ALIGNMENT DATA OF NR.57

ALIGNMENT DATA FOR NR57

	IP			PC			PT			Radius		
No	STA	N	E	STA	N	E	STA	N	E	ABSval	Direction	Actual
1	0.000	1449222.841	305351.141									
2	288.628	1448947.063	305265.981	239.641	1448993.868	305280.434	337.492	1448898.844	305257.346	800	LEFT	-800
3	1213.999	1448036.061	305102.844	1170.549	1448078.831	305110.503	1257.109	1447992.645	305104.547	400	LEFT	-400
4	1419.804	1447830.075	305110.924	1393.271	1447856.587	305109.884	1446.029	1447804.751	305118.841	200	LEFT	-200
5	2109.157	1447171.830	305316.703									
6	2565.524	1446877.578	304967.866	2519.368	1446907.338	305003.147	2608.923	1446872.801	304921.957	150	RIGHT	150
7	3562.052	1446774.150	303973.946	3494.823	1446781.109	304040.814	3626.174	1446734.592	303919.587	250	LEFT	-250
8	4303.984	1446335.762	303371.535	4067.757	1446474.761	303562.540	4536.363	1446144.786	303232.496	1500	LEFT	-1500
9	4812.662	1445921.416	303069.872	4693.570	1446017.694	303139.967	4924.385	1445882.365	302957.365	380	RIGHT	380
10	5886.849	1445566.767	302048.115	5850.691	1445578.624	302082.274	5922.812	1445548.977	302016.635	400	LEFT	-400
11	6075.389	1445473.909	301883.803	6014.575	1445503.829	301936.747	6136.186	1445446.158	301829.690	3000	RIGHT	3000
12	6324.873	1445360.057	301661.793	6287.591	1445377.070	301694.967	6362.147	1445344.293	301628.007	2000	RIGHT	2000
13	6427.147	1445316.808	301569.104	6362.147	1445344.293	301628.007	6492.136	1445287.424	301511.124	4000	LEFT	-4000
14	6668.861	1445207.534	301353.487	6608.708	1445234.727	301407.143	6728.978	1445177.166	301301.562	2000	LEFT	-2000
15	6885.860	1445097.964	301166.141	6808.867	1445136.834	301232.602	6962.380	1445047.133	301108.313	800	LEFT	-800
16	7178.410	1444904.508	300946.057	7113.735	1444947.207	300994.633	7243.056	1444864.377	300895.338	2500	RIGHT	2500
17	7384.918	1444776.353	300784.088	7329.670	1444810.634	300827.414	7440.138	1444739.732	300742.720	2000	LEFT	-2000
18	7760.240	1444527.557	300503.041	7680.418	1444580.465	300562.808	7839.723	1444484.799	300435.637	1000	RIGHT	1000
19	7990.384	1444404.095	300308.415	7917.311	1444443.238	300370.120	8063.436	1444362.410	300248.397	3500	LEFT	-3500
20	8712.947	1443991.899	299714.931	8626.124	1444041.427	299786.242	8799.722	1443938.330	299646.604	3000	LEFT	-3000
21	9235.175	1443669.659	299303.916	9092.437	1443757.727	299416.246	9377.858	1443587.032	299187.526	6000	RIGHT	6000
22	10037.694	1443205.072	298649.483	9959.811	1443250.156	298712.991	10115.568	1443158.354	298587.168	6000	LEFT	-6000
23	10421.968	1442974.562	298342.011	10334.969	1443026.748	298411.622	10508.287	1442908.633	298285.246	800	LEFT	-800
24	10595.996	1442842.166	298228.018	10508.287	1442908.633	298285.246	10682.472	1442794.861	298154.159	600	RIGHT	600
25	12632.833	1441742.967	296511.774	12482.875	1441823.844	296638.053	12782.769	1441665.913	296383.127	10000	RIGHT	10000
26	13373.730	1441362.253	295876.150	13284.072	1441408.322	295953.066	13463.382	1441317.570	295798.421	10000	RIGHT	10000
27	14258.526	1440921.289	295109.062	14186.200	1440957.335	295171.766	14329.307	1440909.484	295037.705	400	RIGHT	400
28	15454.940	1440725.754	293927.168	15260.584	1440757.478	294118.917	15648.079	1440657.705	293745.114	2000	LEFT	-2000
29	16105.721	1440497.473	293316.439	15961.284	1440548.045	293451.734	16249.658	1440427.986	293189.815	2000	LEFT	-2000
30	16453.318	1440330.009	293011.271	16395.303	1440357.919	293062.131	16509.315	1440282.552	292977.900	250	LEFT	-250
31	16901.818	1439961.481	292752.131	16822.811	1440026.110	292797.576	16980.816	1439895.679	292708.403	6000	LEFT	-6000
32	17567.449	1439407.089	292383.721	17464.620	1439492.732	292440.633	17670.096	1439327.735	292318.325	2000	RIGHT	2000
33	18774.669	1438475.317	291615.855	18679.865	1438548.479	291676.147	18869.470	1438401.588	291556.260	20000	LEFT	-20000
34	20124.611	1437425.450	290767.251	19986.068	1437533.197	290854.342	20263.147	1437319.331	290678.184	15000	RIGHT	15000
35	21247.958	1436564.998	290045.070	21176.606	1436619.651	290090.941	21318.818	1436502.213	290011.170	700	LEFT	-700
36	22693.322	1435292.752	289358.127	22619.553	1435357.663	289393.176	22766.355	1435221.283	289339.846	600	LEFT	-600
37	23333.338	1434671.985	289199.341	23193.411	1434807.548	289234.017	23470.463	1434556.241	289120.710	800	RIGHT	800
38	23688.893	1434375.561	288997.964	23626.255	1434427.374	289033.163	23747.661	1434312.927	288998.608	200	LEFT	-200
39	24157.816	1433902.793	289002.829	24111.840	1433948.767	289002.356	24201.065	1433864.450	288977.459	150	RIGHT	150
40	25609.467	1432689.893	288200.276	25545.885	1432742.919	288235.362	25671.752	1432652.094	288149.149	360	RIGHT	360
41	27200.792	1431743.105	286919.635	27141.019	1431778.639	286967.699	27260.172	1431698.787	286879.526	600	LEFT	-600
42	28591.147	1430711.951	285986.414	28514.767	1430768.583	286037.667	28666.356	1430673.205	285920.591	500	RIGHT	500
43	31098.759	1429439.277	283824.402	31012.546	1429483.012	283898.698	31182.373	1429368.821	283774.718	400	LEFT	-400
44	31598.031	1429029.130	283535.175	31525.349	1429088.528	283577.061	31666.813	1429001.447	283467.971	250	RIGHT	250

ALIGNMENT DATA FOR NR57

IP				PC			PT			Radius		
No	STA	N	E	STA	N	E	STA	N	E	ABSval	Direction	Actual
45	32393.943	1428724.497	282795.649	32329.044	1428749.216	282855.656	32453.619	1428667.173	282765.223	180	LEFT	-180
46	33647.717	1427612.439	282205.395	33579.468	1427672.723	282237.392	33714.665	1427566.176	282155.218	400	RIGHT	400
47	35075.171	1426643.952	281154.979	34989.932	1426701.731	281217.646	35157.633	1426564.942	281122.995	380	LEFT	-380
48	35436.301	1426306.635	281018.432	35367.791	1426370.139	281044.139	35503.354	1426256.107	280972.167	380	RIGHT	380
49	35867.617	1425987.450	280726.177	35784.169	1426048.997	280782.531	35951.023	1425929.132	280666.490	3000	RIGHT	3000
50	36674.968	1425423.199	280148.678	36591.005	1425481.877	280208.733	36758.132	1425380.388	280076.449	700	RIGHT	700
51	37030.513	1425241.508	279842.134	36942.594	1425286.336	279917.767	37118.320	1425203.489	279762.860	2000	RIGHT	2000
52	37546.801	1425018.204	279376.511	37457.069	1425057.006	279457.419	37635.213	1424957.428	279310.494	600	LEFT	-600
53	38349.747	1424473.475	278784.805	38269.020	1424528.151	278844.197	38430.403	1424414.592	278729.580	2200	LEFT	-2200
54	39343.000	1423748.946	278105.281	39181.309	1423866.883	278215.893	39501.916	1423671.877	277963.139	1000	RIGHT	1000
55	39635.873	1423608.027	277845.379	39534.449	1423656.371	277934.540	39736.220	1423538.964	277771.102	800	LEFT	-800
56	39981.614	1423371.865	277591.391	39900.271	1423427.255	277650.962	40060.768	1423297.609	277558.185	400	LEFT	-400
57	40389.466	1422997.546	277424.004	40335.451	1423046.855	277446.054	40443.190	1422945.092	277411.115	600	LEFT	-600
58	40657.038	1422737.421	277360.087	40628.621	1422765.017	277366.868	40684.789	1422714.217	277343.683	150	RIGHT	150
59	40738.864	1422670.063	277312.466	40714.342	1422690.086	277326.623	40763.318	1422652.025	277295.854	380	RIGHT	380
60	40908.083	1422545.539	277197.784	40834.235	1422599.860	277247.812	40981.193	1422480.708	277162.421	600	LEFT	-600
61	41214.739	1422275.680	277050.586	41158.752	1422324.830	277077.396	41270.261	1422233.676	277013.569	500	RIGHT	500
62	41870.772	1421783.148	276616.532	41827.123	1421815.896	276645.392	41913.074	1421765.403	276576.653	200	RIGHT	200
63	42063.658	1421704.183	276439.075	41954.617	1421748.514	276538.698	42172.697	1421658.769	276339.941	20000	LEFT	-20000
64	43440.261	1421130.849	275187.544	43384.761	1421153.963	275238.001	43495.528	1421100.072	275141.360	700	LEFT	-700
65	43746.145	1420961.095	274932.808	43615.645	1421033.462	275041.404	43876.641	1420890.150	274823.277	20000	RIGHT	20000
66	44129.859	1420752.492	274610.746	44045.594	1420798.301	274681.472	44213.029	1420688.972	274555.375	600	LEFT	-600
67	46508.470	1418958.673	273047.027	46456.963	1418997.499	273080.873	46557.786	1418941.026	272998.637	200	RIGHT	200
68	46999.703	1418789.616	272583.468	46894.940	1418825.510	272681.890	47077.839	1418869.664	272515.884	150	RIGHT	150
69	47699.600	1419344.741	272114.776	47618.405	1419282.701	272167.156	47780.439	1419397.518	272053.074	1000	LEFT	-1000
70	47820.711	1419423.694	272022.470	47780.439	1419397.518	272053.074	47860.963	1419451.475	271993.315	1500	RIGHT	1500
71	48338.705	1419781.041	271647.448	48282.000	1419741.924	271688.500	48394.578	1419806.469	271596.765	380	LEFT	-380
72	48512.388	1419859.298	271491.465	48446.924	1419829.943	271549.977	48577.839	1419890.553	271433.945	4000	RIGHT	4000
73	49728.452	1420439.903	270422.942	49668.318	1420411.192	270475.780	49788.012	1420455.266	270364.804	500	LEFT	-500
74	49822.398	1420464.052	270331.558	49788.012	1420455.266	270364.804	49856.737	1420475.843	270299.256	750	RIGHT	750
75	50338.174	1420640.920	269847.005	50269.042	1420617.216	269911.946	50406.964	1420653.133	269778.960	800	LEFT	-800
76	50629.576	1420692.458	269559.849	50527.106	1420674.356	269660.708	50731.868	1420720.773	269461.368	2000	RIGHT	2000
77	50974.662	1420787.862	269228.027	50877.079	1420760.898	269321.811	51071.971	1420826.750	269138.527	1500	RIGHT	1500
78	51626.164	1421047.603	268630.241	51586.200	1421031.676	268666.895	51664.314	1421043.181	268590.522	150	LEFT	-150
79	51760.556	1421032.532	268494.871	51741.095	1421034.686	268514.212	51779.800	1421035.386	268475.621	150	RIGHT	150
80	52381.843	1421123.664	267880.085	52283.900	1421109.303	267976.970	52479.353	1421122.125	267782.154	1200	LEFT	-1200
81	52878.728	1421115.849	267382.828	52818.929	1421116.789	267442.620	52937.555	1421133.318	267325.638	380	RIGHT	380
82	53341.253	1421251.252	266939.549	53281.909	1421233.916	266996.305	53399.738	1421251.364	266880.205	400	LEFT	-400
83	54392.772	1421253.237	265887.173	54327.693	1421253.114	265952.252	54457.723	1421260.397	265822.490	1200	RIGHT	1200
84	54771.836	1421294.956	265510.283	54701.471	1421287.214	265580.222	54840.626	1421277.142	265442.210	380	LEFT	-380
85	55587.526	1421088.051	264719.642	55496.316	1421111.142	264807.881	55675.348	1421107.526	264630.536	380	RIGHT	380
86	56327.791	1421246.841	263993.141	56191.190	1421217.673	264126.591	56464.323	1421268.679	263858.297	5000	LEFT	-5000
87	57302.485	1421402.676	263030.916	57202.259	1421386.653	263129.853	57401.671	1421393.797	262931.085	800	LEFT	-800
88	58247.981	1421318.822	262088.102	58177.533	1421325.063	262158.274	58317.788	1421329.004	262018.394	600	RIGHT	600

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	IP			PC			PT			Radius		
No	STA	N	E	STA	N	E	STA	N	E	ABSval	Direction	Actual
89	58897.201	1421412.755	261445.065	58848.735	1421405.749	261493.022	58942.490	1421390.375	261402.076	150	LEFT	-150
90	59358.758	1421198.157	261032.846	59303.900	1421223.488	261081.505	59409.082	1421210.194	260979.326	150	RIGHT	150
91	59655.579	1421264.282	260738.637	59596.088	1421251.228	260796.878	59714.682	1421265.684	260679.362	600	LEFT	-600
92	59952.316	1421271.284	260441.795	59897.878	1421270.001	260496.217	60002.319	1421237.363	260399.217	150	LEFT	-150
93	60240.143	1421089.174	260213.205	60145.176	1421148.349	260287.483	60332.875	1421061.354	260122.404	500	RIGHT	500
94	60984.847	1420870.361	259499.034	60931.658	1420885.942	259549.890	61037.759	1420863.968	259446.230	600	RIGHT	600
95	61512.249	1420806.944	258975.180	61406.561	1420819.646	259080.102	61617.740	1420805.372	258869.504	2000	RIGHT	2000
96	61839.110	1420802.077	258648.158	61763.610	1420803.201	258723.650	61914.030	1420817.077	258574.162	700	RIGHT	700
97	62301.476	1420894.053	258194.439	62217.193	1420877.308	258277.042	62385.660	1420917.688	258113.538	2000	RIGHT	2000
98	62615.972	1420982.273	257892.467	62547.115	1420962.964	257958.561	62678.645	1420952.540	257830.360	180	LEFT	-180
99	63012.725	1420808.284	257529.031	62977.890	1420823.327	257560.451	63046.347	1420808.629	257494.197	150	RIGHT	150
100	63148.898	1420809.644	257391.651	63117.173	1420809.330	257423.375	63180.538	1420805.946	257360.142	500	LEFT	-500
101	63839.854	1420729.090	256705.321	63693.132	1420746.193	256851.043	63976.794	1420629.380	256597.686	450	LEFT	-450
102	64369.131	1420362.754	256309.869	64299.562	1420410.032	256360.905	64437.175	1420336.623	256245.395	380	RIGHT	380
103	64788.490	1420204.665	255919.805	64701.034	1420237.515	256000.857	64875.835	1420179.016	255836.194	2000	RIGHT	2000
104	65677.991	1419943.759	255069.312	65504.664	1419994.592	255235.017	65846.042	1419966.067	254897.426	800	RIGHT	800
105	66038.395	1419990.825	254706.673	65975.183	1419982.689	254769.359	66100.570	1419979.234	254644.533	400	LEFT	-400
106	66381.130	1419927.791	254368.729	66306.556	1419941.465	254442.039	66451.502	1419876.190	254314.891	250	LEFT	-250
107	67046.446	1419464.519	253885.374	66929.232	1419545.626	253969.996	67160.744	1419421.224	253776.449	600	RIGHT	600
108	67587.529	1419263.582	253379.845	67507.096	1419293.292	253454.590	67662.733	1419195.862	253336.446	250	LEFT	-250
109	67814.106	1419068.414	253254.771	67758.303	1419115.397	253284.880	67869.193	1419014.985	253238.670	400	LEFT	-400
110	68082.874	1418810.392	253177.016	68001.437	1418888.365	253200.513	68161.884	1418729.637	253187.535	380	LEFT	-380
111	68365.967	1418527.263	253213.897	68252.194	1418640.084	253199.201	68473.886	1418423.597	253167.018	400	RIGHT	400
112	69835.060	1417183.345	252606.154	69724.272	1417284.290	252651.803	69932.843	1417149.357	252500.709	250	RIGHT	250
113	71357.872	1416712.175	251144.398	71260.913	1416741.921	251236.682	71454.808	1416678.873	251053.337	5000	LEFT	-5000
114	71678.481	1416602.051	250843.270	71613.579	1416624.342	250904.223	71739.095	1416548.216	250807.019	200	LEFT	-200
115	71802.757	1416495.410	250771.461	71739.095	1416548.216	250807.019	71863.770	1416466.042	250714.977	250	RIGHT	250
116	72484.594	1416179.650	250164.158	72407.298	1416215.307	250232.738	72561.042	1416162.538	250088.780	600	RIGHT	600
117	73244.260	1416011.287	249422.515	73169.603	1416027.814	249495.320	73318.848	1416000.233	249348.680	2000	RIGHT	2000
118	73466.724	1415978.338	249202.435	73404.890	1415987.493	249263.587	73526.124	1415998.745	249144.066	250	RIGHT	250
119	73758.076	1416075.294	248925.110	73691.621	1416053.363	248987.841	73824.509	1416099.982	248863.411	3000	RIGHT	3000
120	73905.799	1416130.181	248787.938	73867.898	1416116.101	248823.126	73943.127	1416154.058	248758.504	250	RIGHT	250
121	74039.405	1416214.713	248683.734	73982.291	1416178.731	248728.090	74091.435	1416212.081	248626.680	150	LEFT	-150
122	74563.424	1416190.334	248155.192	74526.743	1416192.025	248191.835	74598.693	1416171.925	248123.465	150	LEFT	-150
123	74677.008	1416132.621	248055.728	74632.445	1416154.986	248094.272	74719.813	1416130.822	248011.202	180	RIGHT	180
124	74850.898	1416125.530	247880.224	74786.219	1416128.141	247944.850	74908.351	1416170.733	247833.962	150	RIGHT	150
125	74987.988	1416226.390	247777.003	74934.329	1416188.889	247815.382	75040.523	1416248.262	247728.005	300	LEFT	-300
126	75484.488	1416429.233	247322.598	75454.243	1416416.904	247350.217	75513.933	1416429.896	247292.360	150	LEFT	-150
127	75769.797	1416435.503	247036.558	75705.685	1416434.098	247100.654	75826.859	1416482.802	246993.278	150	RIGHT	150
128	75958.660	1416580.039	246904.304	75889.879	1416529.296	246950.735	76027.103	1416637.963	246867.215	800	RIGHT	800
129	76227.570	1416806.787	246759.116	76162.840	1416752.274	246794.021	76289.518	1416837.511	246702.142	250	LEFT	-250
130	76382.528	1416881.657	246620.276	76331.197	1416857.293	246665.457	76433.501	1416914.693	246580.988	500	RIGHT	500
131	76512.505	1416965.538	246520.520	76463.500	1416933.999	246558.028	76561.388	1416992.263	246479.443	800	LEFT	-800
132	77130.472	1417302.611	246002.431	77074.393	1417272.028	246049.438	77185.825	1417319.088	245948.827	400	LEFT	-400

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IP				PC			PT			Radius		
No	STA	N	E	STA	N	E	STA	N	E	ABSval	Direction	Actual
133	77738.678	1417481.528	245420.377	77685.751	1417465.977	245470.968	77790.994	1417509.702	245375.571	400	RIGHT	400
134	77938.245	1417588.086	245250.916	77891.107	1417562.994	245290.821	77983.694	1417592.717	245204.006	200	LEFT	-200
135	78016.946	1417595.984	245170.915	77983.694	1417592.717	245204.006	78049.140	1417612.929	245142.304	150	RIGHT	150
136	78260.208	1417720.488	244960.697	78190.244	1417684.834	245020.895	78330.071	1417761.589	244904.079	1500	RIGHT	1500
137	79045.511	1418181.888	244325.112	78858.376	1418071.952	244476.550	79226.035	1418347.591	244238.151	800	RIGHT	800
138	79386.283	1418489.485	244163.684	79336.293	1418445.221	244186.914	79436.252	1418532.534	244138.271	2000	LEFT	-2000
139	80422.286	1419381.655	243637.016	80341.091	1419311.734	243678.292	80503.471	1419452.667	243597.647	6000	RIGHT	6000
140	80874.006	1419776.732	243417.988	80760.436	1419677.405	243473.054	80987.537	1419873.457	243358.468	5000	LEFT	-5000
141	81628.477	1420419.327	243022.566	81598.751	1420394.010	243038.145	81657.442	1420436.789	242998.511	150	LEFT	-150
142	81751.608	1420492.106	242922.305	81695.598	1420459.203	242967.633	81806.818	1420510.532	242869.412	380	LEFT	-380
143	82361.519	1420693.010	242345.585	82307.128	1420675.117	242396.949	82415.909	1420710.623	242294.125	20000	LEFT	-20000
144	83606.296	1421096.101	241167.881	83555.639	1421079.697	241215.807	83654.865	1421133.342	241133.541	200	RIGHT	200
145	83729.910	1421188.511	241082.668	83654.865	1421133.342	241133.541	83794.031	1421180.880	241008.013	150	LEFT	-150
146	83825.112	1421177.719	240977.093	83794.031	1421180.880	241008.013	83842.216	1421208.730	240975.028	30	RIGHT	30
147	84497.090	1421862.156	240931.509	84423.528	1421788.757	240936.398	84570.387	1421934.049	240915.933	1000	LEFT	-1000
148	84682.895	1422044.006	240892.110									
149	85197.130	1422285.874	240438.306	85141.169	1422259.553	240487.690	85252.768	1422320.873	240394.641	600	RIGHT	600
150	85289.449	1422343.814	240366.019	85252.768	1422320.873	240394.641	85325.969	1422361.818	240334.059	450	LEFT	-450
151	85411.684	1422403.886	240259.378	85381.517	1422389.080	240285.662	85441.056	1422407.380	240229.414	150	LEFT	-150
152	85673.262	1422434.273	239998.771	85494.722	1422413.596	240176.110	85846.045	1422528.389	239847.052	800	RIGHT	800
153	86260.639	1422746.938	239494.738	86146.053	1422686.535	239592.111	86372.498	1422838.973	239426.477	600	RIGHT	600
154	86605.445	1423026.074	239287.708	86516.425	1422954.574	239340.738	86692.618	1423074.878	239213.258	500	LEFT	-500
155	87076.304	1423285.228	238892.373	87011.247	1423249.561	238946.782	87141.280	1423316.050	238835.080	1500	LEFT	-1500
156	87362.245	1423420.736	238640.487									
157	87534.675	1423579.720	238707.242	87487.003	1423535.765	238688.786	87581.217	1423627.382	238708.228	250	LEFT	-250
158	88637.604	1424683.544	238730.067	88587.576	1424633.527	238729.033	88684.152	1424722.927	238760.918	150	RIGHT	150
159	88802.591	1424816.164	238833.957	88756.976	1424780.256	238805.827	88848.162	1424854.105	238859.279	1200	LEFT	-1200
160	89432.813	1425340.394	239183.839	89345.471	1425267.747	239135.353	89503.657	1425418.421	239144.591	150	LEFT	-150
161	89696.282	1425590.503	239058.033	89642.175	1425542.166	239082.347	89748.746	1425624.460	239015.908	250	LEFT	-250
162	89815.074	1425666.088	238964.269	89777.844	1425642.723	238993.254	89852.250	1425692.044	238937.580	800	RIGHT	800
163	90033.098	1425818.129	238807.932	89975.880	1425778.237	238848.951	90085.205	1425820.568	238750.766	150	LEFT	-150
164	90184.230	1425824.788	238651.831	90150.302	1425823.342	238685.728	90217.034	1425811.506	238620.612	150	LEFT	-150
165	90377.689	1425748.612	238472.780	90332.579	1425766.272	238514.290	90422.304	1425742.054	238428.150	350	RIGHT	350
166	90584.205	1425718.518	238267.968	90535.710	1425725.568	238315.948	90629.518	1425740.890	238224.943	150	RIGHT	150
167	90897.344	1425864.446	237987.320	90842.635	1425839.207	238035.858	90951.377	1425901.791	237947.341	400	RIGHT	400
168	91160.720	1426044.693	237794.359	91038.117	1425961.002	237883.954	91282.105	1426147.550	237727.636	1000	RIGHT	1000
169	91817.200	1426596.463	237436.426	91786.328	1426570.563	237453.227	91847.221	1426613.623	237410.763	150	LEFT	-150
170	92194.762	1426806.802	237121.856	92102.776	1426755.671	237198.324	92283.605	1426886.199	237075.406	400	RIGHT	400
171	92428.426	1427011.200	237002.276	92378.532	1426968.134	237027.472	92476.325	1427037.385	236959.805	200	LEFT	-200
172	92693.395	1427151.305	236775.031	92642.140	1427124.406	236818.660	92744.609	1427175.163	236729.668	1500	LEFT	-1500
173	92921.190	1427257.358	236573.383	92885.831	1427240.899	236604.678	92956.366	1427279.052	236545.461	400	RIGHT	400
174	93091.088	1427361.707	236439.074	93007.907	1427310.673	236504.761	93170.192	1427371.629	236356.487	300	LEFT	-300
175	93241.762	1427380.166	236285.428	93170.192	1427371.629	236356.487	93307.652	1427431.847	236235.919	200	RIGHT	200
176	93627.677	1427662.944	236014.536	93557.460	1427612.238	236063.110	93694.367	1427731.525	235999.466	250	RIGHT	250

ALIGNMENT DATA FOR NR57

	IP			PC			PT			Radius		
No	STA	N	E	STA	N	E	STA	N	E	ABSval	Direction	Actual
177	93805.754	1427840.316	235975.559	93732.620	1427768.886	235991.256	93876.089	1427896.508	235928.752	300	LEFT	-300
178	94092.447	1428062.747	235790.276	94044.918	1428026.228	235820.696	94139.830	1428103.042	235765.072	700	RIGHT	700
179	94407.920	1428330.332	235622.904	94345.746	1428277.620	235655.875	94470.077	1428381.633	235587.778	3000	LEFT	-3000
180	94615.902	1428501.955	235505.392	94565.573	1428460.428	235533.826	94666.146	1428546.128	235481.271	1000	RIGHT	1000
181	94897.589	1428749.258	235370.347	94845.225	1428703.300	235395.444	94945.985	1428800.850	235379.305	150	RIGHT	150
182	95047.532	1428900.901	235396.676	94945.985	1428800.850	235379.305	95124.518	1428954.193	235310.237	150	LEFT	-150
183	95167.205	1428976.596	235273.901	95124.518	1428954.193	235310.237	95207.693	1429014.773	235254.805	150	RIGHT	150
184	95363.416	1429154.044	235185.141	95312.617	1429108.612	235207.866	95412.850	1429187.004	235146.486	250	LEFT	-250
185	96392.354	1429822.542	234401.154	96352.612	1429796.756	234431.395	96430.311	1429859.919	234387.648	150	RIGHT	150
186	97228.021	1430610.152	234116.556	97190.036	1430574.428	234129.465	97265.779	1430647.668	234110.603	400	RIGHT	400
187	97362.867	1430743.556	234095.385	97313.690	1430694.987	234103.093	97408.731	1430778.134	234060.418	150	LEFT	-150
188	97481.735	1430829.466	234008.509	97438.676	1430799.189	234039.126	97524.582	1430864.532	233983.518	500	RIGHT	500
189	97843.918	1431124.584	233798.186	97793.278	1431083.345	233827.576	97893.206	1431151.135	233755.065	250	LEFT	-250
190	98049.645	1431233.157	233621.853	97994.664	1431204.330	233668.671	98100.064	1431224.899	233567.495	150	LEFT	-150
191	98226.523	1431205.906	233442.471	98184.516	1431212.215	233484.001	98268.333	1431206.614	233400.470	500	RIGHT	500
192	98890.248	1431217.102	232778.644	98800.069	1431215.582	232868.810	98978.508	1431187.028	232693.627	500	LEFT	-500
193	99032.913	1431168.884	232642.337	98993.955	1431181.876	232679.065	99070.187	1431139.661	232616.574	150	LEFT	-150
194	99249.961	1431004.811	232497.686	99210.510	1431034.404	232523.776	99288.413	1430987.342	232462.313	200	RIGHT	200
195	99836.362	1430744.713	231971.009	99767.905	1430775.026	232032.389	99896.349	1430678.484	231953.688	150	LEFT	-150
196	100090.827	1430490.333	231904.484	99994.447	1430583.577	231928.869	100165.780	1430473.762	231809.539	150	RIGHT	150
197	100253.533	1430458.675	231723.092	100202.463	1430467.455	231773.402	100304.515	1430444.814	231673.939	1000	LEFT	-1000
198	100576.927	1430370.883	231411.751	100531.693	1430383.159	231455.287	100619.558	1430336.585	231382.260	150	LEFT	-150
199	100740.543	1430244.850	231303.381	100699.154	1430276.233	231330.366	100779.923	1430204.069	231296.308	150	LEFT	-150
200	100910.594	1430075.320	231273.978	100803.442	1430180.896	231292.289	100989.529	1430058.409	231168.169	150	RIGHT	150
201	101050.294	1430048.818	231108.165	100989.529	1430058.409	231168.169	101104.998	1430000.170	231071.754	150	LEFT	-150
202	101328.448	1429821.278	230937.861	101216.869	1429910.607	231004.720	101408.737	1429859.625	230833.079	150	RIGHT	150
203	101903.443	1430029.645	230368.506	101843.863	1430009.168	230424.458	101959.675	1430016.164	230310.471	200	LEFT	-200
204	102367.853	1429923.811	229912.878	102300.586	1429939.031	229978.401	102434.318	1429891.815	229853.707	500	LEFT	-500
205	102684.291	1429772.917	229633.822	102434.318	1429891.815	229853.707	102868.456	1429942.336	229450.019	350	RIGHT	350
206	103369.189	1430281.707	229081.833	103189.092	1430159.646	229214.257	103513.487	1430222.222	228911.844	300	LEFT	-300
207	103832.209	1430116.949	228611.009	103781.889	1430133.569	228658.504	103882.003	1430089.083	228569.110	400	LEFT	-400
208	104000.000	1430023.738	228470.858									

Vertical Profile of NR57

PVI	Station	Elevation	Grade Out (%)	Curve Length
1	0.000	14.150	-0.780	
2	228.362	12.370	0.211	
3	449.724	12.837	0.043	
4	1373.662	13.239	-0.100	
5	1847.523	12.765	0.139	
6	2272.832	13.356	-0.292	
7	2493.499	12.710	0.158	
8	3053.964	13.595	-0.310	
9	3195.687	13.156	-0.011	
10	4468.054	13.013	0.137	
11	5075.322	13.847	-0.132	
12	5400.000	13.419	0.218	
13	5661.841	13.989	-0.055	
14	6923.713	13.298	-0.156	
15	7000.000	13.179	0.254	
16	7242.346	13.794	-0.078	
17	7600.000	13.516	0.054	
18	8656.881	14.091	-0.187	
19	9400.000	12.699	0.142	
20	9760.475	13.212	-0.228	
21	10000.000	12.667	0.053	
22	10800.000	13.093	-0.022	
23	11200.000	13.003	-0.020	
24	12400.000	12.757	0.110	
25	12715.331	13.103	0.006	
26	13800.000	13.171	-0.163	
27	14202.099	12.516	0.109	
28	15200.000	13.604	-0.014	
29	17800.000	13.235	-0.116	
30	18117.205	12.868	0.059	
31	18800.000	13.273	-0.089	
32	19117.692	12.991	0.097	
33	20100.208	13.939	-0.041	
34	20681.559	13.700	0.052	
35	22880.185	14.833	0.024	
36	23600.000	15.006	0.151	
37	24800.000	16.822	0.012	
38	25200.000	16.869	0.200	
39	25444.653	17.359	0.061	
40	25708.612	17.521	0.364	
41	26124.972	19.036	0.221	
42	26589.575	20.061	0.403	
43	27535.656	23.870	0.222	
44	28144.599	25.224	0.329	
45	28600.000	26.723	0.880	100
46	29025.487	30.466	0.422	200
47	29515.191	32.532	0.265	
48	30119.573	34.134	0.456	
49	30597.993	36.318	0.154	
50	31226.659	37.289	0.412	
51	31508.589	38.451	0.798	

Vertical Profile of NR57

PVI	Station	Elevation	Grade Out (%)	Curve Length
52	32030.173	42.613	-0.027	100
53	32446.421	42.499	0.674	100
54	32697.608	44.193	0.053	80
55	33120.813	44.417	0.856	60
56	33577.575	48.329	1.759	100
57	33742.452	51.228	0.531	180
58	34145.170	53.366	0.185	
59	34569.736	54.151	0.320	
60	34987.394	55.488	-0.200	100
61	35366.467	54.728	0.362	300
62	35759.940	56.154	-1.043	200
63	36000.000	53.649	0.000	100
64	36611.954	53.649	1.055	200
65	37008.050	57.829	0.246	80
66	37478.759	58.985	0.043	
67	37842.116	59.141	0.247	
68	38309.033	60.294	-0.353	140
69	38930.488	58.099	-0.458	
70	39530.869	55.350	-0.088	
71	40039.704	54.901	-0.503	
72	40457.284	52.801	-2.138	200
73	40617.131	49.383	-0.390	80
74	40822.105	48.583	-0.076	
75	41200.000	48.295	-0.774	80
76	41647.524	44.833	-3.000	160
77	41786.773	40.655	0.201	50
78	41963.717	41.010	0.972	60
79	42457.786	45.813	-0.057	120
80	43000.000	45.502	0.288	
81	43200.000	46.077	0.080	
82	44277.650	46.943	0.231	
83	44761.712	48.062	0.124	
84	46096.932	49.712	0.196	
85	46959.676	51.404	-0.016	
86	47151.798	51.374	0.457	200
87	47646.695	53.635	0.906	80
88	47923.032	56.139	-0.049	80
89	48944.657	55.634	1.409	80
90	49926.346	69.468	-1.862	80
91	50468.639	59.370	0.332	380
92	50939.958	60.936	0.015	
93	51400.000	61.004	-0.296	
94	51632.094	60.318	-0.881	80
95	51759.298	59.197	0.919	80
96	51867.248	60.190	0.495	
97	52236.442	62.015	0.060	
98	52400.000	62.113	0.551	80
99	52763.944	64.117	0.352	
100	53200.000	65.653	0.189	
101	53600.000	66.408	0.291	
102	54439.565	68.853	0.201	

Vertical Profile of NR57

PVI	Station	Elevation	Grade Out (%)	Curve Length
103	55085.753	70.151	0.356	
104	55672.009	72.240	0.753	
105	55941.700	74.272	-0.669	22
106	56028.510	73.690	0.353	60
107	57000.000	77.119	0.162	
108	57200.000	77.443	0.318	
109	57481.924	78.338	0.111	
110	58097.003	79.019	0.492	100
111	58496.396	80.986	-0.086	100
112	58823.000	80.705	0.984	120
113	58924.228	81.701	0.289	80
114	59640.815	83.769	0.136	
115	59879.554	84.094	2.000	80
116	60038.000	87.263	-2.000	60
117	60190.036	84.222	0.639	120
118	61110.442	90.100	0.306	
119	61398.404	90.982	-0.439	80
120	61620.763	90.005	0.574	80
121	62634.881	95.830	0.355	
122	63009.635	97.162	-1.023	80
123	63105.295	96.183	0.822	100
124	63472.070	99.196	0.505	
125	63848.772	101.097	0.412	
126	64328.363	103.074	0.915	80
127	64689.312	106.375	0.297	120
128	64849.758	106.852	0.552	
129	65149.697	108.508	0.021	80
130	65336.079	108.547	1.520	180
131	65617.295	112.822	1.721	
132	66044.931	120.180	0.148	160
133	67079.045	121.714	0.609	300
134	67855.332	126.440	-1.861	180
135	68035.018	123.096	0.169	80
136	68322.231	123.581	2.011	80
137	68483.828	126.830	1.207	100
138	68778.731	130.390	0.835	
139	70073.392	141.204	0.669	200
140	70653.029	145.084	0.776	
141	71342.129	150.430	2.322	600
142	71822.346	161.582	0.862	100
143	72214.132	164.960	1.351	80
144	72447.756	168.116	0.278	140
145	73001.204	169.653	1.012	300
146	73401.722	173.706	3.646	180
147	73576.904	180.093	1.228	120
148	74166.236	187.331	-2.853	130
149	74341.295	182.337	5.000	118
150	74527.149	191.630	1.585	60
151	74806.620	196.060	2.533	80
152	74961.996	199.996	1.590	120
153	75136.964	202.778	-1.852	60

Vertical Profile of NR57

PVI	Station	Elevation	Grade Out (%)	Curve Length
154	75421.692	197.506	2.818	100
155	75653.023	204.026	1.266	160
156	75899.331	207.144	3.132	100
157	76554.308	227.655	2.200	60
158	77257.611	243.129	1.992	
159	77693.213	251.807	4.400	80
160	77885.952	260.288	-0.202	200
161	78106.872	259.841	-6.000	90
162	78342.114	245.726	-3.312	60
163	79098.865	220.659	0.037	150
164	79433.872	220.783	-1.717	400
165	80191.862	207.767	1.725	60
166	80683.807	216.253	-1.219	130
167	80975.737	212.693	-3.700	300
168	81236.327	203.052	-2.856	60
169	81617.295	192.172	-1.996	200
170	82017.295	184.190	3.800	190
171	82333.416	196.202	2.099	80
172	82589.824	201.584	-3.800	100
173	83069.507	183.356	2.900	110
174	83792.026	204.309	-4.000	276
175	84142.996	190.270	0.019	380
176	84769.014	190.390	-3.800	300
177	85530.567	161.451	0.778	700
178	86130.300	166.118	-0.138	60
179	86427.190	165.710	-1.835	120
180	86632.358	161.945	1.352	60
181	87062.132	167.756	0.231	100
182	87429.842	168.605	-1.534	60
183	87575.665	166.368	1.609	60
184	88028.311	173.652	-1.940	60
185	88589.231	162.771	1.837	120
186	88704.169	164.882	-1.824	80
187	89277.459	154.423	-0.098	100
188	89633.350	154.073	-2.561	240
189	89896.204	147.340	2.434	140
190	90017.295	150.287	0.879	60
191	90229.184	152.150	3.289	80
192	90456.990	159.641	5.000	80
193	90671.317	170.357	-3.800	150
194	90932.429	160.435	-1.521	60
195	91161.695	156.947	1.733	180
196	91359.410	160.374	-0.375	60
197	91630.519	159.357	5.000	140
198	92018.786	178.770	2.160	300
199	92321.608	185.310	4.600	60
200	92488.295	192.977	-3.351	120
201	92695.654	186.029	-1.899	60
202	93027.303	179.730	0.841	60
203	93186.320	181.067	1.874	80
204	93371.741	184.543	3.600	60

Vertical Profile of NR57

PVI	Station	Elevation	Grade Out (%)	Curve Length
205	93654.172	194.711	2.507	50
206	94163.752	207.484	2.180	
207	94694.064	219.043	-5.000	110
208	94948.918	206.301	-0.357	320
209	95192.750	205.431	-3.650	160
210	96214.551	168.136	-1.202	180
211	96531.986	164.319	-5.000	80
212	96898.221	146.007	-0.432	80
213	97437.714	143.675	-4.000	60
214	97598.615	137.239	2.095	100
215	97698.887	139.340	0.155	50
216	97949.872	139.727	-3.400	100
217	98137.395	133.352	2.892	160
218	98300.768	138.076	-0.013	60
219	98692.647	138.024	1.590	60
220	98907.163	141.434	0.636	60
221	99527.887	145.384	3.521	300
222	99983.241	161.419	1.492	50
223	100313.367	166.344	-3.000	80
224	100862.653	149.865	3.000	90
225	101076.601	156.284	-3.000	120
226	101247.626	151.153	3.000	90
227	101483.116	158.218	-4.000	200
228	101676.545	150.481	-0.318	60
229	101874.590	149.851	-4.000	120
230	102146.672	138.968	-2.090	100
231	102674.951	127.925	-0.409	50
232	102940.327	126.840	2.400	60
233	103217.295	133.488	-2.360	72
234	103437.657	128.286	-5.000	160
235	103806.221	109.858	-0.202	340
236	104000.000	109.466		

REFERENCE FOR GUIDELINE PREPARATION (BUDGET PLANNING)

DRAFT OF ROAD MAINTENANCE BUDGET PLANNING

Road Maintenance Budget Planning (FIRST DRAFT)

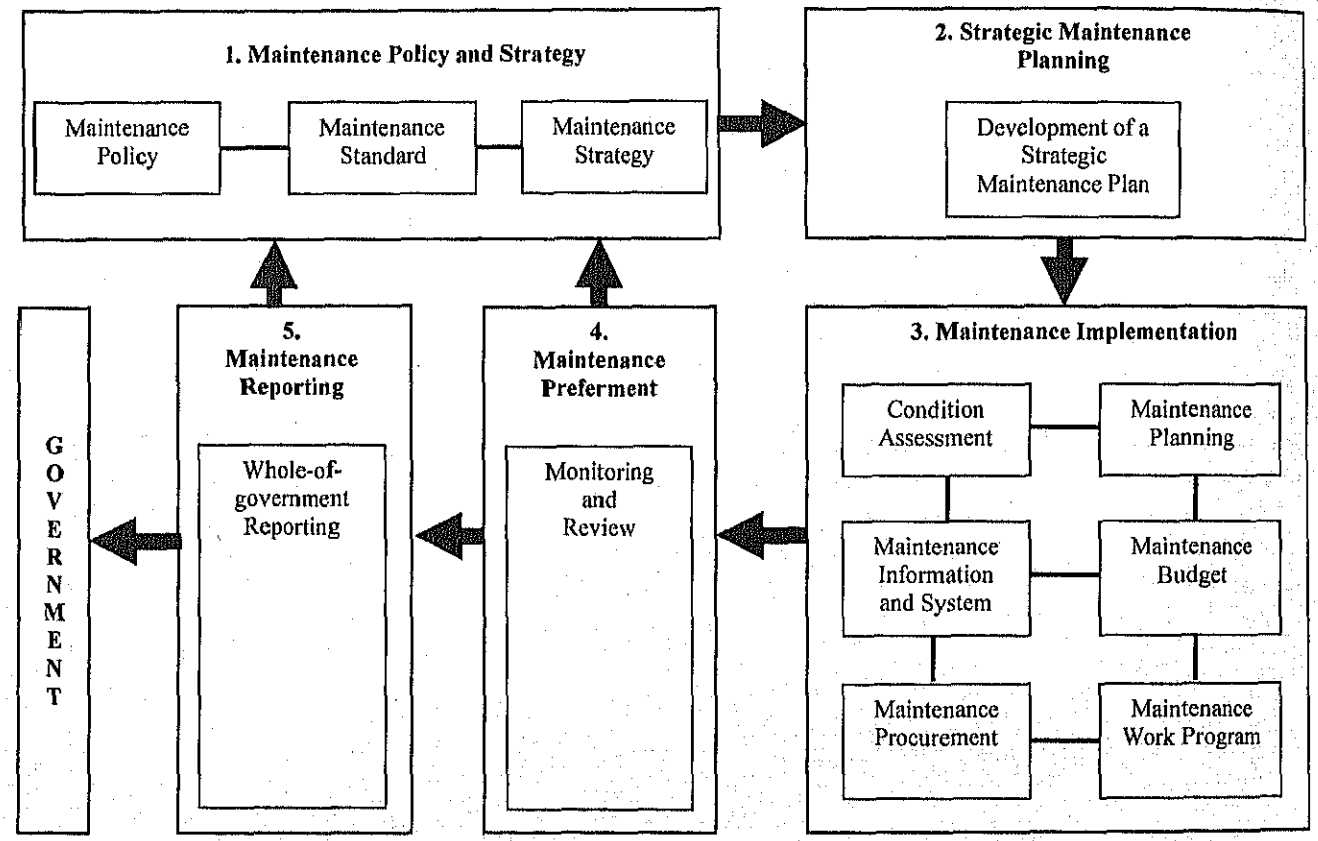
TABLE OF CONTENTS

Road Maintenance Budget Planning

1. Introduction

This guideline forms part of the Maintenance Management Framework (MMF). The MMF is the government policy framework stated in the rectangle strategy. The MMF maintenance management process that assist Ministry of Public Works and Transport (MPWT) in establishing framework for the maintenance of the road network in Cambodia. Its objective is to achieve consistency in planning, implementation and reporting of road maintenance activities.

Diagram 1- Maintenance Management Process



This guideline is part of a suit guideline and resources available to MPWT in relation to the implementation of the MMF. In accordance with the MMF, MPWT is responsible for ensuring that a road maintenance budget is developed and implemented. The objective of this guideline is to provide best practice guideline to MPWT and DPWT on the preparation of road maintenance budget.

It would provide MPWT and DPWT with a model for the development of road maintenance budget, the maintenance budget review processes and establishing financial benchmarks to assist in the review process.

The aims of a Maintenance Budget Model are to:

- establish a guideline for the development of maintenance budget in the context of the overall budget process of the government;
- establish a review process to ensure that the maintenance budget developed meets policy requirements and establish guidelines; and

- ensure key benchmarks are available to enable a reasonable assessment of the appropriateness of the maintenance budget.

2. Guideline for Budget Planning

2.1. Process for the development of a maintenance budget

The development of a maintenance budget should be base on the following:

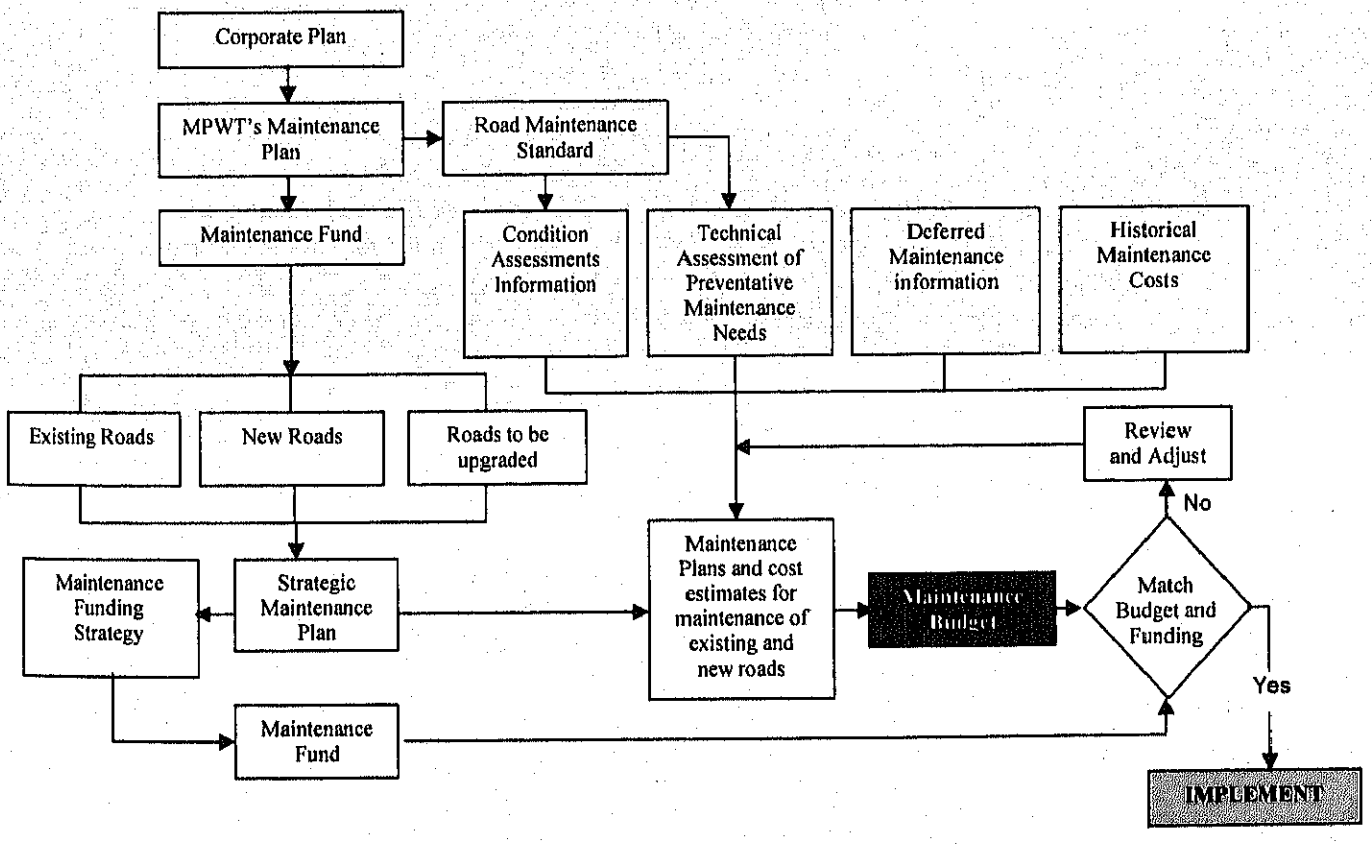
- Maintenance Management Framework;
- Maintenance Fund;
- Strategic Maintenance Plans; and
- Annual Maintenance Expenditure Plans.

The process to be employed in developing a maintenance budget is illustrated in the following diagram 2.

The MPWT's maintenance plans will determine the fund for maintenance and establish:

- existing roads to be maintain;
- new roads coming on line and requiring maintenance; and
- existing roads to be upgraded.

Diagram 2- Process for the Development of a Maintenance Budget



2.2. Review

The review process should be undertaken as part of the budget cycle at a macro level and would involve a review of the following:

- the maintenance fund and strategic maintenance plan;
- maintenance plan;

- maintenance preferment indicators and benchmarks.

2.3. Benchmarks

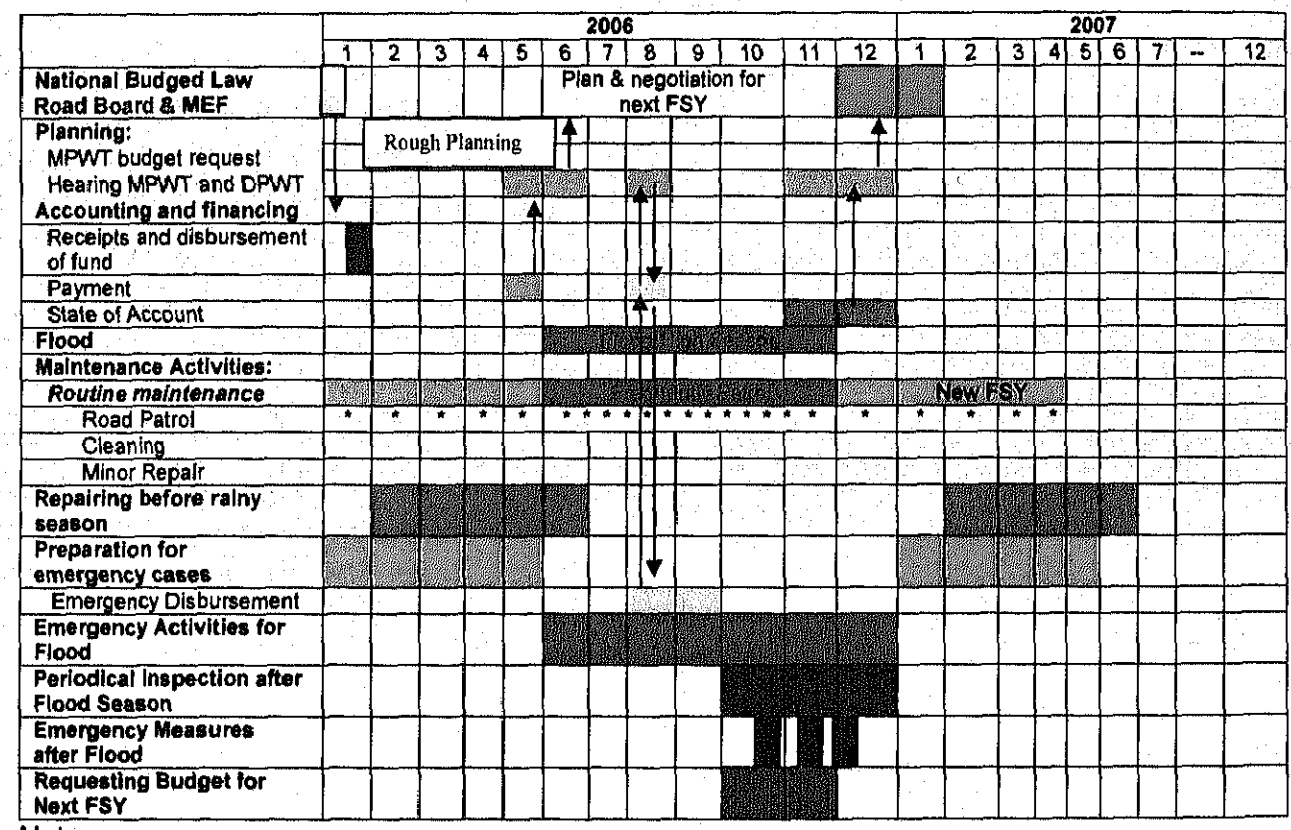
Benchmark should be established base on selected performance indicators to enable an assessment of the appropriateness of the maintenance budget. These benchmarks may be compared:

- $/m^2$
- $ as % of asset value
- ratio of planned/unplanned maintenance
- deferred maintenance index, and
- road condition index

2.4. Annual maintenance expenditure plan

The maintenance budget allocation system process, illustrated in the following diagram 3, is generic process that assists the Ministry of Public Works and Transport in establishing a frame work for the maintenance budget planning and reporting of road maintenance activities.

Diagram 3- Annual Maintenance Expenditure Plan



Note:

3. Road Inventory

The road inventory was accomplished by inspecting all roads, culverts and bridges under the MPWT. The following details noted were:

- The road surface type, width, and condition
- The shoulder type width and condition
- Ditch depth, type and condition
- Land use and development along the road
- Cross drainage structure type, size and condition

- Bridge type, spans, width and condition

Diagram 4- Road Condition Inventory Graph

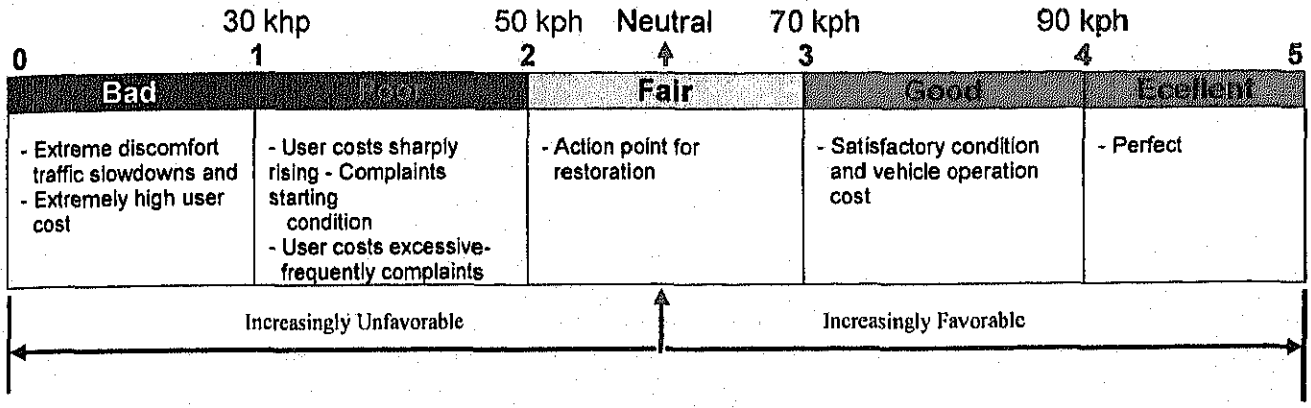


Table 1-National Level for Road Condition Inventory Detail Form

General Detail

1. *Data sheet No.* :
2. Total all Roads Length :
3. Date of Last Inventory :

Road No.	From	To	Total Length of Road in Km	Excellent 5	Good 4	Fair 3	Poor 2	Bad 1	Under Construction
Road Surface									
AC									
DBST									
Macadam									
Laterite									
Earth									
Total all roads									

Existing Road Drainage Structures	**Length in meter**	**Proposed Road Drainage Structure**	**Length in meter**
Number of Concrete Bridge:	.....	Number of Concrete Bridge:	.....
Number of Steel Bridge :	.....	Number of Steel Bridge:	.....
Number of Wooden Bridge:	.....	Number of Wooden Bridge:	.....
Number of Pipe Culvert :	.....	Number of Pipe Culvert:	.....
Number of Box culverts :	.....	Number of Box culverts:	.....
Total number of drainage structure:	.....	Total number of drainage structure:	.....
Total length of drainage structure:	.....	Total length of drainage structure:	.....

Table 2-Provincial Level for Road Condition Inventory Detail Form

General Detail	Start Location	End Location
1. Data Sheet No.:	Easting GPS :	Easting GPS :
2. Road No. :	Northing GPS :	Northing GPS :
3. Province :		
4. Total Length:		
5. Date of Last Inventory:		

Road No.	From	To	Total Length of Road in Km	Excellent 5	Good 4	Fair 3	Poor 2	Bad 1	Under Construction
Road Surface									
AC									
DBST									
Macadam									
Laterite									
Earth									
Total Length									

Existing Road Drainage Structures	Length in meter	Proposed Road Drainage Structure	Length in meter
Number of Concrete Bridge:	.....	Number of Concrete Bridge:	.....
Number of Steel Bridge :	.....	Number of Steel Bridge :	.....
Number of Wooden Bridge:	.....	Number of Wooden Bridge:	.....
Number of Pipe Culvert :	.....	Number of Pipe Culvert :	.....
Number of Box culverts :	.....	Number of Box culverts :	.....
Total number of drainage structure:	.....	Total number of drainage structure:	.....
Total length of drainage structure:	.....	Total length of drainage structure:	.....

4. Assessment

4.1. Condition Assessment

A Road Condition Assessment process must be part of the condition-based maintenance strategy and should be undertaken as part of the maintenance planning process. All DPWT assets must be inspected, through the Condition Assessment process, at least 3 times in every one year.

DPWTs may determine specific intervals for particular types of road assets and the level of inspection detail appropriate to each asset but must meet the minimum requirement. The guideline "Condition Assessment of Road Assets" produced by the MPWT provides the methodology to be employed by DPWTs in the assessment of their road assets. The Condition Assessment process should produce the following minimum outputs:

- A Condition Index for each asset that indicates the conditionof the asset in accordance with the Condition Index Scale in this Framework (refer Table 3);

- An itemised Schedule of Maintenance Work necessary to bring the asset up to the required standard, ranked in order of priority in accordance with the Priority Ranking Scale in this Framework (refer Table 4);

- *Cost Estimates of the maintenance activities identified; and*

- A Technical Assessment of the longer term maintenance needs of the asset to assist in planning and decision-making (for example, any anticipated major replacements and upgrades).

Table 3- Index Scale of Road Condition and Definition

No.	Status	Definitions	Rating
1	Excellent	Road or asset has no defects; condition and appearance are as new.	5
2	Good	Road or asset exhibits superficial wear and tear, minor defects, minor signs of deterioration to surface finishes; but does not require major maintenance, no major defects exist	4
3	Fair	Road or asset is in average condition; deteriorated surfaces required attention; services are functional, but require attention; deferred maintenance work exists.	3
4	Poor	Road or asset has deteriorated badly; serious structural problems; general appearance is poor with eroded protective coatings; elements are defective, services are frequently failing; significant number of major defects exist.	2
5	Bad	Road or asset has failed; is not operational and unfit for transportation or impassable.	1

Table 4- Priority Ranking of Work: the priority ranking to be used as part of the Condition Assessment Process

Priority	Definition
1	Works needed immediately or as soon as possible to meet statutory requirements, and to ensure the transport and safety for road users, including work to prevent serious disruption of transportation activities and services.
2	Works that affect the operational capacity of the road and those which are likely to lead to serious deterioration and higher future costs of repair.
3	Works that have minimal effect on the operational capacity of the asset but desirable to maintain the environmental quality of the asset and its surroundings.
4	Works which can be deferred beyond one year and be re-assessed at a future date.

4. 2. Planning Stage

Planning for maintenance should be undertaken on an annual basis based on information from Condition Assessments, existing programs and historical data as well as a review of MEF's fund for road maintenance. Planning horizons should be at least three years ahead but the objective is to identify activities for each year in the planning period, for the purpose of developing annual maintenance work programs and budget allocations as shown in table 5.

Maintenance programming requires an appropriate level of knowledge of the assets and their maintenance requirements. A well-designed and planned maintenance program should seek to meet the maintenance requirements efficiently and in a cost-effective manner. It should include:

- a condition-based evaluation system from which an annual program of planned maintenance work can be developed for each asset;
- a program of routine and periodic maintenance to address statutory and engineering requirements as determined by legislation, asset characteristics and reliability considerations;
- a breakdown maintenance system for responding to breakdowns and minor and urgent repairs.

Table 5-Timetable for Annual Maintenance Work Program and Budget Allocation

No.	Activities	Responsible organization	Month			
			Sep	Oct	Nov	Dec
1	Prepare base budget proposal for routine maintenance	MPWT				
2	Prepare base budget allocation to selected provinces to implement maintenance activities	MPWT				
3	Assess road condition	DPWT				
4	Select priority road for periodic maintenance	DPWT				
5	Check estimation costs, prepare road maintenance budget estimate and submit to MPWT	DPWT				
6	Receive notification of budget approval from MEF	MPWT				
7	Prepare final estimate budget proposal for road maintenance base on MEF notification	MPW				
8	Adjust base budget allocation to selected provinces to implement maintenance activities	MPW				
9	Approve final budget for road maintenance and annual cash flow projection and submit to MEF	MPWT				
10	Notify provinces of final budget allocation for carrying out road maintenance activities	MPWT				

4. 4. Contract management

Contract management consists of all activities within the delivery of the maintenance service. It includes:

- development of contract packages to meet works program and monthly maintenance plans;
- procurement of services to deliver monthly maintenance plans by field staff or contractors;
- administration of contracts and quality control of works;
- development of procedures for the delivery of maintenance services;
- reporting on work progress;
- provision of work certification and approval of payments to contractors;
- collection of maintenance information into the computerized maintenance management system;

4.5. Final check of inspection

(1) The number and type of maintenance features (physical assets) and the condition of these features are major factors in determining the kinds and amounts of work needed. An inventory of such maintenance features (physical assets) shall be prepared.

(2) Maintenance Management is based upon work activities. Work activities shall be defined for the significant activities representing the maintenance work to be performed. Definitions shall include and activity code; title, description, work unit and inventory unit. Such complete descriptions of activities are referred to as Activity Guidelines and provide standards of performance for individuals and crews by setting forth the quality and quantity of results anticipated from each activity.

(3) An annual Work Program & Budget shall be prepared. The activity-based work program and budget represents the product of the planning process and summarizes the kinds and amounts of work planned the productivity of the work force, and the costs of the planned work. It also provides the basis for managing the annual work effort.

(4) The resources needed to accomplish the annual work program shall be documented. By organizing the labor, equipment and material resources, DPWT can ensure that planned maintenance can be accomplished with the available budget. Preparation of an annual work calendar and a monthly distribution of work can help document resource needs.

(5) Work scheduling procedures shall be documented. The preparation of annual, seasonal and short-term schedules, as well as daily meetings, can provide guidance in achieving annual work program goals.

(6) Work accomplishment and expenditure shall be monitored to ensure that planned work programs are actually achieved within available resource levels. By evaluating actual and planned work accomplishment and costs, managers and supervisors can take the necessary actions to help achieve the county's maintenance work objectives.

The following information is provided for the annual review of the implementation of and compliance with the requirements of final check of inspection. The information provided herein is current as latest, and summarizes Maintenance Management activities for Calendar Year.

Yes No In accordance with final check of inspection, maintenance management procedures have been used by the MPWT to guide cost-effective maintenance and preservation activities on roads maintenance in the previous calendar year.

DPWT's maintenance management practices meet the following requirements, in accordance with final check of inspection:

Yes No (1) An inventory of maintainable road features (physical assets) has been prepared and/or updated.

Yes No (2) Activity Guidelines have been prepared, reviewed and/or updated for all significant maintenance activities.

Yes No (3) A work program and budget has been prepared for maintenance activities planned in the year. This work program and budget is based upon the road features to be maintained, levels of service to be provided by the maintenance, the types and amounts of maintenance work planned and the costs for the labor, equipment and materials needed to complete the work.

Yes No (4) An annual work calendar has been prepared showing the monthly distribution of planned maintenance activities. Labor, equipment and material resource requirements needed to accomplish the planned workload are also identified.

Yes No (5) Work scheduling procedures are identified, documented, and utilized in carrying out the maintenance work program.

Yes No (6) Reports showing work accomplishment and cost data and a comparison of planned and actual work program accomplishment have been prepared and reviewed by managers and supervisors.

5. Treatment Selection

1100 Patch Bituminous Surface
Patching of small areas of bituminous roadway or paved shoulder with hot or cold bituminous mixtures and hand tools to correct potholes, edge failures and other potential surface hazards. This activity also includes temporary patching of bituminous pavement and the use of hot liquid bituminous material crack patching.

1200 Grade Shoulders
Grading and reshaping aggregate or earth shoulders to eliminate edge ruts, ridges, corrugations and high shoulders.

1250 Grade Earth/Gravel Roads
Grading and reshaping aggregate or earth roads to eliminate edge ruts, ridges, corrugations, high shoulders and to restore good drainage characteristics.

1260 Heavy Grading
Description: Grading and reshaping aggregate or earth road to eliminate edge ruts, ridges, corrugations and high shoulders. This activity includes the application of small amounts of additional earth or aggregate and includes the use of water and compaction equipment to restore the road surface and reduce road roughness.

1300 Re-gravel Road
The repair of aggregate surface roads by reshaping, adding 10 to 20 cm of crushed or natural aggregate and compacting to specification to restore the thickness of gravel surface and to restore smooth riding condition on the road.

1450 DBST Gravel Road
The application of the signal or double bituminous surface treatment to a gravel road to improve riding conditions, reduce dust, improve durability and to seal the road from water, include preparation of the road bed by reshaping, compaction, addition of gravel base material, priming of road bed if necessary and other required to provide a finished bituminous sealed road surface.

1570 Rehabilitation Gravel Road
The complete rehabilitation of a gravel road to include removal of weak sub-grade, widening of the road to design specification, addition of required drainage structure, placement and compaction of aggregate base material and surfacing with the bituminous seal if specified. Also includes the repair of small bridges and installation of specified road furniture. Many include the raising of the road about design flood, level.

1900 General Road Way maintenance
Other routine roadway maintenance activities are not specifically identified as separate activities.

2100 Clean and Cut Ditches

The cleaning and clearing of roadside drainage courses to restore the drainage of water away from the road structure using hand tools, includes the loading and removal of cleared debris from the site.

3100 Clean Culvert
The cleaning and clearing of drainage structure to ensure the proper drainage of water through and away from the road structure using hand tools, includes the loading and removal of cleared debris from the site.

3130 *Repair Culvert*
The repair of damaged culvert barrel, head and wing walls and other appurtenances to the culvert structure, does not include installation of new culvert.

3150 Install Pipe Culvert
The installation of a new pipe culvert, include the excavation and preparation and the bedding for the culvert, the placement and backfill of the culvert, repair of the road surface and the construction of head and wing walls.

3200 Minor Bridge Repair
The minor repair and cleaning of bridges using hand tools, includes the replacement or repair of bridge decks, repair of handrails, cleaning of drainage openings, repair of curbs, repair of bridge approaches and guardrails and repair of signs and other bridge appurtenances.

4150 Control Vegetation & Clean Roadside
The clearing of vegetation and trash from the roadside to improve drainage and restore sight distances, includes the loading and removing of cleared materials.

4500 Pick Litter
Removing trash and rubbish from the road right of way to improve the aesthetics of the road.

6. Unit Cost

Table 6- Unit Cost

Code	Work Activities	Unit	Unit Cost (Riel)
1100	Patch Bituminous Surface (Asphalt Concrete)	m^2	
1120	Clean Bituminous Surface (Soil, Rubbish, Trash)	m^2	
1130	Sealing on Bituminous Surface (Crack)	m^2	
1160	Patch Bituminous Surface (DBST)	m^2	
1170	Patch Bituminous Surface (Macadam)	m^2	
1180	Patch Bituminous Surface (Laterite, Bitumen)	m^2	
1190	Fill Laterite Road Surface (Laterite)	m^2	
1200	Grade Shoulders	Km	
1250	Grade Earth/Gravel Road	Km	
1260	Heavy Grading	Km	
2100	Clean and Cut Ditches by Hand	m	
3100	Clean Culverts	No.	
3130	Repair Culverts	No.	
3150	Install Pipe Culvert	No.	
3200	Minor Bridge Repair	m/h	
4150	*Control Vegetation and Clean Roadsides*	Km	
4200	Sand Bags	Bag	

7. Implementation Plan

7.1. Time schedule preparation

The routine maintenance program of the designated province will involve of one-year period and will be managed by MPWT. The Ministry is currently focusing on the prevention of national preventing maintenance program that will provide and improve maintenance planning and management skills at the provincial and municipal level. The work schedule is proposed in the following table:

Table 7-Work Schedule

Step	Work Item	Responsible Person	Month											
			1	2	3	4	5	6	7	8	9	10	11	12
1	Update road inventory	Mr. xxxxx												
		Mr. xxxxx												
2														
3														
4														

7. 2. Item activities

- AC
- DBST
- MACADAM
- Laterite
- Earth

7. 3. Implementation organization and arrangement

- **Member schedule**

Table 8-Staff Schedule

No.	Assignment	Name	Month											
			1	2	3	4	5	6	7	8	9	10	11	12
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														

- **Equipment schedule**

Table 9- Equipment schedule

No.	Equipment Item	Unit	Capacity	Weigh/Volume	Month											
					1	2	3	4	5	6	7	8	9	10	11	12
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																

7. 4. Operation plan

The operation and schedule of the provincial and town routine maintenance programs will be based on maintenance guideline (Annex 1) and work agreement compensation to be determined by calculating the quantity of work accomplished in each activity multiplied by the agree unit rate.

Annex 1

Guideline for Routine Maintenance Program

Code No.	Description	Determination	Inspection
1100	**Patch Bituminous Surface**		
	Patching of small areas of bituminous roadway or paved shoulder with hot or cold bituminous mixtures and hand tools to correct potholes, edge failures and other potential surface hazards. This activity also includes temporary patching of bituminous pavement and the use of hot liquid bituminous material crack patching.	Through the inspection of the bituminous pavement. It is determined that the amount of patching by pavement condition is approximately.	A well constructed patch of the same material as and flush with the surface and with square and vertical sides to the patch.
1200	**Grade Shoulders**		
	Grading and reshaping aggregate or earth shoulders to eliminate edge ruts, ridges, corrugations and high shoulders.	Base on guideline and inspected that earth or aggregate shoulders should be graded one time per year.	Well-graded shoulders free from ruts, ridges obstructions and are flush with road surface.
1250	**Grade Earth/Gravel Roads**		
	Grading and reshaping aggregate or earth roads to eliminate edge ruts, ridges, corrugations, high shoulders and to restore good drainage characteristics.	Depending on guideline and inspection of the earth/gravel roads, it is directed that earth/gravel roads should be grade one time per year.	Well-graded shoulders avoiding from ruts, ridges, and obstructions and are flush with road surface.
1260	**Heavy Grading**		
	Grading and reshaping aggregate or earth road to eliminate edge ruts, ridges, corrugations and high shoulders. This activity is included the application of small amounts of additional earth or aggregate and used of water and compaction equipment to restore the road surface and reduce road roughness.	By inspection of the earth and gravel road is estimated that half of the road kilometer will require heavy grading this next fiscal year. This amount should be reduced in future years as regular grading maintenance the desired condition.	As well graded and shaped road without ruts, ridges, corrugations or raised shoulders.
1300	**Re-gravel Road**		
	The repair of aggregate surface roads by reshaping, adding 10 to 20 cm of crushed or natural aggregate and compacting to specification to restore the thickness of gravel surface and to restore smooth riding condition on the road.	On year-to-year basis aggregate surfaced roads should be re-graveled once every three to five years depending on traffic and results of condition inspection and evaluation.	
1450	**DBST Gravel Road**		

	The application of the signal or double bituminous surface treatment to a gravel road to improve riding conditions, reduce dust, improve durability and to seal the road from water, include preparation of the road bed by reshaping, compaction, addition of gravel base material, priming of road bed if necessary and other required to provide a finished bituminous sealed road surface.	A long-term objective of the road is to seal the national late rite roads.	Adding late rite about 10 to 20 cm, if level to low, we graded, shaped, spray water if not enough for good compaction (90%). When the surface of late rite road is good, smooth, without ruts, ridges, corrugations, we can seal (DBST) with stone 19 mm and 12 mm.
1570	**Rehabilitation Gravel Road**		
	The complete rehabilitation of a gravel road to include removal of weak sub-grade, widening of the road to design specification, addition of required drainage structure, placement and compaction of aggregate base material and surfacing with the bituminous seal if specified. Also *includes the repair of small* bridges and installation of specified road furniture. Many include the raising of the road about design flood, level.	The national road class N2 to be recommended 15% of earth/late rite and provincial road class N3, we recommended 10% of earth/late rite road in condition 3 be rehabilitation totally as part of long term road improvement program.	The first we remove all of weak sub-grade material, and replacement with suitable sub-grade. A well graded and reshaped road without ruts, ridges, corrugations and adding late rite about 10 to 20 cm, after we graded, reshaped, spray water if not enough for good compaction.
1900	***General Road Way maintenance***		
	Other routing roadway maintenance activities that are not specifically identified as separate activities.	Referring to guideline roadside that 1500 Man hours will be required in work not identified in other activities.	
2100	**Clean and Cut Ditches**		
	Cleaning and clearing of roadside drainage courses to restore the drainage of water away from the road structure using hand tools. Includes the loading and removal of cleared debris from the site.	By policy roadside ditches are to be cleaned one time a year.	Clear and clean drainage ditches capable of carrying away without obstruction.
3100	**Clean Culvert**		
	Cleaning and clearing of drainage structure to ensure the proper drainage of water through and away from the road structure using hand tools. Includes the loading and removal of cleared debris from the site.		Cleared and clean culvert capable of carrying away water without obstruction.
3130	**Repair Culvert**		
	Repair of damaged culvert barrel, head and wing walls and other appurtenances to the culvert structure. Does not include installation of new culvert.	Many culverts and drainages in all provinces are needed to repair in the next fiscal year.	A repaired culvert with proper grade and slop, with head and wing walls repaired. Finished grade to conform to road surface.
3150	**Install Pipe Culvert**		

	Installation of a new pipe culvert, include the excavation, preparation and the bedding for the culvert, the placement and backfill of the culvert, repair of the road surface and the construction of head and wing walls.	It is considered reasonable to plan for installation of new culverts on road in the coming year. More may be required but if installed over a few years the drainage requirements will be met.	A new culvert installed to proper grade and slope with head and wing walls constructed according to plans. Finished grade to conform to road surface without depressions or extreme mounding of backfill.
3200	**Minor Bridge Repair**		
	Minor repair and cleaning of bridges using hand tools, includes the replacement or repair of bridge decks, handrails, curbs, bridge approaches, guardrails, repair of signs and other bridge appurtenances and cleaning of drainage openings.	The bridge in province require substantial minor repair. This cannot be accomplished immediately but as a start it is recommended that two-man hours/linear meter of bridge be planned.	Evidence of bridge repairs such as new decks, handrails, approaches. Bridge will be capable of carrying traffic without substantial slowing.
4150	**Control Vegetation & Clean Roadside**		
	Clearing of vegetation and trash from the roadside to improve drainage and restore sight distance consist of loading and removal of cleared materials.	Base on guideline for roadside vegetation is to be controlled and need to be cut four times a year to preserve drainage and enhance aesthetics.	Well-cleared and aesthetically pleasing roadsides. All grass cut to 15cm or less. All non-flowering shrubs or trees less than 10cm removed from roadsides.
4500	**Pick Litter**		
	The removal of trash and rubbish from the road right of way to improve the aesthetics of the road.	To maintain the roads and roadsides litter and rubbish clear, it is recommended that each kilometer be cleared each *month.*	Well-cleared and aesthetically pleasing roadsides. All trash and rubbish *removed from* roadside.

Type of Asphalt Surface Damage	Methods for Asphalt Surface Maintenance
1- Cracks	**1- Cracks**
Crack may result from structural weakness or from the normal aging process of the asphalt surface or the underlying sub-grade layers.	If asphalt surface not so poor, we can seal and filling cracks, after cleaning. If asphalt surface so poor, we have to replace all asphalt surface or base and sub-bases if necessary.
2- Pothole	**2- Pothole**
Potholes are sleep-side holes of varying size in pavement resulting from localized *disintegration often caused by poor drainage* and aggravated by traffic loads.	The first we have to squaring up the pothole sides, digging it max. 200mm, min. 100mm. Cleaning and *drying the hole, and filling with cold or hot mix asphalt* (for A/C surface), or stone 4x6, 1x2 and spray bitumen, covering aggregate 1x2 and pray bitumen on it, and covering 1x1 aggregate with good compaction by each layer.
3- Corrugation	**3- Corrugation**
Corrugations are usually caused by traffic over unstable mixtures in which the content of fines or asphalt is too high. Corrugations generally less than 10 feet a part. When more than 10 feet apart, they can be called waves.	On high traffic roads, completely removal and resurfacing are recommended action. On low traffic roads, cutting of high spots and adding leveling material to low spots will take advantage of the roadway compaction already present.
4- Flushing	**4- Flushing**

Flushing can result from a mix that is too rich, traffic loading that cause and increased combination of aggregate, too much asphalt in patches, and unstable mix, or other factor. Flushing occurs in hot weather, and if not treated, may cause slippery surface.	Slight to moderate flushing without surface irregurities may be repaired by blotting with sand or porous aggregates. Generally, permanent repair of flushed areas requires removal and replacement, overlaying with a seal coat or hot plant mix having suitable asphalt content, or planning the area.
5- Polished Aggregate	**5- Polished Aggregate**
This condition is associated with heavy traffic wear and is caused largely by the type of aggregate use in the mix. Smooth, rounded aggregate or soft aggregate, may wear or polish to the point that the surface becomes slippery when wet.	Applying a thin overlay with and open-graded asphalt friction course, applying a chip seal, applying a slurry seal, or overlaying with hot plant mix are all appropriate treatments.
6- Raveling:	**6- Raveling:**
Raveling is usually caused by construction condition, such as inadequate compaction, not enough asphalt in the mix, wet weather during lay down, overhead asphalt in thee mix.	We can repair with fog seal, sand seal, chip seal or slurry seal should be adequate except for roadway under very heavy traffic volume operating at high speed.
7- Settlements:	**7- Settlements:**
Excessive moisture rising through capillary in the sub-grade swelling soils, surface cracking, and poor drainage can all cause pavement heaving or sagging.	Repairs to the sub-grade are essential to avoid continue distortion of the surface. Unsuitable material should be removed and replaced with material that has good drainage qualities.

Type of Shoulders Damage	Methods for Shoulders Maintenance
1200 Grade Shoulder:	**1200 Grade Shoulder:**
Some of our national road have shoulders on both side, but not so good, because some narrow, some higher than pavement, some ruts, ridges from rain water to flow and the big reason because we never maintenance from a long time ago.	The first we clearing and take out grass, rush, and then well graded shoulders from ruts, ridges, obstructions and are flush with road surface. We can push some soil or late rite from heightens apart of shoulder and put at the lower area. We must flow the water away from shoulders.
Type of Earth/Gravel Road Surface Damage	**Method for Earth/Gravel Road Surface Maintenance**
1250 Grade Earth/Gravel Road	**1250 Grade Earth/Gravel Road**
The entire earth/gravel/late rite road surface are ruts, ridges and obstructions, it cause by rainwater and traffic will occur small holes on the surface.	Well-graded shoulders free from ruts, ridges, and obstruction and are flush with road surface, so after grading the surface will smooth for safety traffic.
1260 Heavy Grading	***1260 Heavy Grading***
Some late rite road surface have occurred big hole, cause by water and heavy traffic. Sometime the traffic has to cut off, because water flows across the road and the big hole has full water.	Grading and reshaping aggregate or earth roads to eliminate edge ruts, ridges, and corrugations. This activity includes the application of small amounts of additional earth or aggregate and includes the use of water and compaction equipment to restore the road surface and reduce road roughness.
1300 Re-gravel Road	**1300 Re-gravel Road**
The entire earth/gravel/late rite road surface are ruts, ridges and obstructions, it cause by rainwater and traffic will occur small holes on the surface. For along time that we never maintenance or repair, so the thickness of the crush rock or late rite surface had lose. When laetrile surface loose thickness.	A well graded and reshaped road without ruts, ridges, corrugations and adding late rite about 10 to 20 cm, we graded, shaped, spray water if not enough for good compaction to specification to restore the thickness of gravel surface and to restore smooth riding condition on the road.
1450 DBST Gravel Road	**1450 DBST Gravel Road**
The application of the single or double bituminous surface treatment to the gravel road to improve riding conditions, reduce dust, improve durability and to seal the road from	Adding late rite about 10 to 20 cm, if level too low, we graded, shaped, spray water if not enough good compaction (90%). When the surface of late rite road is good, smooth, without ruts, ridges, corrugations, we can

water. And includes preparation of the road bed by reshaping, compaction, addition of gravel base material, priming of road bed if necessary and other operation required to provide a finished bituminous seal road surface.	seal (DBST) with stone 19 mm and 12 mm.
1570 Rehabilitation Gravel Road	**1570 Rehabilitation Gravel Road**
The complete rehabilitation of a gravel road to include removal of weak sub-grade material, replacement with suitable sub-grade, widening of the road to design specification, addition of required drainage structure, placement and compaction of aggregate base material and surfacing with the bituminous seal if specified.	The first we remove all of weak sub-grade material, and replacement with suitable sub-grade, a well grade and reshaped road without ruts, ridges, corrugations and adding late rite about 10 to 20 cm, after we graded, shaped, spray water if not enough for good compaction.
1900 General Roadway Maintenance	**1900 General Roadway Maintenance**
Other routing roadway maintenance activities that are not specially identified as separate activities.	
2100 Clean and Cut Ditches	**2100 Clean and Cut Ditches**
Some of our national roads are higher than side land, they are no problem about roadside drainage, but some roads need drainage for flowing water away from the road, because have rush, debris, log and some places narrow, that we have to cut and clean for water way.	The cleaning and clearing of roadside drainage courses to restore the drainage of water away from the road structure using hand tools, ex, hoe, basket, shove, etc. Includes the loading and removal of cleared from the site to keep way from the site.
3100 Clean Culvert	**3100 Clean Culvert**
In side, out side, in let, out let of the culvert have a lot of soil, debris, rush, log that can be stuck current of the water.	We use hand tools, ex, hoe, basket, shove, etc. to take all debris, rush, soil, and any thing that can block the water way.
3130 Repair Culvert	**3130 Repair Culvert**
Some of the culverts are breakdown some part like wing wall, in let, out let, pipe, so the water can flow into the embankment, soil can be lose.	A repaired culvert with proper grade and slope, with head and wing walls repaired. Finished grade to conform to road surface.
3150 Install Pipe Culvert	**3150 Install Pipe Culvert**
Some section of the road have to open for waterway, because not enough bridge or culvert to flow the water. We need to install new pipe culvert.	Survey the first and after to dig by excavator, compact the bed and lay sand, compact with water sickness 200mm, put pipe culvert with the good slope (bigger than 1%), fill by sand from the bottom to the half of culvert, compact with water, fill soil and the top with water, fill soil and the top with late rite and good compaction. Wing wall, in let, out let, will construct at the last.
3200 Minor Bridge Repair	**3200 Minor Bridge Repair**
Description: The minor repair and cleaning of bridges using hand tools. Include the replacement or repair of bridge decks, repair of handrails, cleaning of drainage openings, repair of curbs, repair of bridge approaches and guardrails and repair of signs and other bridge appurtenances.	Evidence of bridge repairs such as new decks, handrails, approaches. Bridge will be capable of carrying traffic without substantial slowing.
4150 Control Vegetation and Clean Roadside	**4150 Control Vegetation and Clean Roadside**
Description: The clearing of vegetation and trash from the roadside to improve aesthetics, improve drainage and restore sight distances. Includes the loading and removal of cleared material.	Well-cleared and aesthetically pleasing roadsides. All grass cut to 15cm or less. All non-flowing shrubs or trees less than 10cm removed from roadside.

GENERAL SPECIFICATIONS

TRAFFIC

1. The Contractor shall arrange his work that at least half the road width remains open to traffic at all times or, if necessary, Contractor shall provide and maintain and adequate diversion for traffic and shall provide traffic control as necessary or when directed to do so by the Employer.

ROAD SAFETY

2. When carrying out the works the Contractor shall be responsible for the provision of adequate warning signs and traffic barriers to ensure the safety of road users and his employees. The cost of provision of all necessary warning signs and barriers shall be included in tender rates for each activity.
3. If the work is undertaken on the road without adequate warning signs and barriers, and if the Employer considers the situation a danger to road safety, the Employer may instruct Contractor to cease such work until adequate safety precautions and warnings are provided. Whether the Employer instruct the contractor or not the Contractor is fully responsible for the road safety of his work and the Contractor shall at all time identify the Employer against all liabilities to other people for body injury and damages to property under Clause 21 of the contract.
4. The following provisions for road safety shall be met:
    a) **Work on the road side**: (e.g. Vegetation cleaning) provision of two red flags on cut poles on each side of the road and not less than 100 meters of the each side of the working area before work begins.
    b) **Mechanical operations to the road surface**: (e.g. grading or potholes repair) provision of warning signs indicating a grader working ahead place on the edge of the road at the beginning and at the end of the operations before work begins; where fitted to the grader yellow flashing lights shall be switched on.
    c) **Partial closure of the road**: (e.g. culvert barrel repairs, sectional re-gravelling) provision of two red flags or men working signs 200 meters on each side of the work area and lane closure barriers or painted oil drums placed at each end of the work area.
    d) Total closure of the road: (e.g. culvert construction or replacement) provision of maintenance of a traffic diversion and warning signs placed 200 meters on each side of the work area, lane closure barriers or painted oil drums placed at each end of the work area and let/right arrows clearly painted and displayed to direct traffic to the diversion.
5. Where possible work shall not be left unfinished or the road left in a hazardous condition for road users overnight: where this is unavoidable clear warning signs must be left in the place and made safe through the night.

HANDTOOLS

6. The Contractor is responsible for providing suitable hand tools to his employees to carry out the work according to the standard work method of each activity.
7. The Contractor shall provide the necessary equipment to set the work out to the line and levels as stated in the Activity Specifications and/or as specified or directed by Employer.

EQUIPMENT

8. The Contractor shall use equipment approve for the work as noted in the Activity Specifications unless otherwise directed or approve by the Employer.

ACTIVITY SPECIFICATIONS

9. The Activity Specifications are to guide the Contractor in executing the work to acceptable standard and qualify. The Contractor shall make himself familiar with the Activity Specifications and General Specifications included in the Contract Document before tendering his rates in the Bill of Quantities.

10. The Approve Work Method is to be followed by the Contractor unless otherwise directed by the Employer in writing.

11. The Typical Crew is then recommended composition of work force required to execute the work according to the Activity Approve Work Method.

12. The recommend equipment is the list of equipment required to execute the work according to the Activity Approve Work Method. The Contractor may use equipment other than listed here, but Employer shall, if he believes that the substitution of equipment is having an adverse effect on the standard of work performed, instruct the Contractor to cease work until approved equipment is on site.
13. The Approve Materials is the list of materials required to execute the work according to the Activity Approve Work Method and Technical Specification. Materials not listed, shall only be used with the approval or instruction of the Employer.

14. The Technical Specification describes the particular technical requirements of the work to be performed under each activity. These Technical Specifications are to be followed by the Contractor unless instructed otherwise in writing by the Employer to follow these specifications may result in the work of an unacceptable standard and in such cases no payment for work done will be made.

15. The Method of Measurement of Work specified for each activity the unit activity the unit that will be used in measuring work on completion and the basic upon which payment will be made for work done. The items involved in the work that are to be included in the payment per unit of work are described. The Contractor shall assess the work involved taking into account all the costs he is likely to incur in executing the work before operating tender his rates. General items that are included in the payment of work and that apply to all activities are described in the General Specifications and should read in the conjunction with individual Activity Specifications before the Contractor prepare his tender rates. Claim for costs incurred in executing works, which are already allowed in the specifications, shall not be accepted.

16. The Contractor shall take whatever samples, measurement, or any other form of testing which is necessary to be confident that all components of the work comply with the specified requirements before presenting the works for payment purposes. If the Employer tests any part of the work and finds that it is not in compliance with the specified requirements, the Contractor shall be liable for the cost of further testing.

17. Working hours: the contractor should schedule section of road and/or time of day where restricted no maintenance work should be carried out due to peak traffic or other requirements.

18. The preliminary and general section of the contract documents should clearly indicate specific requirement for that contract in term of the technical content, extent of work, and location. It should avoid repetition of clauses in standard

specifications or a series of amendments to these and need to be brief and concise to remain effective.

19. No standard materials: request to use a material which does not meet the requirements of the relevant maintenance materials specification will require the approval of the Employer. Employer shall advice Contractor of details of any approvals given.

20. The Contractor shall keep accurate and legible record of all maintenance work carried out which may be required at any time. In addition the Contractor shall submit on a monthly basic (or other such period as may be agreed by the Employer) a record of all works undertaken within reference station lengths of the road. The record shall be clear and concise and is required as a permanent maintenance record for the road.

REASONABLE COST ESTIMATION

Cost Estimation for Road Maintenance

Those rates are reference only!

Unit Cost

Labor

Foreman	12.0$/day
Pavement Labor	7.0$/day
Skilled Labor	6.5$/day
Common Labor	6.0$/day

Overhead 20%

Material

Straight Asphalt	250$/t x 112% = 280$/ton
Prime Coat	320$/t x 113% = 362$/ton
Tack Coat	370$/t x 115% = 425$/ton
Diesel	0.20$/Lt x 145% = 0.29$/Lt

River sand	2.5$/m3		At quarry
Sub-base	6.0$/m3		At quarry
Base	7.0$/m3		At quarry

Binder Course	43$/ton		At plant
Surface Course	49$/ton	small quantity	At plant
	45$/ton		At plant

Equipment

Including driver, operator, diesel, lubricant, insurance, tax

Dump Truck 10t	120.0 $/day	
Bloomer with Tractor	120.0 $/day	
Asphalt Distributor	150.0 $/day	
Asphalt Finisher	250.0 $/day	
Tire Roller 8~20t	130.0 $/day	
Macadam Roller 10t	130.0 $/day	
Roller 1ton	20.0 $/day	without operator
Sprinkler Lorry	80.0 $/day	
Trailer	150.0 $/day	
Tire Backhoe 0.4m3	130.0 $/day	
Wheel Loader 1.0m3	140.0 $/day	
Truck with 3ton Crane	100.0 $/day	
Rammer	12.0 $/day	without operator

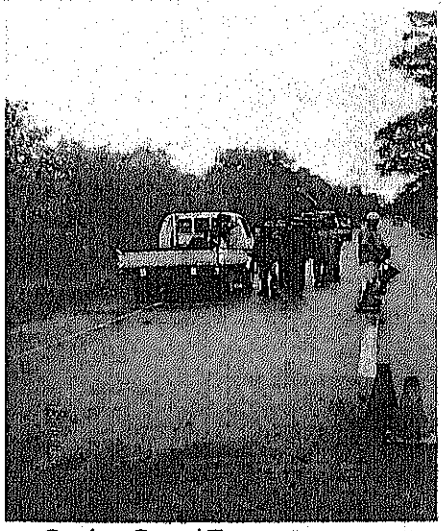
Cost Estimation for Road Maintenance

Those figures and rates are reference only!

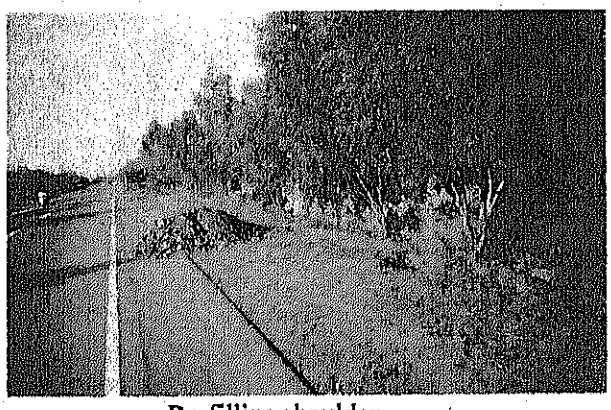
Routine Maintenance Team 2 Parties

Work Items :
- Preparing road inventory based on a daily patrol.
- Cleaning road surface, side ditch, culvert.
- Trimming and cutting the tree/grasses.
- Checking and replacing the deflective traffic signs guard post/rail including minor repair based on daily patrol.

Item		Quantity	Unit	Unit Price ($)	Amount ($)	Remarks
1 Labour						
Foreman	2 x 12months	24.0	month	200.0	4,800.0	
Skilled Worker	6 x 12months	72.0	month	100.0	7,200.0	
Driver	2 x 12months	24.0	month	100.0	2,400.0	
Sub-total					14,400.0	
2 Machinery Cost						
Pick-up	1 x 2parties	2.0	Nos		Free of cost	
Engine grass cutter	3 x 2parties	6.0	Nos		Free of cost	
Tools		24.0	month	50.0	1,200.0	
Fuel / Lubricant	150Lt/mth x 2 x 12	3,600.0	Lt	0.68	2,448.0	
Repairing Cost		24.0	month	80.0	1,920.0	
Sub-total					5,568.0	
3 Material Cost						
Cement	1.0t x 2 x 12month	24.0	ton	75.0	1,800.0	
Crushed Stone, Sand		80.0	m3	7.0	560.0	
Miscellaneous materials		24.0	month	150.0	3,600.0	
Sub-total					5,960.0	
Total					25,928.0	



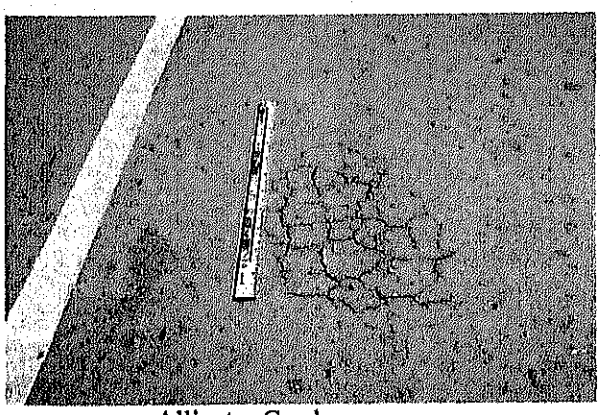
Cutting Grass/ Tree



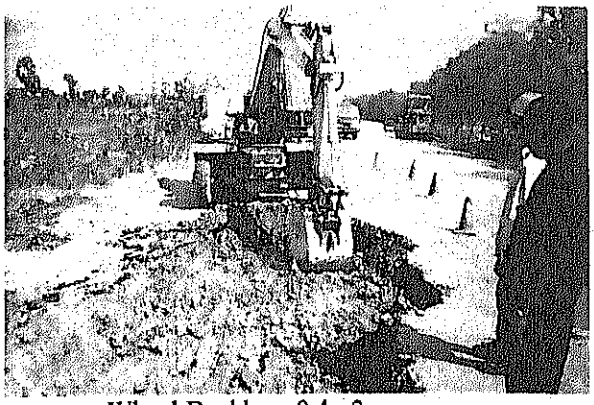
Re-filling shoulder

Routine Maintenance Team 2 Parties
Work Items : - Repairing Alligator Crack

Item		Quantity	Unit	Unit Price ($)	Amount ($)	Remarks
1 Labor						
Foreman	2 x 12months	24.0	month	200.0	4,800.0	
Skilled Worker	20 x 12months	240.0	month	100.0	24,000.0	
Driver	2 x 12months	24.0	month	100.0	2,400.0	
Sub-total					31,200.0	
2 Machinery Cost						
Wheel Backhoe 0.4m3	1 x 2parties	2.0	Nos		Free of cost	
4ton Truck with Crane 3t	1 x 2parties	2.0	Nos		Free of cost	
Asphalt Cutter	1 x 2parties	2.0	Nos		Free of cost	
Compressor, Breaker	1 x 2parties	2.0	Nos		Free of cost	
Vibration roller 1ton	2 x 2parties	4.0	Nos		Free of cost	
Rammer 80kg	2 x 2parties	4.0	Nos		Free of cost	
Plate Compactor 60kg	2 x 2parties	4.0	Nos		Free of cost	
Dump Truck 8ton	1 x 2parties	2.0	Nos		Free of cost	
Tools		24.0	month	60.0	1,440.0	
Fuel / Lubricant		30,200.0	Lt	0.68	20,536.0	
Repairing Cost		24.0	month	150.0	3,600.0	
Sub-total					25,576.0	
3 Material Cost	1,500m2/year x 2 parties					
Straight Asphalt		20.0	ton	280.0	5,600.0	
Crushed Stone	t = 15cm	600.0	m3	7.0	4,200.0	
Miscellaneous materials		24.0	month	200.0	4,800.0	
Sub-total					14,600.0	
Total					71,376.0	


Alligator Crack


Hacking Crack by Concrete Breaker



Wheel Backhoe 0.4m3

Compaction by Rammer 80kg

Compaction by Plate 60kg

Compaction by Roller 7ton

Compaction by Roller 1.0t