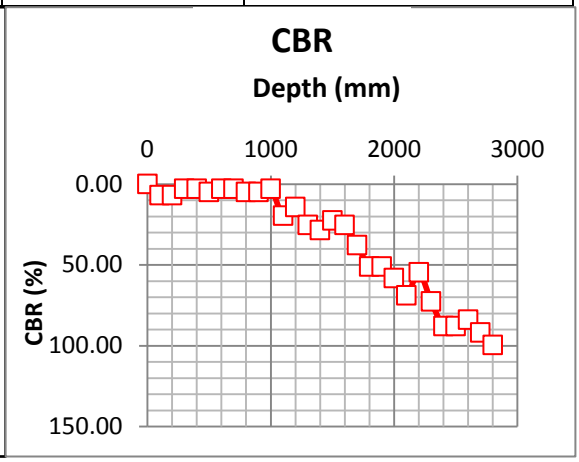
Dynamic Cone Penetration Test

DCP-No.12

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-03-14
Location:	(NR-20) Bridge No. 8 Houay Pao
Coordinates	
Direction:	DCP-No.12 (To Pakse)
Ground El:	
N:	E:

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
4	4	-100	25.00	6.96	
4	8	-200	25.00	6.96	
2	10	-300	50.00	2.87	
2	12	-400	50.00	2.87	
3	15	-500	33.33	4.82	
2	17	-600	50.00	2.87	
2	19	-700	50.00	2.87	
3	22	-800	33.33	4.82	
3	25	-900	33.33	4.82	
2	27	-1000	50.00	2.87	
9	36	-1100	11.11	19.65	
7	43	-1200	14.29	14.25	
11	54	-1300	9.09	25.41	
12	66	-1400	8.33	28.40	
10	76	-1500	10.00	22.49	
11	87	-1600	9.09	25.41	
15	102	-1700	6.67	37.79	
19	121	-1800	5.26	51.15	
19	140	-1900	5.26	51.15	
21	161	-2000	4.76	58.14	
24	185	-2100	4.17	68.97	
20	205	-2200	5.00	54.62	
25	230	-2300	4.00	72.67	
29	259	-2400	3.45	87.88	
29	288	-2500	3.45	87.88	
28	316	-2600	3.57	84.02	
30	346	-2700	3.33	91.77	
32	378	-2800	3.13	99.68	



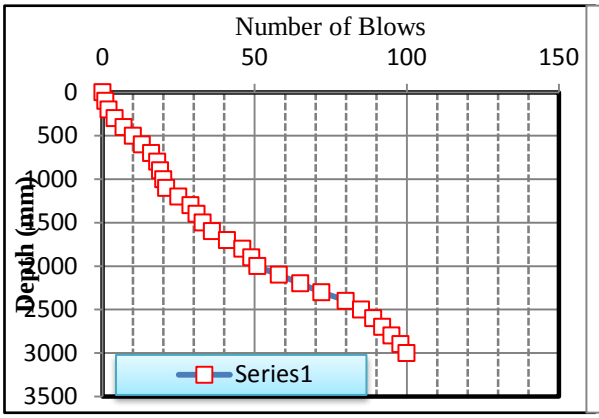


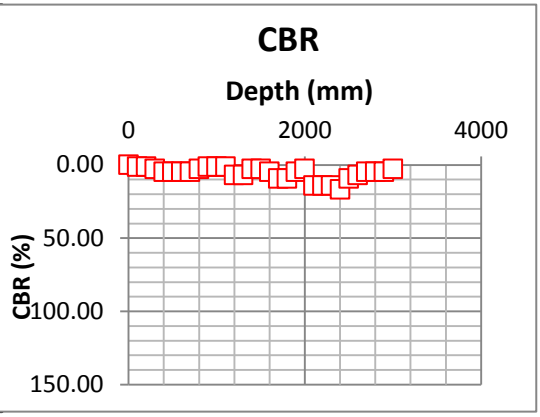
Dynamic Cone Penetration Test

DCP-No.13

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-02-14
Location:	(NR-20) Bridge No. 9 Houay Ta Pung
Coordinates	N: E:
Direction:	DCP-No.13 (To Salavan)
Ground El:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
1	1	-100	100.00	1.18	
1	2	-200	100.00	1.18	
2	4	-300	50.00	2.87	
3	7	-400	33.33	4.82	
3	10	-500	33.33	4.82	
3	13	-600	33.33	4.82	
3	16	-700	33.33	4.82	
2	18	-800	50.00	2.87	
1	19	-900	100.00	1.18	
1	20	-1000	100.00	1.18	
1	21	-1100	100.00	1.18	
4	25	-1200	25.00	6.96	
4	29	-1300	25.00	6.96	
2	31	-1400	50.00	2.87	
2	33	-1500	50.00	2.87	
3	36	-1600	33.33	4.82	
5	41	-1700	20.00	9.26	
5	46	-1800	20.00	9.26	
3	49	-1900	33.33	4.82	
2	51	-2000	50.00	2.87	
7	58	-2100	14.29	14.25	
7	65	-2200	14.29	14.25	
7	72	-2300	14.29	14.25	
8	80	-2400	12.50	16.90	
5	85	-2500	20.00	9.26	
4	89	-2600	25.00	6.96	
3	92	-2700	33.33	4.82	
3	95	-2800	33.33	4.82	
3	98	-2900	33.33	4.82	
2	100	-3000	50.00	2.87	



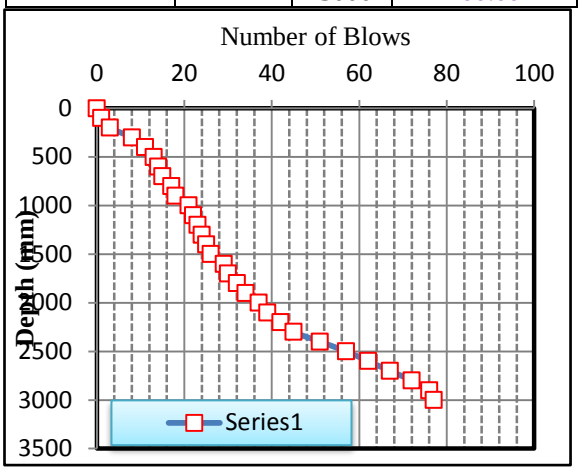


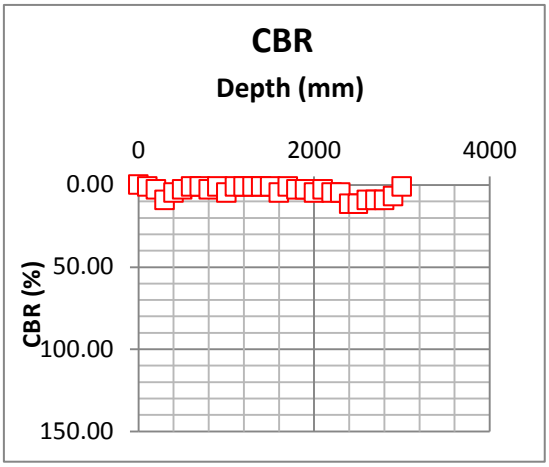
Dynamic Cone Penetration Test

DCP-No.14

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-02-14
Location:	(NR-20) Bridge No. 9 Houay Ta Pung
Direction:	DCP-No.14 (To Pakse)
Ground El:	
Coordinates N:	
Coordinates E:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
1	1	-100	100.00	1.18	
2	3	-200	50.00	2.87	
5	8	-300	20.00	9.26	
3	11	-400	33.33	4.82	
2	13	-500	50.00	2.87	
1	14	-600	100.00	1.18	
1	15	-700	100.00	1.18	
2	17	-800	50.00	2.87	
1	18	-900	100.00	1.18	
3	21	-1000	33.33	4.82	
1	22	-1100	100.00	1.18	
1	23	-1200	100.00	1.18	
1	24	-1300	100.00	1.18	
1	25	-1400	100.00	1.18	
1	26	-1500	100.00	1.18	
3	29	-1600	33.33	4.82	
1	30	-1700	100.00	1.18	
2	32	-1800	50.00	2.87	
2	34	-1900	50.00	2.87	
3	37	-2000	33.33	4.82	
2	39	-2100	50.00	2.87	
3	42	-2200	33.33	4.82	
3	45	-2300	33.33	4.82	
6	51	-2400	16.67	11.70	
6	57	-2500	16.67	11.70	
5	62	-2600	20.00	9.26	
5	67	-2700	20.00	9.26	
5	72	-2800	20.00	9.26	
4	76	-2900	25.00	6.96	
1	77	-3000	100.00	1.18	



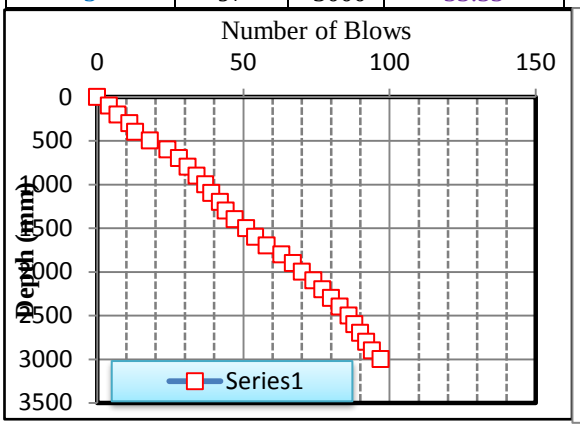


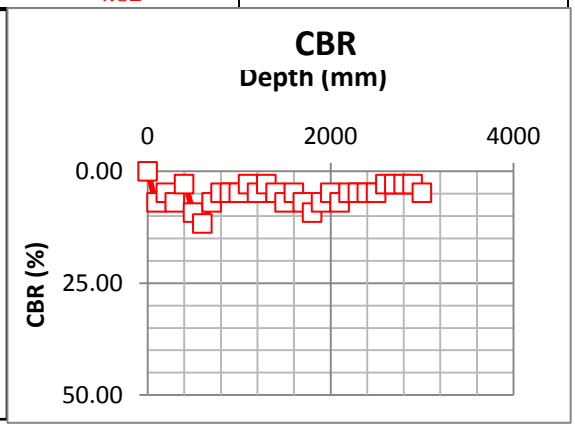
Dynamic Cone Penetration Test

DCP-No.16

Project:	ADB TA 8492 Lao Road Sector Governance and Maintenance Project
Consultant:	Layvanh Road and Bridge Construction Co., Ltd
Date:	10-02-14
Location:	(NR-20) Bridge No. 10 Houay Nam Sun
Direction:	DCP-No.16 (To Pakse)
Ground El:	
Coordinates N:	
Coordinates E:	

Number of blows	Sum of blows	Depth (mm)	DCP Value (mm/blow)	CBR (%)	Remark
0	0	0	0.00	0.00	
4	4	-100	25.00	6.96	
3	7	-200	33.33	4.82	
4	11	-300	25.00	6.96	
2	13	-400	50.00	2.87	
5	18	-500	20.00	9.26	
6	24	-600	16.67	11.70	
4	28	-700	25.00	6.96	
3	31	-800	33.33	4.82	
3	34	-900	33.33	4.82	
3	37	-1000	33.33	4.82	
2	39	-1100	50.00	2.87	
3	42	-1200	33.33	4.82	
2	44	-1300	50.00	2.87	
3	47	-1400	33.33	4.82	
4	51	-1500	25.00	6.96	
3	54	-1600	33.33	4.82	
4	58	-1700	25.00	6.96	
5	63	-1800	20.00	9.26	
4	67	-1900	25.00	6.96	
3	70	-2000	33.33	4.82	
4	74	-2100	25.00	6.96	
3	77	-2200	33.33	4.82	
3	80	-2300	33.33	4.82	
3	83	-2400	33.33	4.82	
3	86	-2500	33.33	4.82	
2	88	-2600	50.00	2.87	
2	90	-2700	50.00	2.87	
2	92	-2800	50.00	2.87	
2	94	-2900	50.00	2.87	
3	97	-3000	33.33	4.82	





Visual Inspection Survey for Bridge

Require Detailed Inspection	No

DPWT	Saravan			
National Road	National Road No.20			
Location (Km)	KM14+700			
Road Class	III			
Name of River (Creek)	Houay Pasa	Bridge Name	Pasa	
Superstructure	Bailey Bridge			
Substructure	Abutment	Wall	Pier	-
Bridge Length (m)	18.8	Span	1@18.8	
Bridge Width (m)	5.6	Road Width (m)	3.9	
Completed Year	1990	Last Maintenace Year	-	
Traffic Volume (AADT)	Not Many			

Topographic	Flat Area	Category	National Road
Surrounding	Rural Area	Design Code	-

Span No.	1

Check Items/Parts	Visual Inspection Items			Evaluation					No. of Photo
	*1 Essential	Applicable	Inspection Items	N/A	Obser	Mainte	Repair	Emerg	
				A	B	C	D	E	
Steel Beam/Truss & Steel Slab	■		①Progress of corrosion			✓			
	■		②Crack condtions			✓			
	■		③Tightening of bolts				✓		
	■		④Occurrence of vibration and noise					✓	
Concrete Beam & Girder (RC/PC)	■	•	①Cracking						
	■	•	②Detachment, exposure of steel						
Concrete Slab	■	•	①Cracking						
	■	•	②free lime						
	■	•	③Detachment, exposure of steel						
Bearing (Steel/ Rubber)	■		①Progress of corrosion				✓		
	■		②Deform, damage, move and settle				✓		
		•	③Mounting debris				✓		
Abutment/ Pier	■	•	①Cracking				✓		
	■	•	②Detachment, exposure of steel			✓			
	■	•	③free lime			✓			
	■	•	④Scouring and washing out			✓			
Handrail/ Kerb/ Guard (Steel/Concrete/others)		•	①Progress of corrosion					✓	
		•	②Deform, damage, move and settle					✓	
		•	③Cracking, other damages					✓	
Pavement (Asphalt/Concrete)		•	①Pothole						
		•	②Cracking						
Expansion Joint (Steel/ Rubber)			①Differencial level					✓	
			②Abnormal movement			✓			
			③Deform, damage, move and settle				✓		
Drainage			①Mounting debris				✓		
			②Progress of corrosion					✓	
Others	■		Design issue or out of specification, etc						

Remarks (**Describe the particular observation for the damage and other structural concern**)

- Temporaly bridge but use as permanent.
- Damange in many element, which is required for replacement.
- Emergency theatment is require for safety reason, such re-bolt, expension joint and bridge surface.

*1Note "■" is critial items for verifying the essential damages of major membre of bridge at the visual inspection

Photos at Visual Inspection Sheet
(Particular Points)

Photo No.	NO.2_2	Span No.	1
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.2_4	Span No.	1
Subject	Bridge Surface (Steel Plate)		
Memo	Damange was found on Bridge Surface		

Photo No.	No.2_8	Span No.	1
Subject	Handrail		
Memo	Corrosion, deformation and cracking was found		

Photo No.	No.2_14	Span No.	1
Subject	Approach Road		
Memo	Relatively good condition		

Photo No.	No.2-12	Span No.	1
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.2-19	Span No.	1
Subject	Handrail		
Memo	Damage		

Photo No.	No.2-11	Span No.	1
Subject	Bridge Surface		
Memo	Damage on Steel plate		

Photo No.	No.2-20	Span No.	1
Subject	Bridge Abutment		
Memo	Damage		

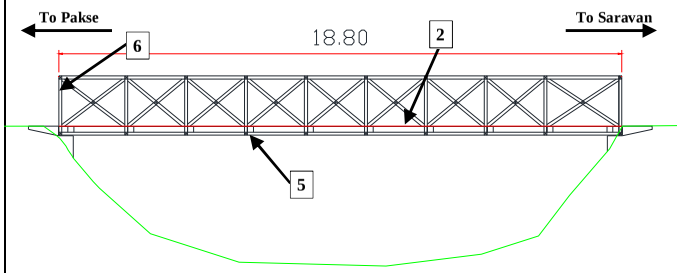
Detailed Observation Sheet

No. 1

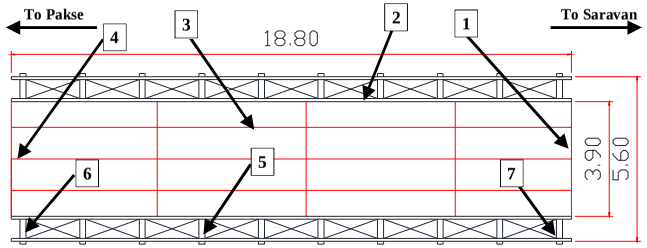
Bridge No.	1	Route No.	National Road No.20	DPWT	Saravan	Length (m)	18.80	Span (m)	1@18.8	Year Built	1990
Name of Bridge	Pasa			Place	Saravan District	Profile/Crossfall		Width (m)	5.6	Donor/Fund	-
				Kilo-Post	KM14+700	Design Code	-	Load Capacity (ton)	20	Ranking	-
Type of Superstructure:	Bailey Bridge					Information /Note	Bearing shoe: Steel and concrete		Handrail: Steel (Function as main structure)		
Type of Substructure:	Abutment: Wall P -						Expansion joint: No Specific Equipment		Other facilities (street light, kerb, ditch and plaque, etc): No specific Bridge facilities		

Drawing

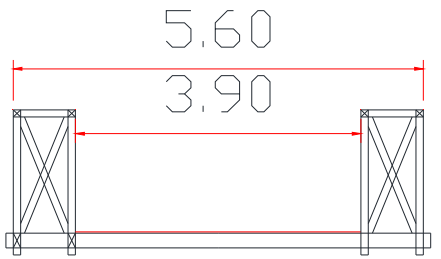
Side View



Top View



Section View



Over View

Road View

Approach road

Damage 1

Damage 2

Damage 3

Damage 4

Damage 5

Damage 6

Damage 7

Remarks

- Bridge Expension Joint was damaged
- Handrail of the bridge was damaged
- Bridge surface was damaged
- Crack and Damage was found on abutment

Visual Inspection Survey for Bridge

Require Detailed Inspection	No

DPWT	Saravan			
National Road	National Road No.20			
Location (Km)	KM13+400			
Road Class	III			
Name of River (Creek)	Houay Ko	Bridge Name	Ko	
Superstructure	PC-I			
Substructure	Abutment	Wall	Pier	-
Bridge Length (m)	37.2	Span	1@37.2	
Bridge Width (m)	11.5	Road Width (m)	8.4	
Completed Year	2014	Last Maintenace Year	-	
Traffic Volume (AADT)	Not Many			

Topographic	Flat Area	Category	National Road
Surrounding	Rural Area	Design Code	-

Span No.	1

Check Items/Parts	Visual Inspection Items			Evaluation					No. of Photo
	*1 Essential	Applicable	Inspection Items	N/A A	Obser B	Mainte C	Repair D	Emerg E	
Steel Beam/Truss & Steel Slab	■		①Progress of corrosion						
	■		②Crack condtions						
	■		③Tightening of bolts						
	■		④Occurrence of vibration and noise						
Concrete Beam & Girder (RC/PC)	■	•	①Cracking	✓					
	■	•	②Detachment, exposure of steel	✓					
Concrete Slab	■	•	①Cracking	✓					
	■	•	②free lime	✓					
	■	•	③Detachment, exposure of steel	✓					
Bearing (Steel/ Rubber)	■		①Progress of corrosion	✓					
	■		②Deform, damage, move and settle	✓					
		•	③Mounting debris	✓					
Abutment/ Pier	■	•	①Cracking	✓					
	■	•	②Detachment, exposure of steel	✓					
	■	•	③free lime	✓					
	■	•	④Scouring and washing out	✓					
Handrail/ Kerb/ Guard (Steel/Concrete/others)		•	①Progress of corrosion	✓					
		•	②Deform, damage, move and settle	✓					
		•	③Cracking, other damages	✓					
Pavement (Asphalt/Concrete)		•	①Pothole	✓					
		•	②Cracking	✓					
Expansion Joint (Steel/ Rubber)			①Differencial level	✓					
			②Abnormal movement	✓					
			③Deform, damage, move and settle	✓					
Drainage			①Mounting debris	✓					
			②Progress of corrosion	✓					
Others	■		Design issue or out of specification, etc						

Remarks **(Describe the particular observation for the damage and other structural concern)**

- This bridge was re-construction and complete in the year of 2014.
- No any significant damage found on the structure and bridge facilities
- Drainage on expansion (Space) between bridge and abutment should be improve for long life using.

*1Note "■" is critial items for verifying the essential damages of major membre of bridge at the visual inspection

Photos at Visual Inspection Sheet
(Particular Points)

Photo No.	NO.1_2	Span No.	1
Subject	Expansion Joint		
Memo	No significant Damage, installation of drainage system properly is required		

Photo No.	No.1_4	Span No.	1
Subject	Bridge Surface (Concrete)		
Memo	Good condition		

Photo No.	No.1_5	Span No.	1
Subject	Handrail		
Memo	Good condition		

Photo No.	No.1_1	Span No.	1
Subject	Approach Road		
Memo	Good condition		

Photo No.		Span No.	1
Subject			
Memo			

Photo No.		Span No.	
Subject			
Memo			

Photo No.		Span No.	1
Subject			
Memo			

Photo No.		Span No.	
Subject			
Memo			

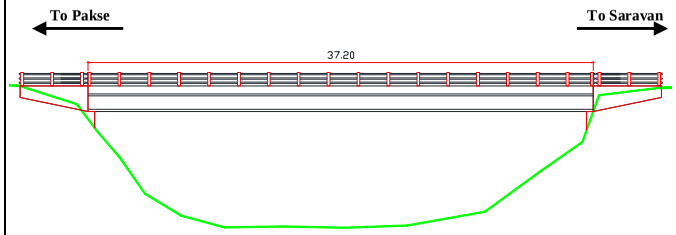
Detailed Observation Sheet

No. 1

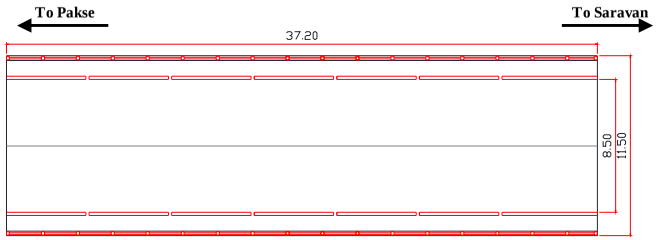
Bridge No.	1	Route No.	National Road No.20	DPWT	Saravan	Length (m)	37.20	Span (m)	1@37.2	Year Built	2014
Name of Bridge	Ko			Place	Saravan District	Profile/Crossfall		Width (m)	11.5	Donor/Fund	-
				Kilo-Post	KM13+400	Design Code	-	Load Capacity (ton)	20	Ranking	-
Type of Superstructure:	PC-I					Information /Note	Bearing shoe: Steel rabber bearing shoe			Handrail: Concrete and Steel pipe	
Type of Substructure:	Abutment: Wall P -						Expansion joint: No Specific Equipment			Other facilities (street light, kerb, ditch and plaque, etc): No specific Bridge facilities	

Drawing

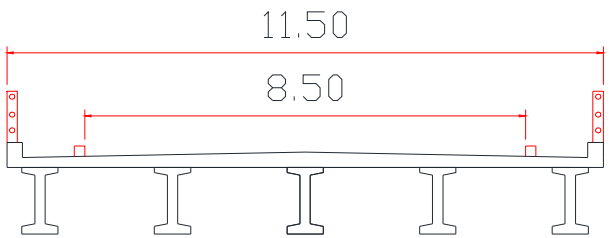
Side View



Top View



Section View



Over View

Damage 3

Road View

Damage 4

Handrail

Damage 5

Expansion Joint

Damage 6

Approach Road

Damage 7

Remarks

- Bridge is new (re-construction and complete on the year 2014)
- Bridge condition is good

Visual Inspection Survey for Bridge

Require Detailed Inspection	No

DPWT	Saravan			
National Road	National Road No.20			
Location (Km)	KM15+300			
Road Class	III			
Name of River (Creek)	Houay Sung	**Bridge Name**	Sung	
Superstructure	**Bailey Bridge**			
Substructure	**Abutment** Wall	**Pier**	Douple Concrete Pipes	
Bridge Length (m)	30.8	**Span**	2@15.50-15.30	
Bridge Width (m)	6.1	**Road Width (m)**	4.5	
Completed Year	1990	**Last Maintenace Year**	2007	
Traffic Volume (AADT)	**Not Many**			

Topographic	Flat Area	**Category**	National Road
Surrounding	Rural Area	**Design Code**	-

Span No. 1

Check Items/Parts	Visual Inspection Items			Evaluation					No. of Photo
	*1 Essential	Applicable	Inspection Items	N/A A	Obser B	Mainte C	Repair D	Emerg E	
Steel Beam/Truss & Steel Slab	■		①Progress of corrosion				✓		
	■		②Crack condtions				✓		
	■		③Tightening of bolts				✓		
	■		④Occurrence of vibration and noise					✓	
Concrete Beam & Girder (RC/PC)	■	•	①Cracking						
	■	•	②Detachment, exposure of steel						
Concrete Slab	■	•	①Cracking						
	■	•	②free lime						
	■	•	③Detachment, exposure of steel						
Bearing (Steel/ Rubber)	■		①Progress of corrosion				✓		
	■		②Deform, damage, move and settle				✓		
		•	③Mounting debris				✓		
Abutment/ Pier	■	•	①Cracking				✓		
	■	•	②Detachment, exposure of steel			✓			
	■	•	③free lime			✓			
	■	•	④Scouring and washing out			✓			
Handrail/ Kerb/ Guard (Steel/Concrete/others)		•	①Progress of corrosion					✓	
		•	②Deform, damage, move and settle					✓	
		•	③Cracking, other damages					✓	
Pavement (Asphalt/Concrete)		•	①Pothole						
		•	②Cracking						
Expansion Joint (Steel/ Rubber)			①Differencial level					✓	
			②Abnormal movement				✓		
			③Deform, damage, move and settle				✓		
Drainage			①Mounting debris				✓		
			②Progress of corrosion					✓	
Others	■		Design issue or out of specification, etc						

Remarks (**Describe the particular observation for the damage and other structural concern**)

- Temporaly bridge but use as permanent.
- No Significan damange was found on structure. Lack of Load Capacity was estimated. Therefore replacement of structure is required for permanent use.

*1Note "■" is critial items for verifying the essential damages of major membre of bridge at the visual inspection

Photos at Visual Inspection Sheet
(Particular Points)

Photo No.	NO.3_2	Span No.	1
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.3_5	Span No.	1
Subject	Bridge Surface (Steel Plate)		
Memo	No Significant Damage was found		

Photo No.	No.3_3	Span No.	1
Subject	Handrail		
Memo	Corrosion, deformation was found		

Photo No.	No.3_15	Span No.	1
Subject	Approach Road		
Memo	Relatively good condition		

Photo No.	No.3-13	Span No.	2
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.3-9	Span No.	2
Subject	Handrail		
Memo	No Significant Damage was found		

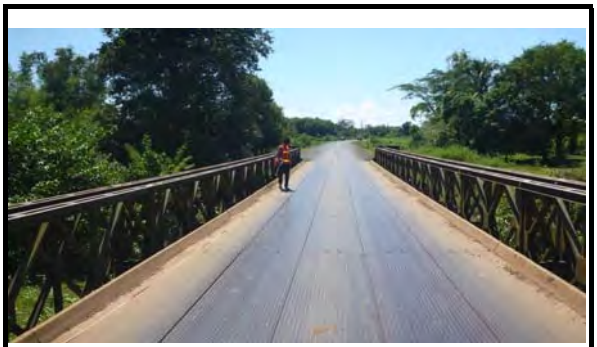


Photo No.	No.3-14	Span No.	1,2
Subject	Bridge Surface		
Memo	No Significant Damage on Steel plate		

Photo No.	No.3-4	Span No.	2
Subject	Bridge Surface		
Memo	No Significant Damage was found		

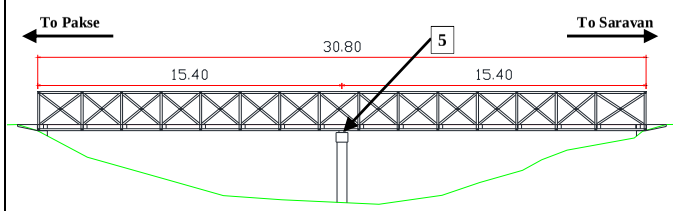
Detailed Observation Sheet

No. 1

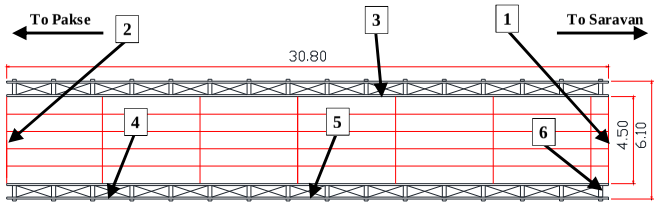
Bridge No.	1	Route No.	National Road No.20	DPWT	Saravan	Length (m)	30.80	Span (m)	2@15.50-15.30	Year Built	1990
Name of Bridge	Sung			Place	Saravan District	Profile/Crossfall		Width (m)	6.1	Donor/Fund	-
				Kilo-Post	KM15+300	Design Code	-	Load Capacity (ton)	20	Ranking	-
Type of Superstructure:	Bailey Bridge					Information /Note	Bearing shoe: Steel and concrete		Handrail: Steel which use a part of structure		
Type of Substructure:	Abutment: Wall		P	Douple Concrete Pipes			Expansion joint: No Specific Equipment		Other facilities (street light, kerb, ditch and plaque, etc): No specific Bridge facilities		

Drawing

Side View



Top View



Section View

Over View

Road View

Approach Road

Damage 1

Damage 2

Damage 3

Damage 4

Damage 5

Damage 6

Damage 7

Remarks

- Damage on Expension Joint (Emergency repaire is required for road safety)
- No significant damage was found on structure and road bridge surface

Visual Inspection Survey for Bridge

Require Detailed Inspection	No

DPWT	Saravan			
National Road	National Road No.20			
Location (Km)	KM15+800			
Road Class	III			
Name of River (Creek)	Houay Phad	**Bridge Name**	Phad	
Superstructure	Bailey Bridge			
Substructure	**Abutment**	**Wall**	**Pier**	-
Bridge Length (m)	12.7	**Span**	1@12.7	
Bridge Width (m)	5.6	**Road Width (m)**	3.9	
Completed Year	1990	**Last Maintenace Year**	-	
Traffic Volume (AADT)	Not Many			

Topographic	Flat Area	**Category**	National Road
Surrounding	Rural Area	**Design Code**	-

Span No. 1

Check Items/Parts	Visual Inspection Items			Evaluation					No. of Photo
	*1 Essential	Applicable	Inspection Items	N/A	Obser	Mainte	Repair	Emerg	
				A	B	C	D	E	
Steel Beam/Truss & Steel Slab	■		①Progress of corrosion				✓		
	■		②Crack condtions				✓		
	■		③Tightening of bolts				✓		
	■		④Occurrence of vibration and noise					✓	
Concrete Beam & Girder (RC/PC)	■	•	①Cracking						
	■	•	②Detachment, exposure of steel						
Concrete Slab	■	•	①Cracking						
	■	•	②free lime						
	■	•	③Detachment, exposure of steel						
Bearing (Steel/ Rubber)	■		①Progress of corrosion				✓		
	■		②Deform, damage, move and settle				✓		
		•	③Mounting debris				✓		
Abutment/ Pier	■	•	①Cracking				✓		
	■	•	②Detachment, exposure of steel				✓		
	■	•	③free lime				✓		
	■	•	④Scouring and washing out				✓		
Handrail/ Kerb/ Guard (Steel/Concrete/others)		•	①Progress of corrosion					✓	
		•	②Deform, damage, move and settle					✓	
		•	③Cracking, other damages					✓	
Pavement (Asphalt/Concrete)		•	①Pothole						
		•	②Cracking						
Expansion Joint (Steel/ Rubber)			①Differencial level					✓	
			②Abnormal movement				✓		
			③Deform, damage, move and settle				✓		
Drainage			①Mounting debris				✓		
			②Progress of corrosion					✓	
Others	■		Design issue or out of specification, etc						

Remarks (**Describe the particular observation for the damage and other structural concern**)

- Temporaly bridge but use as permanent.
- Damange in many element, which is required for replacement.
- Emergency theatment is require for safety reason, such re-bolt, expension joint and bridge surface.
- Emergency repaire is require for abutment.

*1Note "■" is critial items for verifying the essential damages of major membre of bridge at the visual inspection

Photos at Visual Inspection Sheet
(Particular Points)

Photo No.	NO.4_2	Span No.	1
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.4_4	Span No.	1
Subject	Bridge Surface (Steel Plate)		
Memo	Minor Damag was found on bridge surface		

Photo No.	No.4_5	Span No.	1
Subject	Handrail		
Memo	Corrosion, deformation was found		

Photo No.	No.4_3	Span No.	1
Subject	Approach Road		
Memo	Relatively good condition		

Photo No.	No.4-10	Span No.	1
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.4-16	Span No.	1
Subject	Handrail		
Memo	Corrosion, deformation was found		

Photo No.	No.4-6	Span No.	1
Subject	Bridge Surface		
Memo	Minor damage was found on bridge surface		

Photo No.	No.4-14	Span No.	1
Subject	Abutment		
Memo	Scouring and waching out was found on abutment		

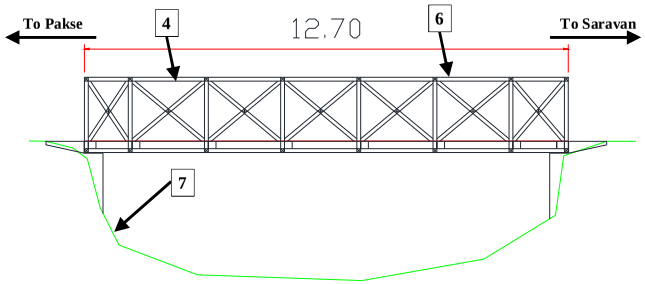
Detailed Observation Sheet

No. 1

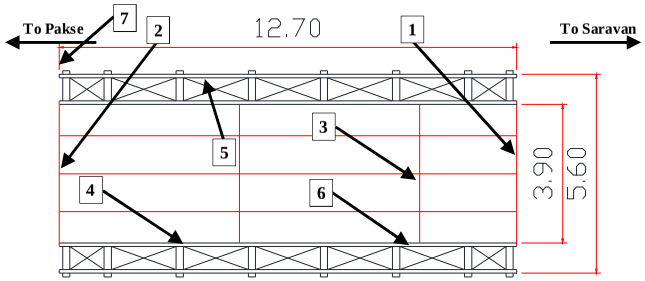
Bridge No.	1	Route No.	National Road No.20	DPWT	Saravan	Length (m)	12.70	Span (m)	1@12.7	Year Built	1990
Name of Bridge	Phad			Place	Saravan District	Profile/Crossfall		Width (m)	5.6	Donor/Fund	-
				Kilo-Post	KM15+800	Design Code	-	Load Capacity (ton)	20	Ranking	-
Type of Superstructure:	Bailey Bridge					Information /Note	Bearing shoe: Steel and concrete		Handrail: Steel and used as a part of Structure		
Type of Substructure:	Abutment:	Wall	P	-			Expansion joint: No Specific Equipment		Other facilities (street light, kerb, ditch and plaque, etc): No specific Bridge facilities		

Drawing

Side View



Top View



Section View

Over View

Road View

Approach Road

Damage 1

Damage 2

Damage 3

Damage 4

Damage 5

Damage 6

Damage 7

Remarks

- Corrosion and damage was found on handrail (Structure)
- Scouring and washing out was found on abutment
- Damage on expansion join was found

Visual Inspection Survey for Bridge

Require Detailed Inspection	No

DPWT	**Saravan**			
National Road	**National Road No.20**			
Location (Km)	**KM17+200**			
Road Class	**III**			
Name of River (Creek)	**Houay Kapok**	**Bridge Name**	**Kapok**	
Superstructure	**Bailey Bridge**			
Substructure	**Abutment**	**Wall**	**Pier**	-
Bridge Length (m)	**19.4**	**Span**	**1@19.4**	
Bridge Width (m)	**5.7**	**Road Width (m)**	**4.2**	
Completed Year	**1990**	**Last Maintenace Year**	-	
Traffic Volume (AADT)	**Not Many**			

Topographic	Flat Area	**Category**	National Road
Surrounding	Rural Area	**Design Code**	-

Span No. 1

Check Items/Parts	Visual Inspection Items			Evaluation					No. of Photo
	*1 Essential	Applicable	Inspection Items	N/A	Obser	Mainte	Repair	Emerg	
				A	B	C	D	E	
Steel Beam/Truss & Steel Slab	■		①Progress of corrosion				✓		
	■		②Crack condtions				✓		
	■		③Tightening of bolts					✓	
	■		④Occurrence of vibration and noise					✓	
Concrete Beam & Girder (RC/PC)	■	•	①Cracking						
	■	•	②Detachment, exposure of steel						
Concrete Slab	■	•	①Cracking						
	■	•	②free lime						
	■	•	③Detachment, exposure of steel						
Bearing (Steel/ Rubber)	■		①Progress of corrosion				✓		
	■		②Deform, damage, move and settle				✓		
		•	③Mounting debris					✓	
Abutment/ Pier	■	•	①Cracking				✓		
	■	•	②Detachment, exposure of steel				✓		
	■	•	③free lime				✓		
	■	•	④Scouring and washing out				✓		
Handrail/ Kerb/ Guard (Steel/Concrete/others)		•	①Progress of corrosion					✓	
		•	②Deform, damage, move and settle					✓	
		•	③Cracking, other damages					✓	
Pavement (Asphalt/Concrete)		•	①Pothole						
		•	②Cracking						
Expansion Joint (Steel/ Rubber)			①Differencial level					✓	
			②Abnormal movement					✓	
			③Deform, damage, move and settle					✓	
Drainage			①Mounting debris				✓		
			②Progress of corrosion					✓	
Others	■		Design issue or out of specification, etc						

Remarks **(Describe the particular observation for the damage and other structural concern)**

- Temporaly bridge but use as permanent.
- Damange in many element, which is required for replacement.
- Emergency theatment is require for safety reason, such re-bolt, expension joint and bridge surface.

*1Note "■" is critial items for verifying the essential damages of major membre of bridge at the visual inspection

Photos at Visual Inspection Sheet
(Particular Points)

Photo No.	NO.5_2	Span No.	1
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.5_5	Span No.	1
Subject	Bridge Surface (Wood)		
Memo	Significant Damage was found		

Photo No.	No.5_3	Span No.	1
Subject	Handrail		
Memo	Corrosion, deformation was found		

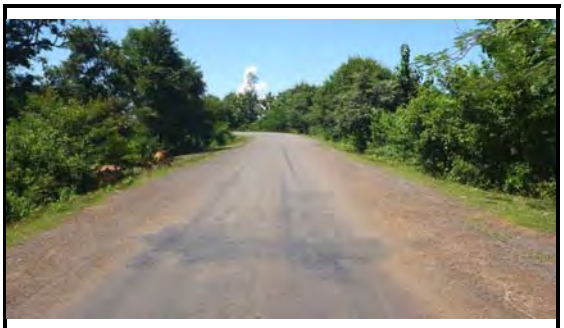


Photo No.	No.5_21	Span No.	1
Subject	Approach Road		
Memo	Relatively good condition		

Photo No.	No.5_19	Span No.	1
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.5_6	Span No.	1
Subject	Handrail		
Memo	Corrosion, deformation was found		

Photo No.	No.5_25	Span No.	1
Subject	Bridge Surface		
Memo	Significant Damage on Wood plate		

Photo No.	No.5_8	Span No.	1
Subject	Bridge Surface		
Memo	Significant Damage was found		

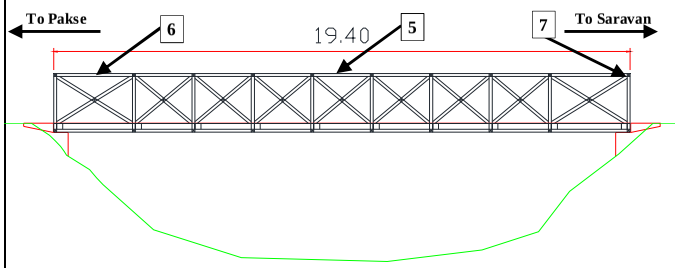
Detailed Observation Sheet

No. 5

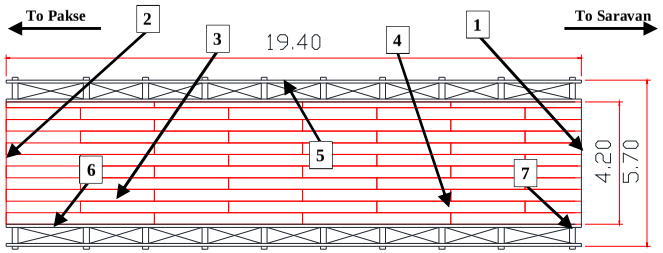
Bridge No.	1	Route No.	National Road No.20	DPWT	Saravan	Length (m)	19.40	Span (m)	1@19.4	Year Built	1990
Name of Bridge	Kapok			Place	Saravan District	Profile/Crossfall		Width (m)	5.7	Donor/Fund	-
				Kilo-Post	KM17+200	Design Code	-	Load Capacity (ton)	20	Ranking	-
Type of Superstructure:	Bailey Bridge					Information /Note	Bearing shoe: Steel and concrete		Handrail: Steel which use as a part of Structure		
Type of Substructure:	Abutment: Wall		P	-			Expansion joint: No Specific Equipment		Other facilities (street light, kerb, ditch and plaque, etc): No specific Bridge facilities		

Drawing

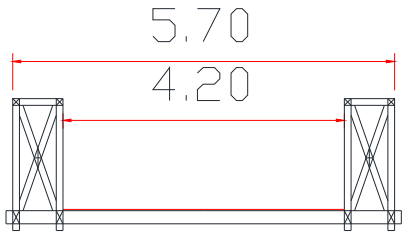
Side View



Top View



Section View



Over View

Road View

Approach Road View

Damage 1

Damage 2

Damage 3

Damage 4

Damage 5

Damage 6

Damage 7

Remarks

- Significant damage was found on bridgute surface which made by woods, and need to be replace as soon as possible for road safety.
- Corrosion, deformation and damage was found on handrail (Structure).

Visual Inspection Survey for Bridge

Require Detailed Inspection	No

DPWT	Saravan			
National Road	National Road No.20			
Location (Km)	KM26+600			
Road Class	III			
Name of River (Creek)	Houay Tone	Bridge Name	Tone	
Superstructure	PC-I			
Substructure	Abutment	Wall	Pier	-
Bridge Length (m)	36.8	Span	1@36.8	
Bridge Width (m)	11.7	Road Width (m)	8.5	
Completed Year	2014	Last Maintenace Year	-	
Traffic Volume (AADT)	Not Many			

Topographic	Flat Area	Category	National Road
Surrounding	Rural Area	Design Code	-

Span No.	1

Check Items/Parts	Visual Inspection Items			Evaluation					No. of Photo
	*1 Essential	Applicable	Inspection Items	N/A A	Obser B	Mainte C	Repair D	Emerg E	
Steel Beam/Truss & Steel Slab	■		①Progress of corrosion						
	■		②Crack condtions						
	■		③Tightening of bolts						
	■		④Occurrence of vibration and noise						
Concrete Beam & Girder (RC/PC)	■	•	①Cracking	✓					
	■	•	②Detachment, exposure of steel	✓					
Concrete Slab	■	•	①Cracking	✓					
	■	•	②free lime	✓					
	■	•	③Detachment, exposure of steel	✓					
Bearing (Steel/ Rubber)	■		①Progress of corrosion	✓					
	■		②Deform, damage, move and settle	✓					
		•	③Mounting debris	✓					
Abutment/ Pier	■	•	①Cracking	✓					
	■	•	②Detachment, exposure of steel	✓					
	■	•	③free lime	✓					
	■	•	④Scouring and washing out	✓					
Handrail/ Kerb/ Guard (Steel/Concrete/others)		•	①Progress of corrosion	✓					
		•	②Deform, damage, move and settle	✓					
		•	③Cracking, other damages	✓					
Pavement (Asphalt/Concrete)		•	①Pothole	✓					
		•	②Cracking	✓					
Expansion Joint (Steel/ Rubber)			①Differencial level	✓					
			②Abnormal movement	✓					
			③Deform, damage, move and settle	✓					
Drainage			①Mounting debris	✓					
			②Progress of corrosion	✓					
Others	■		Design issue or out of specification, etc						

Remarks **(Describe the particular observation for the damage and other structural concern)**

- This bridge was re-construction and complete in the year of 2014.
- No any significant damage found on the structure and bridge facilities
- Drainage on expansion (Space) between bridge and abutment should be improve for long life using.

*1Note "■" is critial items for verifying the essential damages of major membre of bridge at the visual inspection

Photos at Visual Inspection Sheet
(Particular Points)

Photo No.	NO.3_2	Span No.	1
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.3_5	Span No.	1
Subject	Bridge Surface (Wood)		
Memo	No Significant Damage was found		

Photo No.	No.3_3	Span No.	1
Subject	Handrail		
Memo	Corrosion, deformation was found		

Photo No.	No.3_15	Span No.	1
Subject	Approach Road		
Memo	Relatively good condition		

Photo No.	No.3-13	Span No.	2
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.3-9	Span No.	2
Subject	Handrail		
Memo	No Significant Damage was found		

Photo No.	No.3-14	Span No.	1,2
Subject	Bridge Surface		
Memo	No Significant Damage on Steel plate		

Photo No.	No.3-4	Span No.	2
Subject	Bridge Surface		
Memo	No Significant Damage was found		

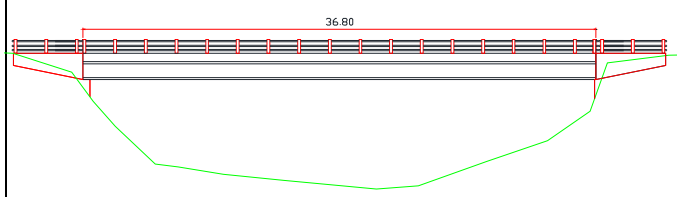
Detailed Observation Sheet

No. 1

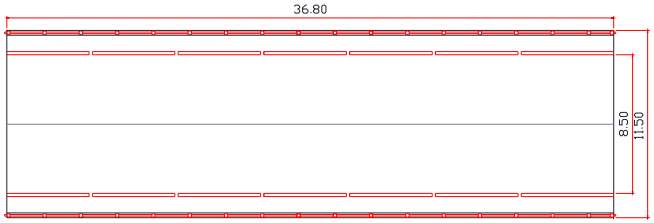
Bridge No.	1	Route No.	National Road No.20	DPWT	Saravan	Length (m)	36.80	Span (m)	1@36.8	Year Built	2014
Name of Bridge	Tone			Place	Saravan District	Profile/Crossfall		Width (m)	11.7	Donor/Fund	-
				Kilo-Post	KM26+600	Design Code	-	Load Capacity (ton)	20	Ranking	-
Type of Superstructure:	PC-I					Information /Note	Bearing shoe: Steel rabber bearing shoe			Handrail: Concrete and Steel pipe	
Type of Substructure:	Abutment: Wall P -						Expansion joint: No Specific Equipment			Other facilities (street light, kerb, ditch and plaque, etc): No specific Bridge facilities	

Drawing

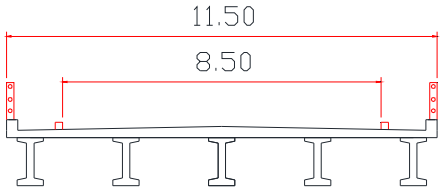
Side View



Top View



Section View



Over View

Road View

Approach Road View

Handrail

Expansion Joint

Bridge surface

Bearing shoe

Main girder

Abutment

Remarks

- Bridge is new (re-construction and complete on the year 2014)
- Bridge condition is good

Visual Inspection Survey for Bridge

Require Detailed Inspection	No

DPWT	Saravan			
National Road	National Road No.20			
Location (Km)	KM30+900			
Road Class	III			
Name of River (Creek)	Houay Sed	**Bridge Name**	Sed	
Superstructure	Bailey Bridge			
Substructure	**Abutment**	**Wall**	**Pier**	-
Bridge Length (m)	70.4	**Span**	4@15.5-1236-27.50-15.40	
Bridge Width (m)	6.1	**Road Width (m)**	4.5	
Completed Year	1990	**Last Maintenace Year**	-	
Traffic Volume (AADT)	Not Many			

Topographic	Flat Area	**Category**	National Road
Surrounding	Rural Area	**Design Code**	-

Span No. 1

Check Items/Parts	Visual Inspection Items			Evaluation					No. of Photo
	*1 Essential	Applicable	Inspection Items	N/A	Obser	Mainte	Repair	Emerg	
				A	B	C	D	E	
Steel Beam/Truss & Steel Slab	■		①Progress of corrosion			✓			
	■		②Crack condtions			✓			
	■		③Tightening of bolts			✓			
	■		④Occurrence of vibration and noise					✓	
Concrete Beam & Girder (RC/PC)	■	•	①Cracking						
	■	•	②Detachment, exposure of steel						
Concrete Slab	■	•	①Cracking						
	■	•	②free lime						
	■	•	③Detachment, exposure of steel						
Bearing (Steel/ Rubber)	■		①Progress of corrosion				✓		
	■		②Deform, damage, move and settle				✓		
		•	③Mounting debris					✓	
Abutment/ Pier	■	•	①Cracking				✓		
	■	•	②Detachment, exposure of steel			✓			
	■	•	③free lime			✓			
	■	•	④Scouring and washing out			✓			
Handrail/ Kerb/ Guard (Steel/Concrete/others)		•	①Progress of corrosion					✓	
		•	②Deform, damage, move and settle					✓	
		•	③Cracking, other damages					✓	
Pavement (Asphalt/Concrete)		•	①Pothole						
		•	②Cracking						
Expansion Joint (Steel/ Rubber)			①Differencial level					✓	
			②Abnormal movement			✓			
			③Deform, damage, move and settle				✓		
Drainage			①Mounting debris				✓		
			②Progress of corrosion					✓	
Others	■		Design issue or out of specification, etc						

Remarks (**Describe the particular observation for the damage and other structural concern**)

- Temporaly bridge but use as permanent.
- No Significant damage was found in structure, but lack of Load Capacity was estimated. Replacement of the structure is recommanded for permanent use.

*1Note "■" is critial items for verifying the essential damages of major membre of bridge at the visual inspection

Photos at Visual Inspection Sheet
(Particular Points)

Photo No.	NO.7_2	Span No.	1
Subject	Expansion Joint		
Memo	No Significant Damange on the joint was found		

Photo No.	No.7_4	Span No.	1
Subject	Bridge Surface (Steel Plate)		
Memo	No Significant Damange was found on Bridge Surface		

Photo No.	No.7_9	Span No.	1
Subject	Handrail		
Memo	Minor Corrosion, deformation and cracking was found		

Photo No.	No.7_3	Span No.	1
Subject	Approach Road		
Memo	Relatively good condition		

Photo No.	No.7-27	Span No.	1
Subject	Expansion Joint		
Memo	Minor Damange on the joint was found		

Photo No.	No.7-19	Span No.	1
Subject	Handrail		
Memo	No Significant Damage was found\		

Photo No.	No.7-43	Span No.	1
Subject	Bridge Surface		
Memo	Minor Corrosion, Deformation and Damage		

Photo No.	No.7-37	Span No.	1
Subject	Bridge Abutment		
Memo	Significant Corrosion occure under the bridge		

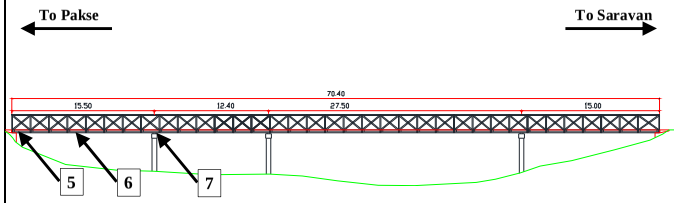
Detailed Observation Sheet

No. 7

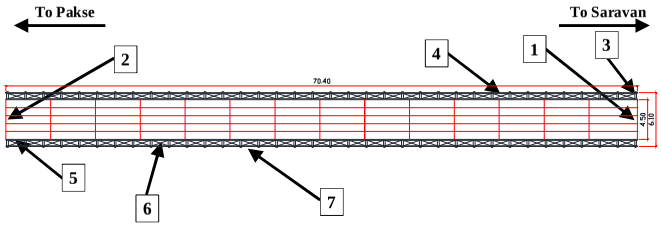
Bridge No.	1	Route No.	National Road No.20	DPWT	Saravan	Length (m)	70.40	Span (m)	4@15.5-1236-27.50-15.40	Year Built	1990
Name of Bridge	Sed			Place	Saravan District	Profile/Crossfall		Width (m)	6.1	Donor/Fund	-
				Kilo-Post	KM30+900	Design Code	-	Load Capacity (ton)	20	Ranking	-
Type of Superstructure:	Bailey Bridge					Information /Note	Bearing shoe: Steel and concrete		Handrail: Steel (Function as main structure)		
Type of Substructure:	Abutment:	Wall	P	-			Expansion joint: No Specific Equipment		Other facilities (street light, kerb, ditch and plaque, etc): No specific Bridge facilities		

Drawing

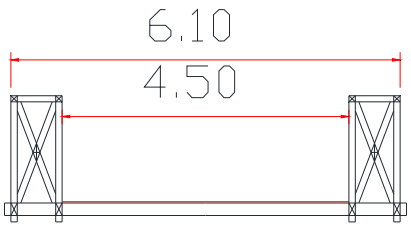
Side View



Top View



Section View



Over View

Road View

Approach road

Damage 1

Damage 2

Damage 3

Damage 4

Damage 5

Damage 6

Damage 7

Remarks

- Minor damage on Bridge Expension Joint.
- Minor corrosion occure on Handrail.
- Large scale of corrosion was found under the bridge.
- Damage on steel bearing was found.

Visual Inspection Survey for Bridge

Require Detailed Inspection	No

DPWT	**Saravan**			
National Road	**National Road No.20**			
Location (Km)	**KM39+900**			
Road Class	**III**			
Name of River (Creek)	**Houay Pao**	**Bridge Name**	**Vang Puei**	
Superstructure	**Bailey Bridge**			
Substructure	**Abutment**	**Wall**	**Pier**	-
Bridge Length (m)	**15.9**	**Span**	**1@15.9**	
Bridge Width (m)	**5.7**	**Road Width (m)**	**3.9**	
Completed Year	**1990**	**Last Maintenace Year**	-	
Traffic Volume (AADT)	**Not Many**			

Topographic	Flat Area	**Category**	National Road
Surrounding	Rural Area	**Design Code**	-

Span No.	1

Check Items/Parts	Visual Inspection Items			Evaluation					No. of Photo
	*1 Essential	Applicable	Inspection Items	N/A A	Obser B	Mainte C	Repair D	Emerg E	
Steel Beam/Truss & Steel Slab	■		①Progress of corrosion			✓			
	■		②Crack condtions			✓			
	■		③Tightening of bolts				✓		
	■		④Occurrence of vibration and noise					✓	
Concrete Beam & Girder (RC/PC)	■	•	①Cracking						
	■	•	②Detachment, exposure of steel						
Concrete Slab	■	•	①Cracking						
	■	•	②free lime						
	■	•	③Detachment, exposure of steel						
Bearing (Steel/ Rubber)	■		①Progress of corrosion					✓	
	■		②Deform, damage, move and settle				✓		
		•	③Mounting debris					✓	
Abutment/ Pier	■	•	①Cracking				✓		
	■	•	②Detachment, exposure of steel				✓		
	■	•	③free lime			✓			
	■	•	④Scouring and washing out			✓			
Handrail/ Kerb/ Guard (Steel/Concrete/others)		•	①Progress of corrosion					✓	
		•	②Deform, damage, move and settle					✓	
		•	③Cracking, other damages				✓		
Pavement (Asphalt/Concrete)		•	①Pothole						
		•	②Cracking						
Expansion Joint (Steel/ Rubber)			①Differencial level					✓	
			②Abnormal movement				✓		
			③Deform, damage, move and settle				✓		
Drainage			①Mounting debris				✓		
			②Progress of corrosion					✓	
Others	■		Design issue or out of specification, etc						

Remarks **(Describe the particular observation for the damage and other structural concern)**

- Temporaly bridge but use as permanent.
- Bridge surface (Wood) was damage and it is necessary to be replace for road safety.
- Replacing of the strutcture is recommanded for permanent use.

*1Note "■" is critial items for verifying the essential damages of major membre of bridge at the visual inspection

Photos at Visual Inspection Sheet
(Particular Points)

Photo No.	NO.8_2	Span No.	1
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.8_18	Span No.	1
Subject	Expansion Joint		
Memo	Damange on Expansion joint		

Photo No.	No.8_4	Span No.	1
Subject	Bridge surface		
Memo	Significant Damage on Bridge surface (Wood)		

Photo No.	No.8_6	Span No.	1
Subject	Bridge surface		
Memo	Significant Damage on Bridge surface (Wood)		

Photo No.	No.8_5	Span No.	1
Subject	Handrail (Structure)		
Memo	Minor Damange on Handrail (Structure)		

Photo No.	No.8_15	Span No.	1
Subject	Handrail (Structure)		
Memo	Minor Damange on Handrail (Structure)		

Photo No.	No.8_29	Span No.	1
Subject	Handrail (Structure)		
Memo	Minor Corrosion, Deformation and Damage		

Photo No.	No.8_22	Span No.	1
Subject	Handrail (Structure)		
Memo	Significant Corrosion occure on Handrail		

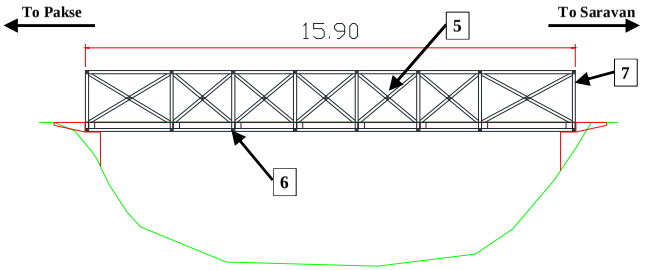
Detailed Observation Sheet

No. 7

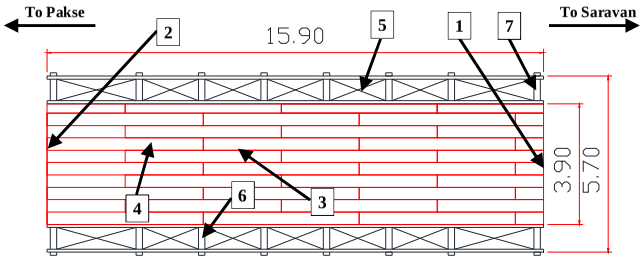
Bridge No.	1	Route No.	National Road No.20	DPWT	Saravan	Length (m)	15.90	Span (m)	1@15.9	Year Built	1990
Name of Bridge	Vang Puei			Place	Lao Ngam District	Profile/Crossfall		Width (m)	5.7	Donor/Fund	-
				Kilo-Post	KM39+900	Design Code	-	Load Capacity (ton)	20	Ranking	-
Type of Superstructure:	Bailey Bridge					Information /Note	Bearing shoe: Steel and concrete		Handrail: Steel (Function as main structure)		
Type of Substructure:	Abutment: Wall		P	-			Expansion joint: No Specific Equipment		Other facilities (street light, kerb, ditch and plaque, etc): No specific Bridge facilities		

Drawing

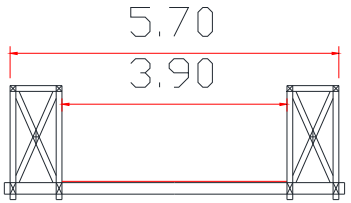
Side View



Top View



Section View



Over View

Road View

Approach road

Damage 1

Damage 2

Damage 3

Damage 4

Damage 5

Damage 6

Damage 7

Remarks

- Significant Damage on Expansion Joint
- Corrosion, deformation and damage occure on Handrail.
- Significant damage on bridge surface (Wood) which is recommanded to be repalce as soon as possible for road safety.
- Damage on steel bearing was found.

Visual Inspection Survey for Bridge

Require Detailed Inspection	No

DPWT	**Saravan**			
National Road	**National Road No.20**			
Location (Km)	**KM45+300**			
Road Class	**III**			
Name of River (Creek)	**Houay Ta Pung**	**Bridge Name**	**Ta Pung**	
Superstructure	**Bailey Bridge**			
Substructure	**Abutment**	**Wall**	**Pier**	-
Bridge Length (m)	**43.3**	**Span**	**2@21.9-21.4**	
Bridge Width (m)	**5.1**	**Road Width (m)**	**4.4**	
Completed Year	**1990**	**Last Maintenace Year**	-	
Traffic Volume (AADT)	**Not Many**			

Topographic	Flat Area	**Category**	National Road
Surrounding	Rural Area	**Design Code**	-

Span No.	1

Check Items/Parts	Visual Inspection Items			Evaluation					No. of Photo
	*1 Essential	Applicable	Inspection Items	N/A A	Obser B	Mainte C	Repair D	Emerg E	
Steel Beam/Truss & Steel Slab	■		①Progress of corrosion			✓			
	■		②Crack condtions			✓			
	■		③Tightening of bolts			✓			
	■		④Occurrence of vibration and noise				✓		
Concrete Beam & Girder (RC/PC)	■	•	①Cracking						
	■	•	②Detachment, exposure of steel						
Concrete Slab	■	•	①Cracking						
	■	•	②free lime						
	■	•	③Detachment, exposure of steel						
Bearing (Steel/ Rubber)	■		①Progress of corrosion				✓		
	■		②Deform, damage, move and settle				✓		
		•	③Mounting debris				✓		
Abutment/ Pier	■	•	①Cracking				✓		
	■	•	②Detachment, exposure of steel			✓	✓		
	■	•	③free lime			✓			
	■	•	④Scouring and washing out			✓			
Handrail/ Kerb/ Guard (Steel/Concrete/others)		•	①Progress of corrosion				✓		
		•	②Deform, damage, move and settle				✓		
		•	③Cracking, other damages				✓		
Pavement (Asphalt/Concrete)		•	①Pothole						
		•	②Cracking						
Expansion Joint (Steel/ Rubber)			①Differencial level					✓	
			②Abnormal movement					✓	
			③Deform, damage, move and settle				✓		
Drainage			①Mounting debris				✓		
			②Progress of corrosion					✓	
Others	■		Design issue or out of specification, etc						

Remarks **(Describe the particular observation for the damage and other structural concern)**

- Temporaly bridge but use as permanent.
- No significant damage was found in Bridge surface.
- Lack of Load Capacity was estimated, Replacing of the strutcture is recommanded for permanent use.

*1Note "■" is critial items for verifying the essential damages of major membre of bridge at the visual inspection

Photos at Visual Inspection Sheet
(Particular Points)

Photo No.	NO.9_3	Span No.	1
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.9_13	Span No.	1
Subject	Expansion Joint		
Memo	Damange on Expansion joint		

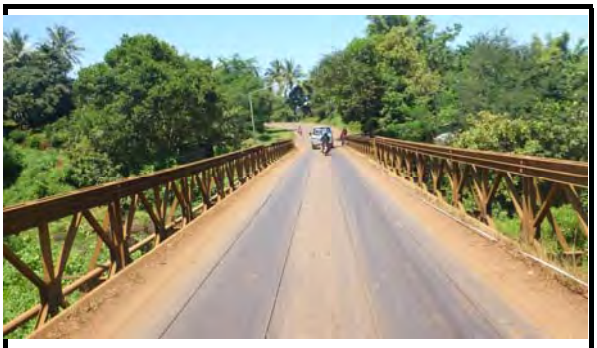


Photo No.	No.9_5	Span No.	1
Subject	Bridge surface		
Memo	Significant Damage on Bridge surface (Wood)		

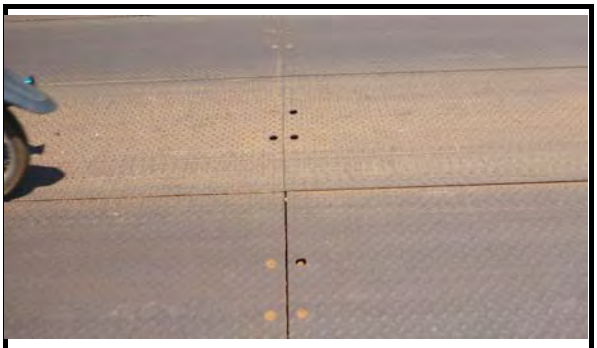


Photo No.	No.9_19	Span No.	1
Subject	Bridge surface		
Memo	Significant Damage on Bridge surface (Wood)		

Photo No.	No.9_7	Span No.	1
Subject	Handrail (Structure)		
Memo	Minor Damange on Handrail (Structure)		

Photo No.	No.9_24	Span No.	2
Subject	Handrail (Structure)		
Memo	Minor Damange on Handrail (Structure)		

Photo No.	No.9_16	Span No.	2
Subject	Handrail (Structure)		
Memo	Minor Corrosion, Deformation and Damage		

Photo No.	No.9_23	Span No.	2
Subject	Handrail (Structure)		
Memo	Significant Corrosion occure on Handrail		

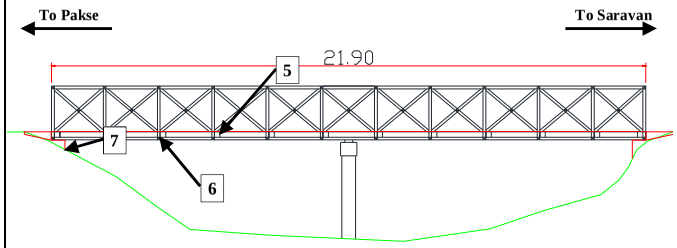
Detailed Observation Sheet

No. 9

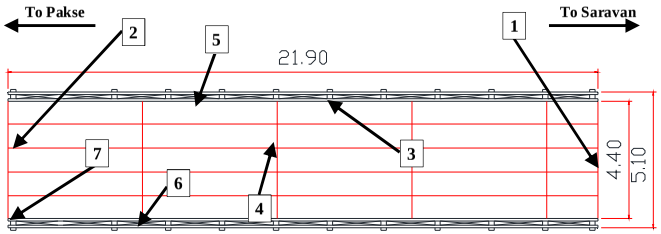
Bridge No.	1	Route No.	National Road No.20	DPWT	Saravan	Length (m)	43.30	Span (m)	2@21.9-21.4	Year Built	1990
Name of Bridge	Ta Pung			Place	Saravan District	Profile/Crossfall		Width (m)	5.1	Donor/Fund	-
				Kilo-Post	KM45+300	Design Code	-	Load Capacity (ton)	20	Ranking	-
Type of Superstructure:	Bailey Bridge					Information /Note	Bearing shoe: Steel and concrete		Handrail: Steel (Function as main structure)		
Type of Substructure:	Abutment:	Wall	P	-			Expansion joint: No Specific Equipment		Other facilities (street light, kerb, ditch and plaque, etc): No specific Bridge facilities		

Drawing

Side View



Top View



Section View

Over View

Road View

Approach road

Damage 1

Damage 2

Damage 3

Damage 4

Damage 5

Damage 6

Damage 7

Remarks

- Significant Damage on Expansion Joint.
- No significant damage was found on Handrail (Structure).
- No Significant damage was found on Bridge surface (Steel Plate).
- Lack of Load Capacity was estimated, replacement of the structure is recommanded for permanent use.

Visual Inspection Survey for Bridge

Require Detailed Inspection	No

DPWT	Saravan			
National Road	National Road No.20			
Location (Km)	KM47+200			
Road Class	III			
Name of River (Creek)	Houay Nam San	**Bridge Name**	Nam San	
Superstructure	Bailey Bridge			
Substructure	**Abutment**	**Wall**	**Pier**	**Double Concrete Pipe**
Bridge Length (m)	24.8	**Span**	2@12.4-12.4	
Bridge Width (m)	5.7	**Road Width (m)**	3.9	
Completed Year	1990	**Last Maintenace Year**	-	
Traffic Volume (AADT)	Not Many			

Topographic	Flat Area	**Category**	National Road
Surrounding	Rural Area	**Design Code**	-

Span No. 1

Check Items/Parts	Visual Inspection Items			Evaluation					No. of Photo
	*1 Essential	Applicable	Inspection Items	N/A	Obser	Mainte	Repair	Emerg	
				A	B	C	D	E	
Steel Beam/Truss & Steel Slab	■		①Progress of corrosion				✓		
	■		②Crack condtions				✓		
	■		③Tightening of bolts				✓		
	■		④Occurrence of vibration and noise					✓	
Concrete Beam & Girder (RC/PC)	■	•	①Cracking						
	■	•	②Detachment, exposure of steel						
Concrete Slab	■	•	①Cracking						
	■	•	②free lime						
	■	•	③Detachment, exposure of steel						
Bearing (Steel/ Rubber)	■		①Progress of corrosion					✓	
	■		②Deform, damage, move and settle					✓	
		•	③Mounting debris					✓	
Abutment/ Pier	■	•	①Cracking				✓		
	■	•	②Detachment, exposure of steel				✓		
	■	•	③free lime				✓		
	■	•	④Scouring and washing out				✓		
Handrail/ Kerb/ Guard (Steel/Concrete/others)		•	①Progress of corrosion					✓	
		•	②Deform, damage, move and settle					✓	
		•	③Cracking, other damages				✓		
Pavement (Asphalt/Concrete)		•	①Pothole						
		•	②Cracking						
Expansion Joint (Steel/ Rubber)			①Differencial level					✓	
			②Abnormal movement				✓		
			③Deform, damage, move and settle					✓	
Drainage			①Mounting debris					✓	
			②Progress of corrosion					✓	
Others	■		Design issue or out of specification, etc						

Remarks **(Describe the particular observation for the damage and other structural concern)**

- Temporaly bridge but use as permanent.
- Bridge surface (Wood) was damage and it is necessary to be replace for road safety.
- Replacing of the strutcture is recommanded for permanent use.

*1Note "■" is critial items for verifying the essential damages of major membre of bridge at the visual inspection

Photos at Visual Inspection Sheet
(Particular Points)

Photo No.	NO.10_1	Span No.	1
Subject	Expansion Joint		
Memo	Damange on the joint was found		

Photo No.	No.10_5	Span No.	1
Subject	Expansion Joint		
Memo	Damange on Expansion joint		

Photo No.	No.10_3	Span No.	1
Subject	Bridge surface, Handrrail (structure)		
Memo	rosion on Handrail, Significant Damage on Bridge surface (W		

Photo No.	No.10_6	Span No.	1
Subject	Bearing		
Memo	Significant Damage on Bearing		

Photo No.	No.10_7	Span No.	1
Subject	Under Bridge		
Memo	Corrosion, Deformation and damage on bridge		

Photo No.	No.10_8	Span No.	1
Subject	Under Bridge		
Memo	Corrosion, Deformation and damage on bridge		

Photo No.	No.10_11	Span No.	1
Subject	Under Bridge		
Memo	Corrosion, Deformation and damage on bridge		

Photo No.	No.10_9	Span No.	1
Subject	Under Bridge		
Memo	Corrosion, Deformation and damage on bridge		

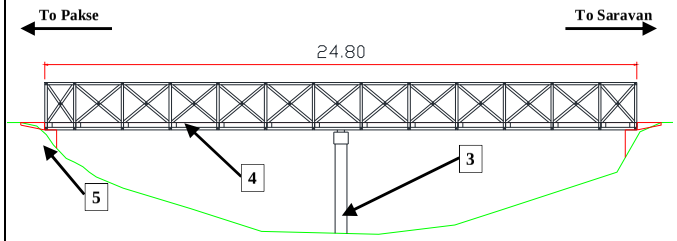
Detailed Observation Sheet

No. 10

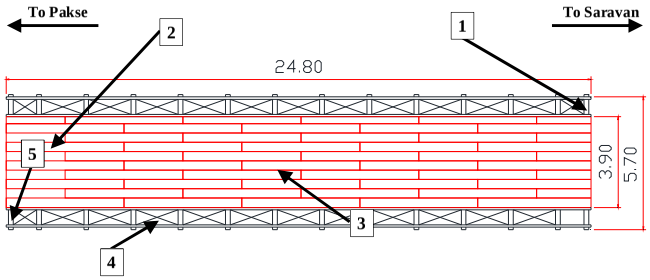
Bridge No.	1	Route No.	National Road No.20	DPWT	Saravan	Length (m)	24.80	Span (m)	2@12.4-12.4	Year Built	1990
Name of Bridge	Nam San			Place	Lao Ngam District	Profile/Crossfall		Width (m)	5.7	Donor/Fund	-
				Kilo-Post	KM47+200	Design Code	-	Load Capacity (ton)	20	Ranking	-
Type of Superstructure:	Bailey Bridge					Information /Note	Bearing shoe: Steel and concrete		Handrail: Steel (Function as main structure)		
Type of Substructure:	Abutment: Wall			P	Double Concrete Pipe		Expansion joint: No Specific Equipment		Other facilities (street light, kerb, ditch and plaque, etc): No specific Bridge facilities		

Drawing

Side View



Top View



Section View

Over View

Road View

Under Bridge

Damage 1

Damage 2

Damage 3

Damage 4

Damage 5

Damage 6

Damage 7

Remarks

- Significant Damage on Expansion Joint
- Corrosion, deformation and damage occure on Handrail.
- Significant damage on bridge surface (Wood) which is recommanded to be repalce as soon as possible for road safety.
- Damage on steel bearing was found.

Annex M – Traffic Surveys

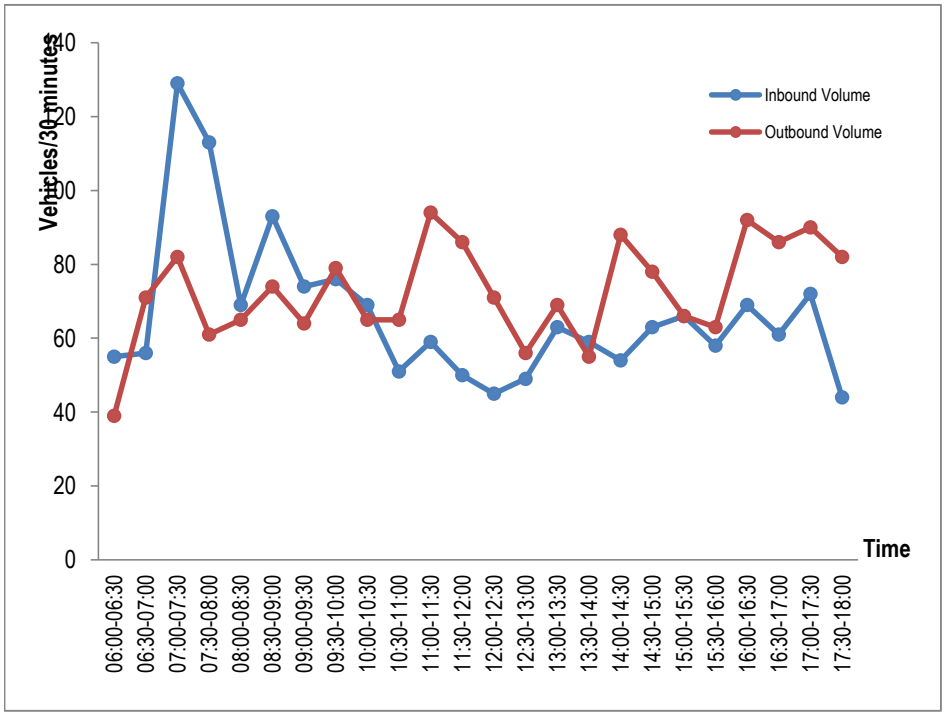
TRAFFIC COUNT RESULTS **APPENDIX 2.1.2**

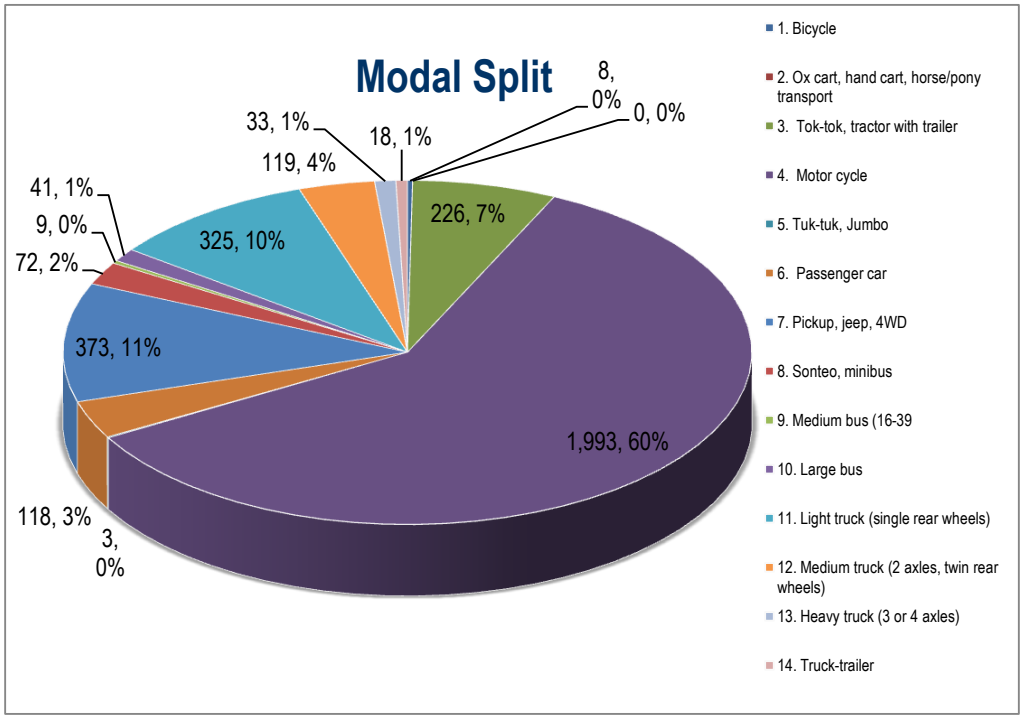
Survey Location:B-Road No.20-Saravan **Road Name: 20**

Survey Date: 10&13/10/2014

Location	Direction	Vehicle Class														Total
		1. Bicycle	2. Ox cart, hand cart, horse/pony transport	3. Tok-tok, tractor with trailer	4. Motor cycle	5. Tuk-tuk, Jumbo	6. Passenger car	7. Pickup, jeep, 4WD	8. Sonteo, minibus	9. Medium bus (16-39	10. Large bus	11. Light truck (single rear	12. Medium truck (2 axles, twin	13. Heavy truck (3 or 4 axles)	14. Truck-trailer	
B	1	7	0	117	939	1	59	190	37	3	19	149	55	14	7	1,597
	2	1	0	109	1,054	2	59	183	35	6	22	176	64	19	11	1,741
Total		8	0	226	1,993	3	118	373	72	9	41	325	119	33	18	3,338
ADT		4	0	113	997	2	59	187	36	5	21	163	60	17	9	1,669

Remark: In bound (Saravan - Pakxe), Out bound (Pakxe - Saravan)





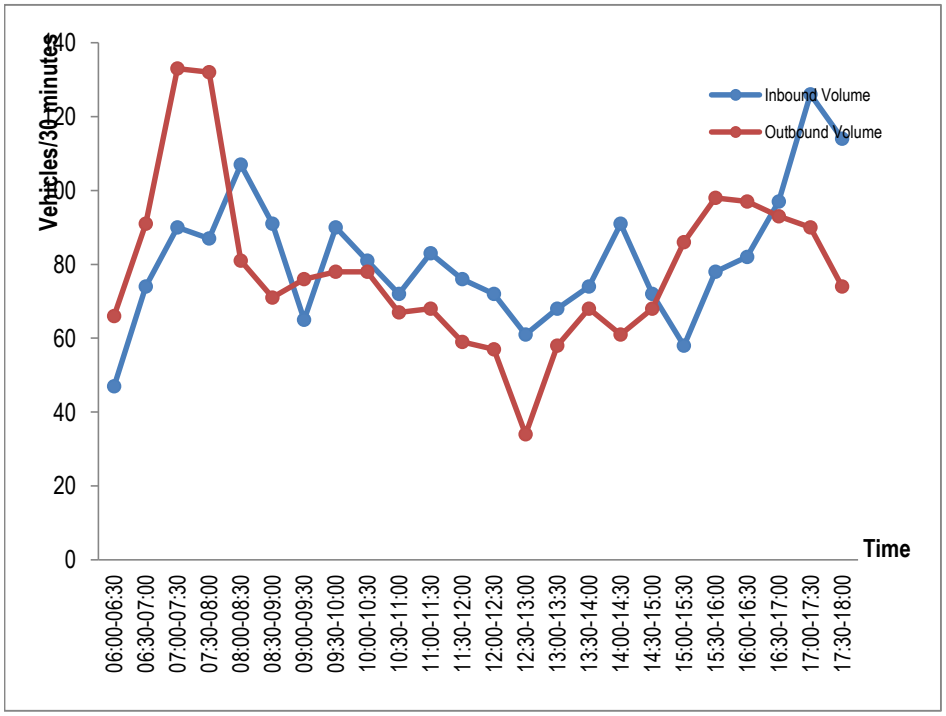
TRAFFIC COUNT RESULTS **APPENDIX 2.1.3**

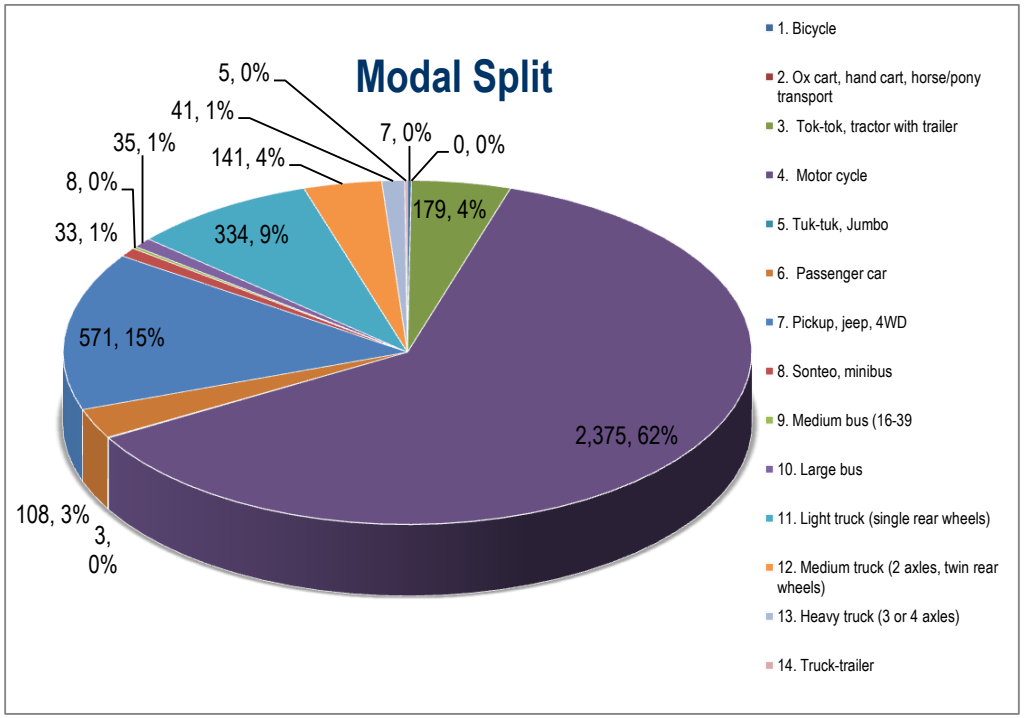
Survey Location:C-Road No.20-Saravan **Road Name: 20**

Survey Date: 10&13/10/2014

Location	Direction	Vehicle Class														Total
		1. Bicycle	2. Ox cart, hand cart, horse/pony transport	3. Tok-tok, tractor with trailer	4. Motor cycle	5. Tuk-tuk, Jumbo	6. Passenger car	7. Pickup, jeep, 4WD	8. Sonteo, minibus	9. Medium bus (16-39	10. Large bus	11. Light truck (single rear	12. Medium truck (2 axles, twin	13. Heavy truck (3 or 4 axles)	14. Truck-trailer	
C	1	7	0	96	1,157	0	74	308	18	3	18	151	93	30	1	1,956
	2	0	0	83	1,218	3	34	263	15	5	17	183	48	11	4	1,884
Total		7	0	179	2,375	3	108	571	33	8	35	334	141	41	5	3,840
ADT		4	0	90	1,188	2	54	286	17	4	18	167	71	21	3	1,920

Remark: In bound (Saravan - Pakxe), Out bound (Pakxe - Saravan)





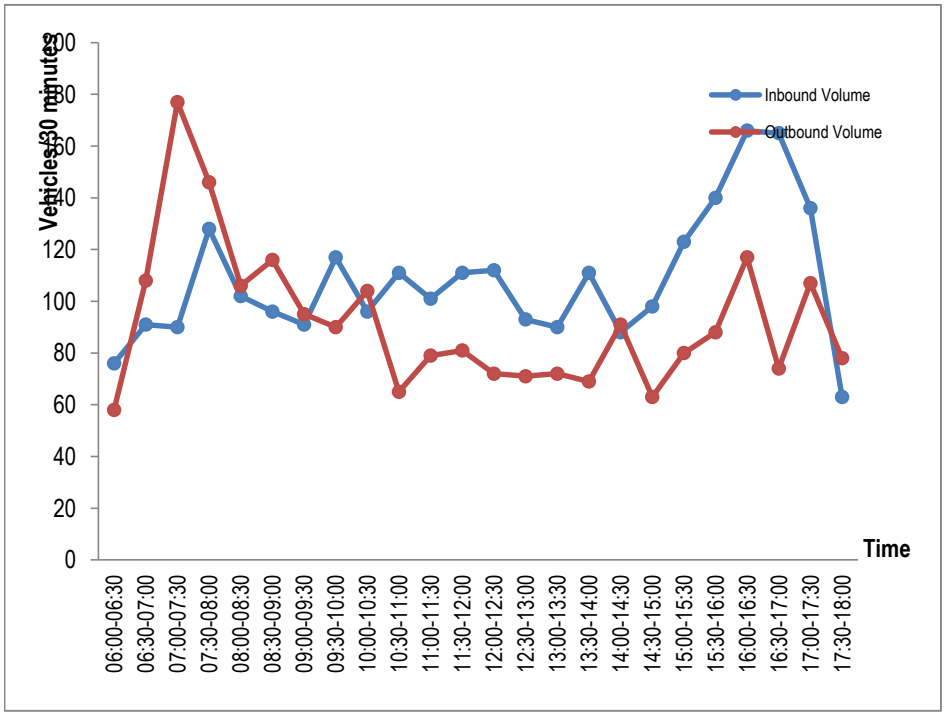
TRAFFIC COUNT RESULTS **APPENDIX 2.1.4**

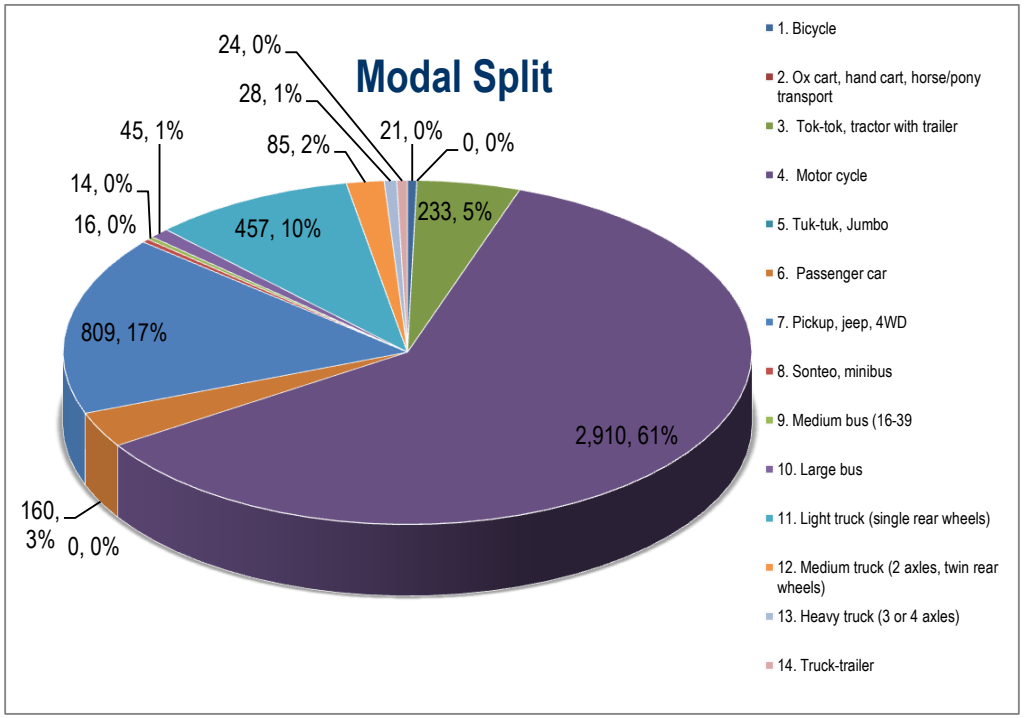
Survey Location:D-Road No.20-Saravan **Road Name: 20**

Survey Date: 10&13/10/2014

Location	Direction	Vehicle Class														Total
		1. Bicycle	2. Ox cart, hand cart, horse/pony transport	3. Tok-tok, tractor with trailer	4. Motor cycle	5. Tuk-tuk, Jumbo	6. Passenger car	7. Pickup, jeep, 4WD	8. Sonteo, minibus	9. Medium bus (16-39	10. Large bus	11. Light truck (single rear	12. Medium truck (2 axles, twin	13. Heavy truck (3 or 4 axles)	14. Truck-trailer	
D	1	14	0	136	1,564	0	63	440	8	6	25	260	50	14	15	2,595
	2	7	0	97	1,346	0	97	369	8	8	20	197	35	14	9	2,207
Total		21	0	233	2,910	0	160	809	16	14	45	457	85	28	24	4,802
ADT		11	0	117	1,455	0	80	405	8	7	23	229	43	14	12	2,401

Remark: In bound (Saravan - Pakxe), Out bound (Pakxe - Saravan)





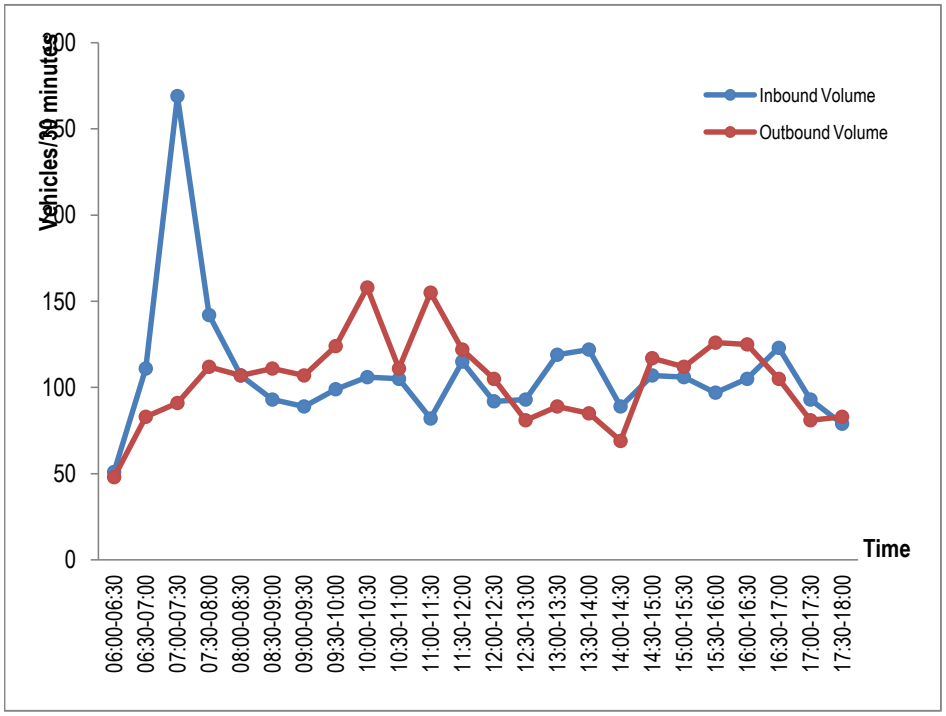
TRAFFIC COUNT RESULTS **APPENDIX 2.1.5**

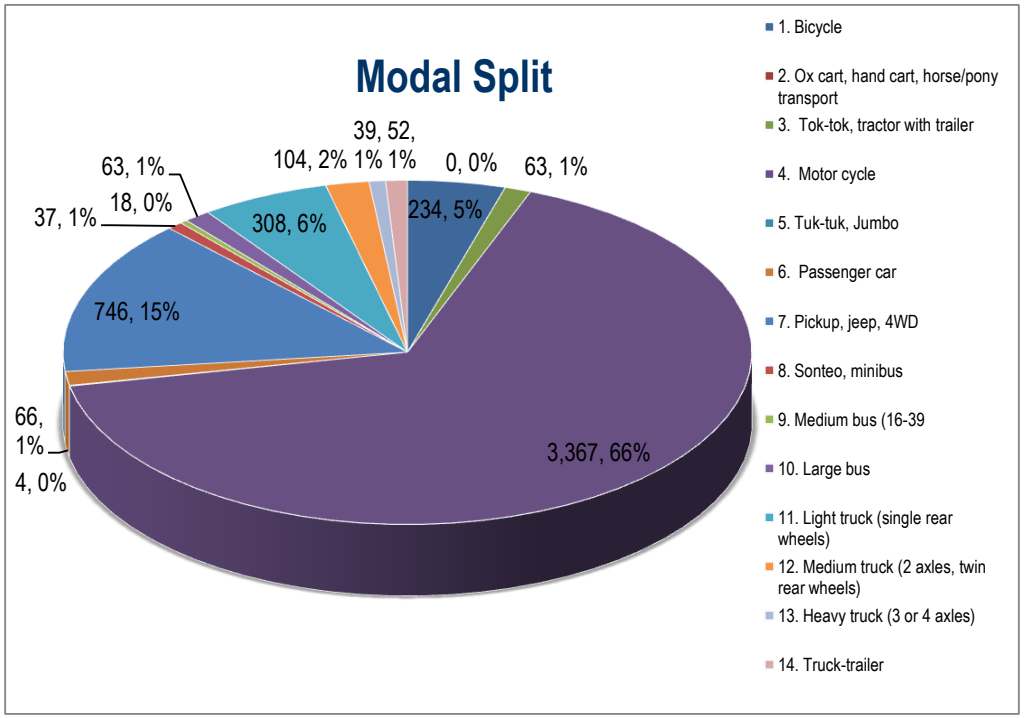
Survey Location:E-Road No.16-Xekong **Road Name: 16**

Survey Date: 06-07/10/2014

Location	Direction	Vehicle Class														Total
		1. Bicycle	2. Ox cart, hand cart, horse/pony transport	3. Tok-tok, tractor with trailer	4. Motor cycle	5. Tuk-tuk, Jumbo	6. Passenger car	7. Pickup, jeep, 4WD	8. Sonteo, minibus	9. Medium bus (16-39	10. Large bus	11. Light truck (single rear	12. Medium truck (2 axles, twin	13. Heavy truck (3 or 4 axles)	14. Truck-trailer	
E	1	125	0	30	1,692	2	26	411	21	8	37	135	68	11	28	2,594
	2	109	0	33	1,675	2	40	335	16	10	26	173	36	28	24	2,507
Total		234	0	63	3,367	4	66	746	37	18	63	308	104	39	52	5,101
ADT		117	0	32	1,684	2	33	373	19	9	32	154	52	20	26	2,551

Remark: In bound (Lamam - Thateng), Out bound (Thateng - Lamam)





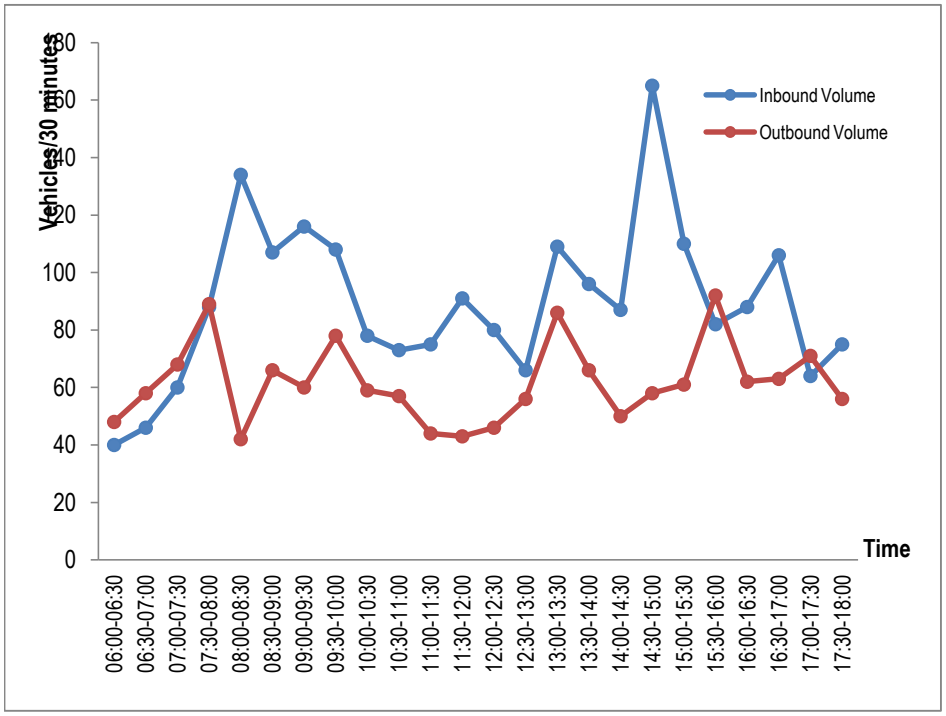
TRAFFIC COUNT RESULTS **APPENDIX 2.1.7**

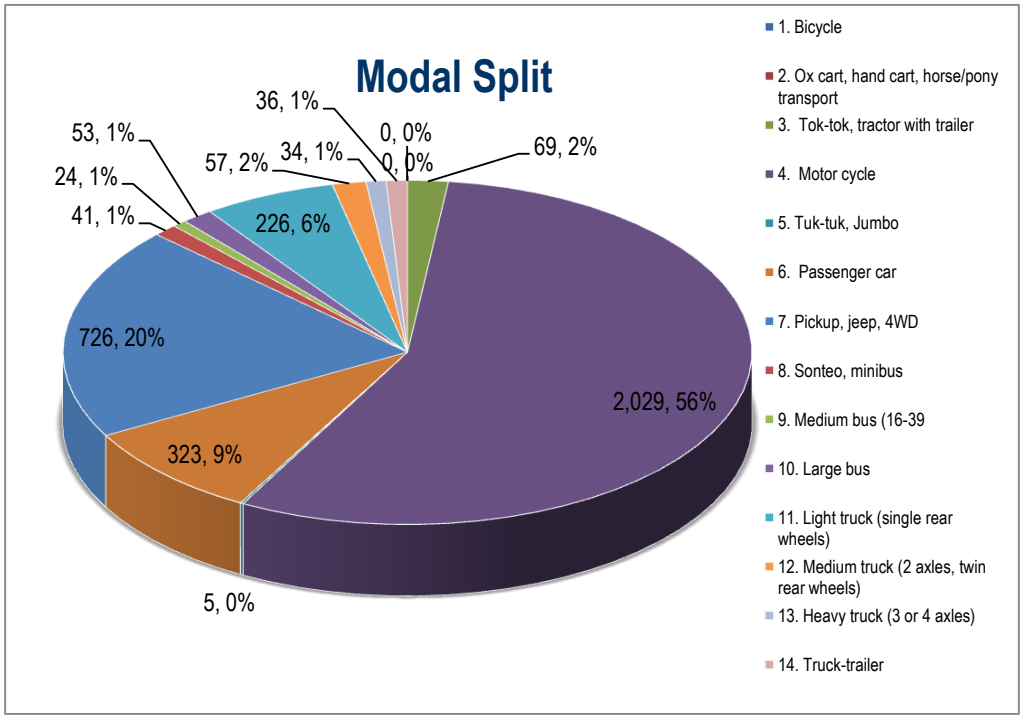
Survey Location:G-Road No.16-Xekong **Road Name: 16**

Survey Date: 06-07/10/2014

Location	Direction	Vehicle Class														Total
		1. Bicycle	2. Ox cart, hand cart, horse/pony transport	3. Tok-tok, tractor with trailer	4. Motor cycle	5. Tuk-tuk, Jumbo	6. Passenger car	7. Pickup, jeep, 4WD	8. Sonteo, minibus	9. Medium bus (16-39	10. Large bus	11. Light truck (single rear	12. Medium truck (2 axles, twin	13. Heavy truck (3 or 4 axles)	14. Truck-trailer	
G	1	0	0	32	1,146	4	251	482	14	15	30	116	24	13	17	2,144
	2	0	0	37	883	1	72	244	27	9	23	110	33	21	19	1,479
Total		0	0	69	2,029	5	323	726	41	24	53	226	57	34	36	3,623
ADT		0	0	35	1,015	3	162	363	21	12	27	113	29	17	18	1,812

Remark: In bound (Lamam - Thateng), Out bound (Thateng - Lamam)





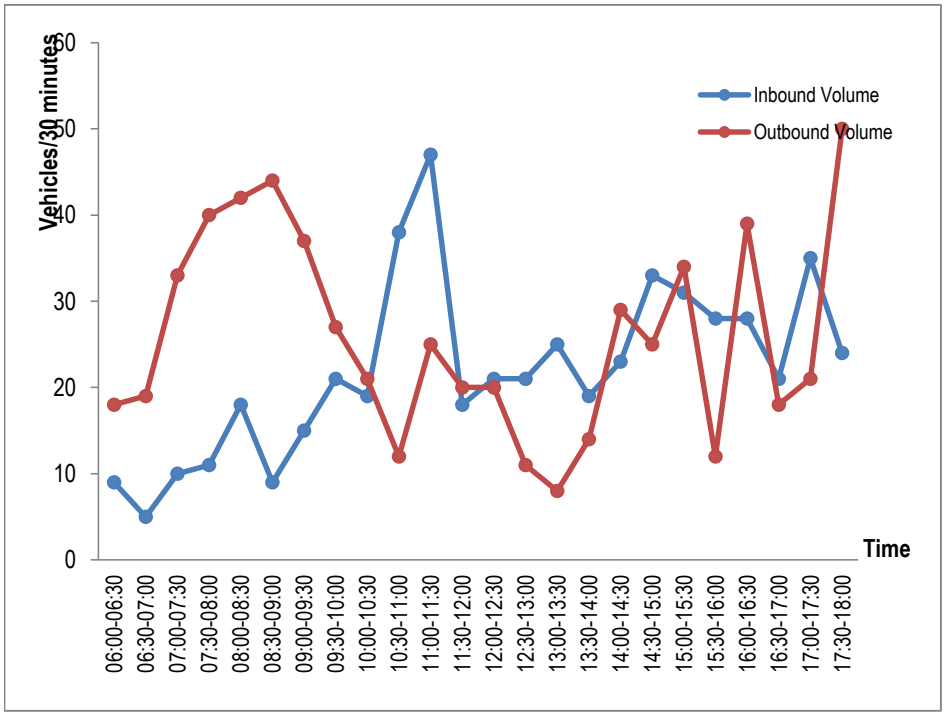
TRAFFIC COUNT RESULTS **APPENDIX 2.1.8**

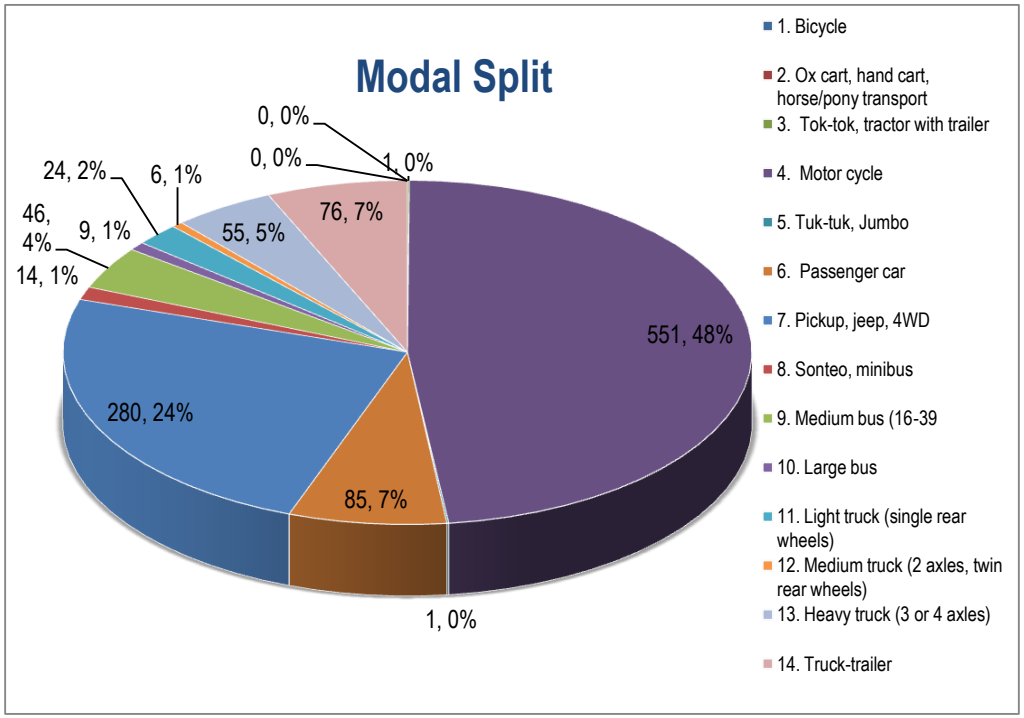
Survey Location:H-Road No. 18B-ATTAPEU **Road Name: 18B**

Survey Date: 29-30/09/2014

Location	Direction	Vehicle Class														Total
		1. Bicycle	2. Ox cart, hand cart, horse/pony transport	3. Tok-tok, tractor with trailer	4. Motor cycle	5. Tuk-tuk, Jumbo	6. Passenger car	7. Pickup, jeep, 4WD	8. Sonteo, minibus	9. Medium bus (16-39	10. Large bus	11. Light truck (single rear	12. Medium truck (2 axles, twin	13. Heavy truck (3 or 4 axles)	14. Truck-trailer	
H	1	0	0	0	252	0	42	123	4	23	2	15	6	20	42	529
	2	0	0	1	299	1	43	157	10	23	7	9	0	35	34	619
Total		0	0	1	551	1	85	280	14	46	9	24	6	55	76	1,148
ADT		0	0	1	276	1	43	140	7	23	5	12	3	28	38	574

Remark: In bound (Vietnam Border - KM 52), Out bound (KM52 - Vietnam Border)





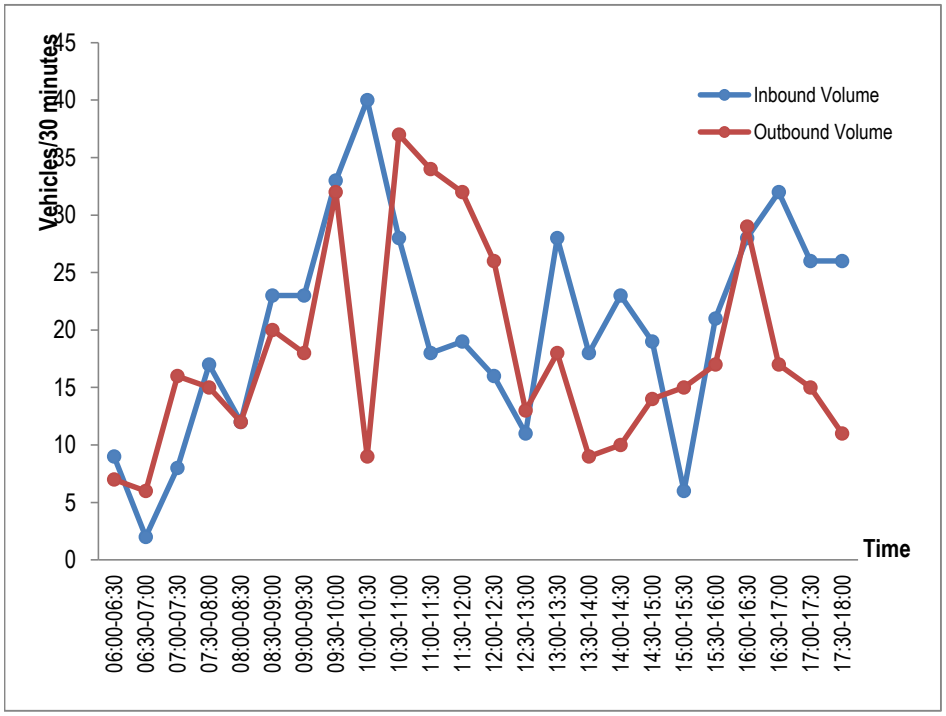
TRAFFIC COUNT RESULTS **APPENDIX 2.1.9**

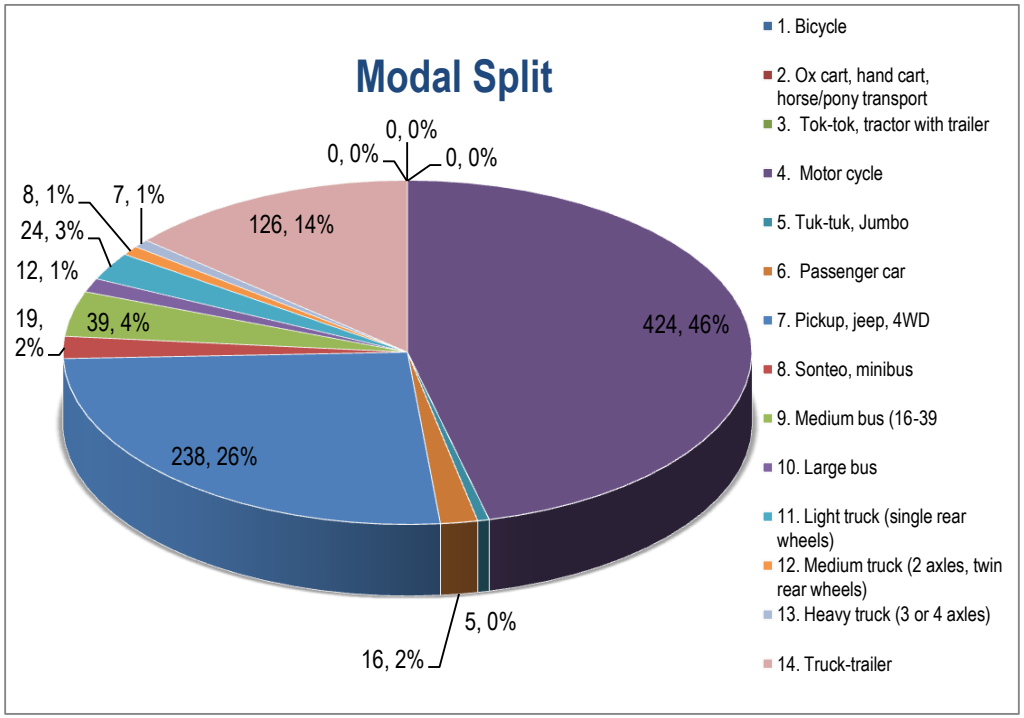
Survey Location:J-Road No.18B-ATTAPEU **Road Name: 18B**

Survey Date: 29-30/09/2014

Location	Direction	Vehicle Class														Total
		1. Bicycle	2. Ox cart, hand cart, horse/pony transport	3. Tok-tok, tractor with trailer	4. Motor cycle	5. Tuk-tuk, Jumbo	6. Passenger car	7. Pickup, jeep, 4WD	8. Sonteo, minibus	9. Medium bus (16-39	10. Large bus	11. Light truck (single rear	12. Medium truck (2 axles, twin	13. Heavy truck (3 or 4 axles)	14. Truck-trailer	
J	1	0	0	0	233	1	8	97	13	20	4	15	7	5	83	486
	2	0	0	0	191	4	8	141	6	19	8	9	1	2	43	432
Total		0	0	0	424	5	16	238	19	39	12	24	8	7	126	918
ADT		0	0	0	212	3	8	119	10	20	6	12	4	4	63	459

Remark: In bound (Vietnam Border - KM 102), Out bound (KM102 - Vietnam Border)





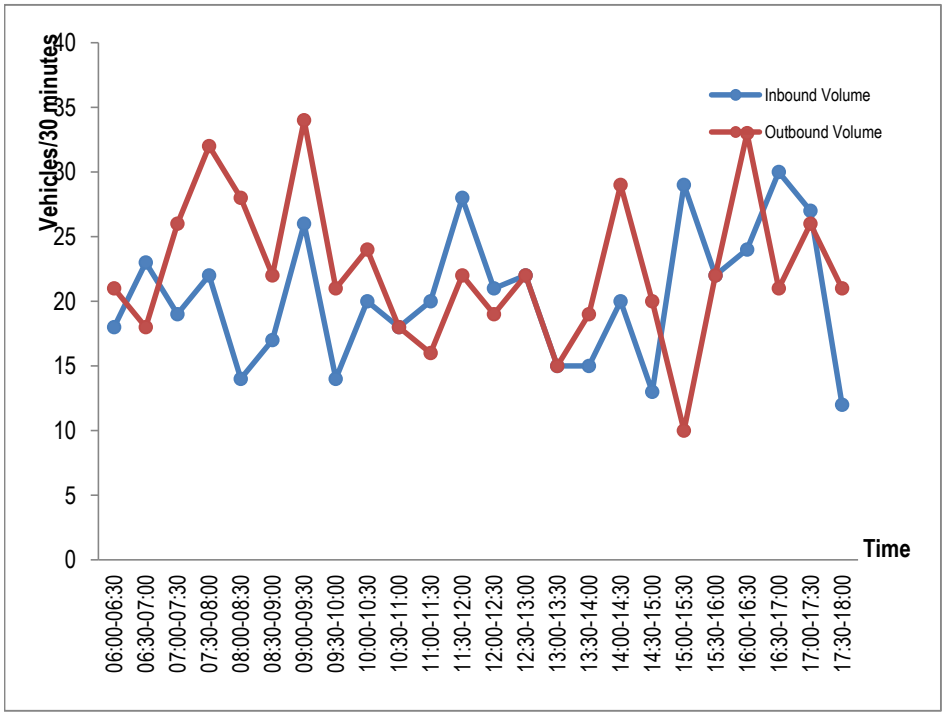
TRAFFIC COUNT RESULTS **APPENDIX 2.1.1**

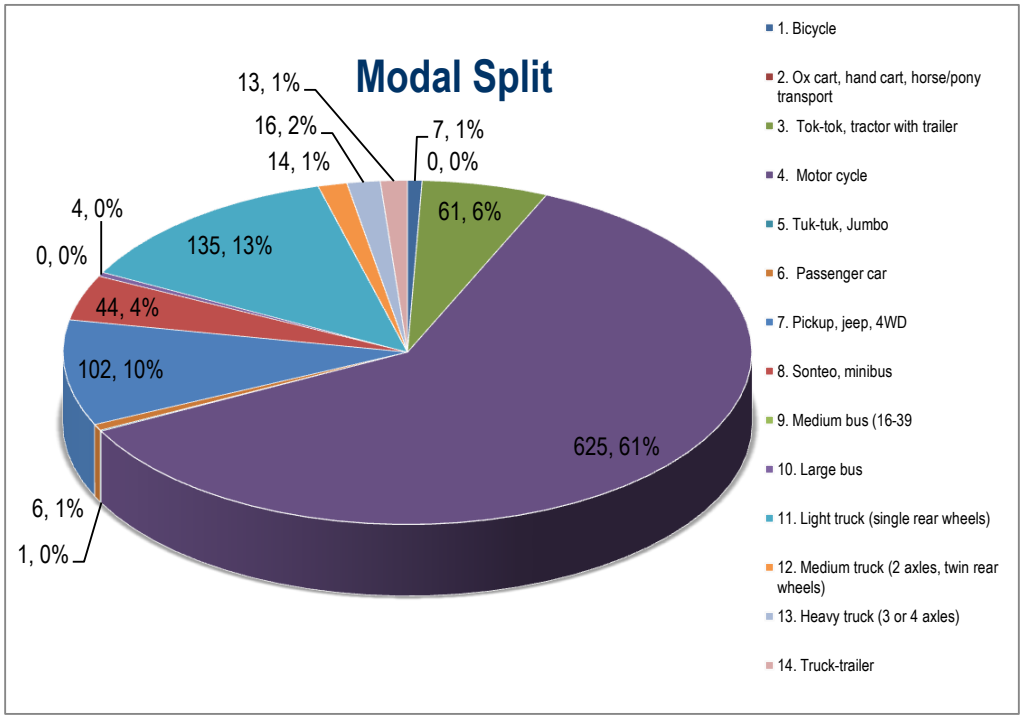
Survey Location: A-Road No.6901-Saravan **Road Name: 6901**

Survey Date: 13-14/10/2014

Location	Direction	Vehicle Class														Total
		1. Bicycle	2. Ox cart, hand cart, horse/pony transport	3. Tok-tok, tractor with trailer	4. Motor cycle	5. Tuk-tuk, Jumbo	6. Passenger car	7. Pickup, jeep, 4WD	8. Sonteo, minibus	9. Medium bus (16-39	10. Large bus	11. Light truck (single rear	12. Medium truck (2 axles, twin	13. Heavy truck (3 or 4 axles)	14. Truck-trailer	
A	1	4	0	28	295	1	4	48	26	0	3	60	6	8	6	489
	2	3	0	33	330	0	2	54	18	0	1	75	8	8	7	539
Total		7	0	61	625	1	6	102	44	0	4	135	14	16	13	1,028
ADT		4	0	31	313	1	3	51	22	0	2	68	7	8	7	514

Remark: In bound (13S - 6901), Out bound (6901 - 13S)





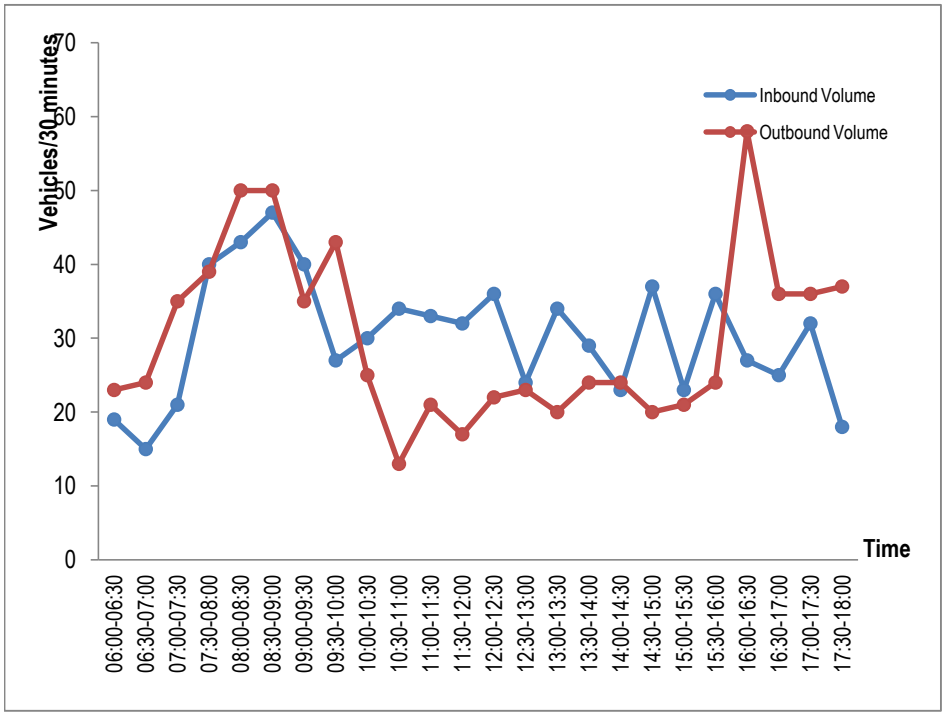
TRAFFIC COUNT RESULTS **APPENDIX 2.1.6**

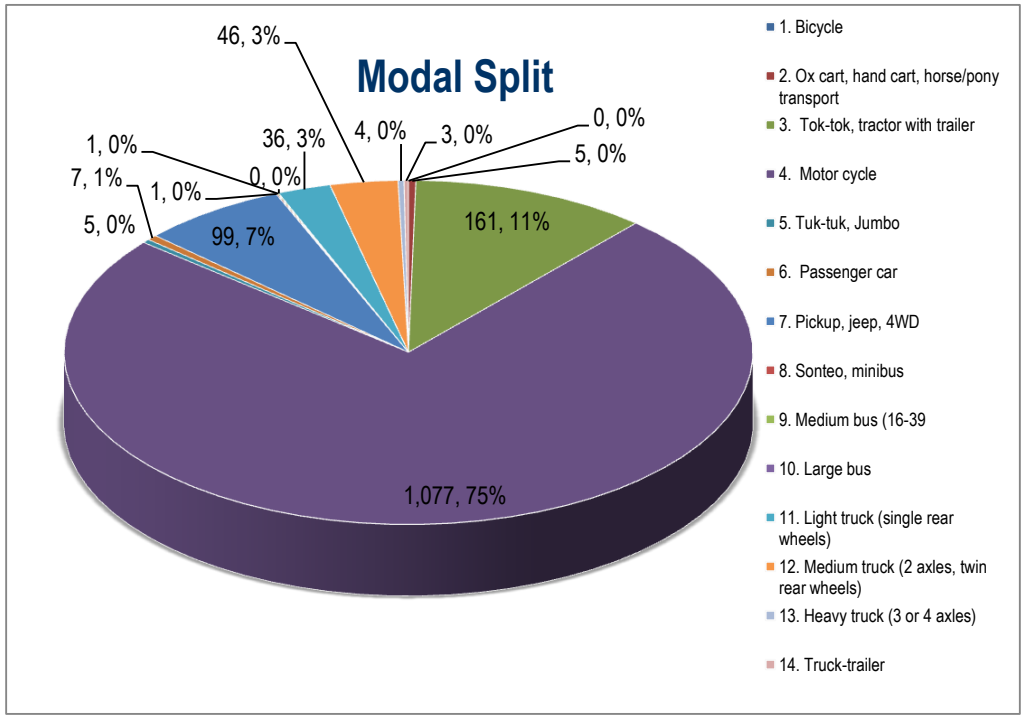
Survey Location:F-Road No.7615-Xekong **Road Name: 7516**

Survey Date: 06-07/10/2014

Location	Direction	Vehicle Class														Total
		1. Bicycle	2. Ox cart, hand cart, horse/pony transport	3. Tok-tok, tractor with trailer	4. Motor cycle	5. Tuk-tuk, Jumbo	6. Passenger car	7. Pickup, jeep, 4WD	8. Sonteo, minibus	9. Medium bus (16-39	10. Large bus	11. Light truck (single rear	12. Medium truck (2 axles, twin	13. Heavy truck (3 or 4 axles)	14. Truck-trailer	
F	1	0	3	80	539	4	1	49	1	0	0	22	23	2	1	725
	2	0	2	81	538	1	6	50	0	1	0	14	23	2	2	720
Total		0	5	161	1,077	5	7	99	1	1	0	36	46	4	3	1,445
ADT		0	3	81	539	3	4	50	1	1	0	18	23	2	2	723

Remark: In bound (Pakxong - Thateng), Out bound (Thateng - Pakxong)





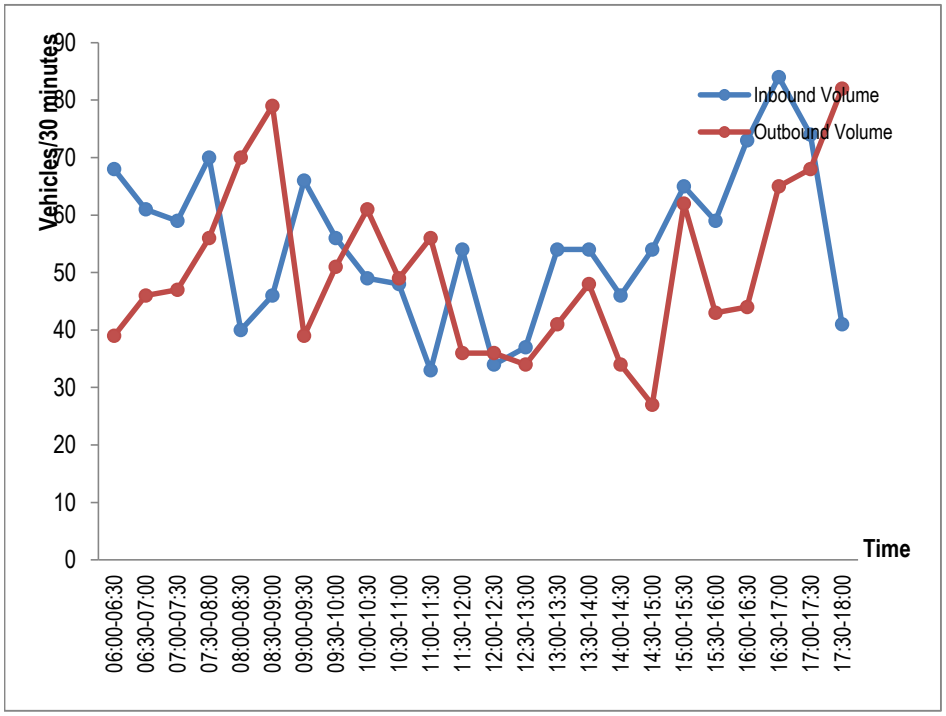
TRAFFIC COUNT RESULTS **APPENDIX 2.1.10**

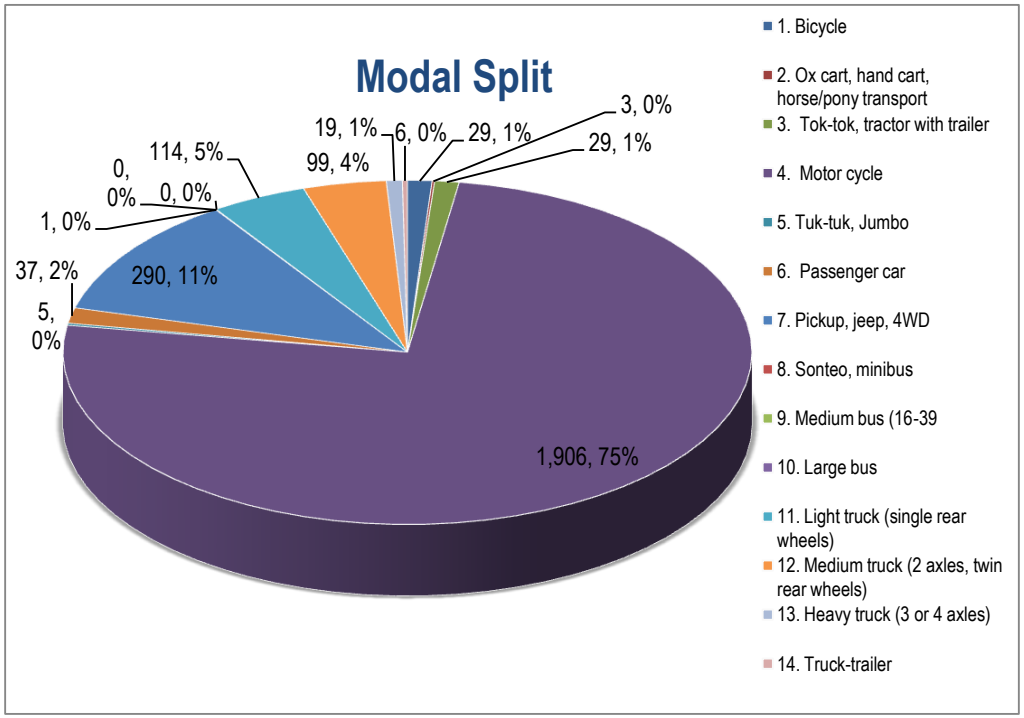
Survey Location:K-Road No.9001-ATTAPEU **Road Name: 9001**

Survey Date: 02-03/10/2014

Location	Direction	Vehicle Class														Total
		1. Bicycle	2. Ox cart, hand cart, horse/pony transport	3. Tok-tok, tractor with trailer	4. Motor cycle	5. Tuk-tuk, Jumbo	6. Passenger car	7. Pickup, jeep, 4WD	8. Sonteo, minibus	9. Medium bus (16-39	10. Large bus	11. Light truck (single rear	12. Medium truck (2 axles, twin	13. Heavy truck (3 or 4 axles)	14. Truck-trailer	
K	1	14	2	16	1,008	5	15	138	1	0	0	60	54	9	3	1,325
	2	15	1	13	898	0	22	152	0	0	0	54	45	10	3	1,213
Total		29	3	29	1,906	5	37	290	1	0	0	114	99	19	6	2,538
ADT		15	2	15	953	3	19	145	1	0	0	57	50	10	3	1,269

Remark: In bound (Sanxay - Attapeu), Out bound (Attapeu - Sanxay)





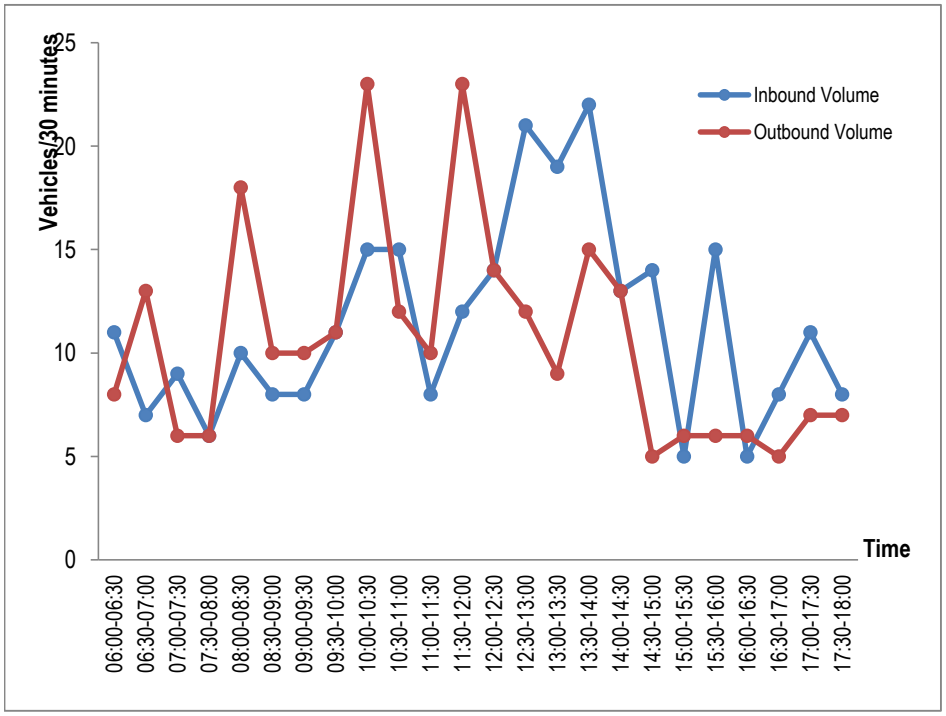
TRAFFIC COUNT RESULTS **APPENDIX 2.1.11**

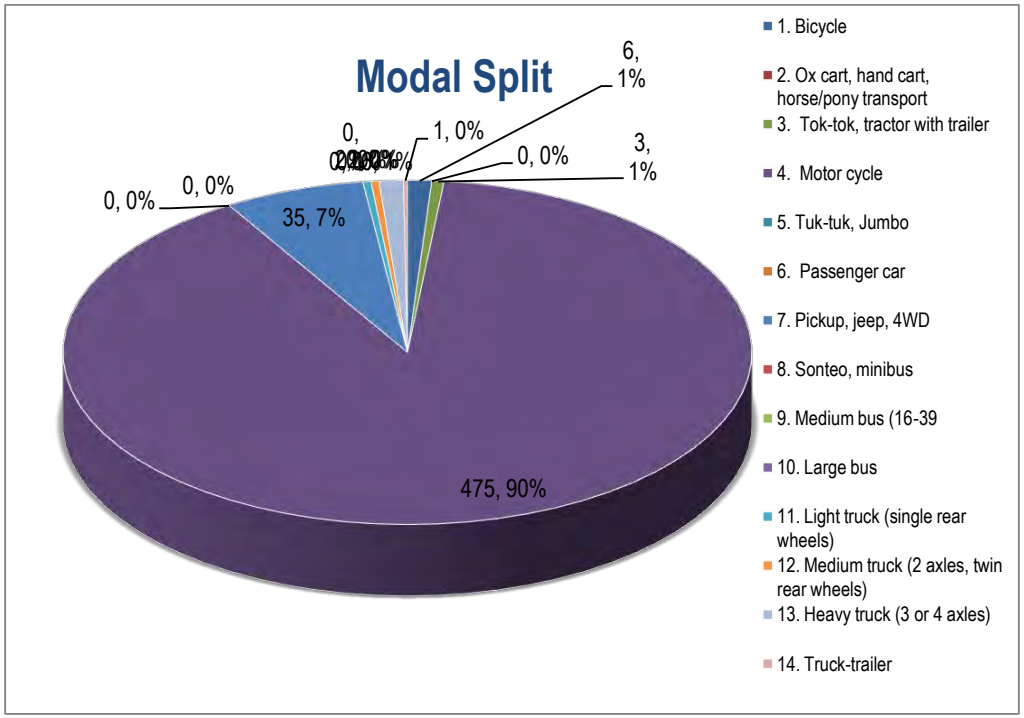
Survey Location:L-Road No.9001-ATTAPEU **Road Name: 9001**

Survey Date: 02-03/10/2014

Location	Direction	Vehicle Class														Total
		1. Bicycle	2. Ox cart, hand cart, horse/pony transport	3. Tok-tok, tractor with trailer	4. Motor cycle	5. Tuk-tuk, Jumbo	6. Passenger car	7. Pickup, jeep, 4WD	8. Sonteo, minibus	9. Medium bus (16-39	10. Large bus	11. Light truck (single rear	12. Medium truck (2 axles, twin	13. Heavy truck (3 or 4 axles)	14. Truck-trailer	
L	1	2	0	3	249	0	0	16	0	0	0	1	0	3	1	275
	2	4	0	0	226	0	0	19	0	0	0	1	2	3	0	255
Total		6	0	3	475	0	0	35	0	0	0	2	2	6	1	530
ADT		3	0	2	238	0	0	18	0	0	0	1	1	3	1	265

Remark: In bound (Sanxay - Attapeu), Out bound (Attapeu - Sanxay)





Annex N – Origin / Destination Surveys

ADB TA 8492: Lao Road Maintenance Project: Origin-Destination Survey Results

Q2. VEHICLE TYPE

	Road No.18B		Road No.9001		Road No.16		Road No.7615		Road No.20		Road No.6901		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
1 Bicycle			2	0.7%							3	0.5%	5	0.2%
2 Hand cart or animal							3	0.5%					3	0.1%
3 Tok-tok or tractor transport			6	2.2%			125	21.3%			40	7.0%	171	5.6%
4 Motor cycle			242	87.1%			330	56.2%			257	45.2%	829	27.2%
5. Tuk-tuk or jumbo			1	0.4%			2	0.3%					3	0.1%
6 Passenger car	62	14.4%			61	11.2%	5	0.9%	69	10.8%	15	2.6%	212	7.0%
7 4WD, van, pickup, jeep	151	35.0%	18	6.5%	203	37.4%	78	13.3%	198	31.0%	83	14.6%	731	24.0%
8 Sonteo, minibus	19	4.4%			28	5.2%			45	7.0%	24	4.2%	116	3.8%
9 Medium bus	44	10.2%			13	2.4%			5	0.8%	7	1.2%	69	2.3%
10 Large bus	8	1.9%			28	5.2%			20	3.1%	2	0.4%	58	1.9%
11 Light truck	13	3.0%	2	0.7%	149	27.4%	30	5.1%	252	39.4%	107	18.8%	553	18.1%
12 Medium truck	7	1.6%	1	0.4%	19	3.5%	7	1.2%	36	5.6%	8	1.4%	78	2.6%
13 Heavy truck	52	12.1%	6	2.2%	17	3.1%	7	1.2%	11	1.7%	13	2.3%	106	3.5%
14 Truck-trailer	75	17.4%			25	4.6%			3	0.5%	10	1.8%	113	3.7%
Total	431	100.0%	278	100.0%	543	100.0%	587	100.0%	639	100.0%	569	100.0%	3,047	100.0%

Q3. PLATE TYPE

	Road No.18B		Road No.9001		Road No.16		Road No.7615		Road No.20		Road No.6901		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
0 No plates	30	7.0%	143	51.4%	36	6.6%	375	63.9%	61	9.5%	210	36.9%	855	28.1%
1 Lao vehicle	125	29.0%	133	47.8%	478	88.0%	207	35.3%	560	87.6%	339	59.6%	1,842	60.5%
2 Vietnamese vehicle	276	64.0%	2	0.7%	19	3.5%	2	0.3%	15	2.3%	4	0.7%	318	10.4%
3 Other country, UN					10	1.8%	3	0.5%	3	0.5%	16	2.8%	32	1.1%
Total	431	100.0%	278	100.0%	543	100.0%	587	100.0%	639	100.0%	569	100.0%	3,047	100.0%

Q4. FROM PLACE or DISTRICT (if in southern provinces), PROVINCE (if not southern)

	Road No.18B		Road No.9001		Road No.16		Road No.7615		Road No.20		Road No.6901		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
1 Vientiane Capital	1	0.2%			19	3.5%			11	1.7%	1	0.2%	32	1.1%
9. K. Xiangkhouang	1	0.2%			1	0.2%							2	0.1%
10 K. Vientiane									1	0.2%			1	0.0%
12. K. Khammouan					5	0.9%			1	0.2%			6	0.2%
13. K. Savannakhet	1	0.2%	1	0.4%	9	1.7%			3	0.5%	17	3.0%	31	1.0%
22 Vietnam	130	30.2%			7	1.3%			1	0.2%			138	4.5%
23 Border	21	4.9%											21	0.7%
66 Thailand											5	0.9%	5	0.2%
1401 M. Salavan	1	0.2%			17	3.1%	2	0.3%	254	39.7%	9	1.6%	283	9.3%
1402 M. Ta-Oy									1	0.2%			1	0.0%
1404 M. Lakhonpheng									3	0.5%	507	89.1%	510	16.7%
1405 M. Vapi									1	0.2%			1	0.0%
1406 M. Khongxedon					1	0.2%			4	0.6%	27	4.7%	32	1.1%
1407 M. Lao-Ngam	2	0.5%			5	0.9%			218	34.1%			225	7.4%
1408 M. Samouay									1	0.2%			1	0.0%
1501 M. Lamam	6	1.4%			175	32.2%			8	1.3%			189	6.2%
1502 M. Kalum	1	0.2%			1	0.2%							2	0.1%
1504 M. Thateng					101	18.6%	574	97.8%	7	1.1%			682	22.4%
1601 M. Pakxe	15	3.5%			53	9.8%	1	0.2%	93	14.6%	1	0.2%	163	5.3%
1602 M, Sanasomboun					2	0.4%							2	0.1%
1603 M.					1	0.2%			2	0.3%			3	0.1%
1604 M. Pakxong	2	0.5%			21	3.9%	7	1.2%	11	1.7%			41	1.3%
1606 M. Phonthong					2	0.4%							2	0.1%
1607 M. Champasak	6	1.4%			13	2.4%	2	0.3%	9	1.4%	2	0.4%	32	1.1%
1610 M. Khong									2	0.3%			2	0.1%
1700 Attapu town	99	23.0%	7	2.5%	97	17.9%			8	1.3%			211	6.9%
1701 M. Xaisettha	112	26.0%	10	3.6%	3	0.6%	1	0.2%					126	4.1%
1702 M. Samakkhixai	17	3.9%	2	0.7%	8	1.5%							27	0.9%
1703 M. Sanamxai	1	0.2%											1	0.0%
1704 M. Sanxai	4	0.9%	258	92.8%	2	0.4%							264	8.7%
1705 M. Phouvong	11	2.6%											11	0.4%
Total	431	100.0%	278	100.0%	543	100.0%	587	100.0%	639	100.0%	569	100.0%	3,047	100.0%

Q5. TO PLACE or DISTRICT (if in southern provinces), PROVINCE (if not southern)

	Road No.18B		Road No.9001		Road No.16		Road No.7615		Road No.20		Road No.6901		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
1 Vientiane Capital	1	0.2%			18	3.3%							19	0.6%
11 K. Bolikhamxay					2	0.4%							2	0.1%
12. K. Khammouan	1	0.2%			2	0.4%							3	0.1%
13. K. Savannakhet					11	2.0%			3	0.5%	12	2.1%	26	0.9%
22 Vietnam	146	33.9%			6	1.1%			3	0.5%			155	5.1%
23 Border	49	11.4%											49	1.6%
66 Thailand											9	1.6%	9	0.3%
1401 M. Salavan					21	3.9%	1	0.2%	245	38.3%	15	2.6%	282	9.3%
1402 M. Ta-Oy									4	0.6%			4	0.1%
1404 M. Lakhonpheng					2	0.4%			1	0.2%	501	88.0%	504	16.5%
1405 M. Vapi									1	0.2%			1	0.0%
1406 M. Khongxedon									1	0.2%	25	4.4%	26	0.9%
1407 M. Lao-Ngam					16	2.9%			255	39.9%			271	8.9%
1501 M. Lamam					139	25.6%			4	0.6%			143	4.7%
1502 M. Kalum	1	0.2%			1	0.2%							2	0.1%
1504 M. Thateng	1	0.2%			100	18.4%	585	99.7%	16	2.5%			702	23.0%
1601 M. Pakxe	14	3.2%			91	16.8%			79	12.4%	3	0.5%	187	6.1%
1602 M, Sanasomboun					1	0.2%							1	0.0%
1603 M.					4	0.7%			4	0.6%			8	0.3%
1604 M. Pakxong					17	3.1%	1	0.2%	3	0.5%			21	0.7%
1606 M. Phonthong									1	0.2%			1	0.0%
1607 M. Champasak	2	0.5%			15	2.8%			4	0.6%	4	0.7%	25	0.8%
1700 Attapu town	87	20.2%	5	1.8%	79	14.5%			13	2.0%			184	6.0%
1701 M. Xaisettha	82	19.0%	9	3.2%	10	1.8%							101	3.3%
1702 M. Samakkhixai	10	2.3%	1	0.4%	7	1.3%			2	0.3%			20	0.7%
1703 M. Sanamxai	2	0.5%	1	0.4%	1	0.2%							4	0.1%
1704 M. Sanxai	3	0.7%	262	94.2%									265	8.7%
1705 M. Phouvong	32	7.4%											32	1.1%
Total	431	100.0%	278	100.0%	543	100.0%	587	100.0%	639	100.0%	569	100.0%	3,047	100.0%

Q6. PURPOSE

	Road No.18B		Road No.9001		Road No.16		Road No.7615		Road No.20		Road No.6901		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
0 no reply			11	4.1%							8	2.0%	19	1.0%
1 to or from work	137	64.3%	39	14.5%	50	18.9%	117	21.5%	100	37.5%	224	56.3%	667	34.1%
2 employer's business	29	13.6%	3	1.1%	25	9.5%	40	7.4%	28	10.5%	59	14.8%	184	9.4%
3 personal business	28	13.1%	7	2.6%	78	29.5%	4	0.7%	63	23.6%	60	15.1%	240	12.3%
4 education			3	1.1%			39	7.2%			4	1.0%	46	2.4%
5 medical			1	0.4%	3	1.1%	3	0.6%	4	1.5%	5	1.3%	16	0.8%
6 visiting friends or relations	7	3.3%	91	33.8%	86	32.6%	25	4.6%	57	21.3%	33	8.3%	299	15.3%
7 recreation or tourism	12	5.6%	12	4.5%	21	8.0%	1	0.2%	7	2.6%	5	1.3%	58	3.0%
8 shared taxi or sonteo			1	0.4%			2	0.4%					3	0.2%
9 To or from Farm			101	37.5%			186	34.3%					287	14.7%
10 Shopping					1	0.4%	126	23.2%	8	3.0%			135	6.9%
Total	213	100.0%	269	100.0%	264	100.0%	543	100.0%	267	100.0%	398	100.0%	1,954	100.0%

Q6. 6. PURPOSE

	1 Bicycle		2 Hand cart or animal		3 Tok-tok or tractor		4 Motor cycle		5. Tuk-tuk or jumbo		6 Passenger car		7 4WD, van, pickup,		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
0 no reply					5	2.9%	14	1.7%							19	1.0%
1 to or from work	2	40.0%			33	19.3%	281	33.9%			75	35.4%	276	37.8%	667	34.1%
2 employer's business							43	5.2%			23	10.8%	118	16.1%	184	9.4%
3 personal business					4	2.3%	24	2.9%			57	26.9%	155	21.2%	240	12.3%
4 education	2	40.0%					43	5.2%					1	0.1%	46	2.4%
5 medical	1	20.0%			1	0.6%	5	0.6%			3	1.4%	6	0.8%	16	0.8%
6 visiting friends or relations					8	4.7%	128	15.4%			37	17.5%	126	17.2%	299	15.3%
7 recreation or tourism							11	1.3%			13	6.1%	34	4.7%	58	3.0%
8 shared taxi or sonteo									3	100.0%					3	0.2%
9 To or from Farm			3	100.0%	89	52.0%	192	23.2%					3	0.4%	287	14.7%
10 Shopping					31	18.1%	88	10.6%			4	1.9%	12	1.6%	135	6.9%
Total	5	100.0%	3	100.0%	171	100.0%	829	100.0%	3	100.0%	212	100.0%	731	100.0%	1,954	####

Q7. NO. OF PERS.

	1 Bicycle		2 Hand cart or animal		3 Tok-tok or tractor		4 Motor cycle		5. Tuk-tuk or jumbo		6 Passenger car		7 4WD, van, pickup,		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
1	4	80.0%	3	100.0%	22	12.9%	416	50.2%			51	24.1%	165	22.6%	661	33.8%
2	1	20.0%			37	21.6%	381	46.0%			80	37.7%	276	37.8%	775	39.7%
3					28	16.4%	32	3.9%			40	18.9%	122	16.7%	222	11.4%
4					21	12.3%					27	12.7%	97	13.3%	145	7.4%
5					19	11.1%			2	66.7%	10	4.7%	25	3.4%	56	2.9%
6					20	11.7%			1	33.3%	4	1.9%	17	2.3%	42	2.1%
7					9	5.3%							11	1.5%	20	1.0%
8					7	4.1%							11	1.5%	18	0.9%
9					3	1.8%							7	1.0%	10	0.5%
10					4	2.3%									4	0.2%
14					1	0.6%									1	0.1%
Total	5	100.0%	3	100.0%	171	100.0%	829	100.0%	3	100.0%	212	100.0%	731	100.0%	1,954	####

Q8. PASS. CAP.

	8 Sonteo, minibus		9 Medium bus		10 Large bus		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %
9	45	38.8%					45	18.5%
10	1	0.9%					1	0.4%
12	25	21.6%					25	10.3%
14	1	0.9%					1	0.4%
15	41	35.3%					41	16.9%
16	1	0.9%					1	0.4%
18	2	1.7%	2	2.9%			4	1.6%
20			7	10.1%			7	2.9%
22			1	1.4%			1	0.4%
25			16	23.2%			16	6.6%
28			25	36.2%			25	10.3%
30			1	1.4%			1	0.4%
35			17	24.6%	1	1.7%	18	7.4%
45					53	91.4%	53	21.8%
46					1	1.7%	1	0.4%
48					1	1.7%	1	0.4%
50					2	3.4%	2	0.8%
Total	116	100.0%	69	100.0%	58	100.0%	243	100.0%

Q9. NO. OF PASS.

	8 Sonteo, minibus		9 Medium bus		10 Large bus		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %
1	13	11.2%	1	1.4%			14	5.8%
2	21	18.1%	3	4.3%			24	9.9%
3	19	16.4%	1	1.4%	1	1.7%	21	8.6%
4	14	12.1%	3	4.3%			17	7.0%
5	9	7.8%	1	1.4%	1	1.7%	11	4.5%
6	7	6.0%	1	1.4%	1	1.7%	9	3.7%
7	8	6.9%					8	3.3%
8	8	6.9%	3	4.3%	2	3.4%	13	5.3%
9	3	2.6%			1	1.7%	4	1.6%
10	2	1.7%	3	4.3%	4	6.9%	9	3.7%
11	4	3.4%					4	1.6%
12			4	5.8%	1	1.7%	5	2.1%
13	3	2.6%	1	1.4%			4	1.6%
14	2	1.7%	3	4.3%			5	2.1%
15	2	1.7%	2	2.9%	3	5.2%	7	2.9%
16	1	0.9%					1	0.4%
17			3	4.3%	1	1.7%	4	1.6%
18			4	5.8%	2	3.4%	6	2.5%
19			3	4.3%			3	1.2%
20			3	4.3%	4	6.9%	7	2.9%
21			3	4.3%	1	1.7%	4	1.6%
22			4	5.8%	2	3.4%	6	2.5%
23			3	4.3%			3	1.2%
24			2	2.9%			2	0.8%
25			3	4.3%	2	3.4%	5	2.1%
26			2	2.9%	1	1.7%	3	1.2%
27			2	2.9%			2	0.8%
28			3	4.3%	4	6.9%	7	2.9%
29			2	2.9%			2	0.8%
30			2	2.9%	3	5.2%	5	2.1%
32					3	5.2%	3	1.2%
33			2	2.9%	1	1.7%	3	1.2%
34					2	3.4%	2	0.8%
38			2	2.9%	3	5.2%	5	2.1%

39					1	1.7%	1	0.4%
40					3	5.2%	3	1.2%
42					2	3.4%	2	0.8%
45					7	12.1%	7	2.9%
48					1	1.7%	1	0.4%
50					1	1.7%	1	0.4%
Total	116	100.0%	69	100.0%	58	100.0%	243	100.0%

Q10. CAPACITY(No. of tonnes vehicle is legally allowed to carry)

	Road No.18B		Road No.9001		Road No.16		Road No.7615		Road No.20		Road No.6901		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
3.5	3	2.0%			29	13.8%					3	2.2%	35	4.1%
6.0	9	6.1%	2	22.2%	118	56.2%	30	68.2%	243	80.5%	102	73.9%	504	59.3%
9.5	5	3.4%			11	5.2%	1	2.3%	17	5.6%	8	5.8%	42	4.9%
14.1	3	2.0%	1	11.1%	10	4.8%	6	13.6%	28	9.3%	2	1.4%	50	5.9%
20.0	4	2.7%											4	0.5%
23.2	48	32.7%	6	66.7%	16	7.6%	7	15.9%	11	3.6%	12	8.7%	100	11.8%
27.2					1	0.5%					1	0.7%	2	0.2%
32.3					2	1.0%			2	0.7%	1	0.7%	5	0.6%
41.4					1	0.5%							1	0.1%
49.6	75	51.0%			22	10.5%			1	0.3%	9	6.5%	107	12.6%
Total	147	100.0%	9	100.0%	210	100.0%	44	100.0%	302	100.0%	138	100.0%	850	100.0%

Q10. CAPACITY(No. of tonnes vehicle is legally allowed to carry)

	11 Light truck		12 Medium truck		13 Heavy truck		14 Truck-trailer		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
3.5	35	6.3%							35	4.1%
6.0	504	91.1%							504	59.3%
9.5	14	2.5%	28	35.9%					42	4.9%
14.1			50	64.1%					50	5.9%
20.0					4	3.8%			4	0.5%
23.2					100	94.3%			100	11.8%
27.2					2	1.9%			2	0.2%
32.3							5	4.4%	5	0.6%
41.4							1	0.9%	1	0.1%
49.6							107	94.7%	107	12.6%
Total	553	100.0%	78	100.0%	106	100.0%	113	100.0%	850	100.0%

Q11. UTILIZATION

	Road No.18B		Road No.9001		Road No.16		Road No.7615		Road No.20		Road No.6901		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
0 empty or almost empty	111	75.5%	7	77.8%	124	59.0%	30	68.2%	194	64.2%	91	65.9%	557	65.5%
1 about 1:4 full	5	3.4%			11	5.2%	1	2.3%	23	7.6%	13	9.4%	53	6.2%
2 about half full	4	2.7%	1	11.1%	11	5.2%			16	5.3%	4	2.9%	36	4.2%
3 about 3:4 full					10	4.8%			16	5.3%	2	1.4%	28	3.3%
4 full or almost full	8	5.4%	1	11.1%	40	19.0%	6	13.6%	44	14.6%	17	12.3%	116	13.6%
5 overloaded	19	12.9%			14	6.7%	7	15.9%	9	3.0%	11	8.0%	60	7.1%
Total	147	100.0%	9	100.0%	210	100.0%	44	100.0%	302	100.0%	138	100.0%	850	100.0%

Q11. UTILIZATION

	11 Light truck		12 Medium truck		13 Heavy truck		14 Truck-trailer		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
0 empty or almost empty	382	69.1%	39	50.0%	53	50.0%	83	73.5%	557	65.5%
1 about 1:4 full	43	7.8%	7	9.0%	1	0.9%	2	1.8%	53	6.2%
2 about half full	27	4.9%	3	3.8%	2	1.9%	4	3.5%	36	4.2%
3 about 3:4 full	22	4.0%	2	2.6%			4	3.5%	28	3.3%
4 full or almost full	52	9.4%	23	29.5%	25	23.6%	16	14.2%	116	13.6%
5 overloaded	27	4.9%	4	5.1%	25	23.6%	4	3.5%	60	7.1%
Total	553	100.0%	78	100.0%	106	100.0%	113	100.0%	850	100.0%

Q12. NO. OF PERS.

	11 Light truck		12 Medium truck		13 Heavy truck		14 Truck-trailer		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
1	113	20.4%	20	25.6%	67	63.2%	80	70.8%	280	32.9%
2	244	44.1%	35	44.9%	35	33.0%	28	24.8%	342	40.2%
3	85	15.4%	11	14.1%	4	3.8%	5	4.4%	105	12.4%
4	38	6.9%	2	2.6%					40	4.7%
5	24	4.3%	4	5.1%					28	3.3%
6	18	3.3%	3	3.8%					21	2.5%
7	12	2.2%	2	2.6%					14	1.6%
8	7	1.3%							7	0.8%
9	2	0.4%							2	0.2%
10	6	1.1%	1	1.3%					7	0.8%
11	3	0.5%							3	0.4%
13	1	0.2%							1	0.1%
Total	553	100.0%	78	100.0%	106	100.0%	113	100.0%	850	100.0%

Q13. COMMODITY

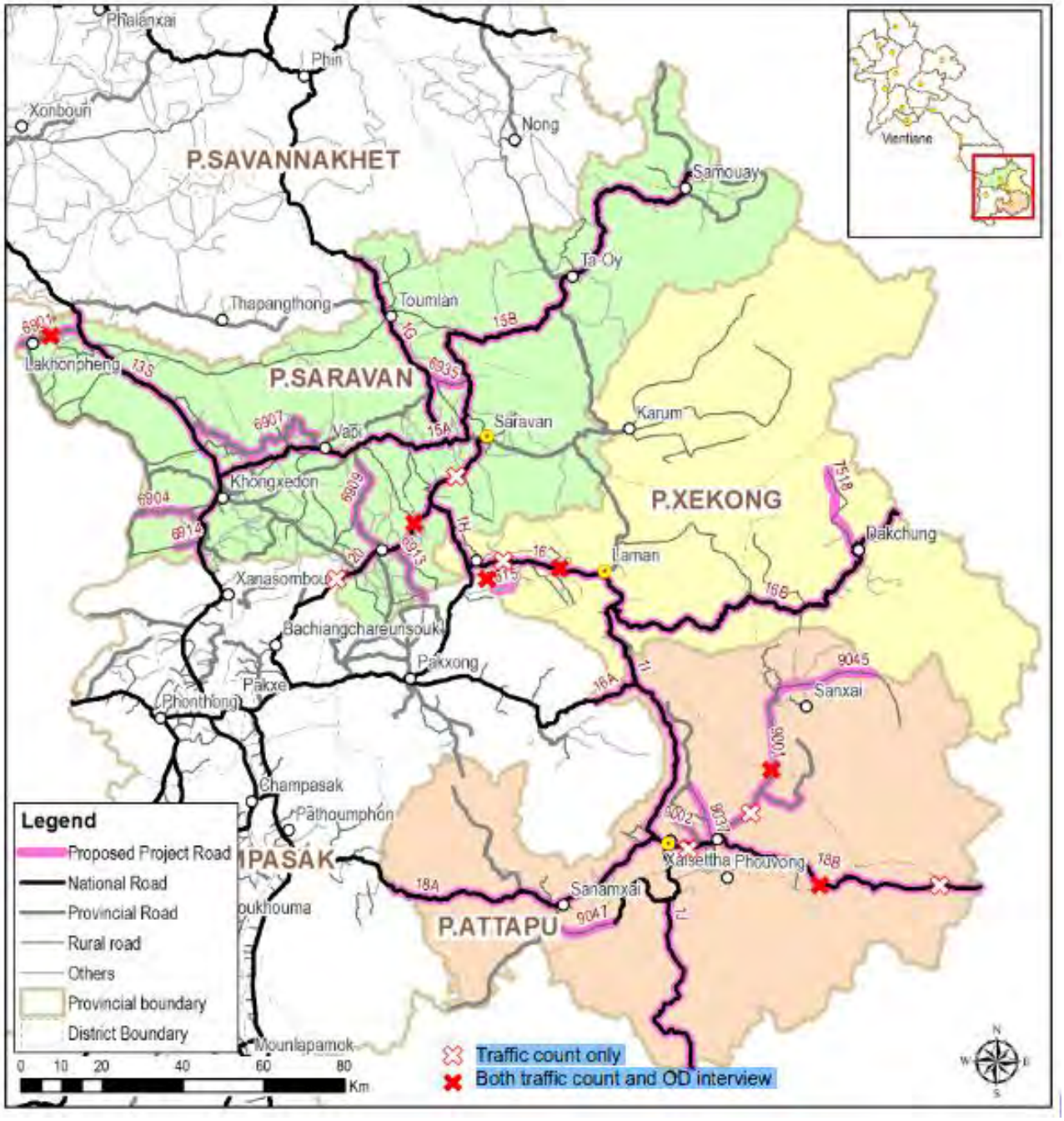
	Road No.18B		Road No.9001		Road No.16		Road No.7615		Road No.20		Road No.6901		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
0 empty	111	75.5%	7	77.8%	123	58.6%	30	68.2%	195	64.6%	91	65.9%	557	65.5%
1 fruit or vegetablesor, fish,			1	11.1%	11	5.2%			18	6.0%	3	2.2%	33	3.9%
2 rice and other agriculture	1	0.7%			5	2.4%	6	13.6%	20	6.6%	6	4.3%	38	4.5%
3 livestock					4	1.9%			5	1.7%	7	5.1%	16	1.9%
4 logs or lumber, bamboo,	6	4.1%			9	4.3%			9	3.0%			24	2.8%
5 processed foods and	1	0.7%			13	6.2%	1	2.3%	4	1.3%	9	6.5%	28	3.3%
6 machinery, equipment	1	0.7%			6	2.9%	3	6.8%	4	1.3%	1	0.7%	15	1.8%
7 other maufactured goods	2	1.4%			13	6.2%			11	3.6%	5	3.6%	31	3.6%
8 bulk minerals ;ore, coal,	17	11.6%			4	1.9%	1	2.3%	8	2.6%	2	1.4%	32	3.8%
9 construction materials,	7	4.8%	1	11.1%	14	6.7%			15	5.0%	8	5.8%	45	5.3%
10 fuel or chemicals	1	0.7%			5	2.4%	2	4.5%	5	1.7%	4	2.9%	17	2.0%
11 miscellaneous or					3	1.4%	1	2.3%	8	2.6%	2	1.4%	14	1.6%
Total	147	100.0%	9	100.0%	210	100.0%	44	100.0%	302	100.0%	138	100.0%	850	100.0%

Q13. COMMODITY

	11 Light truck		12 Medium truck		13 Heavy truck		14 Truck-trailer		Total	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
0 empty	383	69.3%	39	50.0%	52	49.1%	83	73.5%	557	65.5%
1 fruit or vegetablesor, fish,	31	5.6%	2	2.6%					33	3.9%
2 rice and other agriculture	29	5.2%	7	9.0%	2	1.9%			38	4.5%
3 livestock	14	2.5%	1	1.3%	1	0.9%			16	1.9%
4 logs or lumber, bamboo,	13	2.4%	2	2.6%	2	1.9%	7	6.2%	24	2.8%
5 processed foods and	19	3.4%	4	5.1%			5	4.4%	28	3.3%
6 machinery, equipment	8	1.4%	4	5.1%	1	0.9%	2	1.8%	15	1.8%
7 other maufactured goods	21	3.8%	6	7.7%	3	2.8%	1	0.9%	31	3.6%
8 bulk minerals ;ore, coal,	4	0.7%	2	2.6%	26	24.5%			32	3.8%
9 construction materials,	20	3.6%	7	9.0%	6	5.7%	12	10.6%	45	5.3%
10 fuel or chemicals	3	0.5%	2	2.6%	9	8.5%	3	2.7%	17	2.0%
11 miscellaneous or	8	1.4%	2	2.6%	4	3.8%			14	1.6%
Total	553	100.0%	78	100.0%	106	100.0%	113	100.0%	850	100.0%

Annex O - Traffic Data Collection and Forecasts

Traffic Count and Origin-Destination Survey Locations



ABBREVIATIONS

AADT	Annual average daily traffic
ADT	Average daily traffic
Agr.	Agricultural produce (other than perishable)
B.	*Ban* (village)
CA	Carts or animal transport
Constr.	Construction materials
DR	District Road
E	Empty
EB	Employer's business
Ed	Education
Eqt	Machinery or equipment
Fd & Dr	Food or drink
GDP	Gross domestic product
HGV	Heavy goods vehicle (three or four axles)
LB	Large bus (40 or more seats)
LDV	Light delivery vehicle (includes jeeps and other light four-wheel drive vehicles)
LGV	Light goods vehicle (two axles, single rear wheels)
Live	Livestock
Manf.	Manufactured goods (other than machinery or equipment)
MB	Medium bus (16-39 seats)
MC	Motor cycle
Med	Medical
MGV	Medium goods vehicle (two axles, twin rear wheels)
Misc	Miscellaneous
MPWT	Ministry of Public Works and Transport
NR	National Road
O-D	Origin-destination
PB	Personal business (includes shopping)
PC	Passenger car
Perish.	Perishable goods
PPTA	Project Preparatory Technical Assistance
PR	Provincial Road
RMS	Road Management System
RT	Recreation or tourism
SB	Small bus or *'sonteo'* (passenger service pickup)
TFW	To or from work
TTJ	*'Tuk-tuk'* or 'Jumbo' (types of commercial tricycle)
TTT	*'Tok-tok'* (hand tractor) or agricultural tractor with trailer
VFR	Visiting friends or relations
VHGV	Very heavy goods vehicle (five or more axles)

1. BACKGROUND

1.1 Objective of Paper

1. While much of the project is institutional in scope, there are six road sections that have been selected as demonstration projects for maintenance or related interventions under the project. Forecasts of the future traffic on these sections are needed for two main purposes:

(i) To inform the design of the project interventions, to ensure sufficient traffic capacity and bearing capacity of the roads in relation to the expected future traffic levels;

(ii) To contribute to the economic analysis of the project, as the economic benefits are largely dependent on how much traffic will use the roads.

2. The six selected road sections are shown in the following table, which also indicates the sectional location of the traffic survey sites. The traffic surveys are described in the next chapter.

Ref.	*Road and Section*		*Km*	*Description*	*Province*	*District*	*Survey Sites*
1	PR 6901		23.0	Road 13 South – B. Paktaphan, including branch to ferry site	Salavan	Lakhonpheng	A
2	NR 1H*	B	26.0	Salavan – B. Beng	Salavan	Salavan	D
	NR 20	A	5.3	B. Beng – District boundary			-
		B	24.7	To Champasak Province border		Lao Ngam	B, C
3	DR 7615		23.0	B. Lakkhao – B, Khamkok; between Roads 16 (F) and 16 (G), but impassable at Km 20	Xekong	Thateng	F
4	NR 16	F	26.4	Champasak border - Thateng	Xekong	Thateng	-
		G	26.4	Thateng to district boundary			E
		H	24.5	Within Lamam District		Lamam	G**
5	NR 18B	A	35.5	Attapu – Houay Khen 1	Attapu	Xaisettha	-
		B	34.0	Houay Khen 1 – Houay Pranang		Phouvong	H
		C	41.0	Houay Pranang – Vietnam border			J
6	PR 9001	A	9.0	Within Xaisettha District	Attapu	Xaisettha	K
		B	8.0	Paved section in Xanxai District		Xanxai	-
		C	37.1	Unpaved mountain road			L

* Known locally as Road 20

***Site G on Thateng/Lamam district boundary

2. EXISTING TRAFFIC

2.1 Traffic Counts

3. In order to estimate project needs and calculate the benefits, a traffic forecast is essential and the first step is make a classified traffic count (count of the vehicles by their type) on the selected project roads.

4. This was conducted at the sites shown on the map and in the table above. The traffic was counted on two working days, for 12 hours at each site.

5. An expansion factor was then applied to convert the 12-hour average to an assumed 24-hour average. For this purpose, the traffic counts undertaken for the recent ADB-11 study in Laos, where both 12-hour and 24-hour counts were made, were consulted, and appropriate factors applied for each vehicle type.

6. The surveys were carried out in late September and the first half of October. This is the beginning of the dry season but before the main rice harvest. In the absence of any evidence to the contrary, it is assumed that the traffic levels at this time are representative of the annual average.

7. Thus while the current traffic level on each road can only be estimated, the results are regarded as a sufficiently robust starting point for the forecast of future flows.

8. The full results of the counts, together with the expansion factors used, are contained in the detailed tables in ANNEX 1. In summary, the assessment of the average daily traffic (ADT) for each road is as follows (TABLE 2):

Table 2. Assessed Average Daily Traffic (24-hours), Project Roads, 2014

Survey Site	*Road*	*Non-motorised and 2 & 3 wheeled vehicles*	*Light vehicles (cars and pickups or jeeps)*	*Trucks*	*Buses (including pickups on passenger service)*	*Total (4 or more wheels)*
A	6901	446	60	101	26	187
B	20	1428	283	278	66	626
C	20	826	192	145	20	357
D	1H	2038	550	332	39	921
F	7615	795	59	49	2	110
E	16	2402	453	287	62	803
G	16	1361	609	201	62	872
H	18B	360	209	103	36	348
J	18B	279	141	116	37	295
K	9001	1285	185	134	1	320
L	9001	314	19	6	0	26

Source: Consultant surveys, details in Annex 1.

9. Motor cycles comprise the predominant traffic on almost all the project roads. The exception is Road 18B, which for most of its length traverses unpopulated terrain on its way to the Vietnam border. In this case motor cycles make up about half of the total traffic. Roads 6901, 7615 and the northern section of 9001 have very poor surfaces which will inhibit traffic growth, on 9001 in particular as it is also very mountainous with difficult steep slopes.

10. The forecast of the future traffic on each road is developed in Chapter 3.

2.2 Origin-Destination Surveys

11. To supplement the traffic counts, origin-destination (O-D) surveys were carried out at key locations (one site on each project road). These were designed to establish journey patterns and route choice, understand the purposes of the passenger trips (to help assess the value of passenger time), and get to know the occupancy of the vehicles and the types of goods being carried.

12. A questionnaire was designed to be easy and quick to complete, and at the selected sites as many vehicles as possible were stopped in the time available (12 hour days, two days each location). The surveys were undertaken simultaneously with the traffic counts described earlier. This allowed the size of the sample to be assessed, as it was mostly not possible to stop and interview every single vehicle.

13. On the national roads, only vehicles with four wheels or more were stopped for the surveys. On the local roads, all traffic types including two and three wheel vehicles were stopped.

14. The full O-D survey results are shown in Annex 2. Table 3 shows the key features of the traffic at each site, as gathered from the surveys.

Survey Site	***Road***	***Surveyed vehicles****	***Light Vehicle Occupancy***			***Bus Load Factor, %***	***Goods Vehicles***		
							Per cent empty	***Average Load (%)******	
			MC	***Cars***	***LDVs****			***All***	***Loaded***
A	6901	55%	1.4	1.8	2.2	40%	67%	27%	96%
C	20	100%	-	2.3	2.4	43%	64%	28%	80%
F	7615	41%	1.6	2.4	4.4	-	73%	34%	112%
G	16	36%	-	2.7	2.5	54%	56%	33%	86%
H	18B	72%	-	2.4	2.3	65%	76%	28%	95%
L	9001	50%	1.5	-	3.3	-	78%	18%	75%

* As per cent of eligible vehicles counted in traffic survey. On national roads (16, 18B, 20), these are vehicles of four wheels and more. On other roads, all vehicles including two-wheelers are included.

**Light delivery vehicles – includes pickups, jeeps and sports utility vehicles (SUVs).

***Loads are approximate, by visual assessment only.

15. One noticeable feature from the O-D survey results is the number of trucks that are running empty. This especially true of the light trucks. It seems as though many owners use

them as their private passenger vehicles when they are not required for agricultural or other trucking duties. Their loading may be very different at harvest times for rice and other products.

16. In general, also bus passenger loadings seem to be lower than the average of 60% which might be expected in a healthy business. It seems possible that neither the trucking nor the bus business is in very strong financial condition at the moment, but this is only a snapshot at one time of year.

17. The full results of the surveys, including the origins and destinations, journey purposes and commodities carried, are contained in Annex 2. On the passenger side, by far the most important journey purpose is the travel to or from work. This is often the daily trip to the fields, but it includes long distance trips of Vietnamese and Lao workers whose work is based far from home. This combined category accounts for half (49%) of all trips. Personal business (including shopping and market visits) is the next most common category (almost 20% of trips), followed by visiting friends and relations (15%). There were very few trips for educational or medical purposes.

18. With regard to commodities carried, this does of course vary by season. At the time of the survey (the beginning of the dry season), only one-third of the observed trucks were loaded. The commodities carried by the loaded trucks were very mixed. Almost a quarter carried agricultural products, and of these nearly half were regarded as perishable traffic, requiring expeditious transport. Some 15% of the loaded trucks carried construction materials.

3. REGIONAL ECONOMIC TRENDS

3.1 The Project Area

19. The southern region of the Lao PDR has seen rapid development in the last 20 years. The west of the area, in Salavan province, is low lying and has extensive areas suitable for rice cultivation. Its districts of Vapi and Lakhonpheng are major rice growing areas. This area has a local border crossing point with Thailand that supplements the main trade routes through Savannakhet and Champasak provinces. Much of the rice is grown for subsistence but there are growing exports to elsewhere in the country.

20. The centre of the project area is dominated by the Bolavens Plateau. Much of this is in Champasak Province, but the north-west of the plateau encompasses Salavan's Lao Ngam District, while the north-east includes parts of Thateng and Lamam Districts of Xekong province. The plateau is a valuable resource for the country, as it uplands are well suited to the growing of coffee as well as temperate fruits and vegetables which are much in demand in an area dominated by tropical crops. Such products can be exported, with markets that include Thailand, Vietnam and Singapore. The plateau also has bauxite and other mineral deposits and its escarpments are being exploited for hydropower generation.

21. South-east of the Bolavens, the project area extends from the Attapeu provincial capital north-easterly up to the Xanxai plateau, which borders on Vietnam. This plateau has the potential to rival the Bolavens plateau in economic importance. Extensively damaged in the war of the 1960s and 1970s, the district is the poorest n the whole country and has only started its development with the arrival of the road in 2009. It is already exporting coffee and has agricultural, mining and tourism potential.

22. Finally, the area includes the highway from Attapeu to the Vietnam border at Phoukeua. This highway passes through a mountainous area with steep slopes, where there is little cultivation. The link with Vietnam is proving very valuable, however, and strong trade and investment links are driving growth in the area, with the border trade increasing by 20% a year since the opening of the crossing in 2010.

3.2 Recent Developments

23. Traditionally, the local population have survived on subsistence agriculture, centered on rice production. In the upland areas the rice production is by shifting cultivation. These areas are well suited to fruit trees and other upland agriculture but markets for such products did not exist until the roads arrived. Coffee plantations started in the 1980s on the Bolavens plateau, as coffee is a dry season crop that can be complementary to the rice that is grown in the rainy season. As the roads developed eastwards, the productive area expanded.

24. More recently, with the opening of the border crossing with Vietnam, there has been significant inward development of rubber plantations. Production from these – and consequent exports to Vietnam – should become significant in the next few years, together with other agricultural exports to that country, fuelling a future flow of consumer goods imports in return.

25. This latter development is helped by the rapid electrification of the rural areas. The national electricity grid has developed in step with the roads and has now reached Xanxai

district. Local hydropower developments help to feed this grid and more are planned.

26. The area is thus a centre of extremely rapid economic development. Its economy has been growing at a rate 50% greater than the national rate, and this rate is expected to continue. It is only now, after the effects of years of war are finally being overcome, that the area is starting to realise its economic potential – a process that it still in its early stages.

27. For the future, the full potential of the two plateaus – including the mining, hydropower and tourist potential – will make the area a cornerstone of the national economy. Its links with Cambodia remain to be developed. Those with Vietnam are still new. Road 18A from Attapu to the west is not yet constructed. Road 18 will then become an Asian Highway linking Vietnam with Thailand.

28. The following table summarises the latest available data on national and regional economic and traffic growth.

	Source	2011	2012	2013	2014	2015	*2016*	*2017*	*2018*	*2019*	*2020*
A. GDP Growth, %											
Lao PDR (national)	a	8.1	8.3	8.0	7.8	7.5	*7.5*	*7.5*	*7.5*	*7.5*	*7.5*
Salavan province	b	11.2	11.2	11.2	11.1	11.5	*11.0*	*11.5*	*10.6*	*10.7*	*11.1*
Xekong province	c			15.9							
Attapeu province	d										
Four southern provinces	a	11.9	12.4	12.5	12.6	14.7	*12.1*	*12.1*	*12.1*	*12.1*	*12.1*
of which:											
Agriculture	a	7.0	8.0	9.0	7.0	9.0	*8.0*	*8.0*	*8.0*	*8.0*	*8.0*
Industry	a	17.0	14.0	16.0	16.0	17.0	*14.0*	*14.0*	*14.0*	*14.0*	*14.0*
Services	a	16.0	13.0	15.0	17.0	17.0	*15.0*	*15.0*	*15.0*	*15.0*	*15.0*
B. Per Capita GDP Growth, %											
Lao PDR (national)											
Salavan province	b		9.9	12.1	8.2	9.0	*8.2*	*8.3*	*5.6*	*14.2*	*16.3*
Xekong province	c			13.1							
Attapeu province	d				3.0	6.9					
Four southern provinces	a	11.9	12.4	12.5	12.6	14.7	*10.1*	*10.1*	*10.1*	*10.1*	*10.1*
C. Traffic growth, %											
Lao PDR (national)		Average 7% annually									
Salavan province - light		Average 20% annually									
- heavy		Average 10% annually									
Xekong province - light		Average 25% annually									
- heavy		Average 25% annually									
Attapeu province - light		Average 25% annually									
- heavy		Average 12% annually									

Sources:

a) Lao PDR. *Five-Year National Socio-Economic Development Plan VIII (2016-2020)* (5th Draft, February 2015). The four southern provinces include Champasak province (not included in project area).

b) Salavan provincial administration

c) Xekong provincial administration (limited data provided)

d) Attapeu provincial administration (limited data provided)

4. TRAFFIC FORECASTS

4.1 Introduction

29. Although this is a maintenance project, it is necessary also to include investments in small improvements, for example to drainage, or to improve road safety or the durability of the roads, and/or or to reduce road maintenance or rehabilitation requirements in the future. Thus a 20-year traffic perspective is needed, so that the investment costs of the improvements can be compared with the benefits that are obtained over their lifetime.

30. For the purposes of the economic analysis, the traffic forecasts are normally considered in three categories:

- *Normal traffic* – that which is present on the roads today, but is predicted to grow in line with increased population, incomes, economic activity and vehicle ownership
- *Generated traffic* – that additional traffic that is attracted by the improved road surface or faster travelling speeds. These are trips not made today, but will be generated by the improvements made under the project, as travelling becomes easier, quicker and cheaper
- *Diverted traffic* – that traffic which travels today, by another route or transport mode, but is predicted to switch to the project road because of the improvements under the project.

31. This chapter is concerned only with the normal traffic. Generated traffic is considered separately, as part of the economic analysis for each project alternative, as the amount of generated traffic depends on the extent of the improvement in travelling conditions.

32. It is not expected that any of the proposed project interventions will result in any significant diverted traffic.

33. Three main sources have been used to estimate the most likely normal traffic growth:

- Trend analysis, looking at traffic growth in recent years
- Trends in vehicle ownership and use
- Growth in the economy and in personal incomes.

34. The next sections discuss the use of each of these sources in arriving at the forecasts for normal traffic.

4.2 Trends in Traffic Growth

Local Roads

35. No historical traffic data is available for the local roads, other than PR 9001, the Xanxai road. This road was only completed in 2009. Previously the mountainous part of the track was almost impassable. The last known traffic count was carried out in November 2002, under the PPTA for the ADB-10 project. This concluded with the following result:

Estimated Traffic on PR 9001 (Xanxai Road) in 2002

Road Section	Car	Pickup/Jeep	Light bus	Medium bus	Hand-tractor + trailer	Light truck	Medium truck 2-axle	Medium truck 3-axle	Motor cycle	Bicycle	Total	Motorised traffic
A. Xaisettha–B. Paam		9	5	3	13		6	3	80	86	206	120
B. B. Paam–Xanxai		0	0	0	1		0	0	4	4	10	6

36. For the B. Paam-Xanxai section, the 2002 count was an estimate based on local knowledge at that time, as the road was impassable at the time of the inspection, as indeed it was for most of the year.

37. Taking Section A first, there has been a remarkable change – from no cars to 25, from 14 pickups/light trucks to 223, from 80 motor cycles to 1239. Over the 12 years, this equates to 26% a year growth for motor cycles, and about 30% a year for light vehicles, including light trucks. For heavy trucks the average annual growth rate has been about 15%.

38. The road was a gravel road in 2002 and is now a paved road in good condition. Some of the new traffic will thus be 'generated' traffic, i.e. newly attracted by the road improvement. This is a once-off phenomenon. The remaining traffic growth is the result of general economic development and better living standards and this part of the growth continues year by year.

39. This 'normal' traffic growth is judged to be about 25% a year for light vehicles and 12% a year for trucks. There has been a decline in bus transport, presumably linked to the rise in motor cycle transport. But the normal growth in bus transport, from the present very low starting point, can be assumed to be the same as for other passenger transport.

40. The northern section was only completed in 2009. It is not known how much it was passable in the years between 2002 and the opening date. The number of motor cycles, assumed to be four a day in 2002 on the days when the road could be used, is now assessed as 309 a day. There was no other motorized traffic in 2002 other than a tractor. There are now 19 light vehicles and six heavy.

41. The growth in motor cycles is equivalent to 44% a year over the 12-year period. Allowing for the traffic generation effects, the underlying growth rate for light vehicles (including motor cycles) is taken as 25%, and for heavy trucks 15% - these are the same rates as assumed for the southern part of the road.

National Road 16

42. The database of the Road Maintenance System (RMS) was consulted to see if any traffic counts had been made in earlier years. It was found that counts were made in each of the project sections in 2008 and 2013. The average annual growth rates over the five-year period have been calculated as follows:

Section	PC	LDV	SB	MB	HB	LGV	MGV	HGV	VHGV	Total
16F	27%	25%	56%	-100%	8%	11%	18%	64%		21%
16G	35%	23%	89%	32%	-2%	37%	30%	57%	48%	33%
16H	42%	42%		-10%	20%	23%	7%	27%	7%	36%

43. Conservatively, this is assumed to correspond to about 25% a year for light vehicles and bus passengers, 20% a year for light and medium trucks, and 40% a year for heavier trucks.

44. It is not certain whether the project's counts in 2014 were at exactly the same site as MPWT's 2013 count, but for Section 16G the Project's 2014 count was about one-third higher than the RMS count of 2013, suggesting that the high growth rate is continuing.

National Road 18B

45. Similarly, the RMS database was consulted to review the earlier traffic counts on this road. The road was completed in 2006. Prior to that over most of the distance (sections B and C) there was only a track. A new border crossing at Phoukeua links the road with Vietnam. This opened in 2010, while the road on the Vietnamese side was only finished in 2014. So traffic growth is still in its early stages.

46. MPWT conducted traffic counts on the road in both 2008 and 2013, and comparison of the two results reveals the following annual average growth rates:

Section	PC	LDV	SB	MB	HB	LGV	MGV	HGV	VHGV	Total
18B-A	22%	26%	113%	10%	32%	28%		8%	-11%	22%
18B-B	28%	41%	38%	25%		64%		25%	0%	16%
18B-C	29%	31%	15%	15%		43%		-13%	13%	17%

47. This also shows a growth rate of about 25% or more a year for light vehicles and bus passengers. For trucks the picture is more mixed. Many of the light trucks are in fact being used for passenger transport. On the above figures, 15% annual growth of truck transport may be a reasonable assumption.

48. The project's 2014 traffic counts for section B show a level about 27% above the 2013 traffic as counted for RMS, while for section C such growth is not evident. The survey site locations may not be the same.

49. The Customs officials at the Phoukheua border gate report that since they opened in 2010, traffic has been growing at about 20% a year. This is consistent with the 25% for light vehicles and 15% for trucks identified above.

50. As the road on the Vietnamese side has only just been completed, there may be some traffic generated by that project which may become apparent in the next 1–2 years.

National Road 20

Traffic counts were carried out by MPWT in 2008 and 2013. The average annual growth rates over the five-year period have been calculated as follows:

Section	PC	LDV	SB	MB	HB	LGV	MGV	HGV	VHGV	Total
20A	62%	16%	18%	33%	25%	21%	-17%	-20%	-4%	22%
20B	-13%	14%	-37%	22%	15%	-12%	-100%	-100%	-100%	3%

51. The pattern here is a bit hard to discern and one or more of these counts may be unreliable. It seems reasonable to assume that light vehicles and bus passengers are growing at 20% a year, and that truck traffic is static.

52. Between MPWT's 2013 counts and the project's 2014 counts, which may not be at exactly the same locations, there has been no traffic growth. Section B has about the same level of traffic as in 2013 and Section A has less traffic than in the earlier year.

53. During 2014, Road 15A, which was formerly gravel, was completed as a new paved road of high standard between Salavan and Road 13 South. It is likely that some journeys that used to go via Road 20 and Pakxe, now find it preferable to use Road 15A as their link with the trunk Road 13 South.

54. Thus the 2014 traffic level may be the new, slightly lower, norm. On the other hand, the economy of the area is still growing rapidly and it would seem likely that the trend growth rates of 20% a year for light vehicles and buses, and 10% a year for freight, will be restored in 2015 and subsequent years.

4.3 Trends in Vehicle Ownership and Use

55. ANNEX 3 shows the annual vehicle registration statistics for the last 10 years, both for the country as a whole and for the southern provinces.

56. The trend in the last four years can be summarised as follows.

Average Annual Increase in Vehicle Registrations over 2009–2013 period

	MC	PC	LDV	SB	Jeep	Truck	Bus	Total
Laos	12%	26%	15%	28%	16%	14%	9%	13%
Salavan	8%	28%	15%	35%	16%	6%	7%	9%
Xekong	11%	15%	12%	36%	12%	10%	8%	11%
Attapu	12%	27%	21%	33%	14%	15%	1%	13%

57. These growth rates are somewhat slower than the traffic growth rates that have been noted. This is understandable as due to the virtual completion of most of the national roads, vehicle productivity can increase and each vehicle can do more trips and cover a greater distance in the year. The generally good condition of the national roads in the area is probably one reason why private car ownership is now rising faster than the ownership of pickups and jeeps.

58. Another reason that traffic grows more quickly than the size of the registered vehicle fleet is that there is now a significant presence of Vietnamese vehicles on the roads in the area. This is particularly true on Road 18B, where almost two-thirds of the vehicles are Vietnamese. On Roads 16 and 20, about 3% of vehicles are Vietnamese.

59. Finally, it is observed that many vehicles have no number plates at all. This is particularly the case on the local roads and applies mostly to motor cycles. Overall 28% of the surveyed vehicles (including motor cycles) had no plates, and on the local roads this number varied between 37% and 64%. On the national roads between 7% and 10% had no plates.

60. This must be a matter of concern both in terms of public revenue forgone, and as a matter for road safety enforcement.

61. Overall vehicle ownership per capita is still at a low level and can be expected to continue increasing for many years to come.

4.4 Economic Growth – GDP and GDP per Capita

62. It is helpful to consider economic growth as the sum of two elements – the population and the average income per head.

63. TABLE 4 shows the national and regional populations and the population growth rate over the last seven years. Only the districts directly served by the project roads are shown.

Table 4 Population Trends in Study Area

		Population ('000)			*Average annual growth*		*Project Roads*
		1995	***2005***	***2012 est***	***1995-2005***	***2005-2012***	
Country	**Laos**	4581.3	5622.0	6514.4	2.1%	2.1%	
Provinces	**Salavan**	256.6	324.3	384.4	2.4%	2.5%	1H/20, 6901
	Xekong	63.8	85.0	103.3	2.9%	2.8%	16, 7615
	Attapu	87.2	112.1	133.5	2.5%	2.5%	18B, 9001
Districts in Salavan	**Salavan**		65.5	85.6		3.9%	1H/20
	Lao Ngam		43.5	58.7		4.4%	20
Districts in Xekong	**Thateng**		15.3	27.1		8.5%	16, 7615
	Lamam		18.0	26.6		5.7%	16
Districts in Attapu	**Samakhixai**		19.3	30.2		6.6%	18B
	Xaisettha		25.5	28.4		1.5%	18B, 9001
	Xanxai		12.3	16.5		4.3%	9001
	Phouvong		10.3	10.7		0.5%	18B

Source: http://www.geohive.com/cntry/laos.aspx (based on Lao NSC data)

64. The population of the project area is growing at least 20% faster than the national average. Xekong is growing particularly fast, with an average recent population growth rate of 2.8% a year. The populations of Salavan and Attapu are growing at 2.5% a year.

65. Even these provincial figures underestimate the population growth in the districts served by the project roads. Thateng, on the Bolavens plateau some 900 m above sea level, has thrived with the completion of the main road network and many feeder roads. There are new plantations and its population is growing at over 8% a year. The town of Attapu (in

Samakhixai district) is growing at more than 6% a year, and the provincial capital of Xekong (in Lamam district) is not far behind. In other upland areas (Lao Ngam and Xanxai) the annual population growth is more than 4%, and the Salavan provincial capital is growing almost as fast. Only Xaisettha, close to Attapu, and Phouvong (most of which is inaccessible and very sparsely populated) have lagged behind in population growth.

66. In the last five years, real GDP for the country as a whole has been growing at an average of 7.5% a year or more. Bearing in mind the 2.1% national population growth rate, this results in per capita incomes growing on average about 5.5% a year.

67. The net immigration into the southern provinces, evidenced by the above average population growth, suggests also that per capita incomes are growing faster than elsewhere in the country. Xekong Province, for example, estimates that its GDP rose by 15.9% in 2013, representing a 13.1% rise in per capita GDP[1]. Salavan province estimates the growth in its per capita GDP at 12.1% in the same year. If the Salavan and Attapu populations have their incomes increasing at a similar speed, then their provincial GDPs could be rising at about 15% a year. This is the same as the trend increase in truck traffic, which is what might be expected, so this figure is very plausible.

68. As noted in Chapter 3, GDP in the south as a whole has been increasing at about 12% a year, about 60% faster than the national average, and this rapid growth is set to continue, as explained in the draft national development plan for the 2016–2020 period.

69. In the south, traffic has been growing at about 25% (passenger) and 12% (freight) - i.e. two times GDP for passenger and about GDP for freight.

70. The elasticity of demand for passenger transport in relation to GDP growth varies according the level of development. Taking India as an example, passenger transport elasticities with respect to GDP fluctuated between 1.4 and 1.8 over the period between 1970 and 2012[2]. For its 11th Five-Year Plan (2007–12), based on its research, India adopted a figure of 1.5 for bus transport and 1.1 for truck transport[3]. A range of 1.5-1.8 applied for passenger transport in Xekong would result in a 23–27% growth on these figures, matching the 25% observed.

71. Another example is China's Yunnan province, bordering Laos to the north, where annual 6% GDP growth has been estimated to lead to 12% passenger traffic growth and 8% growth in freight traffic annually[4]. This is also similar to what has been found in this study, although the figures for the project area more closely match with those found in India.

72. The next question is how long such growth can continue. There are many investment projects under way or planned in the area, from major hydropower and mining projects to new plantations. It is impossible to be certain which of the proposed projects will be completed by what date, but the investment activity in the area is at a high level. Attapeu, in particular, is proving attractive to Vietnamese investors, who are also active in Xekong and Salavan provinces, as evidenced by the number of Vietnamese vehicles on the roads.

[1] Efforts to obtain recent GDP growth rate figures for Xekong and Attapu provinces have not proved successful.
[2] *Trends of Growth and Development in Transport*, National Transport Development Policy Committee, 2013. The latest estimate is 1.8 for the year 2011/12.
[3] *The Working Group Report on Road Transport for the Eleventh Five-Year Plan*, Government of India Planning Commission.
[4] Summarised in ADB RRP VIE 33307, GMS Kunming-Haiphong Transport Corridor Project.

73. Roads 18B and 9001 are recently opened – Road 9001 needs further improvement. Road 18A (direct from Attapeu to Pakxe) is yet to be completed. There is mining and hydropower potential along this road which is already attracting the attention of investors, When complete it can be expected to become the major traffic corridor between Vietnam and Thailand via Attapu and Pakxe, as it will avoid the need to climb up to, and descend from, the Bolavens plateau. It is designated as a future Asian Highway.

74. It seems likely that Attapeu will grow significantly for many years to come, because of its strategic location and the advantage of opening up the formerly isolated Xanxai plateau. Until now this has been the poorest district in the whole of Laos due to its isolation. But the district has great scope to add to the provincial income. Since the road opened it has already begun to export coffee and attract tourists to its spectacular Nong Fa Lake, located in the Dong Amphan National Protected Area. The potential of its agricultural area matches that of the Bolavens.

4.5 Conclusion – Forecast Traffic Growth Rates

75. Bearing all these factors in mind, the recent high rates of traffic growth seem set to continue, although of course they cannot be sustained for ever and they are assumed to decline gradually to national average levels once the local economy has reached its potential.

Table 5 Forecast Growth of Normal Traffic on the Project Roads

Road	*Vehicle Type*	*Forecast Annual Growth Rates (%)*			
		2015-20	2020-25	2025-30	Beyond 2030
6901	Light vehicles and bus passengers	20	15	12	10
	Light and medium trucks	18	12	10	8
	Heavy trucks	15	12	10	7
20/1H	Light vehicles and bus passengers	20	15	12	10
	Light and medium trucks	15	12	10	8
	Heavy trucks	12	10	8	7
7615	Light vehicles and bus passengers	25	20	15	10
	Light and medium trucks	20	15	12	8
	Heavy trucks	40	25	15	7
16	Light vehicles and bus passengers	25	20	15	10
	Light and medium trucks	20	15	12	8
	Heavy trucks	15	12	10	7
9001	Light vehicles and bus passengers	25	20	15	10
	Light and medium trucks	20	15	12	8
	Heavy trucks	15	12	10	7
18B	Light vehicles and bus passengers	25	20	15	10
	Light and medium trucks	20	15	12	8
	Heavy trucks	15	12	10	7

76. These growth rates are carried forward to the economic analysis, where the predicted generated traffic (if any) will be added.

Appendix 1

Project Traffic Counts, 2014

(Includes estimated AADT, and showing O-D survey sample sizes)

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total	4+ wheels
			Bicycle	CA	TTT	MC	TTJ	PC	LDV	SB	MB	LB	LGV	MGV	HGV	VHGV		
A	6901 Paktaphan	Traffic count (2 days)	7	0	61	625	1	6	102	44	0	4	135	14	16	13	1028	
		O-D surveys (2 days)	3	0	40	257	0	15	83	24	7	2	107	8	13	10	569	
		% surveyed	43%		66%	41%	0%	250%	81%	55%		50%	79%	57%	81%	77%	55%	
		Night traffic factor	1.5	1.5	1.1	1.3	1.1	1.3	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.5		
		Assuned AADT, 2014	5	0	34	406	1	4	56	24	0	2	74	8	9	10	632	187
C	20 Xe Set	Traffic count (2 days)	4	0	90	1188	2	54	286	17	4	18	167	71	21	3	641	
		O-D surveys (2 days)						69	198	45	5	20	252	36	11	3	639	
		% surveyed						128%	69%	265%	125%	111%	151%	51%	52%	100%	100%	
		Night traffic factor	1.5	1.5	1.1	1.3	1.1	1.3	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.5		
		Assuned AADT, 2014	3	0	50	772	1	35	157	9	2	9	92	39	12	2	1183	357
B	20 Champasak/ Salavan border	Traffic count (ADT)	4	0	113	997	2	59	187	36	5	21	163	60	17	9		
		Night traffic factor	1.5	1.5	1.1	1.3	1.1	1.3	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.5		
		Assuned AADT, 2014	6	0	124	1296	2	77	206	40	5	21	179	66	19	14	2054	626
	20 average	*Assuned AADT, 2014*	*5*	*0*	*87*	*1034*	*2*	*56*	*182*	*24*	*4*	*15*	*136*	*53*	*15*	*8*	*1619*	*491*
D	1H (former 20) B. Naxai	Traffic count (ADT)	11	0	117	1455	0	80	405	8	7	23	229	43	14	12		
		Night traffic factor	1.5	1.5	1.1	1.3	1.1	1.3	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.5		
		`	17	0	129	1892	0	104	446	9	7	23	252	47	15	18	2958	921
F	7615 Lakkhao - Nongkan	Traffic count (2 days)	0	5	161	1077	5	7	99	1	1	0	36	46	4	3	1445	
		O-D surveys (2 days)	0	3	125	330	2	5	78	0	0	0	30	7	7	0	587	
		% surveyed		60%	78%	31%	40%	71%	79%				83%	15%	175%		41%	
		Night traffic factor	1.1	1.1	1.1	1.3	1.1	1.3	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.5		
		Assuned AADT, 2014	0	3	89	700	3	5	54	1	1	0	20	25	2	2	904	110
E	16 B. Khamkok	Traffic count (ADT)	117	0	32	1684	2	33	373	19	9	32	154	52	20	26		
		Night traffic factor	1.5	1.5	1.1	1.3	1.1	1.3	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.5		
		Assuned AADT, 2014	176	0	35	2189	2	43	410	21	9	32	169	57	22	39	3205	803
G	16 Thateng/Lamam border	Traffic count (2 days)	0	0	69	2029	5	323	726	41	24	53	226	57	34	36	1520	
		O-D surveys (2 days)						61	203	28	13	28	148	20	17	25	543	
		% surveyed						19%	28%	68%	54%	53%	65%	35%	50%	69%	36%	
		Night traffic factor			1.1	1.3	1.1	1.3	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.5		
		Assuned AADT, 2014			38	1319	3	210	399	23	12	27	124	31	19	27	2231	872
	16 average	*Assuned AADT, 2014*	*100*	*0*	*37*	*1754*	*2*	*126*	*405*	*22*	*11*	*29*	*147*	*44*	*20*	*33*	*2730*	*837*
H	18B Attapu - Vietnam (Km 52)	Traffic count (2 days)	0	0	1	551	1	85	280	14	46	9	24	6	55	76	595	
		O-D surveys (2 days)						62	151	19	44	8	13	7	52	75	431	
		% surveyed						73%	54%	136%	96%	89%	54%	117%	95%	99%	72%	
		Night traffic factor			1.1	1.3	1.1	1.3	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.5		
		Assuned AADT, 2014			1	358	1	55	154	8	23	5	13	3	30	57	707	348
J	18B near Vietnam border (Km 102)	Traffic count (ADT)				212	3	8	119	10	20	6	12	4	4	63		
		Night traffic factor				1.3	1.1	1.3	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.5		
		Assuned AADT, 2014				276	3	10	131	11	20	6	13	4	4	95	574	295
	18B average	*Assuned AADT, 2014*	*100*	*0*	*0*	*317*	*2*	*33*	*142*	*9*	*22*	*5*	*13*	*4*	*17*	*76*	*740*	*322*
K	9001 Xanxai (south of B. Paam)	Traffic count (ADT)	15	2	15	953	3	19	145	1	0	0	57	50	10	3		
		Night traffic factor	1.5	1.5	1.1	1.3	1.1	1.3	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.5		
		Assuned AADT, 2014	23	3	17	1239	3	25	160	1	0	0	63	55	11	5	1603	319
L	9001 Xanxai (north of B. Paam)	Traffic count (2 days)	6	0	3	475	0	0	35	0	0	0	2	2	6	1	530	
		O-D surveys (2 days)	1	0	6	231	1	0	18				2	1	6	0	266	
		% surveyed			200%	49%			51%				100%	50%	100%		50%	
		Night traffic factor	1.1	1.1	1.1	1.3	1.1	1.3	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.5		
		Assuned AADT, 2014	3	0	2	309	0	0	19	0	0	0	1	1	3	1	339	26

Appendix 2

Analysis of 2014 Origin-Destination Survey Results

(This supplements the description of the survey and the summary of the main results issued by the project on 30 October 2014)

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD PR 6901: PAKTAPHAN-ROAD 13 SOUTH (Lakhonpheng District, Salavan Province)

		Journey Purpose								
Number Surveyed	**Average Occupancy**	**1 TFW**	**2 EB**	**3 PB**	**4 Ed**	**5 Med**	**6 VFR**	**7 RT**	**8 Commercial**	**9 Farm**
1. Bicycles										
3	1.0	1			1	1				
%		33%			33%	33%				
Origins and destinations										
Local		3	100%							
2. Carts or animal transport										
None										
3. Hand tractors or agricultural tractors										
40	2.3	27		3		1	4			
		68%		8%		3%	10%			
Origins and destinations										
Local		38	95%							
To/from Khongxedon		1	3%							
To/from Salavan		1	3%							
4. Motor cycles										
257	1.4	174	36	17	2	1	21	3		
		68%	14%	7%	1%	0%	8%	1%		
Origins and destinations										
Local		252	98%							
To/from Khongxedon		4	2%							
To/from Salavan		1	0%							
5. Motor tricycles										
None										
6. Passenger cars										
15	1.8	3	1	9		1	1			
		20%	7%	60%		7%	7%			
Origins and destinations										
Local		7	47%							
To/from Savannakhet		4	27%							
To/from Salavan		2	13%							
Thailand-Salavan		1	7%							
Khongxedon-Thailand		1	7%							
7. Light delivery vehicles (including light four-wheel drive vehicles)										
83	2.2	19	22	31	1	1	8	1		
		23%	27%	37%	1%	1%	10%	1%		
Origins and destinations										
Local		57	69%							
To/from Vientiane		1	1%							
To/from Savannakhet		7	8%							
To/from Salavan		5	6%							
To/from Khongxedon		5	6%							
To/from Pakxe		3	4%							
To/from Thailand		3	4%							
To/from Champasak		2	2%							

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD PR 6901: PAKTAPHAN-ROAD 13 SOUTH (Lakhonpheng District, Salavan Province

Number Surveyed	Average Capacity	Average Occupancy		
8. Sonteo *(commercial pickup on passenger service)* **or minibus**				
24	12.4	5.1		
	Load factor:	41%		
Origins and destinations				
Local (within District)			11	46%
To/from Khongxedon			8	33%
To/from Salavan			1	4%
To/from Savannakhet			3	13%
To/from Pakxe			1	4%
9. Medium bus *(16-39 seats, including truck conversions)*				
7	20.7	9.3		
	Load factor:	45%		
Origins and destinations				
Local (within District)			4	57%
To/from Khongxedon			2	29%
To/from Salavan			1	14%
10. Large Bus				
2	45	12.5		
	Load factor:	28%		
Origins and destinations				
To/from Salavan			1	50%
To/from Savannakhet			1	50%

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD PR 6901: PAKTAPHAN-ROAD 13 SOUTH (Lakhonpheng District, Salavan Province)

				Number of Trucks by Commodity											
Number Surveyed	**Average Capacity**	**Average Load, all**	**Average Load,**	**0 E**	**1 Perish.**	**2 Agr.**	**3 Live**	**4 Timber**	**5 Fd & Dr**	**6 Eqt**	**7 Manf.**	**8 Bulk**	**9 Constr.**	**10 Fuel etc.**	**11 Misc**
11. Light goods vehicles (LGV) *(average vehicle occupancy 2.3 persons)*															
107	6.0	18%	58%												
Origins and destinations			***Total***												
Local (within District)			58	45	1	4	2		1	1			2	2	
Paktaphan - Khongxedon			8	5	1				2						
Khongxedon - Paktaphan			12	9			2		1						
Paktaphan - Savannakhet			8	5	1				1					1	
Savannakhet - Paktaphan			5	3			2								
Paktaphan - Salavan			5	4					1						
Salavan - Paktaphan			3	3											
Paktaphan - Champasak			3	1					1		1				
Champasak - Paktaphan			1	1											
Thailand - Lakhonpheng			1								1				
Lakhonpheng - Thailand			1	1											
Savannakhet - Thailand			1			1									
Khongxedon - Thailand			1						1						
12. Medium goods vehicles (MGV) (2 axles) *(average vehicle occupancy 1.5 persons)*															
8	10.7	53%	105%												
Origins and destinations			***Total***												
Local (within District)			7	3							1		2	1	
Lakhonpheng - Thailand			1	1											
13. Heavy goods vehicles (HGV) (3-4 axles) *(average vehicle occupancy 1.6 persons)*															
13	23.5	78%	113%												
Origins and destinations			***Total***												
Local (within District)			6	4								2			
Paktaphan - Khongxedon			1									1			
Paktaphan - Salavan			2				1								1
Salavan - Paktaphan			1								1				
Thailand - Lakhonpheng			1								1				
Thailand - Khongxedon			2		1	1									
14. Very heavy goods vehicles (five or more axles) *(average vehicle occupancy 1.5 persons)*															
10	47.9	43%	106%												
Origins and destinations			***Total***												
Local (within District)			3	1									2		
Paktaphan - Khongxedon			2						1				1		
Khongxedon - Paktaphan			4	4											
Lakhonpheng - Thailand			1	1											

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD NR 20: LAO NGAM (Salavan Province)

		Journey Purpose						
Number Surveyed	**Average Occupancy**	**1 TFW**	**2 EB**	**3 PB**	**4 Ed**	**5 Med**	**6 VFR**	**7 RT**
6. Passenger cars								
69	2.3	24	8	21	0	2	10	4
		35%	12%	30%		3%	14%	6%
Origins and destinations (both directions)								
Local		4	6%		Salavan - Attapu		1	1%
Vientiane - Attapu		2	3%		Lao Ngam - Pakxong		3	4%
Lao Ngam - Salavan		23	33%		Lao Ngam - Lamam		1	1%
Salavan - Thateng		1	1%		Bachiang - Pakxong		1	1%
Salavan - Pakxe		29	42%		Attapu - Pakxe		1	1%
Salavan - Champasak		2	3%		Lao Ngam - Pakxe		1	1%
7. Light delivery vehicles (including light four-wheel drive vehicles)								
198	2.4	76	20	50	0	2	47	3
		38%	10%	25%	0%	1%	24%	2%
Origins and destinations (both directions)								
Vientiane - Salavan		2	1%		Khongxedon - Salavan		1	
Vientiane - Lao Ngam		1			Khongxedon - Lao Ngam		1	
Vientiane - Bachiang		1			Khongxedon - Pakxe		2	1%
Vientiane - Attapu		1			Lao Ngam - Ta-Oy		1	
Vientiane P. - Attapu		1			Lao Ngam local		6	3%
Khammouan - Salavan		1			Lao Ngam - Lamam		1	
Savannakhet - Salavan		2	1%		Lao Ngam - Thateng		2	1%
Salavan - Lao Ngam		89	45%		Lao Ngam - Pakxe		4	2%
Salavan - Thateng		1			Lao Ngam - Pakxong		3	2%
Salavan - Pakxe		53	27%		Samouay - Pakxe		1	
Salavan - Champasak		8	4%		Lamam - Salavan		1	
Salavan - Attapu		2	1%		Thateng - Savannakhet		1	
Ta-Oy - Pakxe		2	1%		Pakxe - Attapu		4	2%
Lakhonpheng - Salavan		1			Bachiang - Salavan		1	
Lakhonpheng - Lao Ngam		1			Pakxong - Salavan		1	
Vapi - Lao Ngam		2	1%		Pakxong - Thateng		1	

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD NR 20: LAO NGAM (Salavan Province)

Number Surveyed	Average Capacity	Average Occupancy		
8. Sonteo *(commercial pickup on passenger service)* **or minibus**				
45	11	3.8		
	Load factor:	35%		
Origins and destinations				
Local (within District)			2	4%
Vientiane - Attapu			1	2%
Salavan - Lao Ngam			25	56%
Salavan - Pakxe			9	20%
Lao Ngam - Pakxong			2	4%
Salavan - Phonthong			1	2%
Lao Ngam - Lakhonpheng			1	2%
Pakxe - Bachiangchaleunsouk			1	2%
Pakxong - Salavan			1	2%
Champasak - Xekong			1	2%
Attapu - Pakxe			1	2%
9. Medium bus *(16-39 seats, including truck conversions)*				
5	20.6	10.2		
	Load factor:	50%		
Origins and destinations				
Salavan - Lao Ngam			2	40%
Pakxe - Salavan			3	60%
10. Large Bus				
20	45.4	26.5		
	Load factor:	58%		
Origins and destinations				
Vientiane - Salavan			1	5%
Vientiane - Attapu			1	5%
Savannakhet - Salavan			1	5%
Vietnam - Pakxe			3	15%
Salavan - Vietnam			1	5%
Salavan - Pakxe			9	45%
Salavan - Attapu			1	5%
Salavan - Lao Ngam			1	5%
Pakxe - Lao Ngam			1	5%
Pakxe - Attapu			1	5%

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD NR 20: LAO NGAM (Salavan Province)

				Number of Trucks by Commodity											
Number Surveyed	Average Capacity	Average Load, all	Average Load,	0 E	1 Perish.	2 Agr.	3 Live	4 Timber	5 Fd & Dr	6 Eqt	7 Manf.	8 Bulk	9 Constr.	10 Fuel etc.	11 Misc
11. Light goods vehicles (LGV) *(average vehicle occupancy 2.9 persons)*															
252	6.1	23%	73%												
Vehicle origins and destinations			***Total***	69%	6%	6%	2%	3%	1%	1%	4%	1%	4%	0%	2%
Local (within District)			32	25	1	2					3				1
Vientiane - Salavan			1	1											
Savannakhet - Salavan			1	1											
Salavan local			2	2											
Salavan - Ta-Oy			1	1											
Salavan - Lao Ngam			83	58	2	8	2	2	1	1	3	2	3		1
Salavan - Pakxe			7	6		1									
Khongxedon - Lao Ngam			2	2											
Lao Ngam - Savannakhet			1	1											
Lao Ngam - Salavan			72	52	6	4	1	2	1		1		4		1
Lao Ngam - Lamam			1		1										
Lao Ngam - Thateng			4	2				1		1					
Lao Ngam - Pakxe			1	1											
Lao Ngam - Bachiangchaleunsouk			1			1									
Lao Ngam - Attapu			1		1										
Lamam - Lao Ngam			4	2	1			1							
Lamam - Pakxe			1								1				
Thateng - Lao Ngam			5	4				1							
Pakxe - Salavan			10	3	2		1		1		1		2		
Pakxe - Ta-Oy			1		1										
Pakxe - Khongxedon			1	1											
Pakxe - Lao Ngam			6	4	1							1			
Pakxe - Lamam			1										1		
Pakxe - Thateng			1	1											
Pakxe - Bachiangchaleunsouk			1	1											
Pakxong - Lao Ngam			3	2											1
Pakxong - Pakxe			1	1											
Pakxong - Attapu			1								1				
Champasak - Salavan			1	1											
Khong - Lao Ngam			1	1											
Attapu - Salavan			1	1											
Attapu - Lao Ngam			2								1				1
12. Medium goods vehicles (MGV) (2 axles) *(average vehicle occupancy 2.6 persons)*															
36	13.1	43%	90%												
Vehicle origins and destinations			***Total***	47%	6%	11%	3%	3%	3%	6%	0%	3%	14%	3%	3%
Local (within District)			1	1											
Salavan - Lao Ngam			9	2	1	1				1			4		
Salavan - Pakxe			5	3	1										1
Lao Ngam - Salavan			10	8		1				1					
Lao Ngam - Pakxe			1	1											
Thateng - Salavan			1										1		
Pakxe - Salavan			6	2		1			1			1		1	
Pakxe - Lao Ngam			3			1	1	1							
13. Heavy goods vehicles (HGV) (3-4 axles) *(average vehicle occupancy 1.6 persons)*															
11	23.2	95%	95%												
Vehicle origins and destinations			***Total***	0%	0%	0%	0%	9%	0%	0%	0%	36%	0%	36%	18%
Salavan - Lao Ngam			6					1				3		1	1
Salavan - Pakxe			3									1		1	1
Pakxe - Salavan			2											2	
14. Very heavy goods vehicles (VHGV) (five or more axles) *(average vehicle occupancy 1.0 persons)*															
3	38.1	0%	-												
Vehicle origins and destinations			***Total***	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Salavan - Lao Ngam			1	1											
Lao Ngam - Salavan			2	2											

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD DR 7615: B. Lakkhao - B. Khamkok (Thateng District, Xekong Province)

		Journey Purpose						
Number Surveyed	**Average Occupancy**	**1 TFW**	**2 EB**	**3 PB**	**4 Ed**	**5 Med**	**6 VFR**	**7 RT**
2. Carts or animal transport								
3	1.0	3						
		100%						
Origins and destinations (both directions)								
Local (Thateng District)		4	80%					
3. Hand tractors or agricultural tractors								
125	4.6	89		32			4	
		71%		26%			3%	
Origins and destinations (both directions)								
Local (Thateng District)		82	66%					
4. Motor cycles								
330	1.6	171	5	90	39	3	21	1
		52%	2%	27%	12%	1%	6%	0%
Origins and destinations (both directions)								
Local (Thateng District)		328	99%					
Salavan - Road 7615		1	0%					
Pakxong - Road 7615		1	0%					
5. Tuk-tuks/Jumbos								
2	5.0							
Origins and destinations (both directions)								
Local (Thateng District)		2	100%					
6. Passenger cars								
5	2.4	1	2	2				
		20%	40%	40%				
Origins and destinations (both directions)								
Local (Thateng District)		4	80%					
Road 7615 - Pakxong		1	20%					
7. Light delivery vehicles (including light four-wheel drive vehicles)								
78	4.4	38	32	7				
		49%	41%	9%				
Origins and destinations (both directions)								
Local (Thateng District)		74	95%					
Champasak - Road 7615		1	1%					
Attapu - Road 7615		1	1%					
Pakxong - Road 7615		2	3%					

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD DR 7615: B. Lakkhao - B. Khamkok (Thateng District, Xekong Province)

				Number of Trucks by Commodity											
Number Surveyed	**Average Capacity**	**Average Load, all**	**Average Load,**	**0 E**	**1 Perish.**	**2 Agr.**	**3 Live**	**4 Timber**	**5 Fd & Dr**	**6 Eqt**	**7 Manf.**	**8 Bulk**	**9 Constr.**	**10 Fuel etc.**	**11 Misc**
11. Light goods vehicles (LGV) *(average vehicle occupancy 3.0 persons)*															
30	6.0	28%	113%												
Vehicle origins and destinations			***Total***	77%		13%			3%	3%					3%
Local (Thateng District)			26	20		4			1						1
Salavan - Road 7615			1	1											
Pakxong - Road 7615			2	1						1					
Champasak - Road 7615			1	1											
12. Medium goods vehicles (MGV) (2 axles) *(average vehicle occupancy 2.9 persons)*															
7	13.4	35%	125%												
Vehicle origins and destinations			***Total***	71%						14%		14%			
Local (Thateng District)			7	5						1		1			
13. Heavy goods vehicles (HGV) (3-4 axles) *(average vehicle occupancy 1.6 persons)*															
7	23.2	58%	100%												
Vehicle origins and destinations			***Total***	57%		14%				14%				14%	
Local (Thateng District)			5	2		1				1				1	
Road 7615 - Salavan			1	1											
Pakxe - Road 7615			1	1											

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD NR 16: THATENG-LAMAM BORDER (Xekong Province)

		Journey Purpose						
Number Surveyed	**Average Occupancy**	**1 TFW**	**2 EB**	**3 PB**	**4 Ed**	**5 Med**	**6 VFR**	**7 RT**
6. Passenger cars								
61	2.7	10	6	17			24	4
		16%	10%	28%			39%	7%
Origins and destinations (both directions)								
Vientiane-Xaisettha		1	2%		Pakxong - Xekong		1	2%
Khammouan - Xekong		2	3%		Pakxong - Pakxe		1	2%
Savannakhet - Attapu		2	3%		Pakxong - Thateng		1	2%
Salavan - Attapu		3	5%		Phonthong - Attapu		1	2%
Xekong - Vientiane		1	2%		Champasak - Attapu		2	3%
Xekong - Bolikhamxay		1	2%		Attapu - Khammouan		1	2%
Xekong - Thateng		9	15%		Attapu - Lamam		1	2%
Xekong - Pakxe		14	23%		Attapu - Pakxong		1	2%
Xekong - Champasak		5	8%		Attapu - Lao Ngam		1	2%
Pakxe - Attapu		11	18%		Thateng - Lao Ngam		1	2%
7. Light delivery vehicles (including light four-wheel drive vehicles)								
203	2.5	40	19	62		3	62	17
		20%	9%	31%		1%	31%	8%
Origins and destinations (both directions)								
Vientiane - Xekong		3	1%		Lamam - Attapu		1	0%
Vientiane - Thateng		1	0%		Thateng - Lao Ngam		1	0%
Vientiane - Attapu		10	5%		Thateng - Attapu		7	3%
Khammouan - Attapu		3	1%		Pakxe - Attapu		26	13%
Savannakhet - Attapu		6	3%		Pakxe - Xaisettha		3	1%
Savannakhet - Sanamxai		1	0%		Sanasomboun - Attapu		2	1%
Vietnam - Pakxong		1	0%		Pakxong - Xekong		8	4%
Salavan - Xekong		10	5%		Pakxong - Thateng		3	1%
Salavan - Attapu		3	1%		Pakxong - Pakxe		1	0%
Khongxedon - Xekong		1	0%		Pakxong - Lao Ngam		1	0%
Lao Ngam - Xekong		5	2%		Pakxong - Attapu		6	3%
Xekong - Savannakhet		1	0%		Phonthong - Xekong		1	0%
Xekong - Lakhonpheng		1	0%		Champasak - Attapu		1	0%
Xekong - Thateng		46	23%		Attapu - Bolikhamxay		1	0%
Xekong - Pakxe		35	17%		Attapu - Lao Ngam		5	2%
Xekong - Champasak		4	2%		Xanxai - Lao Ngam		1	0%
Xekong - Bachiang		1	0%		Kalum - Lakhonpheng		1	0%

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD NR 16: THATENG-LAMAM BORDER (Xekong Province)

Number Surveyed	Average Capacity	Average Occupancy		
8. Sonteo *(commercial pickup on passenger service)* **or minibus**				
28	11	4.1		
	Load factor:	37%		
Origins and destinations				
Local (within Lamam District)			1	4%
Vientiane - Attapu			2	7%
Savannakhet - Xekong			1	4%
Savannakhet - Attapu			2	7%
Vietnam - Pakxe			1	4%
Salavan - Attapu			2	7%
Lao Ngam - Xekong			2	7%
Xekong - Salavan			1	4%
Xekong - Thateng			6	21%
Xekong - Bachiangchaleunsouk			1	4%
Xekong - Pakxe			1	4%
Pakxong - Xekong			2	7%
Pakxong - Thateng			1	4%
Champasak - Xekong			1	4%
Champasak - Attapu			1	4%
Attapu - Thateng			2	7%
Attapu - Pakxong			1	4%
9. Medium bus *(16-39 seats, including truck conversions)*				
13	26.8	17.5		
	Load factor:	65%		
Origins and destinations				
Vietnam - Xekong			1	8%
Vietnam - Pakxe			4	31%
Vietnam - Lao Ngam			1	8%
Xekong - Thateng			1	8%
Xekong - Pakxe			1	8%
Pakxe - Attapu			2	15%
Attapu - Salavan			3	23%
10. Large Bus				
28	44.9	30.3		
	Load factor:	67%		
Origins and destinations				
Vientiane - Attapu			16	57%
Xekong - Vientiane			1	4%
Pakxe - Attapu			8	29%
Attapu - Xekong			1	4%
Attapu -Salavan			1	4%
Xaisettha - Attapu (?)			1	4%

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD NR 16: THATENG-LAMAM BORDER (Xekong Province)

				Number of Trucks by Commodity											
Number Surveyed	**Average Capacity**	**Average Load, all**	**Average Load,**	**0 E**	**1 Perish.**	**2 Agr.**	**3 Live**	**4 Timber**	**5 Fd & Dr**	**6 Eqt**	**7 Manf.**	**8 Bulk**	**9 Constr.**	**10 Fuel etc.**	**11 Misc**
11. Light goods vehicles (LGV) *(average vehicle occupancy 2.7 persons)*															
148	5.5	28%	80%												
Vehicle origins and destinations			***Total***	61%	7%	2%	3%	4%	4%	3%	5%	1%	5%	0%	1%
Local (Lamam District)			2	2											
Local (Thateng District)			4	2				2							
Vientiane - Attapu			1	1											
Savannakhet - Kaum			1										1		
Vietnam - Pakxe			1						1						
Salavan - Xekong			2	1					1						
Xekong - Salavan			7	6	1										
Xekong - Thateng			43	36	2		2	1			1		1		
Xekong - Pakxe			3	1			1			1					
Xekong - Champasak			1		1										
Lamam - Attapu			1												1
Thateng - Lamam			1	1											
Thateng - Xekong			41	23	4	1		2	1	1	5	1	3		
Thateng - Pakxong			1	1											
Thateng - Attapu			3	1									2		
Thateng - Xaisettha			2		1					1					
Pakxe - Xekong			1							1					
Pakxe - Attapu			3	1				1			1				
Sanasomboun - Xekong			1	1											
Pakxong - Xekong			1			1									
Pakxong - Thateng			2	1									1		
Champasak - Xekong			1		1										
Champasak - Attapu			3	1	1	1									
Attapu - Savannakhet			2	1											1
Attapu - Laio Ngam			1	1											
Attapu - Thateng			2	2											
Attapu - Pakxe			8	4			1		3						
Xaisettha - Salavan			1	1											
Xaisettha - Thateng			1	1											
Xanxai - Lao Ngam			1	1											
12. Medium goods vehicles (MGV) (2 axles) *(average vehicle occupancy 2.4 persons)*															
20	11.8	55%	93%												
Vehicle origins and destinations			***Total***	40%	0%	10%	0%	0%	15%	5%	25%	0%	0%	0%	5%
Vientiane - Attapu			1							1					
Khammouan - Attapu			1	1											
Savannakhet - Attapu			1								1				
Salavan - Xekong			2			2									
Xekong - Thateng			3	2											1
Xekong - Pakxe			1	1											
Xekong - Pakxong			2	2											
Thateng - Xekong			3	2							1				
Thateng - Attapu			1						1						
Pakxe - Attapu			3						1		2				
Champasak - Attapu			2						1		1				
13. Heavy goods vehicles (HGV) (3-4 axles) *(average vehicle occupancy 1.2 persons)*															
17	23.4	40%	85%												
Vehicle origins and destinations			***Total***	53%	0%	0%	0%	6%	0%	0%	0%	18%	6%	18%	0%
Savannakhet - Attapu			1											1	
Lao Ngam - Xekong			1	1											
Xekong - Salavan			2	2											
Xekong - Thateng			4	2								2			
Thateng - Xekong			4	2				1				1			
Thateng - Xaisettha			1	1											
Pakxe - Attapu			1											1	
Bachiangchaleunsouk - Attapu			1										1		
Attapu - Pakxe			1											1	
Attapu local (?)			1	1											
14. Very heavy goods vehicles (VHGV) (five or more axles) *(average vehicle occupancy 1.5 persons)*															
25	47.9	55%	93%												
Vehicle origins and destinations			***Total***	44%	0%	0%	0%	8%	16%	4%	4%	0%	16%	8%	0%
Local (Lamam District)			1	1											
Local (Attapu) ?			1	1											
Salavan - Xekong			1					1							
Xekong - Pakxe			1	1											
Xekong - Pakxong			1	1											
Thateng - Xekong			2	1									1		
Pakxe - Vietnam			3					1		1	1				
Pakxe - Attapu			4	1									1	2	
Pakxe - Xaisettha			2										2		
Pakxong - Savannakhet			1	1											
Champasak - Attapu			1						1						
Attapu - Vietnam (?)			1	1											
Attapu - Salavan			1	1											
Attapu - Pakxe			3	1					2						
Attapu - Bachiangchaleunsouk			2	1					1						

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD PR 9001: Xanxai (north of B. Pa-am) (Attapu Province)

		Journey Purpose						
Number Surveyed	**Average Occupancy**	**1 TFW**	**2 EB**	**3 PB**	**4 Ed**	**5 Med**	**6 VFR**	**7 RT**
1. Bicycles								
1	1.5	1			1			
		100%						
Origins and destinations (both directions)								
Local Xanxai District)		4	#DIV/0!					
3. Hand tractors or agricultural tractors								
6	2.0	6						
		100%						
Origins and destinations (both directions)								
Local (Xanxai District)		82	1367%					
4. Motor cycles								
231	1.5	128	2	5	2	1	86	7
		55%	1%	2%	1%	0%	37%	3%
Origins and destinations (both directions)								
Local (Xanxai District)		207	90%					
Attapu - Xanxai		6	3%					
Xaisettha - Xanxai		14	6%					
Samakhixai - Xanxai		2	1%					
Sanamxai - Xanxai		1	0%					
5. Tuk-tuks/Jumbos								
1	6.0							
Origins and destinations (both directions)								
Local (Xanxai District)		1	100%					
6. Passenger cars								
0								
7. Light delivery vehicles (including light four-wheel drive vehicles)								
18	3.3	5	1	2			5	5
		28%	6%	11%			28%	28%
Origins and destinations (both directions)								
Local (Xanxai District)		9	50%					
Savannakhet - Xanxai		1	6%					
Attapu - Xanxai		5	28%					
Xaisettha - Xanxai		2	11%					
Samakhixai - Xanxai		1	6%					

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD PR 9001: XANXAI (north of B. Pa-am) (Attapu Province)

				Number of Trucks by Commodity											
Number Surveyed	**Average Capacity**	**Average Load, all**	**Average Load,**	**0 E**	**1 Perish.**	**2 Agr.**	**3 Live**	**4 Timber**	**5 Fd & Dr**	**6 Eqt**	**7 Manf.**	**8 Bulk**	**9 Constr.**	**10 Fuel etc.**	**11 Misc**
11. Light goods vehicles (LGV) *(average vehicle occupancy 2.5 persons)*															
2	6.0	25%	50%												
Vehicle origins and destinations			***Total***	50%	50%										
Local (Xanxai District)			2	1	1										
12. Medium goods vehicles (MGV) (2 axles) *(average vehicle occupancy 2.0 persons)*															
1	14.1	0%													
Vehicle origins and destinations			***Total***	100%											
Attapu - Xanxai			1	1											
13. Heavy goods vehicles (HGV) (3-4 axles) *(average vehicle occupancy 1.6 persons)*															
6	23.2	18%	100%												
Vehicle origins and destinations			***Total***	83%				17%							
Local (Xanxai District)			3	3											
Xaisettha - Sanxai			1					1							
Xanxai - Xaisettha			2	2											

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD NR 18B: Km 52 (Phouvong District, Attapu Province)

		Journey Purpose						
Number Surveyed	**Average Occupancy**	**1 TFW**	**2 EB**	**3 PB**	**4 Ed**	**5 Med**	**6 VFR**	**7 RT**
6. Passenger cars								
62	2.4	36	6	13			3	4
		58%	10%	21%			5%	6%
Origins and destinations (both directions)								
Vientiane - Vietnam		1	2%		Champasak - VN borde		1	2%
Savannakhet - Vietnam		1	2%		Attapu - Xaisettha		1	2%
Vietnam - Pakxe		1	2%		Attapu - Phouvong		2	3%
Vietnam - Champasak		2	3%		Xaisettha local		2	3%
Vietnam - Attapu		24	39%		Sanamxai - Vietnam		1	2%
Vietnam - Xaisettha		9	15%		Xanxai - Phouvong		1	2%
Vietnam border - Attapu		10	16%		Xanxai - Pakxe		1	2%
VN border - Sanamxai		1	2%		Phouvong - Vietnam		1	2%
Xekong - Vietnam		1	2%		Phouvong - Xaisettha		1	2%
Pakxong - Vietnam		1	2%					
7. Light delivery vehicles (including light four-wheel drive vehicles)								
151	2.3	101	23	15			4	8
		67%	15%	10%			3%	5%
Origins and destinations (both directions)								
Vientiane - Vietnam		1	1%		Lao Ngam - VN border		1	1%
Khammouan - Vietnam		1	1%		Xekong - Vietnam		2	1%
Vietnam - Pakxe		3	2%		Xekong - VN border		1	1%
Vietnam - Champasak		3	2%		Xekong - Kalum		1	1%
Vietnam - Attapu		51	34%		Kalum - VN border		1	1%
Vietnam - Xaisettha		11	7%		Pakxong - VN border		1	1%
Vietnam - Xanxai		3	2%		Champasak - VN borde		1	1%
Vietnam border - Pakxe		5	3%		Attapu - Phouvong		7	5%
Vietnam border - Attapu		36	24%		Attapu - Xasettha		2	1%
VN border - Xaisettha		3	2%		Xaisettha local		14	9%
VN border - Salavan		1	1%		Phouvong - Xaisettha		1	1%
Lao Ngam - Vietnam		1	1%					

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD NR 18B: Km 52 (Phouvong District, Attapu Province)

Number Surveyed	Average Capacity	Average Occupancy		
8. Sonteo *(commercial pickup on passenger service)* **or minibus**				
19	14.9	9.5		
	Load factor:	64%		
Origins and destinations				
Local (within Xaisettha District)			1	5%
Vietnam - Attapu			14	74%
Vietnam - Sanamxai			1	5%
VN border - Thateng			1	5%
VN border - Xanxai			1	5%
Xaisettha - Vitenam			1	5%
9. Medium bus *(16-39 seats, including truck conversions)*				
44	30.2	20.7		
	Load factor:	69%		
Origins and destinations				
Xiangkhouang - Vietnam			1	2%
Vietnam - Pakxe			14	32%
Vietnam - Attapu			23	52%
Vietnam - Xaisettha			2	5%
Xekong - Vietnam			1	2%
Champasak - Vietnam			1	2%
VN border - Attapu			1	2%
Phouvong - Vietnam			1	2%
10. Large Bus				
8	45	21.9		
	Load factor:	49%		
Origins and destinations				
Vitenam - Attapu			6	75%
Vietnam - Salavan			1	13%
VN border - Salavan			1	13%

ORIGIN-DESTINATION SURVEY ANALYSIS

ROAD NR 18B: Km 52 (Phouvong District, Attapu Province)

				Number of Trucks by Commodity											
Number Surveyed	**Average Capacity**	**Average Load, all**	**Average Load,**	**0 E**	**1 Perish.**	**2 Agr.**	**3 Live**	**4 Timber**	**5 Fd & Dr**	**6 Eqt**	**7 Manf.**	**8 Bulk**	**9 Constr.**	**10 Fuel etc.**	**11 Misc**
11. Light goods vehicles (LGV) *(average vehicle occupancy 2.4 persons)*															
13	5.7	8%	100%												
Vehicle origins and destinations			***Total***	92%	0%	0%	0%	0%	8%	0%	0%	0%	0%	0%	0%
Local (Xaisettha District)			4	4											
Local (Samakhixai District) ?			1	1											
Vietnam - Attapu			2	1					1						
Attapu - Vietnam			1	1											
Attapu - Vietnam border			1	1											
Xaisettha - Attapu			2	2											
Xaisettha - Phouvong			2	2											
12. Medium goods vehicles (MGV) (2 axles) *(average vehicle occupancy 2.7 persons)*															
7	11.5	10%	23%												
Vehicle origins and destinations			***Total***	57%	0%	14%	0%	14%	0%	0%	14%	0%	0%	0%	0%
Local (Xaisettha District)			1					1							
Vietnam - Salavan			1								1				
Vietnam - Attapu			1	1											
Attapu - Vietnam			1	1											
Attapu - VN border			2	1		1									
Xaisettha - Vietnam			1	1											
13. Heavy goods vehicles (HGV) (3-4 axles) *(average vehicle occupancy 1.3 persons)*															
52	23.0	48%	118%												
Vehicle origins and destinations			***Total***	60%	0%	0%	0%	0%	0%	0%	2%	33%	6%	0%	0%
Local (Xaisettha District)			30	14								16			
Local (Samakhixai District) ?			2	1								1			
Vietnam - Salavan			1								1				
Attapu - Vietnam			6	6											
Xaisettha - Vietnam			6	6											
Xaisettha - Attapu			2										2		
Xaisettha - Phouvong			3	3											
Attapu - VN border			1	1											
Phouvong - Xaisettha			1										1		
14. Very heavy goods vehicles (VHGV) (five or more axles) *(average vehicle occupancy 1.3 persons)*															
75	49.6	10%	68%												
Vehicle origins and destinations			***Total***	87%	0%	0%	0%	7%	0%	1%	0%	0%	5%	1%	0%
Local Xaisettha District)			2	2											
Vietnam - Vietnam ?			1	1											
Vietnam - Salavan			2	2											
Vietnam - Attapu			9	8										1	
Vietnam - Xaisettha			14	10									4		
Vietnam - Phouvong			17	17											
VN border - Xaisettha			1	1											
Attapu - Vietnam			1	1											
Xaisettha - Vietnam			22	18				4							
Xaisettha - Phouvong			1	1											
Xanxai - Vietnam			2	2											
Phouvong - Vietnam			3	2				1							
Phouvong - Attapu			1							1					

Appendix 3

Vehicle Registration Statistics

Appendix 3 - Vehicle Registrations in the Lao PDR and the Southern Provinces, Plus Annual Growth Rates

Vehicle Registrations 2005-2014 in Lao PDR

Year	Vehicle Type								Total
	Motorcycles		Light Vehicles				Heavy Vehicles		
	Two wheels	Three Wheels	Cars	Pickup	Minibus	Jeep	Trucks	Buses	
2005	337,719	8,043	11,204	42,994	4,862	7,909	13,441	4,234	430,406
2006	453,158	8,441	12,939	59,519	7,236	8,668	15,296	3,033	568,290
2007	509,421	8,518	14,792	68,360	9,355	10,399	17,994	2,242	641,081
2008	623,310	8,460	15,203	77,616	12,675	9,752	19,070	2,520	768,606
2009	711,800	8,624	17,671	93,080	18,634	10,801	23,031	2,707	886,348
2010	804,087	8,542	21,638	109,362	24,727	12,155	25,452	2,825	1,008,788
2011	899,436	8,537	27,901	127,913	22,156	24,052	28,673	3,190	1,141,858
2012	1,005,047	8,588	35,514	147,497	37,831	17,231	33,460	3,532	1,288,700
2013	1,112,072	8,601	43,860	162,633	50,124	19,876	38,454	3,861	1,439,481

Annual Growth in Vehicle Registrations 2005-2014 in Lao PDR

Year	Vehicle Type								Total
	Motorcycles		Light Vehicles				Heavy Vehicles		
	Two wheels	Three Wheels	Cars	Pickup	Minibus	Jeep	Trucks	Buses	
2005									
2006	34%	5%	15%	38%	49%	10%	14%	-28%	32%
2007	12%	1%	14%	15%	29%	20%	18%	-26%	13%
2008	22%	-1%	3%	14%	35%	-6%	6%	12%	20%
2009	14%	2%	16%	20%	47%	11%	21%	7%	15%
2010	13%	-1%	22%	17%	33%	13%	11%	4%	14%
2011	12%	0%	29%	17%	-10%	98%	13%	13%	13%
2012	12%	1%	27%	15%	71%	-28%	17%	11%	13%
2013	11%	0%	24%	10%	32%	15%	15%	9%	12%

Vehicle Registrations 2005-2014 in Salavan

Year	Vehicle Type								Total
	Motorcycles		Light Vehicles				Heavy Vehicles		
	Two wheels	Three Wheels	Cars	Pickup	Minibus	Jeep	Trucks	Buses	
2005	8,783	145	23	757	16	36	245	22	10,027
2006	10,059	148	24	928	19	49	288	22	11,537
2007	11,917	149	33	1,226	31	57	314	21	13,748
2008	13,725	149	35	1,631	56	68	350	24	16,038
2009	15,351	149	41	1,976	111	83	379	27	18,117
2010	16,803	149	49	2,314	172	87	400	28	20,002
2011	17,979	149	67	2,657	235	101	410	32	21,630
2012	19,547	149	91	3,049	320	120	466	35	23,777
2013	20,697	149	109	3,401	367	148	480	35	25,386

Annual Growth in Vehicle Registrations 2005-2014 in Salavan

Year	Vehicle Type								Total
	Motorcycles		Light Vehicles				Heavy Vehicles		
	Two wheels	Three Wheels	Cars	Pickup	Minibus	Jeep	Trucks	Buses	
2005									
2006	15%	2%	4%	23%	19%	36%	18%	0%	15%
2007	18%	1%	38%	32%	63%	16%	9%	-5%	19%
2008	15%	0%	6%	33%	81%	19%	11%	14%	17%
2009	12%	0%	17%	21%	98%	22%	8%	13%	13%
2010	9%	0%	20%	17%	55%	5%	6%	4%	10%
2011	7%	0%	37%	15%	37%	16%	2%	14%	8%
2012	9%	0%	36%	15%	36%	19%	14%	9%	10%
2013	6%	0%	20%	12%	15%	23%	3%	0%	7%

Vehicle Registrations 2005-2014 in Xekong

Year	Vehicle Type								Total
	Motorcycles		Light Vehicles				Heavy Vehicles		
	Two wheels	Three Wheels	Cars	Pickup	Minibus	Jeep	Trucks	Buses	
2005	1,736	18	21	241	0	33	95	16	2,160
2006	1,968	19	25	270	0	39	104	13	2,438
2007	2,238	19	25	318	0	39	115	15	2,769
2008	2,911	20	32	383	0	45	130	17	3,538
2009	3,753	20	40	556	22	68	162	17	4,638
2010	4,546	20	45	629	32	70	173	19	5,534
2011	4,934	20	53	687	56	77	205	22	6,054
2012	5,324	20	59	776	67	93	222	22	6,583
2013	5,741	20	69	867	75	106	239	23	7,140

Annual Growth in Vehicle Registrations 2005-2014 in Xekong

Year	Vehicle Type								Total
	Motorcycles		Light Vehicles				Heavy Vehicles		
	Two wheels	Three Wheels	Cars	Pickup	Minibus	Jeep	Trucks	Buses	
2005									
2006	13%	6%	19%	12%	#DIV/0!	18%	9%	-19%	13%
2007	14%	0%	0%	18%	#DIV/0!	0%	11%	15%	14%
2008	30%	5%	28%	20%	#DIV/0!	15%	13%	13%	28%
2009	29%	0%	25%	45%	#DIV/0!	51%	25%	0%	31%
2010	21%	0%	13%	13%	45%	3%	7%	12%	19%
2011	9%	0%	18%	9%	75%	10%	18%	16%	9%
2012	8%	0%	11%	13%	20%	21%	8%	0%	9%
2013	8%	0%	17%	12%	12%	14%	8%	5%	8%

Vehicle Registrations 2005-2014 in Attapu

Year	Vehicle Type								Total
	Motorcycles		Light Vehicles				Heavy Vehicles		
	Two wheels	Three Wheels	Cars	Pickup	Minibus	Jeep	Trucks	Buses	
2005	2,356	35	15	272	14	55	105	21	2,873
2006	3,186	38	17	309	30	66	126	43	3,815
2007	3,737	38	27	359	39	73	132	45	4,450
2008	4,448	39	37	438	57	76	154	49	5,298
2009	5,341	52	49	522	71	77	165	51	6,328
2010	5,743	52	56	581	87	78	193	51	6,841
2011	6,626	52	78	744	133	95	212	51	7,991
2012	7,408	52	108	909	194	120	258	53	9,102
2013	8,303	52	128	1,107	220	129	286	54	10,279

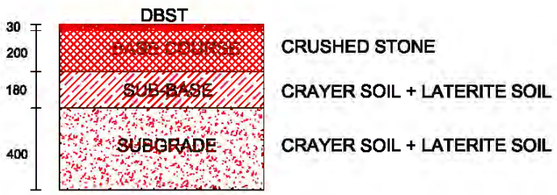
Annual Growth in Vehicle Registrations 2005-2014 in Attapu

Year	Vehicle Type								Total
	Motorcycles		Light Vehicles				Heavy Vehicles		
	Two wheels	Three Wheels	Cars	Pickup	Minibus	Jeep	Trucks	Buses	
2005									
2006	35%	9%	13%	14%	114%	20%	20%	105%	33%
2007	17%	0%	59%	16%	30%	11%	5%	5%	17%
2008	19%	3%	37%	22%	46%	4%	17%	9%	19%
2009	20%	33%	32%	19%	25%	1%	7%	4%	19%
2010	8%	0%	14%	11%	23%	1%	17%	0%	8%
2011	15%	0%	39%	28%	53%	22%	10%	0%	17%
2012	12%	0%	38%	22%	46%	26%	22%	4%	14%
2013	12%	0%	19%	22%	13%	8%	11%	2%	13%

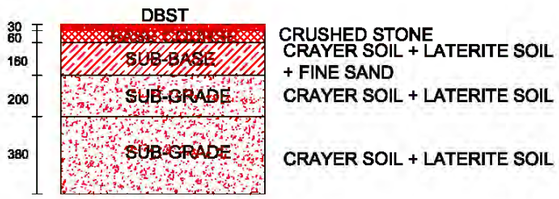
Source: MPWT, Department of Transport

Annex P – Geotechnical Investigations [Pavement Sub-surfaces]

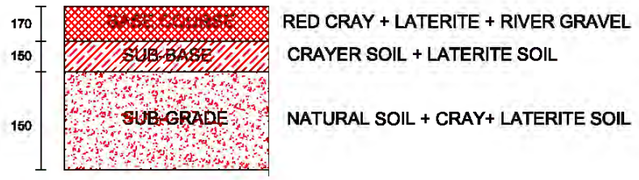
Road NR20
KM 6+200 & KM 21+000



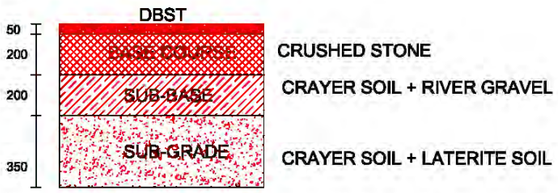
Road LR 6901
KM 4+000



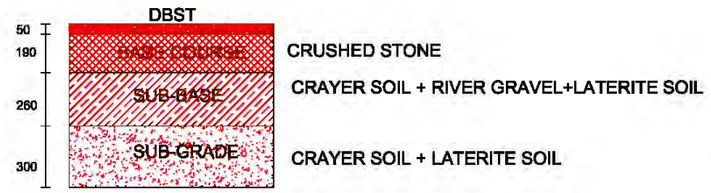
Road LR 6901
KM 18+000



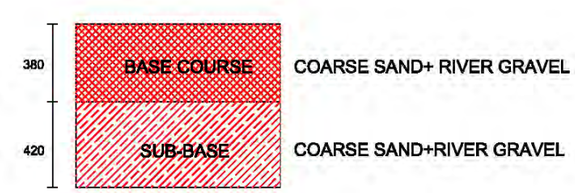
Road 18B
KM 18+000



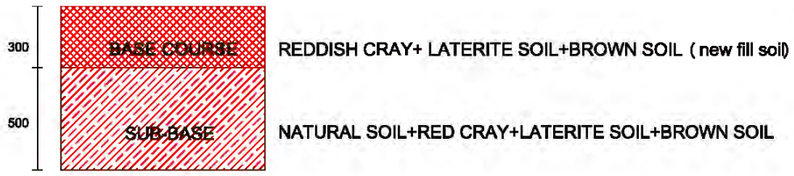
Road 18B
KM 66+000



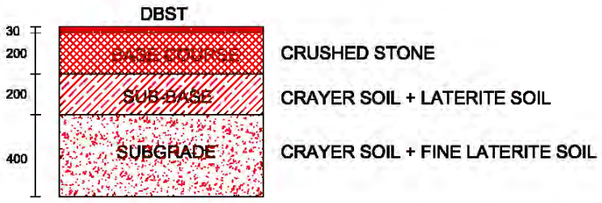
Road 9001
KM 36+000



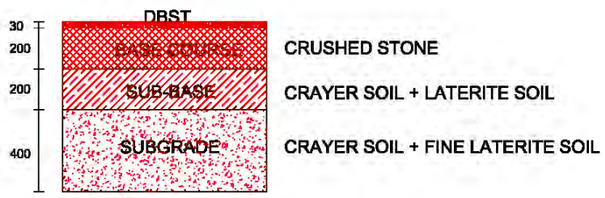
Road 9001
KM 40+900



Road NR16
KM 6+020

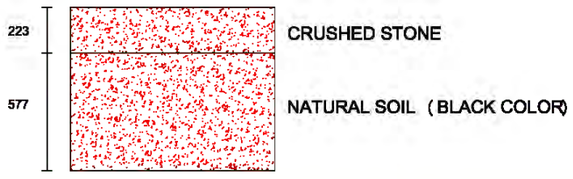


Road NR16
KM 42+980



Road NR7615
KM 6+000

Road NR7615
KM 28+000



ORIENTAL CONSULTANTS CO., LTD.
INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC.
MEKONG CONSULTANTS CO. LTD

TITLE	NAME	SIGNATURE
PREPARED BY		
CHECKED BY		
APPROVED BY		

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC
MINISTRY OF PUBLIC WORKS AND TRANSPORT

ADB TA - 8492 LAO
ROAD MAINTENANCE PROJECT (47085 - 001)

DRAWING TITLE: EXISTING ROAD STRUCTURE

REV. No.	DATE	DESCRIPTION
A	29-OCT-2014	
-		
-		
-		

SCALE: NONE

DRAWING No.:

Summary DCP Value And CBR Survey Road

Road No.7615				
No.	Location	yarer	DC P Value (mm/blow)	CBR (%)
1	06+000	Base Course Sub Base	3.67	83.28
		Sub-grade	3.12	101.89
	11+000	Base Course Sub Base	15.98	34.14
		Sub-grade	36.12	4.5
	15+000	Base Course Sub Base	10.32	31.86
		Sub-grade	26.39	7.04
	18+000	Base Course Sub Base	20	11.42
		Sub-grade	31.95	5.18
Road NR-16				
No.	Location	yarer	DC P Value (mm/blow)	CBR (%)
2	06+000	Base Course Sub Base	8.49	29.4
		Sub-grade	9.57	27.3
	11+050	Base Course Sub Base	7.15	35.5
		Sub-grade	20.50	13.7
	16+000	Base Course Sub Base	10.43	22.6
		Sub-grade	15.4	17.1
	22+000	Base Course Sub Base	4.8	94.0
		Sub-grade	9.9	28.1
	35+000	Base Course Sub Base	513.0	55.9
		Sub-grade	12.0	25.9
	42+980	Base Course Sub Base	5.9	51.6
		Sub-grade	10.4	23.8

REMARK: DCP AND CBR VALUE IS AVERAGE VALUE

Road No.20				
No.	Location	yarer	DC P Value (mm/blow)	CBR (%)
1	06+200	Base Course Sub Base	11.57	20.6
		Sub-grade	17.07	12.8
	21+000	Base Course Sub Base	4.35	72.7
		Sub-grade	15.28	17.1
	30+000	Base Course Sub Base	15.74	31.4
		Sub-grade	22.3	11.2
	35+000	Base Course Sub Base	13.2	18.6
		Sub-grade	23.3	16.5
	42+100	Base Course Sub Base	12.6	18.6
		Sub-grade	24.3	12.0
	45+000	Base Course Sub Base	23.8	7.5
		Sub-grade	50.0	3.6
Road No.6901				
No.	Location	yarer	DC P Value (mm/blow)	CBR (%)
2	04+000	Base Course Sub Base	7.38	40.32
		Sub-grade	2.94	107.72
	10+000	Base Course Sub Base	31.25	5.94
		Sub-grade	65.84	3.78
	18+000	Base Course Sub Base	7.42	36.75
		Sub-grade	7.6	32

REMARK: DCP AND CBR VALUE IS AVERAGE VALUE

Road No.9001				
No.	Location	yarer	DC P Value (mm/blow)	CBR (%)
1	17+000	Base Course		
		Sub Base	2.54	130.6
		Sub-grade	20.00	176.5
	36+000	Base Course		
		Sub Base	3.16	103.3
		Sub-grade	2.08	167.5
	40+900	Base Course		
		Sub Base	8.00	32.6
		Sub-grade	21.8	9.0
Road NR-18B				
2	18+000	Base Course		
		Sub Base	4.17	79.42
		Sub-grade	7.03	38.15
	28+000	Base Course		
		Sub Base	6.33	41.15
		Sub-grade	8.25	30.08
	38+000	Base Course		
		Sub Base	6.34	53.54
		Sub-grade	4.59	63.22
	49+000	Base Course		
		Sub Base	14.22	16.51
		Sub-grade	11.25	23.07
	55+000	Base Course		
		Sub Base	15.27	13.67
		Sub-grade	5.37	51.98
	65+000	Base Course		
		Sub Base	11.39	22.28
		Sub-grade	4.04	74.91
	66+050	Base Course		
		Sub Base	20.28	10.71
		Sub-grade	17.41	15.39
	69+100	Base Course		
		Sub Base	5.37	59.05
		Sub-grade	6.03	51.75
	70+100	Base Course		
		Sub Base	6.59	49.06
		Sub-grade	4.49	57.72
	76+950	Base Course		
		Sub Base	10.33	26.84
		Sub-grade	6.14	51.35
	80+000	Base Course		
		Sub Base	6.72	44.39
		Sub-grade	3.75	95.07
	100+000	Base Course		
		Sub Base	15.09	22.83
		Sub-grade	6.03	47.71

REMARK: DCP AND CBR VALUE IS AVERAGED VALUE

Sampling (Material Test) Road

1. Implementation

The investigation was commenced on 26 September 2014 and finished on 5 October 2014. The purpose of the soil investigations was to clarify the soil composition at the site and to determine the depth, and the thickness

2. Survey Location

Project is located regional Sekong, Salavan and Attapeu province, The soil was taken 2 samplings for each Road (2 Layers: Sub Base and Sub-grade) The total of samplings were 12 samplings

Table 2.1 Survey Location

Province	Road Number	Point Sampling
Sekong	No.7615	1. Km 06+000
		2. Km 18+000
	NR-16	1. Km 60+000
		2. Km 42+980
Salavanh	No.20	1. Km 06+200
		2. Km 21+000
	No.6901	1. km 04+000
		2. km 18+000
Attapeu	No.9001	1. Km 36+000
		2. Km 49+900
	NR-18B	1. Km 18+000
		2. Km 66+050

Table 2.2 Test Results Summary

Province	Road No.	Field Test Location	Field CBR		Lab Test Sample Location	Test Result [95%]	
			Sub-base	Sub-grade		Sub-base	Sub-grade
Xekong	LR-7615	1. 6+000	83.3	101.9*	6+000	n/a	9.0
		2. 11+000	34.1	4.5		-	-
		3. 15+000	31.9	7.0		-	-
		4. 18+000	11.4	5.2	18+000	26.0	12.0
	NR-16	1. 6+000	29.4	27.3	6+000	8.2	14.0
		2. 11+050	35.5	13.7		-	
		3. 16+000	22.6	17.1		-	
		4. 22+000	94.0	28.1		-	
		5. 35+000	55.9	25.9		-	
		6. 42+980	51.6	23.8	42+980	18.0	17.0
1 Salavan	NR-20	1. 6+200	20.6	12.8	6+200	18.0	17.0
		2. 21+000	72.7*	17.1	21+000	17.5	18.0
		3. 30+000	31.4	11.2		-	-
		4. 35+000	18.6	16.5		-	-
		5. 42+100	18.6	12.0		-	-
		6. 45+000	7.5	3.6		-	-
	LR-6901	1. 4+000	40.3	107.7*	4+000	25.5	26.5
		2. 10+000	5.9	3.8		-	-
		3. 18+000	36.8	32.0	18+000	25.5	23.0
Attapeu	LR-9001	1. 17+000	130.6*	176.5*		-	-
		2. 36+000	103.3*	167.5*	36+000	26.0	26.0
		3. 40+900	32.6	9.0	40+900	12.0	9.6
	NR-18B	1. 18+000	79.4	38.2	18+000	25.8	29.0
		2. 28+000	41.2	30.1		-	-
		3. 38+000	53.5	63.2*		-	-
		4. 49+000	16.5	23.1		-	-
		5. 55+000	13.7	52.0		-	-
		6. 65+000	22.3	74.9*		-	-
		7. 66+050	10.7	15.4	66+050	26.6	26.0
		8. 69+100	59.1	51.8		-	-
		9. 70+100	49.1	57.7*		-	-
		10. 76+950	26.8	51.4		-	-
		11. 80+000	44.4	95.1*		-	-
		12. 100+000	22.8	47.7		-	-
	No. of Field Tests = 34 x 2 layers				No. of Lab. Tests = 12 x 2 layers		

** High values likely due to presence of boulders*

2.2 Technical of investigation

Selected representative samples was taken from each soil strata and tested in accordance with ASHTO standards. The detail of testing is given as follows

Sub base (Soil Cement) AASHTO M145-146	**Sub-grade (Soil) AASHTO M145-146**
. Grading/Sieve	. Grading/Sieve
. Moisture Contents (MC)	. Moisture Contents (MC)
. Specific Gravity	. Specific Gravity
. Atterberg Limits	. Atterberg Limits
. Compaction (MDD,OMC & NMC*)	. Compaction (MDD,OMC & NMC*)
. 4Day soaked CBR (95%)	. 4Day soaked CBR (95%)
. 4 Day Soaked Swell Index	. 4Day soaked Swell Index
. Flakiness Index	. Unconfined Compressive Strength (UCS)
. Uniformity Coefficient	. Unconfined Compressive Strength (UCS)

3. The objective of geological investigation

   The objective of geological investigation is find out the quality of soil which were very strong and to provide the information for computed design and stable construction for next step.

4. Summaries of Laboratory Test Results

Xekong Province

TEST SUMMARY FOR EXISTING SUBBASE COURSE and SUBGRADE
ADB-TA 8492 LAO: ROAD SECTOR GOVERNANCE & MAINTENANCE PROJECT

No	Sample No	Location	Grading (% Passing)											Atterberg Test			AASHTO M-145	Uniformity Coefficient	Plastic Modulus	Swell Index	Unconfined Compresssive Strength	Specific Gravity	Field Density		Proctor AASTHTO T180 -D		CBR at percent of MDD AASHTO T-193			REMARKS
			50.0	37.5	25.0	19.0	12.50	9.50	4.75	2.00	0.425	0.150	0.075	LL	PL	PI							DD	MC	MDD	OMC	100	98	95	
		KM	%	%	%	%	%	%	%	%	%	%	%	%	%	%		%	%	%	%	%	g/cm^3	%	%	%	%	%	%	
Xekong NR-16																														
1	TP-01.S1	42+980	100	100	100	78.0	67.1	59.1	54.1	29.9	25.4	21.9	19.7	52.0	25.9	26.1	A-2-7	388.9	662.7	0.40	-	2.4	1.3	32.9	1.7	21.5	25.5	21.5	18.0	SB
1	TP-01.S2	42+980	100	100	100	87.3	80.2	77.0	66.1	52.0	42.8	39.3	37.5	50.0	26.1	23.9	A-7-6	-	1021.7	0.43	56.76	2.4	1.2	38.6	1.7	21.7	27.0	20.0	17.0	SG
2	TP-02.S1	6+000	100	100	100	93.8	85.7	77.5	63.2	51.3	44.4	41.4	39.5	56.0	34.0	22.0	A-7-5	432.4	974.6	0.24	-	2.4	1.5	29.0	1.8	24.0	15.5	12.5	8.2	SB
2	TP-02.S2	6+000	100	100	100	100	92.6	88.5	75.2	59.6	52.5	48.6	47.2	57.2	30.6	26.6	A-7-5	-	1399.4	0.29	54.57	2.4	1.4	33.5	1.7	23.5	22.0	18.0	14.0	SG
Xekong LR-7615																														
1	TP-01.S1	6+000	100	100	85.2	82.4	78.0	76.7	70.6	60.6	38.4	30.1	28.6	49.0	28.6	20.4	A-2-7	250.0	782.3	0.44	-	2.4	1.2	53.6	1.5	33.5	15.0	11.5	9.0	Layer I
2	TP-02.S1	18+000	100	97.1	95.3	86.8	69.8	64.5	51.3	42.3	33.5	20.9	18.8	21.2	16.4	4.8	A-1-a	159.5	160.1	0.03	-	2.4	1.9	5.9	2.2	8.0	33.0	30.0	26.0	SB
2	TP-02.S2	18+000	100	100	100	100	100	100	99.6	99.0	84.8	62.7	58.9	43.0	21.5	21.5	A-7-6	-	1825.9	0.29	61.12	2.4	1.4	29.3	1.7	22.0	23.0	18.0	12.0	SG

4.1 Salavan Province

TEST SUMMARY FOR EXISTING SUBBASE COURSE and SUBGRADE
ADB TA- 8492 LAO: ROAD SECTOR GOVERNANCE & MAINTENANCE PROJCT

Hole No	Sample No	Location	Grading (% Passing)											Atterberg Test			AASHTO M-145	Uniformity Coefficient	Plastic Modulus	Swell Index	Unconfined Compresssive Strength	Specific Gravity	Field Density		Proctor AASTHTO T180 -D		C B R MDD at percent of AASHTO T-193			REMARKS
			50.0	37.5	25.0	19.0	12.50	9.50	4.75	2.00	0.425	0.150	0.075	LL	PL	PI							DD	MC	MDD	OMC	100	98	95	
		KM	%	%	%	%	%	%	%	%	%	%	%	%	%	%		%	%	%	%	%	g/cm^3	%	%	%	%	%	%	
Salavan NR-20																														
1	TP-01.S1	6+200	100	100	84.1	82.0	71.2	65.1	44.5	29.5	15.0	12.2	10.7	55.0	27.6	27.4	A-2-7	214.3	411.9	0.28	-	2.4	1.6	23.2	1.8	22.8	22.5	20.3	18.0	SB
1	TP-01.S2	6+200	100	100	94.9	84.7	72.1	65.5	50.9	39.2	32.0	27.9	26.6	39.0	20.7	18.3	A-2-6		586	0.15	67.67	2.4	1.8	16.1	1.9	17.0	30.0	25.3	17.0	SG
2	TP-02.S1	21+000	100	100	89.0	83.1	78.4	74.2	61.6	44.1	35.0	27.9	25.9	37.5	23.1	14.4	A-2-6	351.4	504.5	0.42	-	2.4	1.7	21.6	1.9	14.0	25.5	22.3	17.5	SB
2	TP-02.S2	21+000	100	100	84.9	82.9	72.7	67.0	47.4	33.2	19.5	16.7	15.4	41.5	28.0	13.5	A-2-7		262.3	0.08	61.12	2.4	1.4	23.5	1.9	16.0	28.9	23.8	18.0	SG
Salavan NR-6901																														
1	TP-01.S1	4+000	100	100	100	100.0	96.8	94.1	76.9	64.6	48.5	30.9	29.1	35.4	20.5	14.9	A-2-6	500.0	722.6	0.42	-	2.5	2.0	14.8	2.2	10.5	37.0	30.0	25.5	SB
1	TP-01.S2	4+000	100	100	100	94.7	89.3	82.0	59.5	43.0	39.3	32.3	27.6	26.8	16.2	10.6	A-2-6		417.2	0.24	67.67	2.5	1.9	8.8	2.1	12.5	39.0	34.0	26.5	SG
2	TP-02.S1	18+000	100	100	100	100	95.4	90.2	72.7	57.3	51.5	41.1	39.2	25.5	13.6	11.9	A-6	646.2	614.8	0.43	-	2.5	2.1	5.9	2.2	10.5	36.0	30.0	25.5	SB
2	TP-02.S2	18+000	100	100	100	100	97.1	92.5	77.6	64.9	58.9	46.7	37.1	20.2	15.9	4.3	A-3		256	0.45	63.31	2.5	1.8	9.8	2.0	12.5	30.0	26.0	23.0	SG

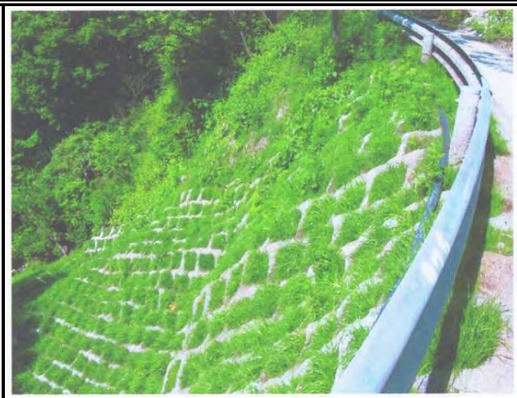
4.2 Attapeu Province

TEST SUMMARY FOR EXISTING SUBBASE COURSE and SUBGRADE
ADB TA-8492 LAO: ROAD SECTOR GOVERNANCE & MAINTENANCE PROJECT

Hole No	Sample No	Location	Grading (% Passing)											Atterberg Test			AASHTO M-145	Uniformity Coefficient	Plastic Modulus	Swell Index	Unconfined Compresssive Strength	Specific Gravity	Field Density		Proctor AASTHTO T180 -D		C B R at percent of MDD AASHTO T-193			REMARKS
			50.0	37.5	25.0	19.0	12.50	9.50	4.75	2.00	0.425	0.150	0.075	LL	PL	PI							DD	MC	MDD	OMC	100	98	95	
		KM	%	%	%	%	%	%	%	%	%	%	%	%	%	%		%	%	%	%	%	g/cm^3	%	%	%	%	%	%	
Attapeu NR-18B																														
1	TP-01.S1	18+100	86.8	71.4	60.5	53.2	50.1	47.4	38.4	29.9	24.8	18.0	16.3	32.5	18.0	14.5	A-2-6	466.7	360.4	0.22	-	2.5	2.0	10.7	2.1	10.0	36.0	31.6	25.8	SB
1	TP-01.S2	18+100	78.3	69.3	62.7	54.9	48.3	42.6	32.3	23.1	19.6	16.3	15.1	33.0	18.9	14.1	A-2-6	-	277.2	0.23	74.2	2.5	1.6	62.4	2.1	10.3	45.0	37.0	29.0	SG
2	TP-02.S1	66+050	100	100	100	93.0	89.3	79.4	64.3	47.4	33.3	27.6	26.6	35.0	21.9	13.1	A-2-6	351.4	436.0	0.17	-	2.5	1.9	12.4	2.0	12.5	34.0	31.0	26.6	SB
2	TP-02.S2	66+050	100	90.9	77.5	72.1	68.2	64.2	57.6	45.2	31.8	26.6	25.1	34.0	22.5	11.5	A-2-6	-	365.7	0.12	69.9	2.5	1.8	18.3	2.2	10.5	34.0	30.0	26.0	SG
Attapeu LR-9001																														
1	TP-01.S1	36+000	74.1	64.9	46.6	45.1	41.6	39.5	36.8	33.3	14.1	8.9	7.5	20.0	17.9	2.1	A-1-b	208.0	30.1	0.1	-	2.6	1.9	7.3	2.0	14.0	34.0	29.0	26.0	SB
1	TP-01.S2	36+000	78.3	64.6	56.9	48.3	39.8	36.7	32.8	28.9	12.4	6.7	4.8	20.8	17.4	3.4	A-1-b	-	42.6	0.1	43.7	2.6	2.0	8.1	2.0	14.0	34.0	28.0	26.0	SG
2	TP-02.S1	40+900	100	100	100	98.7	91.0	83.7	69.4	58.1	50.2	44.1	41.6	52.0	25.1	26.9	A-7-5	280.0	1352.5	0.5	-	2.4	1.4	34.8	1.6	25.0	19.0	15.0	12.0	SB
2	TP-02.S2	40+900	100	100	100	100	100	99.2	97.7	95.2	81.1	66.5	62.7	64.8	41.5	23.3	A-7-6	-	1886.9	0.4	21.8	2.4	1.3	39.1	1.5	34.5	15.9	14.0	9.6	SG

Remarks: TP: Test pit, S: sample, SB: sub-base, SG: sub grade, Layer: layer of soil

Annex Q – Side Slope Treatment Options

	Alternative-1 Concrete Mattress	Alternative-2 Geocell	Alternative-3 Reinforcement
Picture			
Feature	Double layers woven geotextile filled with mortar thick 12 cm. coverd with grass facing	HDPE Honey comb cell with UV resistance thick 10 cm. filled with fertile soil and grass facing	Reinforce soil structure with high strength geo-composite covered with grass facing
Applied Condition	For erosion protection on slope ≤ 70 degree	For erosion protection on slope ≤ 70 degree	For stability increment on slope up to 90 degree
Advantages	- Rapid installation by 400 m2/day - High Durability - Able to install conform to existing slope - Environmental Friendly - Suitable for every soil type	- Easy installation without machine - High Durability - Able to install conform to existing slope - Environmental Friendly	- Increase slope stability - High Durability - Able to make slope up to 90 degree - Environmental Friendly
Disadvantages	- Do not increase slope stability - Need high quality pump	- Do not increase slope stability - Not suitable for soft soil	- Need much working space for anchorage length - Need compaction machine for quality work - More working time than erosion protection only
Workability	Erosion protection for over 10 years	Erosion protection for over 10 years	Stable steep slope with erosion erotection for over 10 years
Price	48.5 (USD/m2)	30.3 (USD/m2)	up to design in each area (USD/m2)
Evaluation	Highly Recommend	Recommend	Recommend in necessary area where need steep slope

BOQ for Erosion Protection by Concrete Mattress

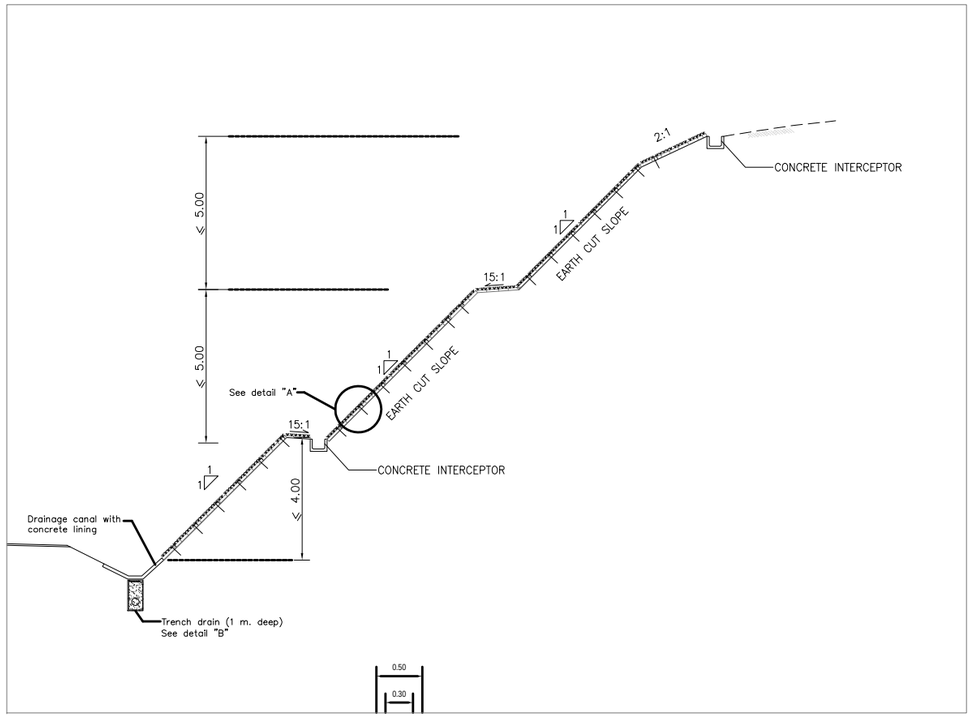
No.	Items	Unit	Amount	Material		Labour		Total Cost (USD)
				Cost/Unit (USD)	Amount (USD)	Cost/Unit (USD)	Amount (USD)	
1	Concrete Mattress	m2	1.00	10.00	10.00	5.00	5.00	15.00
	+ Import Tax	m2	1.00	2.00	2.00	0.00	0.00	2.00
	+ VAT 10%	m2	1.00	1.00	1.00	0.00	0.00	1.00
2	Filled Concrete Mortar	m2	1.00	20.00	20.00	5.00	5.00	25.00
3	Filled Grass Facing	m2	1.00	2.50	2.50	3.00	3.00	5.50
5	Machine Removing (15,000 USD / project)	L.S.	-	-	-	-	-	
	Total Cost (USD/50 m.)							**48.50**
	Total Cost (Factor F = 1.20)							**58.20**

BOQ for Erosion Protection by Geocell

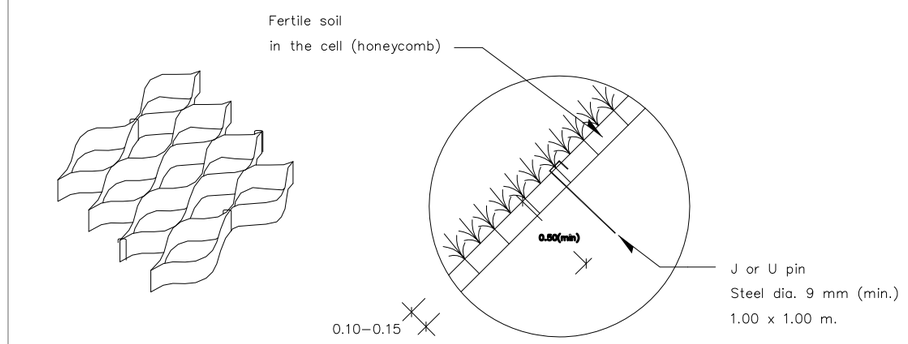
No.	Items	Unit	Amount	Material		Labour		Total Cost (USD)
				Cost/Unit (USD)	Amount (USD)	Cost/Unit (USD)	Amount (USD)	
1	Geocell Depth 100 mm.	m2	1.00	11.00	11.00	5.00	5.00	16.00
	+ Import Tax	m2	1.00	2.20	2.20	0.00	0.00	2.20
	+ VAT 10%	m2	1.00	1.10	1.10	0.00	0.00	1.10
2	Fertile Soil	m2	1.00	2.50	2.50	3.00	3.00	5.50
3	Grass Facing	m2	1.00	2.50	2.50	3.00	3.00	5.50
4	Machine Removing (15,000 USD / project)	L.S.	-	-	-	-	-	
	Total Cost (USD/m2)							**30.30**
	Total Cost (Factor F = 1.20)							**36.36**

SLOPE PROTECTION(18B)

CROSS SECTION

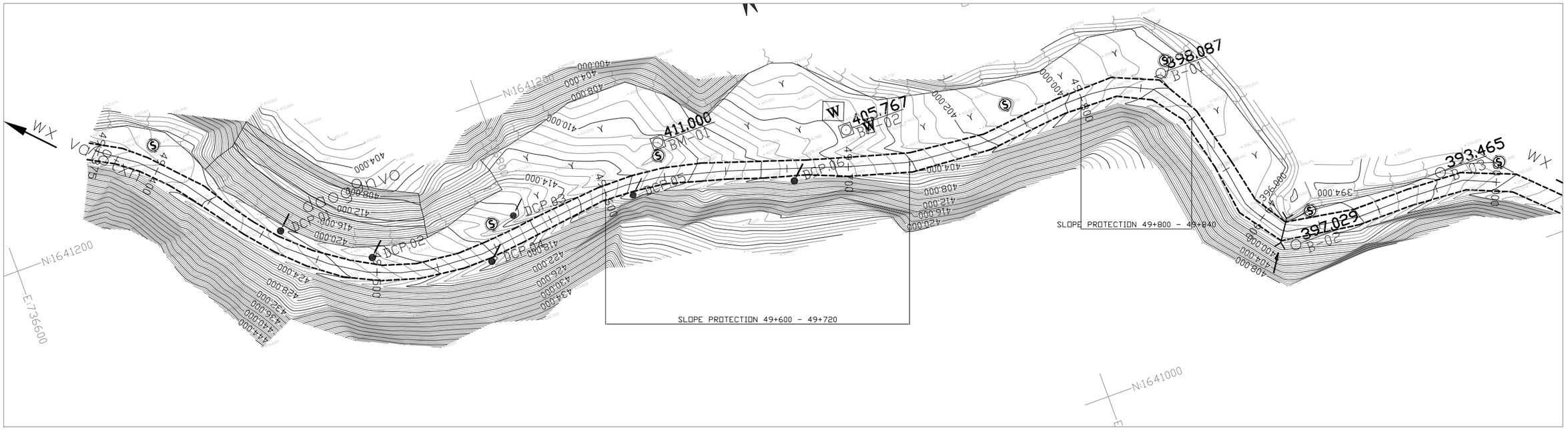


DETAIL



Detail "A"

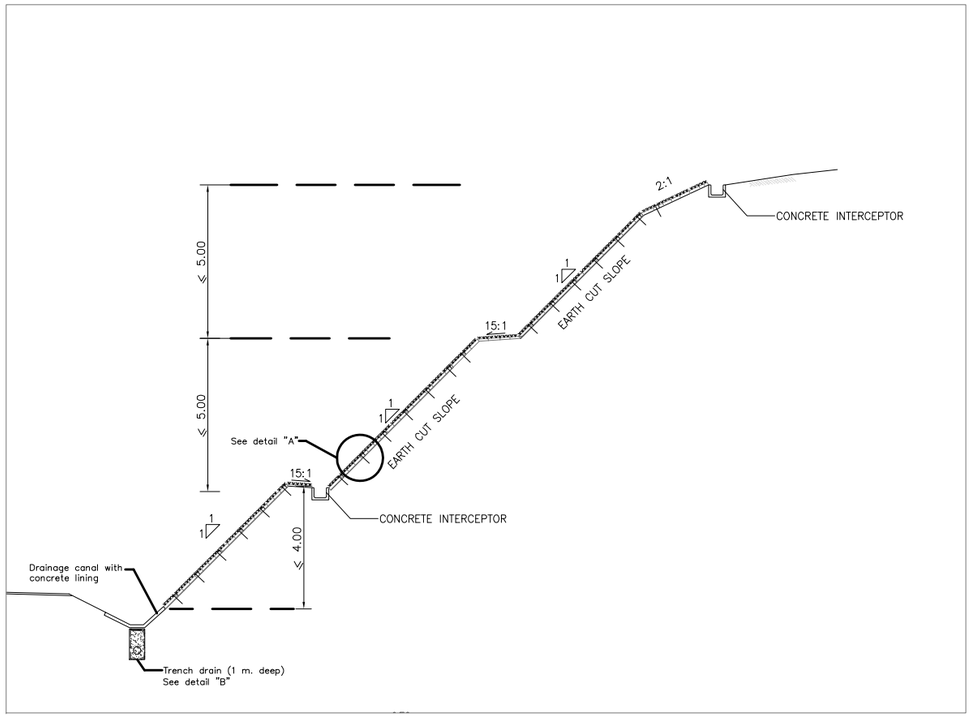
PLAN



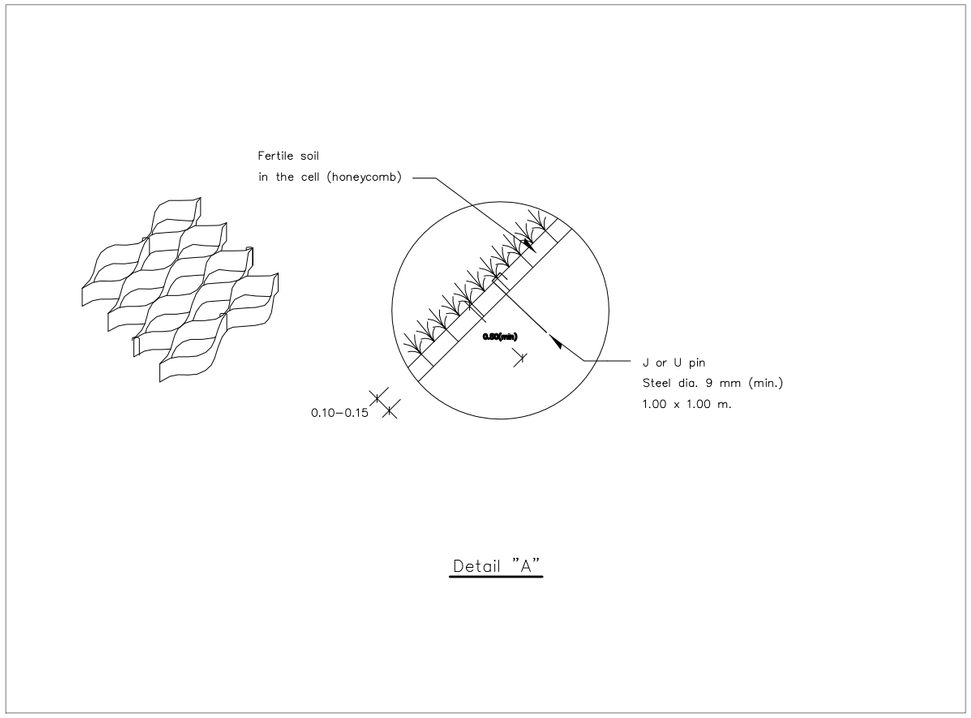
ORIENTAL CONSULTANTS CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD MAINTENANCE PROJECT (47085 - 001)	REV. No.	DATE	DESCRIPTION	SCALE:
	PREPARED BY				DRAWING TITLE: SLOPE PROTECTION(18B)	A	07-NOV-2014		
	CHECKED BY					-			DRAWING No.: 0
	APPROVED BY					-			
						-			

SLOPE PROTECTION(9001)

CROSS SECTION

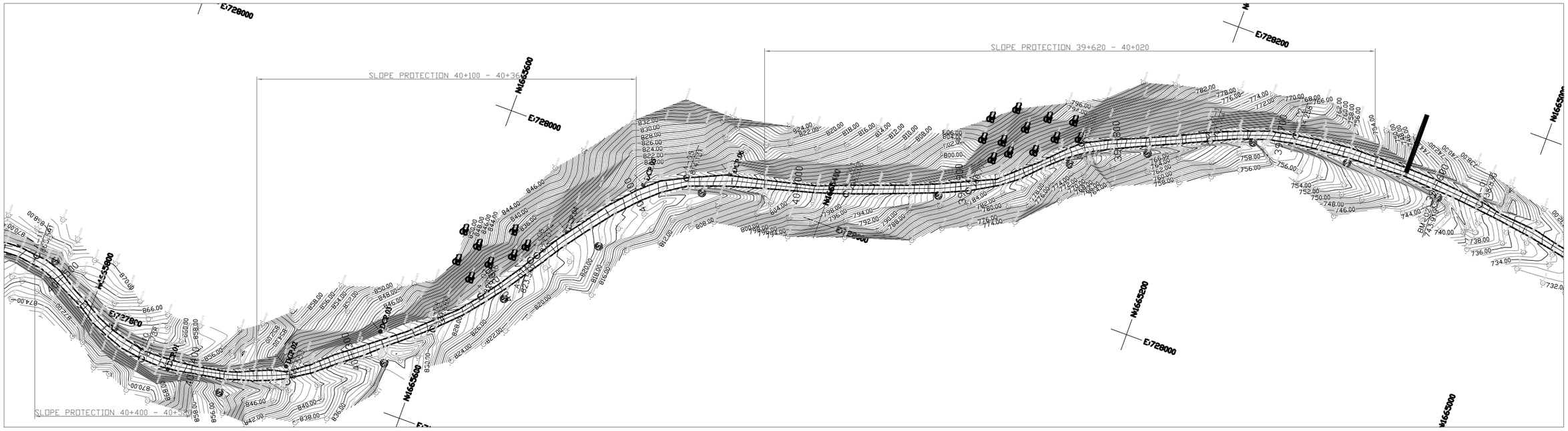


DETAIL



Detail "A"

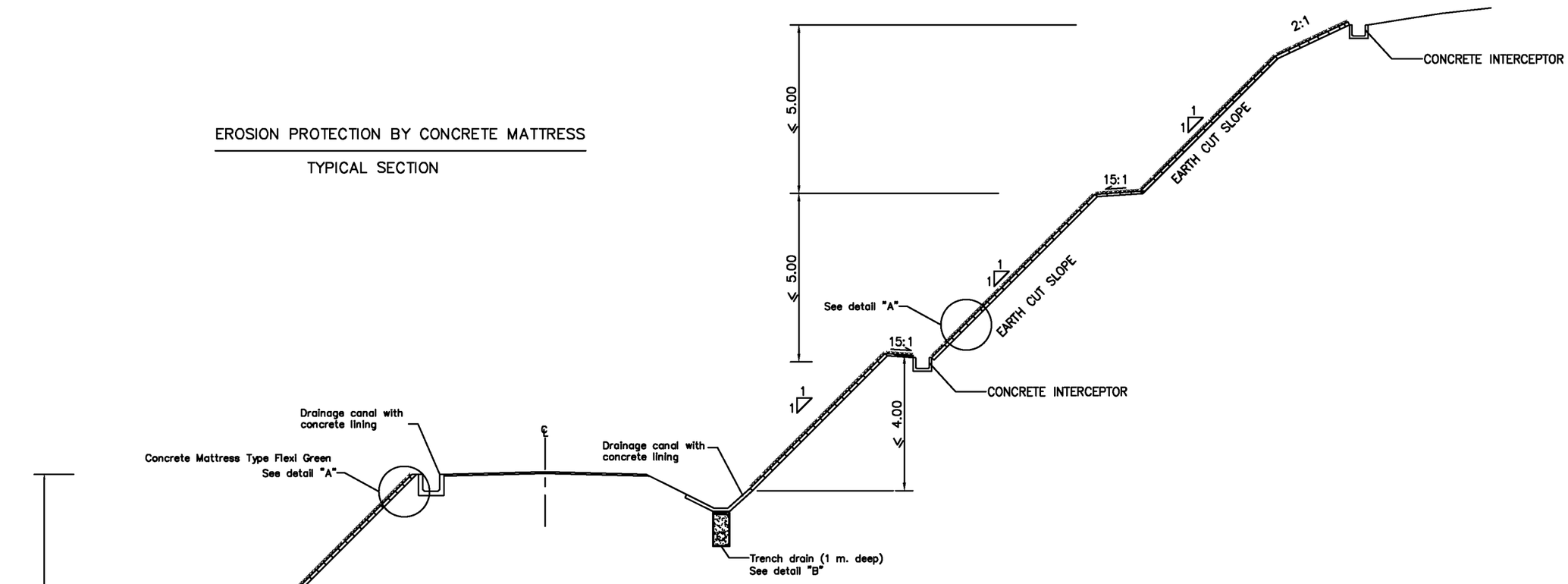
PLAN

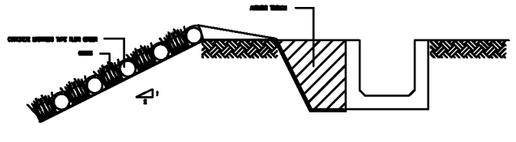


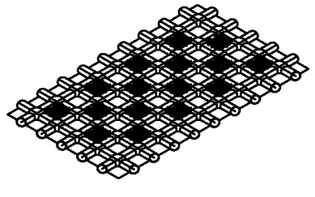
ORIENTAL CONSULTANTS CO., LTD. INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC. MEKONG CONSULTANTS CO. LTD	TITLE	NAME	SIGNATURE	THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF PUBLIC WORKS AND TRANSPORT	ADB TA - 8492 LAO ROAD MAINTENANCE PROJECT (47085 - 001)	REV. No.	DATE	DESCRIPTION	SCALE:
	PREPARED BY					A	07-NOV-2014		
	CHECKED BY				DRAWING TITLE: SLOPE PROTECTION(9001)	-			DRAWING No.: 01
	APPROVED BY					-			
						-			

EROSION PROTECTION BY CONCRETE MATTRESS

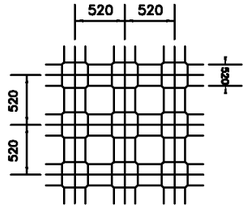
TYPICAL SECTION

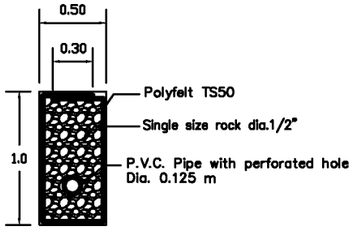






Detail "A"





Detail "B"

TENCATE
บริษัท เทนคาต้า จีโอซินเทติคส์ (ประเทศไทย) จำกัด
TenCate Geosynthetics (Thailand) Ltd.
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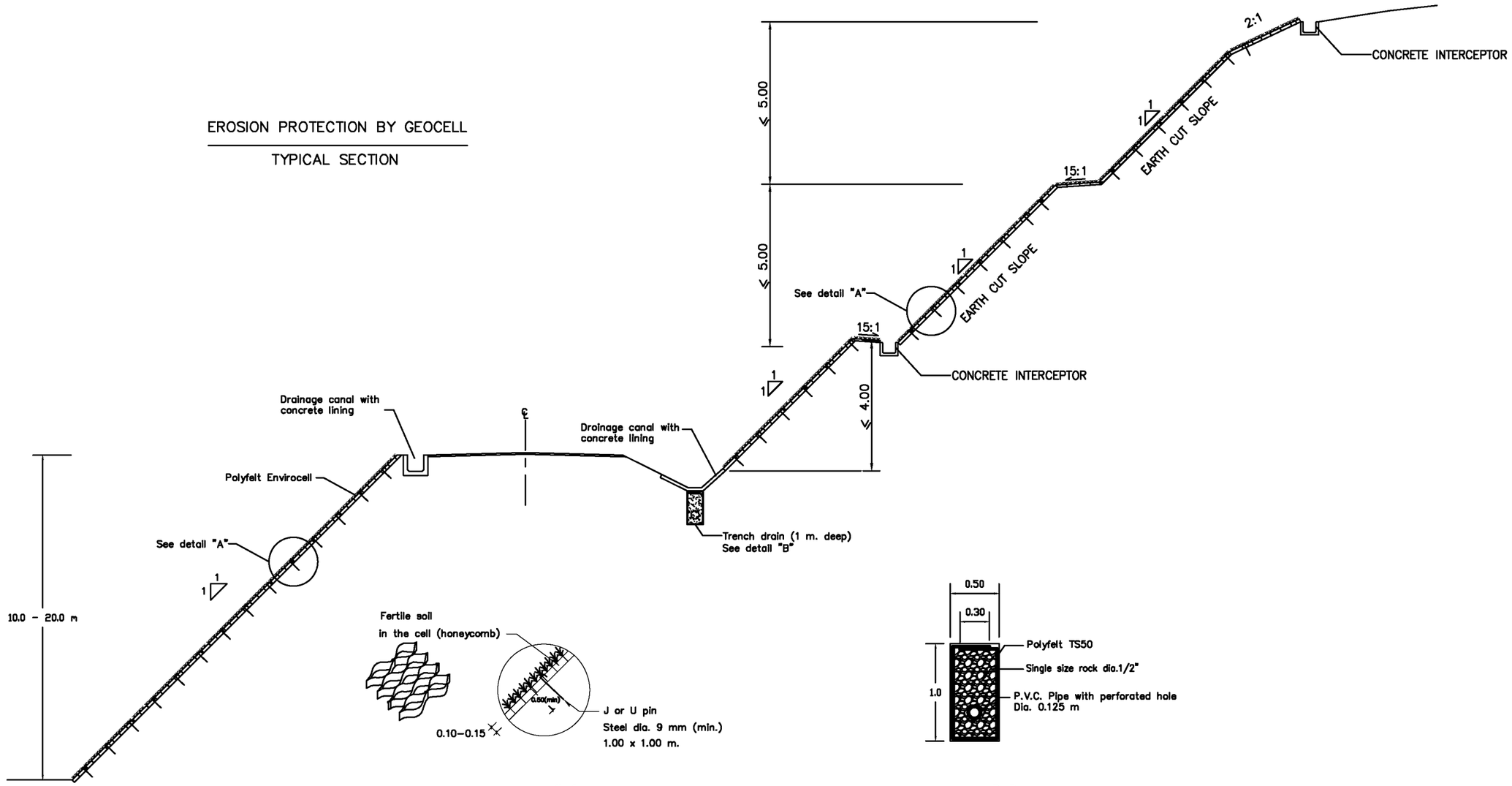
ลูกค้า :

Project :ROAD NO. 9001 , ATTAPUE, LAO PDR

ออกแบบ/เขียนแบบ	ชิรศักดิ์ สินาก	วันที่	
ตรวจ :		วันที่	
อนุมัติ :		วันที่	
มาตราส่วน : ไม่ได้มาตราส่วนจริง			
ไฟล์ / เลขที่ : -			
แบบแสดงที่ :	แก้ไขครั้งที่ : -		

EROSION PROTECTION BY GEOCELL

TYPICAL SECTION



Detail "A"

Detail "B"

TENCATE
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ไฟล์ / เลขที่ : -			
แบบแสดงที่ :	แก้ไขครั้งที่ : -		