Appendix 1

Photographs of Problem Areas

Photo 1: 2 Papaka Rd from Ngunguru Rd – Looking SW (garage flooded during winter 1999)

Photo 2: 1851-1855 Ngunguru Rd – Looking NE (garage/basement flooded during winter 1999)

Photo 3: Garage of 1855 Ngunguru Rd – From Munro Place (garage flooded during winter 1999)

Photo 4: Open Drain – Looking Upstream at Outlet of SW Line D

Photo 5: Driveways of 1895-1901 Ngunguru Rd (flooding of habitable floor at 1895 Ngunguru Rd occurred twice during winter 1999)

Photo 6: Kakariki Rd Culvert (PC11) Looking West

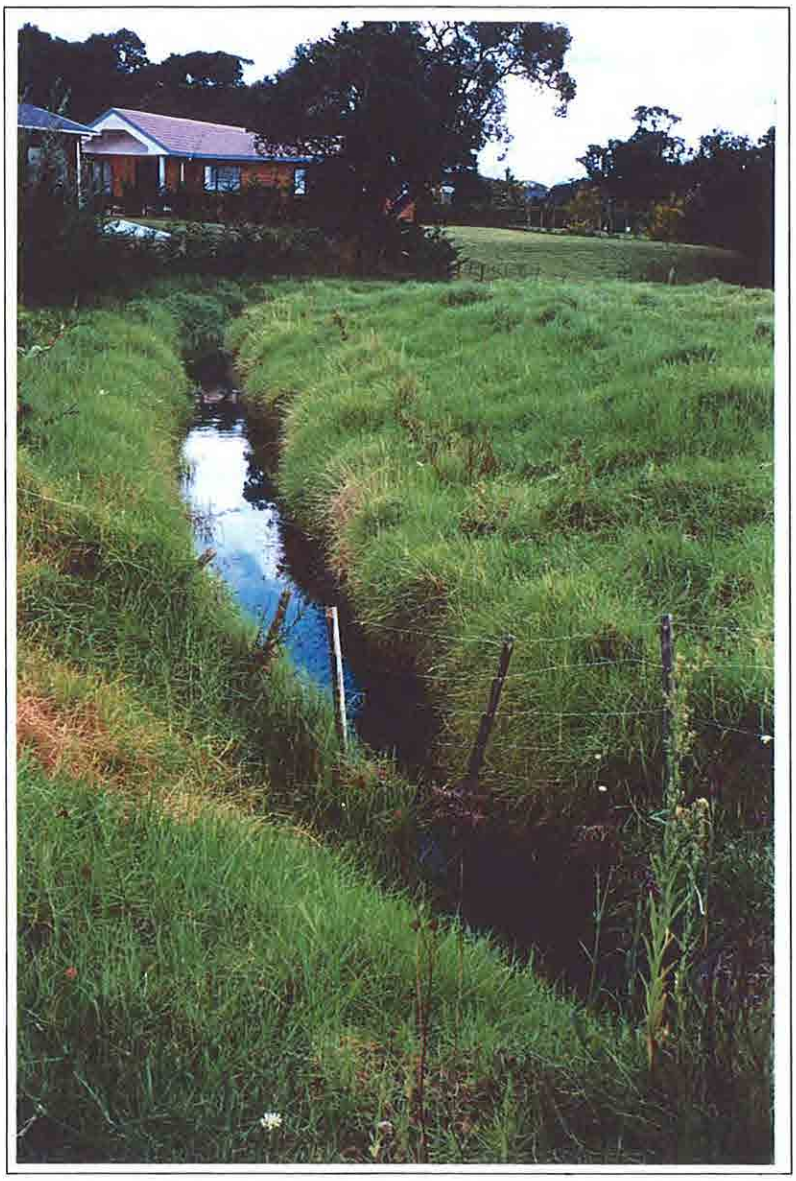

Photo 7: Open Drain – Downstream of Culvert PC11 (Kakariki Rd)

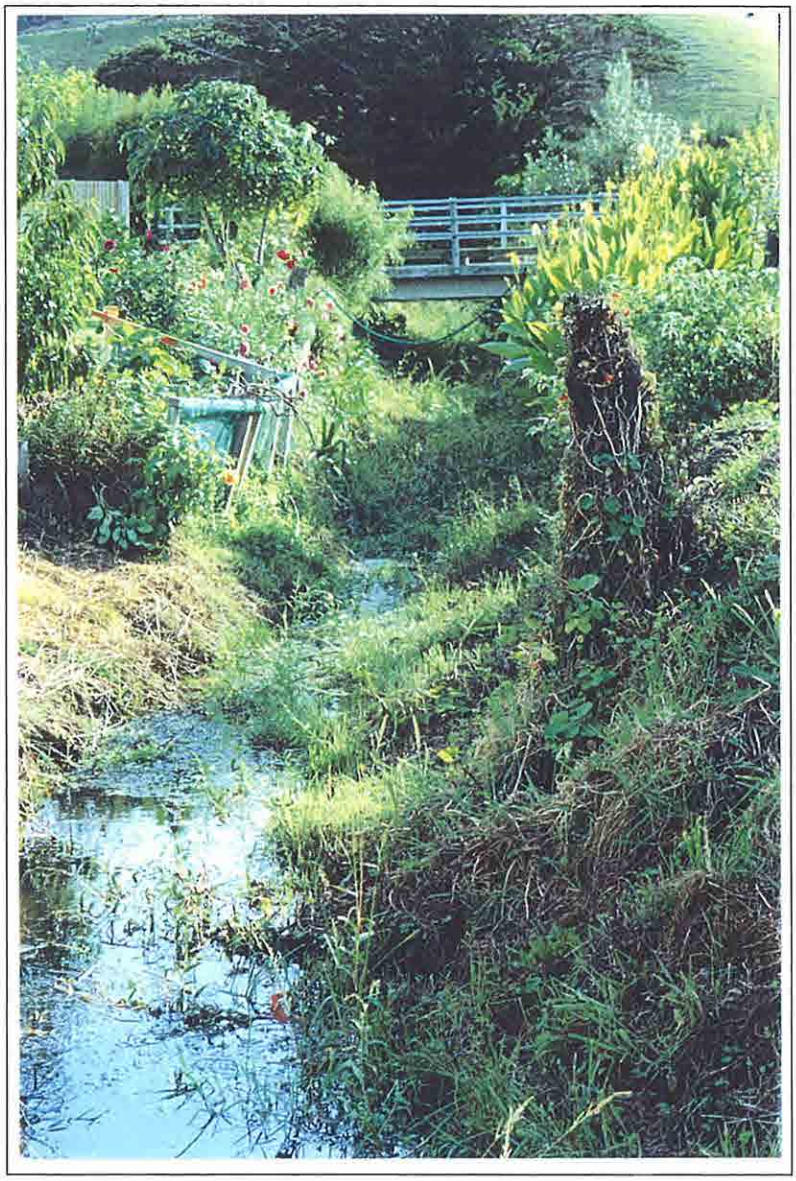

Photo 8: Open Drain – Downstream of Culvert PC10 (note encroachment of gardens into main channel)

Photo 9: Tidal Drain in Catchment W – Looking North

Photo 10: Beach Erosion from Ngunguru Rd Outfall

Photo 11: Tidal Drain adjacent to Waiotoi Rd (saltwater flooding of areas adjacent to this drain occurred in March 1997)

Photo 12: Waiotoi Rd from 3 Waitoi Rd – Looking West

Photo 13: Tidal Drain under Waiotoi Rd - Downstream of PC15 – Looking South (note growth of mangroves in drain).

Photo 14: Inlet of Culvert PC10

Appendix 2

Questionnaire Response Summary

NUMBER	NAME	FLOODING PROBLEM
Chloe Place		
12/1	P Cocklin	Street
16	Graham Belsham	Property/ Section
Ewin Street		
7	A R Genkerr	None
11	J F & H E Price	None
Haven Place		
1	R J & P J Ward	None
3	William & Kathryn Weston Arnold	None
4	Ronald & Edna Garry	None
5	Fraser & Fraser Investment LTD	None
9	Hayden Budd	None
Kakariki Road		
8	Ngunguru Retirement Village	Property/ Section
9	R D Johnston	None
17	Brett Johnston	None
17-21	Les & Celia Barrell	Property/ Section/ Street
28	Brad & Debbie Self	Property/ Section/ Street
28A	G C Graham	Property/ Section
Kopipi Crescent		
4	S & F D Munro	None
5	Simon Deroles	None
9	Esme & Rex Mawson	None
10	Dennis Wilson	None
13	Trev mark	Property/ Section
14	Paul & Vicki Christi	Property/ Section/ Street
16	R & F M Atkinson	None
18	D C Collinson	None
19	Rita Ford	Basement, Section

20	Lorraine Taka	Property/ Section
22	C E Forward	None
23	Mack & Liz Littlejohn	Property/ Section
29	John Wilson	Property/ Section
31	W M Wareham	Street
37	Tony Miller	Property/ Section/ Street
Matapuri Road		
1155	R J S & R M Bell	Property/ Section
Munro Place		
5	Julie Calton	Property/ Section Street
7	G Seagar	None
24	Pitman	None
25	Eric Stockley	Property/ Section
27	Lynne Steegstar	Property/ Section
Ngunguru Heights		
26	Paul Duflou	Street
29	J H Cobbald	None
Ngunguru Road		
1807	L Reynolds	None
1811	H S & A P Newman	None
1815	Kerry Cross	Property/ Section
1817	Abbe Tiemersma	Property/ Section
1821	Bartrum	None
1834	John Dennis	None
1839	G Clapham	None
1845	A J & R M Couzins	None
1851	J R Hickman	Basement
1853	M F J Douglas	Habitable Floor
1855	Kris Kjeldsen	Garage
1886	B T & E A Andrews	Basement

1890	Brian Slager	None
1895	G W & H M Hall	Habitable Floor
1901	T D Power	Property/ Section
1903	R V Main	None
1905	L & R L Laurence	Property/ Section
1909A	Hilton & Beth Polkinghorne	None
1911	Judy Dempster	None
1913	Dorothy Westlake	None
1917	R F & C A Barnaby	Property/ Section
1919	Grant & Michelle Thompson	Property/ Section
1927	L Jamieson	None
1931	A F Potts	Garage
1937	R L Barey	None
1937/2	Jan Howarn	None
1939	Clive Woodward	None
1943	L C & J E T Jeffery	None
1945	I M Mison	Property/ Section
1949	S A & E M Barnes	Basement
1953	Keith Whalley	Property/ Section
1955	W Hardy	Property/ Section
1961	R E Webb	None
1963	N R Benten & I Duffy	None
1967	Frank Willson	None
1971	D P Tasker	None
1973	W & A Kuljish	Property/ Section
1975	J E Hern	None
1975/3	W & A Kuljish	None
1979	Betty Budge	None
1981	John Mayhew	None
1983	Peter & Shirley Bowers	None
1985	C & C J Olsen	None
1987	David & Jacky Smith	None
1991	Gary Buelhthought	Property/ Section

2001	N & J Erickson	Property/ Section
2009	D & N McInnes	None
2015	Barry & Colleen Smith	Street
2021	J S Mitchell	None
2031	J M McPherson	Property/ Section
2033	Mortimer Holdings Trust	None
2039	Katherine Binden	None
2041	M D Fogden	Basement
2043	Benjamine Smith	Property/ Section
2047	A H & H P Dyer	Property/ Section
Papaka Road		
2	Michael Griffin	Basement
6	K J Weatherup	None
12	Tucker	Property/ Section
14	L Thomson	None
Pine Road		
4	R P Jelavich	None
10	Sherryl & Alex Wilson	None
11	E J Crane	None
13	S M Olsen	Property/ Section
19	D & T Miller	None
21	A R & A M Cox	None
22	J A Frian	Property/ Section/ Street
25	Ted McCarten	Property/ Section/ Street
36	Irma Rouse	Habitable Floor
38	Rosemary Johnston	Property/ Section
44	B & A E Main	None
Shoebridge Crescent		
3	T Heswall	Property/ Section
6B	Geoff Horn	Property/ Section
7	G Godfrey	Basement
8	C & D Leeper	None

9	K & S M Friend	None
12	P Reynolds	Property/ Section
14	G M Wright	Property/ Section
16	E F & B C Turner	None
17	J N E J Hawkins	Property/ Section
18	Gilbert Mandano	None
21	Chris Farrelly	Street
23	A P Witheford	None
25	J H Grayling	None
27	Ray Greeks	None
28B	Brian & Carol Burdon	Basement
29	Keith Ellison	None
29A	Carey Smith	None
36	E G Carppe & P J Holt	None
41	Leslie Hill	None
43	S & L K Haakma	Property/ Section
46	A J Kircher	Property/ Section
Te Maika Road		
21	B H L Walker	None
26	B W Eastwood & S G Cate	Property/ Section
31	B C Olwin	None
33	Dallas Family Trust	None
35	Patricia Hodson	None
36	E & M Amos	None
40	B R & H M Gollop	Property/ Section
42	J C Gingles	None
43	Anneke Mnijlwjk	None
45	N R & M E Glengarry	Property/ Section/ Street
Waiotoi Road		
3	Ross Hanley	None
3B	Frederick Mitchel	Garage
5	Susanne Ansell	Garage

5A	John & Lyn Hutchinson	None
10	B E & R J Hayward	None
11	Peter David Bugden	Property/ Section
12	Pam Johnson	Property/ Section
19	Ross & Sue Haldane	None
20	K & E Young	Property/ Section
21	E Brown	None
23/25	L B B & M D Blackhall	Habitable Floor
27	R Burch	Basement
39	Ngunguru Golf Club	Property/ Section
51	John Wilson & Jenny Theobald	Property/ Section

Appendix 3

Hydraulic Analysis Data

```
Input File : S:\51\16194\SWMM\NG Existing.XP
Current Directory:    S:\
Executable Name:      c:\PROGRA~1\xps\XPSWMM~1\swmmengw.exe
Read       0 line(s) and found     0 items(s) from your cfg file.
            *==============================================*
            |                 XP-SWMM2000                  |
            |         Storm Water Management Model         |
            |                 Version 7.51                 |
            |==============================================|
            |                 Developed by                 |
            |==============================================|
            |                                              |
            |        XP Software Inc. and Pty. Ltd.        |
            |                                              |
            |           Based on the U.S. EPA              |
            |  Storm Water Management Model Version 4.40   |
            |                                              |
            |           Originally Developed by            |
            |            Metcalf & Eddy, Inc.              |
            |           University of Florida              |
            |         Camp Dresser & McKee Inc.            |
            |              September 1970                  |
            |                                              |
            |          EPA-SWMM is maintained by           |
            |          Oregon State University             |
            |          Camp Dresser & McKee Inc.           |
            |==============================================|
            |    XP Software       October, 2000           |
            |      Data File Version --->      9.0         |
            *==============================================*
```

Table E3a - Junction Data

Inp Num	Junction Name	Ground Elevation	Crown Elevation	Invert Elevation	Qinst cms	Initial Depth-mt
1	1	6.0000	5.2500	0.0000	0.0000	0.0010
2	8	5.0000	3.9500	-0.1000	0.0000	0.0010
3	22	5.0000	2.2000	-0.1500	0.0000	0.0010
4	26	5.0000	2.0000	-0.2000	0.0000	0.0010
5	30	5.0000	1.7600	-0.2400	0.0000	0.0010
6	34	5.0000	2.0000	-0.2600	0.0000	0.0000
7	36	5.0000	2.0000	-0.3000	0.0000	0.0010
8	38	5.0000	2.0000	-0.4000	0.0000	0.0000
9	PC1	7.0000	5.2070	1.2070	0.0000	0.0000
10	41	5.5000	5.1970	1.1970	0.0000	0.0000
11	43	5.5000	5.5000	1.0500	0.0000	0.0000
12	PC2	5.0000	1.9100	0.9100	0.0000	0.0000
13	47	5.0000	4.9600	0.9000	0.0000	0.0010
14	49	5.0000	5.0000	0.9800	0.0000	0.0000
15	53	5.0000	4.9900	1.0900	0.0000	0.0000
16	55	5.0000	4.9200	0.9100	0.0000	0.0010
17	59	5.0000	5.0000	0.8300	0.0000	0.0010
18	61	5.0000	4.9000	0.8500	0.0000	0.0010
19	65	5.0000	4.4100	0.4100	0.0000	0.0000
20	67	5.0000	3.6500	0.5100	0.0000	0.0000
21	PC6A	5.0000	2.6100	1.6100	0.0000	0.0000
22	71	5.0000	4.1500	1.6000	0.0000	0.0010
23	73	5.0000	4.6700	1.6700	0.0000	0.0010
24	77	5.0000	4.9500	1.6500	0.0000	0.0010
25	79	5.0000	4.9000	1.4700	0.0000	0.0010
26	83	5.0000	4.3600	1.3600	0.0000	0.0000
27	85	5.0000	4.3400	1.3400	0.0000	0.0010
28	89	5.1000	5.0600	2.5600	0.0000	0.0000
29	91	5.0000	4.9300	2.2100	0.0000	0.0010
30	95	5.0000	4.2100	1.5100	0.0000	0.0000
31	97	5.0000	3.0000	1.5400	0.0000	0.0010
32	101	5.0000	3.2000	1.4900	0.0000	0.0010
33	103	5.0000	4.8300	1.3300	0.0000	0.0010
34	107	5.0000	4.7300	0.9200	0.0000	0.0000
35	109	5.0000	3.6000	0.7000	0.0000	0.0010
36	PC12	5.0000	4.8800	1.8800	0.0000	0.0000
37	113	5.0000	4.8700	1.8700	0.0000	0.0010
38	115	5.0000	4.7400	1.7400	0.0000	0.0010
39	119	5.0000	4.1900	1.1900	0.0000	0.0000
40	121	5.0000	3.6500	0.9400	0.0000	0.0010
41	PC14	5.0000	2.5900	1.0900	0.0000	0.0000
42	125	5.0000	2.5400	1.0400	0.0000	0.0010
43	127	5.0000	4.8800	0.8800	0.0000	0.0010
44	131	5.0000	4.3300	0.3300	0.0000	0.0000
45	133	5.0000	3.4100	0.3200	0.0000	0.0010
46	PC16	5.0000	4.9900	1.2900	0.0000	0.0000
47	137	5.0000	4.9400	1.2400	0.0000	0.0000
48	139	5.0000	4.9200	1.1200	0.0000	0.0010
49	143	5.0000	4.7900	0.9900	0.0000	0.0000
50	145	5.0000	4.3100	0.9000	0.0000	0.0000
51	PC18	5.0000	5.0000	3.0000	0.0000	0.0000

52	149	5.0000	4.9000	2.9000	0.0000	0.0010
53	151	5.0000	4.7500	2.7500	0.0000	0.0010
54	154	5.0000	1.5000	-0.5000	0.0000	0.0000
55	PC19	7.0000	2.3000	0.3000	0.0000	0.0000
56	157	7.0000	2.6000	0.2500	0.0000	0.0010
57	159	5.0000	2.5000	0.1100	0.0000	0.0010
58	165	5.0000	4.9900	1.1900	0.0000	0.0000
59	167	5.3000	5.2000	2.7000	0.0000	0.0000
60	170	5.0000	4.8000	1.3000	0.0000	0.0010
61	172	5.0000	4.8050	1.3050	0.0000	0.0010

Table E4 - Conduit Connectivity

Input Number	Conduit Name	Upstream Node	Downstream Node	Upstream Elevation	Downstream Elevation	
1	3	1	8	0.000	-0.050	No Design
2	11	8	22	-0.100	-0.150	No Design
3	25	22	26	-0.150	-0.200	No Design
4	29	26	30	-0.200	-0.240	No Design
5	33	30	34	-0.240	-0.260	No Design
6	37	34	36	-0.260	-0.300	No Design
7	39	36	38	-0.300	-0.400	No Design
8	42	PC1	41	1.207	1.197	No Design
9	PC-1	41	43	1.197	1.050	No Design
10	45	43	1	1.050	0.800	No Design
11	48	PC2	47	0.910	0.900	No Design
12	54	49	53	1.100	1.090	No Design
13	69	67	8	0.510	0.300	No Design
14	72	PC6A	71	1.610	1.600	No Design
15	78	73	77	1.670	1.650	No Design
16	84	79	83	1.470	1.360	No Design
17	87	85	165	1.340	1.190	No Design
18	93	91	95	2.210	1.510	No Design
19	99	97	101	1.540	1.490	No Design
20	105	103	172	1.330	1.305	No Design
21	111	109	22	0.700	0.500	No Design
22	114	PC12	113	1.880	1.870	No Design
23	117	115	119	1.740	1.190	No Design
24	123	121	26	0.940	0.000	No Design
25	126	PC14	125	1.090	1.040	No Design
26	129	127	131	0.880	0.330	No Design
27	135	133	30	0.320	0.100	No Design
28	138	PC16	137	1.290	1.240	No Design
29	141	139	143	1.120	0.990	No Design
30	147	145	34	0.900	0.000	No Design
31	150	PC18	149	3.000	2.900	No Design
32	153	151	36	2.750	0.000	No Design
33	155	38	154	-0.400	-0.500	No Design
34	158	PC19	157	0.300	0.250	No Design
35	161	159	38	0.110	0.000	No Design
36	162	55	59	0.910	0.830	No Design
37	163	61	65	0.850	0.410	No Design
38	166	165	107	1.190	0.930	No Design
39	168	167	89	2.700	2.560	No Design
40	171	170	165	1.300	1.190	No Design
41	173	172	170	1.305	1.300	No Design
42	174	41	59	2.000	1.600	No Design
43	PC-2	49	47	0.980	0.900	No Design
44	PC-2-RD	47	49	2.260	2.250	No Design
45	PC-3	53	55	1.090	0.910	No Design
46	PC-3-RD	53	55	2.530	2.520	No Design
47	PC-4	61	59	0.850	0.830	No Design
48	pc-4-RD	59	61	4.000	3.900	No Design
49	PC-5	67	65	0.510	0.410	No Design
50	PC-5-RD	65	67	2.700	2.650	No Design
51	PC-6A	73	71	1.670	1.600	No Design
52	PC-6A-RD	71	73	3.150	3.100	No Design
53	PC-6B	77	79	1.650	1.470	No Design
54	PC-6B-RD	77	79	3.050	3.000	No Design
55	PC-7	83	85	1.360	1.340	No Design
56	PC-7-RD	83	85	3.060	3.050	No Design
57	PC-8	89	91	2.560	2.210	No Design
58	PC-8-RD	89	91	3.840	3.830	No Design
59	New 1050	89	91	2.560	2.210	No Design
60	PC-9	97	95	1.540	1.510	No Design
61	PC-9-RD	95	97	3.400	2.500	No Design
62	PC-10	101	103	1.490	1.330	No Design
63	PC-10-RD	101	103	2.700	2.500	No Design
64	PC-11	107	109	0.920	0.700	No Design
65	PC-11-RD	107	109	2.650	2.600	No Design
66	PC-12	113	115	1.870	1.740	No Design
67	PC-12-RD	113	115	2.807	2.800	No Design
68	PC-13	119	121	1.190	0.940	No Design
69	PC-13-RD	119	121	2.160	2.150	No Design
70	PC-14	125	127	1.040	0.880	No Design
71	PC-14-RD	125	127	1.040	0.880	No Design

72	PC-15	131	133	0.330	0.320 No Design
73	PC-15-RD	131	133	2.420	2.410 No Design
74	PC-16	137	139	1.240	1.120 No Design
75	PC-16-RD	137	139	3.100	3.090 No Design
76	PC-17	143	145	0.990	0.900 No Design
77	PC-17-RD	143	145	3.320	3.310 No Design
78	PC-18	149	151	2.900	2.750 No Design
79	PC-18-RD	149	151	3.500	3.500 No Design
80	PC-19	157	159	0.250	0.110 No Design
81	PC-19-RD	157	159	1.600	1.500 No Design

Table E10 - CONDUIT SUMMARY STATISTICS

Note: The peak flow may be less than the design flow and the conduit may still surcharge because of the downstream boundary conditions.

Name Conduit Name	Design Flow (cms)	Design Velocity (m/s)	Conduit Vertical Depth (mm)	Maximum Computed Flow (cms)	Time of Occurence Hr.	Time of Occurence Min.	Maximum Computed Velocity (m/s)	Time of Occurence Hr.	Time of Occurence Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Upstream (m)	Ends Dwnstrm (m)
3	778.50	10.2434	4000.000	1.4999	0	12	-0.6154	0	1	0.0019	1.0710	1.0641
11	239.39	7.0410	2000.000	3.0408	0	12	-0.8004	0	1	0.0127	1.0641	1.0595
25	239.39	7.0410	2000.000	5.9327	0	51	-0.8924	0	0	0.0248	1.0595	1.0577
29	214.12	6.2976	2000.000	6.9767	0	50	-1.0713	0	0	0.0326	1.0577	1.0509
33	151.41	4.4531	2000.000	11.5517	0	50	-1.1449	0	0	0.0763	1.0509	1.0379
37	214.12	6.2976	2000.000	14.5357	0	50	-1.1676	0	0	0.0679	1.0379	1.0204
39	1070.6	31.4882	2000.000	15.0362	0	49	-2.2252	0	0	0.0140	1.0204	1.0185
42	46.172	1.2825	4000.000	0.6999	0	47	0.1990	0	30	0.0152	2.0575	2.0564
PC-1	0.4562	1.6135	600.0000	0.5305	0	48	1.8338	0	48	1.1629	2.0564	1.7411
45	50.442	1.8697	4450.000	0.5303	0	48	0.7891	0	48	0.0105	1.7411	1.1594
48	3.281	0.8201	1000.000	1.3195	0	43	0.3299	0	43	0.4022	2.1132	2.1116
54	15.342	0.3147	3900.000	1.6299	0	43	0.5559	0	30	0.1062	2.0788	1.9138
69	65.049	4.3366	3000.000	1.6957	0	51	1.0516	0	51	0.0261	1.1104	1.0641
72	3.281	0.8201	1000.000	0.3492	0	45	0.1645	0	2	0.1064	2.4753	2.4753
78	27.556	2.4172	3000.000	0.3481	0	45	0.7043	0	10	0.0126	2.3803	2.3790
84	20.433	1.5480	3000.000	0.3867	0	49	-0.1889	0	6	0.0189	2.3434	2.3393
87	18.455	1.3670	3000.000	1.8546	0	44	0.8280	0	32	0.1005	2.3079	2.1576
93	20.813	2.9088	2700.000	2.0705	1	0	1.0253	0	36	0.0995	3.0656	2.9414
99	3.119	1.6276	1050.000	2.0759	0	58	1.0833	0	58	0.6656	2.8482	2.8261
105	32.210	1.0226	3500.000	2.1134	0	58	0.8080	1	9	0.0656	2.2206	2.1791
111	14.880	1.4836	1700.000	3.7055	0	52	1.3491	0	52	0.2490	1.5339	1.0595
114	3.509	0.2924	3000.000	0.3499	0	47	0.2845	0	10	0.0997	2.8893	2.8781
117	41.149	3.4291	3000.000	0.3547	0	48	0.5182	1	3	0.0086	2.2310	2.2227
123	8.948	1.4913	2000.000	1.1054	0	48	0.6885	0	48	0.1235	1.6658	1.0577
126	1.248	0.5369	1500.000	0.2684	0	45	0.6313	0	22	0.2150	1.6860	1.6263
129	76.514	3.9851	4000.000	0.9333	1	1	0.8478	1	3	0.0122	1.6266	1.6215
135	4.892	1.6308	1000.000	4.5788	0	49	1.6605	0	49	0.9359	1.2647	1.0509
138	16.023	1.0071	3700.000	4.0118	0	30	1.2682	0	30	0.2504	3.0050	2.8664
141	27.743	2.1348	3800.000	2.8504	0	51	0.7176	1	0	0.1027	2.7227	2.7007
147	165.14	16.5140	2000.000	2.9863	0	49	1.3734	0	49	0.0181	1.0973	1.0379
150	3.588	0.8543	2000.000	0.4900	0	40	0.7412	0	48	0.1366	3.8404	3.5613
153	73.397	12.2329	2000.000	0.4900	0	39	0.4896	0	34	0.0067	2.8895	1.0204
155	44.703	14.2294	2000.000	15.8215	0	49	6.4714	0	49	0.3539	1.0185	1.0000
158	2.566	0.6415	2000.000	0.8529	0	32	0.4320	0	22	0.3324	1.6427	1.6191
161	10.380	1.7300	2000.000	0.8501	0	38	-0.4625	0	2	0.0819	1.0584	1.0185
162	33.696	1.7550	4000.000	1.6020	0	42	0.9986	0	33	0.0475	1.9115	1.8180
163	48.392	2.5204	4000.000	1.6500	0	51	1.1511	0	51	0.0341	1.7490	1.2266
166	65.581	2.2413	3800.000	3.7286	0	50	1.3382	0	50	0.0569	2.1576	1.6254
168	71.945	8.7207	2500.000	2.0704	0	48	3.5600	0	28	0.0288	3.4267	3.4630
171	80.460	3.1708	3500.000	2.1860	1	0	0.9615	1	8	0.0272	2.1719	2.1576
173	6.441	1.3065	1700.000	2.1640	0	58	1.5953	1	8	0.3360	2.1791	2.1719
174	6.477	0.6025	500.0000	0.1671	0	48	0.1086	0	31	0.0258	2.0564	1.8180
PC-2	2.027	3.1868	900.0000	-1.3190	0	43	-2.0422	0	48	-0.6506	2.0788	2.1116
PC-2-RD	39.814	1.1611	2700.000	0.0000	0	0	0.0000	0	0	0.0000	2.0788	2.0788
PC-3	2.684	4.2192	900.0000	0.8033	0	42	1.2806	0	42	0.2993	1.9138	1.9115
PC-3-RD	69.621	2.3394	2400.000	0.0000	0	0	0.0000	0	0	0.0000	1.9115	1.9115
PC-4	0.4351	0.6840	900.0000	-0.8254	0	50	-1.2741	0	50	-1.8969	1.7490	1.8180
pc-4-RD	93.868	2.2895	1000.000	0.0000	0	0	0.0000	0	0	0.0000	1.7490	1.7490
PC-5	1.496	2.3514	900.0000	-1.6955	0	50	-3.4660	0	51	-1.1334	1.1104	1.2266
PC-5-RD	46.818	2.2294	1000.000	0.0000	0	0	0.0000	0	0	0.0000	1.1104	1.1104
PC-6A	0.2973	1.3735	525.0000	-0.3483	0	45	-1.6041	0	45	-1.1715	2.3803	2.4753
PC-6A-RD	33.105	1.5764	1000.000	0.0000	0	0	0.0000	0	0	0.0000	2.3803	2.3803
PC-6B	0.7733	3.5723	525.0000	0.3479	0	45	1.8006	0	6	0.4498	2.3790	2.3434
PC-6B-RD	96.439	2.3177	1900.000	0.0000	0	0	0.0000	0	0	0.0000	2.3434	2.3434
PC-7	0.7168	1.1267	900.0000	0.9297	0	44	1.4192	0	37	1.2970	2.3393	2.3079
PC-7-RD	14.805	0.7050	1000.000	0.0000	0	0	0.0000	0	0	0.0000	2.3079	2.3079
PC-8	2.972	4.6711	900.0000	0.9392	0	49	2.0923	0	26	0.3161	3.4630	3.0656
PC-8-RD	23.184	0.9989	1100.000	0.0000	0	0	0.0000	0	0	0.0000	3.0656	3.0656
New 1050	4.744	5.4785	1050.000	1.1311	0	49	2.2530	0	28	0.2384	3.4630	3.0656
PC-9	1.174	1.3556	1050.000	-2.1137	0	48	-2.4089	0	53	-1.8007	2.8482	2.9414
PC-9-RD	8.126	1.6253	500.0000	0.0000	0	0	0.0000	0	0	0.0000	2.8482	2.8482
PC-10	1.427	1.6481	1050.000	1.8880	0	59	2.4083	1	9	1.3229	2.8261	2.2206
PC-10-RD	4.087	1.0217	500.0000	0.1875	0	59	0.4606	0	59	0.0459	2.8261	2.5675
PC-11	6.723	3.3614	1000.000	1.8585	0	51	1.2185	0	50	0.2764	1.6254	1.5339
PC-11-RD	46.818	2.2294	1000.000	0.0000	0	0	0.0000	0	0	0.0000	1.5339	1.5339
PC-12	0.0653	0.9241	300.0000	0.1724	0	55	2.5482	0	56	2.6392	2.8781	2.2310
PC-12-RD	23.517	0.7292	1500.000	0.2024	0	48	0.2241	0	48	0.0086	2.8781	2.8132

PC-13	1.468	3.3225	750.0000	0.8966	0	47	2.4427	0	10	0.6108	2.2227	1.6658
PC-13-RD	36.926	1.1450	1500.000	0.2124	0	48	0.2602	0	48	0.0058	2.2227	2.1638
PC-14	0.1395	0.8656	453.0000	0.0081	1	1	0.1264	0	6	0.0582	1.6263	1.6266
PC-14-RD	52.272	1.6794	1500.000	0.4919	1	1	0.0599	0	6	0.0094	1.6263	1.6266
PC-15	2.132	0.7105	1500.000	4.5787	0	49	2.0163	0	49	2.1480	1.6215	1.2647
PC-15-RD	31.406	1.4955	1000.000	0.0000	0	0	0.0000	0	0	0.0000	1.2647	1.2647
PC-16	2.759	2.4394	1200.000	2.8453	0	51	2.5103	0	51	1.0313	2.8664	2.7227
PC-16-RD	15.606	0.7431	1000.000	0.0000	0	0	0.0000	0	0	0.0000	2.7227	2.7227
PC-17	2.635	2.3298	1200.000	2.9864	0	49	4.4016	0	49	1.1334	2.7007	1.0973
PC-17-RD	25.643	1.2211	1000.000	0.0000	0	0	0.0000	0	0	0.0000	1.0973	1.0973
PC-18	0.1354	1.4078	350.0000	0.1743	0	37	2.6841	0	18	1.2870	3.5613	2.8895
PC-18-RD	3.141	0.0000	1000.000	0.3157	0	42	0.3495	0	42	0.1005	3.5613	3.5252
PC-19	0.4770	1.6871	600.0000	0.7703	0	42	2.7082	0	38	1.6149	1.6191	1.0584
PC-19-RD	99.316	4.7293	1000.000	0.0797	0	47	0.2984	0	47	0.0008	1.6191	1.5064
FREE # 1	Undefnd	Undefnd	Undefnd	15.8215	0	49						

CULVERT ANALYSIS CLASSIFICATION, and the time the culvert was in a particular classification during the simulation. The time is in minutes. The Dynamic Wave Equation is used for all conduit analysis but the culvert flow classification condition is based on the HW and TW depths.

Conduit Name	Mild Slope Critical D Outlet Control	Mild Slope TW Control Outlet Control	Steep Slope TW Insignf Entrance Control	Slug Flow Outlet/ Entrance Control	Mild Slope TW > D Outlet Control	Mild Slope TW <= D Outlet Control	Outlet Control	Inlet Control	Inlet Configuration
3	0.000	0.000	1.000	69.000	0.000	0.000	0.000	0.000	None
11	0.000	0.000	0.750	69.250	0.000	0.000	0.000	0.000	None
25	0.000	0.000	0.500	69.500	0.000	0.000	0.000	0.000	None
29	0.000	6.250	0.000	63.750	0.000	0.000	0.000	0.000	None
33	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
37	0.000	3.500	0.000	66.500	0.000	0.000	0.000	0.000	None
39	0.000	0.000	0.250	69.750	0.000	0.000	0.000	0.000	None
42	0.250	69.750	0.000	0.000	0.000	0.000	0.000	0.000	None
PC-1	2.000	0.750	2.750	6.500	0.000	0.000	4.500	53.500	Square Edge with Headwall
45	33.500	35.750	0.750	0.000	0.000	0.000	0.000	0.000	None
48	0.000	35.000	0.000	0.000	35.000	0.000	0.000	0.000	None
54	11.500	56.500	2.000	0.000	0.000	0.000	0.000	0.000	None
69	0.000	66.750	3.250	0.000	0.000	0.000	0.000	0.000	None
72	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
78	0.000	68.750	1.250	0.000	0.000	0.000	0.000	0.000	None
84	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
87	5.750	64.250	0.000	0.000	0.000	0.000	0.000	0.000	None
93	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
99	0.500	32.500	0.500	0.000	36.500	0.000	0.000	0.000	None
105	1.000	69.000	0.000	0.000	0.000	0.000	0.000	0.000	None
111	5.750	64.250	0.000	0.000	0.000	0.000	0.000	0.000	None
114	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
117	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
123	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
126	20.750	49.250	0.000	0.000	0.000	0.000	0.000	0.000	None
129	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
135	0.250	69.750	0.000	0.000	0.000	0.000	0.000	0.000	None
138	6.750	63.250	0.000	0.000	0.000	0.000	0.000	0.000	None
141	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
147	0.000	0.000	5.250	0.000	0.000	0.000	64.750	0.000	None
150	6.250	63.750	0.000	0.000	0.000	0.000	0.000	0.000	None
153	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
155	0.000	0.000	0.000	24.500	0.000	0.000	45.500	0.000	None
158	1.500	68.500	0.000	0.000	0.000	0.000	0.000	0.000	None
161	0.500	69.500	0.000	0.000	0.000	0.000	0.000	0.000	None
162	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
163	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
166	12.250	57.750	0.000	0.000	0.000	0.000	0.000	0.000	None
168	0.000	0.000	7.750	37.250	0.000	0.000	25.000	0.000	None
171	0.000	68.750	1.250	0.000	0.000	0.000	0.000	0.000	None
173	2.750	67.250	0.000	0.000	0.000	0.000	0.000	0.000	None
174	3.000	30.750	36.250	0.000	0.000	0.000	0.000	0.000	None
PC-2	0.000	0.000	1.250	31.250	0.000	36.500	1.000	0.000	Square Edge with Headwall
PC-2-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-3	0.000	0.000	8.000	30.750	0.000	0.000	3.500	27.750	Square Edge with Headwall
PC-3-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-4	1.250	48.250	0.000	0.000	20.500	0.000	0.000	0.000	Square Edge with Headwall
pc-4-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-5	0.000	21.000	4.500	19.750	0.000	0.000	23.250	1.500	Square Edge with Headwall
PC-5-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-6A	0.000	24.250	1.250	6.250	38.250	0.000	0.000	0.000	Square Edge with Headwall
PC-6A-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-6B	0.000	0.000	7.000	15.000	0.000	28.250	3.750	16.000	Square Edge with Headwall
PC-6B-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-7	3.750	43.500	0.000	0.000	22.750	0.000	0.000	0.000	Square Edge with Headwall
PC-7-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-8	0.000	0.000	14.250	0.000	0.000	0.000	14.000	41.750	Square Edge with Headwall
PC-8-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
New 1050	0.000	0.000	14.250	0.000	0.000	0.000	14.000	41.750	Square Edge with Headwall

PC-9	0.000	31.250	0.250	0.000	38.500	0.000	0.000	0.000	Square Edge with Headwall
PC-9-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-10	3.500	3.250	0.000	0.000	0.000	0.000	0.000	63.250	Square Edge with Headwall
PC-10-RD	18.000	9.500	42.500	0.000	0.000	0.000	0.000	0.000	None
PC-11	0.000	0.000	7.000	13.250	0.000	0.000	0.750	49.000	30 to 75 deg Wingwall
Flares									
PC-11-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-12	9.500	3.750	0.000	0.000	31.000	0.000	19.250	6.500	Square Edge with Headwall
PC-12-RD	16.750	12.250	41.000	0.000	0.000	0.000	0.000	0.000	None
PC-13	0.000	0.000	10.750	0.000	0.000	0.000	0.000	59.250	Square Edge with Headwall
PC-13-RD	18.750	5.250	46.000	0.000	0.000	0.000	0.000	0.000	None
PC-14	0.000	33.000	0.000	0.000	37.000	0.000	0.000	0.000	Square Edge with Headwall
PC-14-RD	0.000	70.000	0.000	0.000	0.000	0.000	0.000	0.000	None
PC-15	2.500	20.000	0.000	0.000	0.000	0.000	0.000	47.500	Square Edge with Headwall
PC-15-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-16	1.000	0.750	1.500	0.000	0.000	0.000	2.250	64.500	Square Edge with Headwall
PC-16-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-17	3.250	0.000	2.000	0.000	0.000	0.000	0.000	64.750	Square Edge with Headwall
PC-17-RD	0.000	0.000	70.000	0.000	0.000	0.000	0.000	0.000	None
PC-18	2.000	0.000	6.500	0.000	0.000	0.000	10.750	50.750	Square Edge with Headwall
PC-18-RD	26.750	17.750	25.500	0.000	0.000	0.000	0.000	0.000	None
PC-19	0.000	2.500	0.000	2.500	11.000	22.500	0.000	31.500	Square Edge with Headwall
PC-19-RD	9.750	9.250	51.000	0.000	0.000	0.000	0.000	0.000	None

Table E15 - SPREADSHEET INFO LIST

Conduit Flow and Junction Depth Information for use in spreadsheets. The maximum values in this table are the true maximum values because they sample every time step. The values in the review results may only be the maximum of a subset of all the time steps in the run.

Note: These flows are only the flows in a single barrel.

Conduit Name	Maximum Flow	Total Flow	Maximum Velocity	##	Junction Name	Invert Elevation	Maximum Elevation
3	1.4999	1343.0993	-0.6154	##	1	0.0000	1.0710
11	3.0408	5254.3196	-0.8004	##	8	-0.1000	1.0641
25	5.9327	13994.0684	-0.8924	##	22	-0.1500	1.0595
29	6.9767	16013.2621	-1.0713	##	26	-0.2000	1.0577
33	11.5517	27539.9646	-1.1449	##	30	-0.2400	1.0509
37	14.5357	36080.0038	-1.1676	##	34	-0.2600	1.0379
39	15.0362	37085.1042	-2.2252	##	36	-0.3000	1.0204
42	0.6999	1636.4596	0.1990	##	38	-0.4000	1.0185
PC-1	0.5305	1430.5003	1.8338	##	PC1	1.2070	2.0575
45	0.5303	1423.4108	0.7891	##	41	1.1970	2.0564
48	1.3195	3076.3732	0.3299	##	43	1.0500	1.7411
54	1.6299	3761.2811	0.5559	##	PC2	0.9100	2.1132
69	1.6957	4094.6119	1.0516	##	47	0.9000	2.1116
72	0.3492	812.4140	0.1645	##	49	0.9800	2.0788
78	0.3481	802.8008	0.7043	##	53	1.0900	1.9138
84	0.3867	762.6978	-0.1889	##	55	0.9100	1.9115
87	1.8546	4206.2538	0.8280	##	59	0.8300	1.8180
93	2.0705	5636.0815	1.0253	##	61	0.8500	1.7490
99	2.0759	5473.6653	1.0833	##	65	0.4100	1.2266
105	2.1134	5312.7266	0.8080	##	67	0.5100	1.1104
111	3.7055	8981.9858	1.3491	##	PC6A	1.6100	2.4753
114	0.3499	749.8370	0.2845	##	71	1.6000	2.4753
117	0.3547	669.2600	0.5182	##	73	1.6700	2.3803
123	1.1054	2386.8190	0.6885	##	77	1.6500	2.3790
126	0.2684	629.9524	0.6313	##	79	1.4700	2.3434
129	0.9333	344.7324	0.8478	##	83	1.3600	2.3393
135	4.5788	11778.2063	1.6605	##	85	1.3400	2.3079
138	4.0118	9352.0580	1.2682	##	89	2.5600	3.4630
141	2.8504	8421.7720	0.7176	##	91	2.2100	3.0656
147	2.9863	8763.8244	1.3734	##	95	1.5100	2.9414
150	0.4900	1148.0976	0.7412	##	97	1.5400	2.8482
153	0.4900	1143.3193	0.4896	##	101	1.4900	2.8261
155	15.8215	38974.6908	6.4714	##	103	1.3300	2.2206
158	0.8529	1963.1506	0.4320	##	107	0.9200	1.6254
161	0.8501	1911.8447	-0.4625	##	109	0.7000	1.5339
162	1.6020	3668.7379	0.9986	##	PC12	1.8800	2.8893
163	1.6500	4001.4779	1.1511	##	113	1.8700	2.8781
166	3.7286	9215.0942	1.3382	##	115	1.7400	2.2310
168	2.0704	5705.9167	3.5600	##	119	1.1900	2.2227
171	2.1860	5200.4055	0.9615	##	121	0.9400	1.6658
173	2.1640	5232.2277	1.5953	##	PC14	1.0900	1.6860
174	0.1671	197.6350	0.1086	##	125	1.0400	1.6263
PC-2	-1.3190	-3062.1415	-2.0422	##	127	0.8800	1.6266
PC-2-RD	0.0000	0.0000	0.0000	##	131	0.3300	1.6215
PC-3	0.8033	3681.9237	1.2806	##	133	0.3200	1.2647
PC-3-RD	0.0000	0.0000	0.0000	##	PC16	1.2900	3.0050
PC-4	-0.8254	-4042.0064	-1.2741	##	137	1.2400	2.8664
pc-4-RD	0.0000	0.0000	0.0000	##	139	1.1200	2.7227
PC-5	-1.6955	-4108.1729	-3.4660	##	143	0.9900	2.7007
PC-5-RD	0.0000	0.0000	0.0000	##	145	0.9000	1.0973
PC-6A	-0.3483	-804.6333	-1.6041	##	PC18	3.0000	3.8404
PC-6A-RD	0.0000	0.0000	0.0000	##	149	2.9000	3.5613
PC-6B	0.3479	801.2772	1.8006	##	151	2.7500	2.8895
PC-6B-RD	0.0000	0.0000	0.0000	##	154	-0.5000	1.0000

PC-7	0.9297	4264.9618	1.4192	##	PC19	0.3000	1.6427
PC-7-RD	0.0000	0.0000	0.0000	##	157	0.2500	1.6191
PC-8	0.9392	2589.8747	2.0923	##	159	0.1100	1.0584
PC-8-RD	0.0000	0.0000	0.0000	##	165	1.1900	2.1576
New 1050	1.1311	3098.5816	2.2530	##	167	2.7000	3.4267
PC-9	-2.1137	-5711.0666	-2.4089	##	170	1.3000	2.1719
PC-9-RD	0.0000	0.0000	0.0000	##	172	1.3050	2.1791
PC-10	1.8880	5182.5682	2.4083	##			
PC-10-RD	0.1875	232.7488	0.4606	##			
PC-11	1.8585	9140.8188	1.2185	##			
PC-11-RD	0.0000	0.0000	0.0000	##			
PC-12	0.1724	461.5194	2.5482	##			
PC-12-RD	0.2024	213.3318	0.2241	##			
PC-13	0.8966	2264.1534	2.4427	##			
PC-13-RD	0.2124	175.8371	0.2602	##			
PC-14	0.0081	7.2890	0.1264	##			
PC-14-RD	0.4919	534.9930	0.0599	##			
PC-15	4.5787	11838.5425	2.0163	##			
PC-15-RD	0.0000	0.0000	0.0000	##			
PC-16	2.8453	8470.8346	2.5103	##			
PC-16-RD	0.0000	0.0000	0.0000	##			
PC-17	2.9864	8768.1678	4.4016	##			
PC-17-RD	0.0000	0.0000	0.0000	##			
PC-18	0.1743	552.5965	2.6841	##			
PC-18-RD	0.3157	590.8659	0.3495	##			
PC-19	0.7703	1853.6352	2.7082	##			
PC-19-RD	0.0797	78.4850	0.2984	##			
FREE # 1	15.8215	38978.5478	0.0000	##			

Table E15a - SPREADSHEET REACH LIST

Peak flow and Total Flow listed by Reach or those conduits or diversions having the same upstream and downstream nodes.

Upstream Node	Downstream Node	Maximum Flow	Total Flow
1	8	1.4999	1343.0993
8	22	3.0408	5254.3196
22	26	5.9327	13994.0684
26	30	6.9767	16013.2621
30	34	11.5517	27539.9646
34	36	14.5357	36080.0038
36	38	15.0362	37085.1042
PC1	41	0.6999	1636.4596
41	43	0.5305	1430.5003
43	1	0.5303	1423.4108
PC2	47	1.3195	3076.3732
49	53	1.6299	3761.2811
67	8	1.6957	4094.6119
PC6A	71	0.3492	812.4140
73	77	0.3481	802.8008
79	83	0.3867	762.6978
85	165	1.8546	4206.2538
91	95	2.0705	5636.0815
97	101	2.0759	5473.6653
103	172	2.1134	5312.7266
109	22	3.7055	8981.9858
PC12	113	0.3499	749.8370
115	119	0.3547	669.2600
121	26	1.1054	2386.8190
PC14	125	0.2684	629.9524
127	131	0.9333	344.7324
133	30	4.5788	11778.2063
PC16	137	4.0118	9352.0580
139	143	2.8504	8421.7720
145	34	2.9863	8763.8244
PC18	149	0.4900	1148.0976
151	36	0.4900	1143.3193
38	154	15.8215	38974.6908
PC19	157	0.8529	1963.1506
159	38	0.8501	1911.8447
55	59	1.6020	3668.7379
61	65	1.6500	4001.4779
165	107	3.7286	9215.0942
167	89	2.0704	5705.9167
170	165	2.1860	5200.4055
172	170	2.1640	5232.2277
41	59	0.1671	197.6350
49	47	1.3190	3062.1415
53	55	1.6065	3681.9237
61	59	1.6509	4042.0064
67	65	1.6955	4108.1729
73	71	0.3483	804.6333
77	79	0.3479	801.2772
83	85	1.8593	4264.9618
89	91	2.0703	5688.4563
97	95	2.1137	5711.0666
101	103	2.0755	5415.3170

107	109	3.7170	9140.8188
113	115	0.3494	674.8512
119	121	1.1089	2439.9906
125	127	0.5000	542.2820
131	133	4.5787	11838.5425
137	139	2.8453	8470.8346
143	145	2.9864	8768.1678
149	151	0.4900	1143.4624
157	159	0.8500	1932.1201

==================================
| Simulation Specific Information |
==================================

Number of Input Conduits.....	81	Number of Simulated Conduits.....	82
Number of Natural Channels.....	0	Number of Junctions.....	61
Number of Storage Junctions.....	4	Number of Weirs.....	0
Number of Orifices.....	0	Number of Pumps.....	0
Number of Free Outfalls.....	1	Number of Tide Gate Outfalls.....	0

===
| Average % Change in Junction or Conduit is defined as: |
| Conduit % Change ==> 100.0 (Q(n+1) - Q(n)) / Qfull |
| Junction % Change ==> 100.0 (Y(n+1) - Y(n)) / Yfull |
===

The Conduit with the largest average change was..39	with	0.001	percent
The Junction with the largest average change was.38	with	0.175	percent
The Conduit with the largest sinuosity was.....PC-19	with	10.419	

===
| Table E21. Continuity balance at the end of the simulation |
| Junction Inflow, Outflow or Street Flooding |
| Error = Inflow + Initial Volume - Outflow - Final Volume |
===

Inflow Junction	Inflow Volume, m^3	Average Inflow, cms
PC1	1638.0295	0.3900
PC2	3088.8557	0.7354
49	748.8135	0.1783
65	140.4025	0.0334
PC6A	819.0148	0.1950
83	3556.8641	0.8469
95	163.8030	0.0390
PC12	819.0148	0.1950
119	1778.4321	0.4234
PC14	631.8114	0.1504
131	11817.2130	2.8136
PC16	9406.9695	2.2398
143	397.8072	0.0947
PC18	1146.6207	0.2730
154	1893.7384	0.4509
PC19	1989.0358	0.4736
165	163.8030	0.0390
167	5713.3609	1.3603

Outflow Junction	Outflow Volume m^3	Average Outflow, cms
154	40872.2862	9.7315

===
| Initial system volume = 3.9306E+00 Cu M |
| Total system inflow volume = 4.4035E+04 Cu M |
| Inflow + Initial Volume = 4.4038E+04 Cu M |
|===|
| Total system outflow = 4.0872E+04 Cu M |
| Volume left in system = 4.6055E+03 Cu M |
| Evaporation = 0.0000E+00 Cu M |
| Outflow + Final volume = 4.5478E+04 Cu M |
===

===
| Total Model Continuity Error |
| Error in Continuity, Percent = 1.00142 |
| Error in Continuity, m^3 = 441.011 |
| + Error means a continuity loss, - a gain |
===

##
Table E22. Numerical Model judgement section
##

Your overall error was		1.0014 percent
Worst nodal error was in node 137	with	1.5415 percent
Of the total inflow this loss was		0.6239 percent
Your overall continuity error was		Great
		Excellent Efficiency

```
Efficiency of the simulation                          2.10
Most Number of Non Convergences at one Node          839.
Total Number Non Convergences at all Nodes          2472.
Total Number of Nodes with Non Convergences           13.

===> Hydraulic model simulation ended normally.
 ===> SWMM Simulation ended normally.
===> Your input file was named  : S:\51\16194\SWMM\NG Existing.DAT
===> Your output file was named : S:\51\16194\SWMM\NG Existing.out

*============================================================*
|             SWMM Simulation Date and Time Summary          |
*============================================================*
| Starting Date... January    19, 2002  Time...   13:35:11:41  |
|   Ending Date... January    19, 2002  Time...   13:59:40:15  |
|  Elapsed Time...   24.47900 minutes or   1468.74000 seconds  |
*============================================================*
```

NGUNGURU CATCHMENT MODEL **EXISTING CONDITION - 20% AEP / 5 YEAR ARI** **14/08/2002**

Designed By: D. Robinson 21/09/00
Checked By: D. Londer

Urban 1 tc=10min + time for pipe flow
Urban 2 tc=10min + time for pipe flow
Rural 1 tc=10min + time for pipe flow

C1 =	**0.85**	Roads
C2 =	**0.48**	Urban - Living 1
C3 =	**0.35**	Rural (bush-steep) - Living 3
C4 =	**0.3**	Rural (pasture-flat) - Living 3

LINE	UP STM MANHOLE NO.	DN STM MANHOLE NO.	LENGTH [m]	UP STM INV.	DN STM INV.	GRADE [%]	DIAM [mm]	INT DIAM	VELOCITY	CAPACITY [m3/s]	LOCAL AREA [m2]	AREA SERVED [m2]	Q 5yr ARI [m3/s]	% STRESS	DIAM Required	COST [$/m]	COST	PORTION OF TOTAL COSTS	COMMENTS
A1	Cesspit	Outlet	50.00	0.70	0.60	0.18%	300	0.305	0.595	0.043	5000	5000	0.092	212%	450	315	$15,750	$22,050	Pipe length and IL cesspit estimated
B1	Cesspit	Outlet	22.80	1.06	0.97	0.39%	300	0.305	0.869	0.063	4927	4927	0.091	143%	375	270	$6,156	$8,618	IL cesspit estimated
C1	MH6001	MH6004	88.00	2.47	1.66	0.92%	300	0.305	1.345	0.098	11536	11536	0.212	216%	450	315	$27,720	$38,808	
C2	MH6004	MH6002	67.00	1.66	1.26	0.60%	300	0.305	1.082	0.079	850	12386	0.222	281%	450	315	$21,105	$29,547	IL MH6002 estimated
C3	MH6002	MH6003	17.00	1.26	1.16	0.59%	300	0.305	1.074	0.078	7399	19785	0.352	449%	600	450	$7,650	$10,710	IL and grade estimated
C4	MH6003	Outlet	28.00	1.16	1.00	0.56%	300	0.305	1.048	0.077	0	19785	0.348	454%	600	450	$12,600	$17,640	IL and grade estimated
D1	MH6000	MH6079	73.00	2.00	1.42	0.79%	300	0.305	1.249	0.091	8420	8420	0.155	170%	375	270	$19,710	$27,594	IL MH6000 and pipe length estimated
D2	MH6079	MH6078	59.00	1.42	1.00	0.71%	375	0.381	1.366	0.156	9925	18345	0.331	213%	525	375	$22,125	$30,975	
E1	MH6076	MH6077	57.40	2.56	1.93	1.10%	300	0.305	1.469	0.107	4359	4359	0.080	75%					
E2	MH6077	MH6078	98.00	1.93	1.00	0.95%	375	0.381	1.578	0.180	3549	7908	0.142	79%					
Flow from Line E2 enters Line D3																			
EA1	Cesspit	MH6078	98.00	1.69	1.00	0.70%	375	0.381	1.359	0.155	2345	2345	0.043	28%					
Flow from Line EA1 enters Line D3																			
D3	MH6078	Outlet	25.00	1.00	0.92	0.32%	450	0.457	1.029	0.169	8650	37248	0.666	395%	750	600	$15,000	$21,000	
DA1	Cesspit	Outlet	10.00	1.253	0.920	3.33%	300	0.305	2.564	0.187	1275	1275	0.023	13%					
F1	Cesspit	MH6075	31.00	1.50	1.45	0.16%	375	0.381	0.648	0.074	11574	11574	0.213	289%	600	450	$13,950	$19,530	
F2	MH6075	MH6074	18.30	1.45	1.36	0.49%	525	0.533	1.409	0.314	6399	17973	0.331	105%	600	450	$8,235	$11,529	IL MH6075 estimated
F3	MH6074	Outlet	61.50	1.36	1.10	0.43%	525	0.533	1.314	0.293	0	17973	0.324	111%	600	450	$27,675	$38,745	
H1	MH6011	MH6008	49.00	1.98	1.76	0.45%	300	0.305	0.938	0.069	728	728	0.013	20%					
H2	MH6008	MH6009	25.00	1.76	1.64	0.48%	300	0.305	0.970	0.071	2184	2912	0.053	75%					
I2	MH6006.1	MH6009	32.00	1.77	1.64	0.40%	300	0.305	0.885	0.065	2779	2779	0.050	78%					
Flow from Line I2 enters Line H3																			
H3	MH6009	MH6006	16.00	1.64	1.44	1.25%	375	0.381	1.812	0.207	14161	14161	0.261	126%	450	315	$5,040	$7,056	
H4	MH6006	Outlet	2.00	1.94	1.41	26.50%	375	0.381	8.363	0.954	0	14161	0.261	27%					
J1	MH6061	Outlet	50.00	1.94	1.03	1.84%	300	0.305	1.902	0.139	7681	7681	0.141	102%					Pipe length estimated
K1	MH6072	Outlet	90.00	1.18	0.83	0.39%	600	0.610	1.366	0.399	4690	4690	0.086	22%					Pipe length estimated
L1	MH6059	MH6060	48.00	1.74	1.57	0.35%	300	0.305	0.825	0.060	14108	14108	0.226	375%	525	375	$18,000	$25,200	
L2	MH6060	MH6070	54.00	1.57	1.32	0.46%	300	0.305	0.952	0.070	6052	20160	0.314	451%	525	375	$20,250	$28,350	
LA1	MH6071	MH6070	20.00	1.59	1.32	1.35%	300	0.305	1.630	0.119	4689	4689	0.086	73%					
L3	MH6070	Outlet	50.00	1.32	1.14	0.36%	300	0.305	0.839	0.061	2159	27008	0.407	664%	675	510	$25,500	$35,700	Pipe length estimated
M1	MH6030	MH6068	22.00	0.95	0.90	0.23%	300	0.305	0.666	0.049	2060	2060	0.038	78%					
M2	MH6068	MH6067	13.00	0.90	0.78	0.92%	375	0.381	1.557	0.177	1200	3260	0.060	34%					
M3	MH6067	MH6066	33.00	0.78	0.75	0.09%	375	0.381	0.485	0.055	1669	4929	0.088	159%	450	315	$10,395	$14,553	
M4	MH6066	Outlet	25.00	0.75	0.69	0.24%	375	0.381	0.791	0.090		4929	0.087	96%					Pipe length estimated
		N2	Actual Inv.	1.15															
N2	MH6028	MH6065	18.00	1.3	1.27	0.17%	300	0.305	0.569	0.042	2190	2190	0.040	97%					Upstream invert modified to achieve positive grade
N3	MH6065	MH6027	18.00	1.27	1.13	0.78%	300	0.305	1.236	0.090	870	3060	0.056	62%					Pipe length estimated.
N4	MH6027	MH6053	14.00	1.13	1.05	0.57%	300	0.305	1.059	0.077	800	3860	0.070	91%					
N5	MH6053	Outlet	40.00	1.05	0.96	0.23%	375	0.381	0.766	0.087	3070	6930	0.123	141%	450	315	$12,600	$17,640	
O1	MH6058	MH6031	48.00	2.87	2.13	1.54%	225	0.229	1.443	0.059	1553	1553	0.027	46%					
O2	MH6031	MH6057	23.00	1.88	1.48	1.74%	300	0.305	1.851	0.135	5067	6620	0.115	85%					
O3	MH6057	MH6055	84.00	1.48	1.14	0.40%	450	0.457	1.158	0.190	4126	10746	0.178	94%					
OA1	MH6056	MH6055	12.00	1.41	1.14	2.25%	300	0.305	2.106	0.154	4110	4110	0.076	49%					
O4	MH6055	MH6054	48.00	1.14	1.07	0.15%	675	0.686	0.899	0.332	11027	25883	0.406	122%	750	600	$28,800	$40,320	IL MH6054 estimated
O5	MH6054	Outlet	6.00	1.07	0.94	2.17%	750	0.762	3.721	1.697	5400	31283	0.490	29%					Pipe length estimated
P1	MH6026	Outlet	15.00	1.71	1.00	4.73%	375	0.381	3.532	0.403	6768	6768	0.163	40%					Pipe length and outlet invert estimated

NGUNGURU CATCHMENT MODEL **EXISTING CONDITION - 20% AEP / 5 YEAR ARI** **14/08/2002**

Designed By: D. Robinson 21/09/00
Checked By: D. Londer

Urban 1 tc=10min + time for pipe flow
Urban 2 tc=10min + time for pipe flow
Rural 1 tc=10min + time for pipe flow

C1 =	**0.85**	Roads
C2 =	**0.48**	Urban - Living 1
C3 =	**0.35**	Rural (bush-steep) - Living 3
C4 =	**0.3**	Rural (pasture-flat) - Living 3

Q1	MH6052	Outlet	25.00	1.39	0.95	1.76%	300	0.305	1.862	0.136	2000	2000	0.037	27%					Pipe length estimated
R1	MH6019	MH6038	8.00	1.52	1.51	0.13%	300	0.305	0.492	0.036	485	485	0.009	25%					
R2	MH6038	MH6039	25.00	1.51	1.48	0.12%	375	0.381	0.558	0.064	6975	7460	0.135	212%	525	375	$9,375	$13,125	
R3	MH6039	MH6040	7.00	1.48	1.44	0.57%	375	0.381	1.224	0.140	6894	14354	0.259	185%	525	375	$2,625	$3,675	
R4	MH6040	MH6041	29.00	1.44	1.30	0.48%	450	0.457	1.265	0.207		14354	0.256	123%	525	375	$10,875	$15,225	
R5	MH6041	MH6042	11.00	1.30	1.27	0.27%	450	0.457	0.949	0.156	1174	15528	0.275	177%	600	450	$4,950	$6,930	
R6	MH6042	MH6043	14.00	1.27	1.21	0.43%	450	0.457	1.191	0.195		15528	0.274	140%	525	375	$5,250	$7,350	
R7	MH6043	MH6020	16.00	1.21	1.15	0.38%	525	0.533	1.230	0.274	4786	20314	0.356	130%	600	450	$7,200	$10,080	Invert Level for MH6020 estimate & MH6044 estimated
R8	MH6020	MH6044	1.21	1.15	1.11	3.31%	525	0.533	3.662	0.817		20314	0.358	44%	600	450	$545	$762	
R9	MH6044	MH6045	23.00	1.11	1.06	0.22%	525	0.533	0.935	0.209		20314	0.354	170%	600	450	$10,350	$14,490	
R10	MH6045	MH6024	33.00	1.06	0.99	0.21%	600	0.610	1.007	0.294	3956	24270	0.417	142%	675	510	$16,830	$23,562	
R11	MH6024	MH6048	25.00	0.99	0.91	0.32%	675	0.686	1.335	0.493	2911	27181	0.463	94%					
R12	MH6048	MH6046	9.00	0.91	0.75	1.78%	675	0.686	3.153	1.165		27181	0.462	40%					
R13	MH6046	MH6025	20.00	0.75	0.71	0.20%	675	0.686	1.054	0.390	1934	17318	0.292	75%					IL MH6025 estimated; total catchment area contributing to R13 divided between Line S and Line R so that the stress on each pipe is roughly equal.
R14	MH6025	MH6050	34.00	0.71	0.65	0.18%	675	0.686	0.990	0.366		17318	0.287	78%					
R15	MH6050	MH6049	30.00	0.65	0.56	0.30%	675	0.686	1.292	0.478	1987	19305	0.316	66%					
R16	MH6049	Outlet	40.00	0.56	0.54	0.05%	750	0.762	0.561	0.256	1774	21079	0.334	130%	825	675	$27,000	$37,800	Pipe length estimated
R-S1	MH6046	MH6047	10.00	0.78	0.75	0.30%	600	0.61	1.199	0.350	11769	11769	0.200	57%					
S1	MH6022	MH6023	81.00	0.84	0.82	0.02%	300	0.305	0.216	0.016	1083	1083	0.020	126%	375	270	$21,870	$30,618	
S2	MH6023	MH6047	22.00	0.82	0.75	0.32%	300	0.305	0.789	0.058	353	1436	0.026	45%					
S3	MH6047	Outlet	55.00	0.75	0.59	0.29%	600	0.610	1.180	0.345	1748	14600	0.260	75%					Pipe length estimated
T1	MH6064	MH6063	100.00	1.70	1.40	0.30%	225	0.229	0.634	0.026	2340	1890	0.035	133%	300	225	$22,500	$31,500	Invert levels for MH6064 & MH6063 estimated from ground levels and depth to invert
T2	MH6063	Outlet	18.00	1.40	1.30	0.56%	225	0.381	1.206	0.138	3660	2730	0.050	36%					Invert levels for MH6064 & MH6063 estimated from ground levels and depth to invert
U1	MH6051	Outlet	30.00	1.01	0.31	2.35%	450	0.457	2.795	0.458	3570	3570	0.066	14%					
V1	MH6051	Outlet	35.00	1.04	0.31	2.10%	300	0.305	2.033	0.149	7099	7099	0.131	88%					
W1	Inlet	Outlet	20.00	2.40	1.72	3.38%	300	0.305	2.580	0.188	6936	6936	0.128	68%					Pipe size and length estimated
X1*	MH6037	MH6036	11.00	1.34	1.29	0.45%	300	0.305	0.944	0.069	17941	17941	0.287	417%	525	375	$4,125	$5,775	Invert level for MH6036 estimated
X2	MH6036	MH6018	19.50	1.29	1.20	0.46%	450	0.457	1.236	0.203	10597	28538	0.453	224%	600	450	$8,775	$12,285	
X3	MH6018	MH6034	14.40	1.20	1.02	1.25%	450	0.457	2.038	0.334	5776	34314	0.548	164%	600	450	$6,480	$9,072	
X4	MH6034	Outlet	70.00	1.02	0.78	0.34%	525	0.533	1.176	0.262	6519	40833	0.732	279%	825	675	$47,250	$66,150	
Y1	MH6016	Outlet	26.20	1.18	-0.04	4.66%	675	0.686	5.106	1.887	42345	42345	0.567	30%					
Z1	MH6017	Outlet	22.00	1.14	-0.15	5.85%	375	0.305	3.397	0.248	7145	7145	0.121	49%					Pipe length estimated
ZA1	MH6033	Outlet	30.00	1.68	0.00	5.60%	300	0.305	3.325	0.243	9623	9623	0.153	63%					Pipe length estimated
ZB1	MH6015	Outlet	41.60	0.70	0.26	1.06%	375	0.305	1.445	0.106	5765	5765	0.098	92%					Pipe length estimated
ZC1	MH6032	Outlet	2.00	0.16	0.11	2.25%	300	0.305	2.106	0.154	1689	1689	0.055	36%					Pipe length estimated

Construction Costs	**$524,261**
Sub Total	**$524,261**
Design Costs (20%)	$104,852
Contingency (20%)	$104,852
Sub Total	**$733,965**
TOTAL COSTS	**$733,965**

Notes:

(1) * Weighted runoff coefficient based on distribution of different land uses within catchment.
(2) Figures in BLUE indicate estimated values
(3) Figures in RED indicate overstressed pipes

NGUNGURU CATCHMENT MODEL **EXISTING CONDITION - 2% AEP / 50 YEAR ARI** **14/08/2002**

Designed By: D. Robinson 21/09/00
Checked By: D. Londer

Urban 1 n + time for pipe flow
Urban 2 n + time for pipe flow
Rural 1 n + time for pipe flow

C_1 =	0.85	Roads
C_2 =	0.48	Urban - Living 1
C_3 =	0.35	Rural (bush-steep) - Living 3
C_4 =	0.3	Rural (pasture-flat) - Living 3

LINE	UP STM MANHOLE NO.	DN STM MANHOLE NO.	LENGTH [m]	UP STM INV.	DN STM INV.	GRADE [%]	DIAM [mm]	INT DIAM	VELOCITY	CAPACITY [m3/s]	LOCAL AREA [m2]	AREA SERVED [m2]	Q 50yr ARI [m3/s]	% STRESS	DIAM Required	COST [$/m]	COST	PORTION OF TOTAL COSTS	COMMENTS
A1	Cesspit	Outlet	50	0.695	0.604	0.18%	300	0.305	0.60	0.043	5000	5000	0.148	341%	525	375	$18,750	$26,250	Pipe length and IL cesspit estimated
B1	Cesspit	Outlet	22.8	1.056	0.968	0.39%	300	0.305	0.87	0.063	4927	4927	0.146	230%	450	315	$7,182	$10,055	IL cesspit estimated
C1	MH6001	MH6004	88	2.47	1.66	0.92%	300	0.305	1.34	0.098	11536	11536	0.342	348%	525	375	$33,000	$46,200	
C2	MH6004	MH6002	67	1.66	1.26	0.60%	300	0.533	1.55	0.347	850	12386	0.356	103%	525	375	$25,125	$35,175	IL MH6002 estimated
C3	MH6002	MH6003	17	1.26	1.16	0.59%	300	0.305	1.07	0.078	7399	19785	0.565	719%	675	510	$8,670	$12,138	IL and grade estimated
C4	MH6003	Outlet	28	1.16	1.003	0.56%	300	0.305	1.05	0.077	0	19785	0.557	727%	675	510	$14,280	$19,992	IL and grade estimated
D1	MH6000	MH6079	73	2	1.42	0.79%	300	0.305	1.25	0.091	8420	8420	0.249	273%	450	315	$22,995	$32,193	IL MH6000 and pipe length estimated
D2	MH6079	MH6078	59	1.42	1	0.71%	375	0.381	1.37	0.156	9925	18345	0.532	342%	600	450	$26,550	$37,170	
E1	MH6076	MH6077	57.4	2.56	1.93	1.10%	300	0.305	1.47	0.107	4359	4359	0.129	120%	375	270	$15,498	$21,697	
E2	MH6077	MH6078	98	1.93	1	0.95%	375	0.381	1.58	0.180	3549	7908	0.227	126%	450	315	$30,870	$43,218	
Line E2 enters Line D3																			
EA1	Cesspit	MH6078	98	1.69	1	0.70%	375	0.381	1.36	0.155	2345	2345	0.069	45%					
Line EA1 enters Line D3																			
D3	MH6078	Outlet	25	1	0.92	0.32%	450	0.457	1.03	0.169	8650	37248	1.068	633%	900	810	$20,250	$28,350	
DA1	Cesspit	Outlet	10	1.253406	0.92	3.33%	300	0.305	2.56	0.187	1275	1275	0.038	20%					
F1	Cesspit	MH6075	31	1.5	1.45	0.16%	375	0.381	0.65	0.074	11574	11574	0.343	464%	675	510	$15,810	$22,134	
F2	MH6075	MH6074	18.3	1.45	1.36	0.49%	525	0.533	1.41	0.314	6399	17973	0.532	169%	675	510	$9,333	$13,066	IL MH6075 estimated
F3	MH6074	Outlet	61.5	1.36	1.097	0.43%	525	0.533	1.31	0.293	0	17973	0.521	178%	675	510	$31,365	$43,911	
H1	MH6011	MH6008	49	1.98	1.76	0.45%	300	0.305	0.94	0.069	728	728	0.022	31%					
H2	MH6008	MH6009	25	1.76	1.64	0.48%	300	0.305	0.97	0.071	2184	2912	0.085	120%	375	270	$6,750	$9,450	
I2	MH6006.1	MH6009	32	1.768	1.64	0.40%	300	0.305	0.88	0.065	2779	2779	0.081	125%	375	270	$8,640	$12,096	Upstream invert estimated based on grade of 1:250
n Line I2 enters Line H3																			
H3	MH6009	MH6006	16	1.64	1.44	1.25%	375	0.533	2.25	0.502	14161	14161	0.420	84%					
H4	MH6006	Outlet	2	1.94	1.41	26.50%	375	0.381	8.36	0.954	0	14161	0.419	44%					
J1	MH6061	Outlet	50	1.944	1.026	1.84%	300	0.305	1.90	0.139	7681	7681	0.228	164%	375	270	$13,500	$18,900	Pipe length estimated
K1	MH6072	Outlet	90	1.18	0.83	0.39%	600	0.61	1.37	0.399	4690	4690	0.139	35%					Pipe length estimated
L1	MH6059	MH6060	48	1.737	1.57	0.35%	300	0.305	0.82	0.060	14108	14108	0.359	595%	600	450	$21,600	$30,240	
L2	MH6060	MH6070	54	1.57	1.32	0.46%	300	0.305	0.95	0.070	6052	20160	0.496	714%	675	510	$27,540	$38,556	
LA1	MH6071	MH6070	20	1.59	1.32	1.35%	300	0.305	1.63	0.119	4689	4689	0.139	117%	375	270	$5,400	$7,560	
L3	MH6070	Outlet	50	1.32	1.14	0.36%	300	0.305	0.84	0.061	2159	27008	0.643	1048%	750	600	$30,000	$42,000	Pipe length estimated
M1	MH6030	MH6068	22	0.95	0.9	0.23%	300	0.305	0.67	0.049	2060	2060	0.061	125%	375	270	$5,940	$8,316	
M2	MH6068	MH6067	13	0.9	0.78	0.92%	375	0.381	1.56	0.177	1200	3260	0.096	54%					
M3	MH6067	MH6066	33	0.78	0.75	0.09%	375	0.381	0.48	0.055	1669	4929	0.141	255%	525	375	$12,375	$17,325	
M4	MH6066	Outlet	25	0.75	0.69	0.24%	375	0.381	0.79	0.090	0	4929	0.139	154%	450	315	$7,875	$11,025	Pipe length estimated
		N2	Actual Inv.	1.15															
N2	MH6028	MH6065	18	1.3	1.27	0.17%	300	0.305	0.57	0.042	2190	2190	0.065	156%	375	270	$4,860	$6,804	Upstream invert modified to achieve pos
N3	MH6065	MH6027	18	1.27	1.13	0.78%	300	0.305	1.24	0.090	870	3060	0.090	100%					Pipe length estimated.
N4	MH6027	MH6053	14	1.13	1.05	0.57%	300	0.305	1.06	0.077	800	3860	0.113	146%	375	270	$3,780	$5,292	
N5	MH6053	Outlet	40	1.05	0.96	0.23%	375	0.381	0.77	0.087	3070	6930	0.198	226%	525	375	$15,000	$21,000	
O1	MH6058	MH6031	48	2.87	2.13	1.54%	225	0.229	1.44	0.059	1553	1553	0.044	73%					
O2	MH6031	MH6057	23	1.88	1.48	1.74%	300	0.305	1.85	0.135	5067	6620	0.184	136%	375	270	$6,210	$8,694	
O3	MH6057	MH6055	84	1.48	1.14	0.40%	450	0.533	1.28	0.285	4126	10746	0.285	100%	525	375	$31,500	$44,100	
OA1	MH6056	MH6055	12	1.41	1.14	2.25%	300	0.305	2.11	0.154	4110	4110	0.122	79%					
O4	MH6055	MH6054	48	1.14	1.07	0.15%	675	0.686	0.90	0.332	11027	25883	0.649	195%	900	810	$38,880	$54,432	IL MH6054 estimated
O5	MH6054	Outlet	6	1.07	0.94	2.17%	750	0.762	3.72	1.697	5400	31283	0.783	46%					Pipe length estimated

NGUNGURU CATCHMENT MODEL **EXISTING CONDITION - 2% AEP / 50 YEAR ARI** **14/08/2002**

Designed By: D. Robinson 21/09/00
Checked By: D. Londer

Urban 1 n + time for pipe flow
Urban 2 n + time for pipe flow
Rural 1 n + time for pipe flow

C_1 =	0.85	Roads
C_2 =	0.48	Urban - Living 1
C_3 =	0.35	Rural (bush-steep) - Living 3
C_4 =	0.3	Rural (pasture-flat) - Living 3

P1	MH6026	Outlet	15	1.71	1	4.73%	375	0.381	3.53	0.403	6768	6768	0.262	65%					Pipe length and outlet invert estimated
Q1	MH6052	Outlet	25	1.39	0.95	1.76%	300	0.305	1.86	0.136	2000	2000	0.059	44%					Pipe length estimated
R1	MH6019	MH6038	8	1.52	1.51	0.13%	300	0.305	0.49	0.036	485	485	0.014	40%					
R2	MH6038	MH6039	25	1.51	1.48	0.12%	375	0.381	0.56	0.064	6975	7460	0.216	340%	600	450	$11,250	$15,750	
R3	MH6039	MH6040	7	1.48	1.44	0.57%	375	0.381	1.22	0.140	6894	14354	0.415	298%	600	450	$3,150	$4,410	
R4	MH6040	MH6041	29	1.44	1.3	0.48%	450	0.457	1.26	0.207	0	14354	0.410	198%	600	450	$13,050	$18,270	
R5	MH6041	MH6042	11	1.3	1.27	0.27%	450	0.457	0.95	0.156	1174	15528	0.441	284%	675	510	$5,610	$7,854	
R6	MH6042	MH6043	14	1.27	1.21	0.43%	450	0.457	1.19	0.195	0	15528	0.439	225%	600	450	$6,300	$8,820	
R7	MH6043	MH6020	16	1.21	1.15	0.38%	525	0.533	1.23	0.274	4786	20314	0.571						Invert Level for MH6020 estimate & MH6044 estimated
R8	MH6020	MH6044	1.21	1.15	1.11	3.31%	525	0.533	3.66	0.817	0	20314	0.574	70%					
R9	MH6044	MH6045	23	1.11	1.06	0.22%	525	0.533	0.94	0.209	0	20314	0.567	272%	825	675	$15,525	$21,735	
R10	MH6045	MH6024	33	1.06	0.99	0.21%	600	0.61	1.01	0.294	3956	24270	0.666	226%	825	675	$22,275	$31,185	
R11	MH6024	MH6048	25	0.99	0.91	0.32%	675	0.686	1.33	0.493	2911	27181	0.739	150%	825	675	$16,875	$23,625	
R12	MH6048	MH6046	9	0.91	0.75	1.78%	675	0.686	3.15	1.165	0	27181	0.738	63%					
R13	MH6046	MH6025	20	0.75	0.71	0.20%	675	0.686	1.05	0.390	1934	17318	0.466	120%	825	675	$13,500	$18,900	IL HM6025 estimated
R14	MH6025	MH6050	34	0.71	0.65	0.18%	675	0.686	0.99	0.366	0	17318	0.457	125%	825	675	$22,950	$32,130	
R15	MH6050	MH6049	30	0.65	0.56	0.30%	675	0.686	1.29	0.478	1987	19305	0.504	105%	750	600	$18,000	$25,200	
R16	MH6049	Outlet	40	0.56	0.54	0.05%	750	0.762	0.56	0.256	1774	21079	0.529	207%	1050	975	$39,000	$54,600	Pipe length estimated
R-S1	MH6046	MH6047	10	0.78	0.75	0.30%	600	0.610	1.20	0.350	11769	11769	0.320	91%					
S1	MH6022	MH6023	81	0.84	0.82	0.02%	300	0.305	0.22	0.016	1083	1083	0.032	203%	450	315	$25,515	$35,721	
S2	MH6023	MH6047	22	0.82	0.75	0.32%	300	0.305	0.79	0.058	353	1436	0.042	73%					
S3	MH6047	Outlet	55	0.75	0.59	0.29%	600	0.61	1.18	0.345	1748	14600	0.417	121%	675	510	$28,050	$39,270	Pipe length estimated
T1	MH6064	MH6063	100	1.7	1.4	0.30%	225	0.229	0.63	0.026	2340	1890	0.056	214%	300	225	$22,500	$31,500	
T2	MH6063	Outlet	18	1.4	1.3	0.56%	225	0.381	1.21	0.138	3660	2730	0.080	58%					
U1	MH6051	Outlet	30	1.01	0.306	2.35%	450	0.457	2.79	0.458	3570	3570	0.106	23%					
V1	MH6051	Outlet	35	1.04	0.306	2.10%	300	0.305	2.03	0.149	7099	7099	0.210	142%	375	270	$9,450	$13,230	
W1	Inlet	Outlet	20	2.397	1.722	3.38%	300	0.305	2.58	0.188	6936	6936	0.205	109%	375	270	$5,400	$7,560	Pipe size and length estimated
X1	MH6037	MH6036	11	1.34	1.29	0.45%	300	0.305	0.94	0.069	17941	17941	0.456	662%	600	450	$4,950	$6,930	Invert level for MH6036 estimated
X2	MH6036	MH6018	19.5	1.29	1.2	0.46%	450	0.457	1.24	0.203	10597	28538	0.719	355%	750	600	$11,700	$16,380	
X3	MH6018	MH6034	14.4	1.2	1.02	1.25%	450	0.457	2.04	0.334	5776	34314	0.869	260%	675	510	$7,344	$10,282	
X4	MH6034	Outlet	70	1.02	0.78	0.34%	525	0.533	1.18	0.262	6519	40833	1.176	448%	1050	975	$68,250	$95,550	
Y1	MH6016	Outlet	26.2	1.18	-0.04	4.66%	675	0.686	5.11	1.887	42345	42345	0.912	48%					
Z1	MH6017	Outlet	22	1.14	-0.146	5.85%	375	0.305	3.40	0.248	7145	7145	0.194	78%					Pipe length estimated
ZA1	MH6033	Outlet	30	1.68	0	5.60%	300	0.305	3.32	0.243	9623	9623	0.246	101%					Pipe length estimated
ZB1	MH6015	Outlet	41.6	0.702	0.26	1.06%	375	0.305	1.45	0.106	5765	5765	0.157	149%	375	270	$11,232	$15,725	Pipe length estimated
	0	0	0																
ZC1	MH6032	Outlet	2	0.159	0.114	2.25%	300	0.305	2.11	0.154	1689	1689	0.089	58%					Pipe length estimated
	0	0	0	0	0	0.00%	0	0	0.00	0.000	0	0							

Construction Costs	**$901,404**	
Sub Total	**$901,404**	
Design Costs (20%)	$180,281	
Contingency (20%)	$180,281	
Sub Total	**$1,261,966**	
TOTAL COSTS	**$1,261,966**	**$1,261,966**

NGUNGURU CATCHMENT MODEL **FUTURE CONDITION - 20% AEP / 5 YEAR ARI**

14/08/2002

Designed By: D. Robinson 5/12/00
Checked By: D. Londer

Urban 1 tc=10min + time for pipe flow
Urban 2 tc=10min + time for pipe flow
Rural 1 tc=10min + time for pipe flow

C1 =	**0.85**	Roads
C2 =	**0.6**	Urban - Living 1
C3 =	**0.51**	Rural (bush-steep) - Living 3
C4 =	**0.46**	Rural (pasture-flat) - Living 3

LINE	UP STM MANHOLE NO.	DN STM MANHOLE NO.	LENGTH [m]	UP STM INV.	DN STM INV.	GRADE [%]	DIAM [mm]	INT DIAM	VELOCITY	CAPACITY [m3/s]	LOCAL AREA [m2]	AREA SERVED [m2]	Q 50yr ARI [m3/s]	% STRESS	DIAM Required	COST [$/m]	COST	PORTION OF TOTAL COSTS	COMMENTS
A1	Cesspit	Outlet	50.00	0.70	0.60	0.18%	300	0.305	0.595	0.043	5000	5000	0.115	265%	450	315	$15,750	$22,050	Pipe length and IL cesspit estimated
B1	Cesspit	Outlet	22.80	1.06	0.97	0.39%	300	0.305	0.869	0.063	4927	4927	0.113	179%	375	270	$6,156	$8,618	IL cesspit estimated
C1	MH6001	MH6004	88.00	2.47	1.66	0.92%	300	0.305	1.345	0.098	11536	11536	0.266	270%	450	315	$27,720	$38,808	
C2	MH6004	MH6002	67.00	1.66	1.26	0.60%	300	0.305	1.082	0.079	850	12386	0.277	351%	525	375	$25,125	$35,175	IL MH6002 estimated
C3	MH6002	MH6003	17.00	1.26	1.16	0.59%	300	0.305	1.074	0.078	7399	19785	0.440	561%	600	450	$7,650	$10,710	IL and grade estimated
C4	MH6003	Outlet	28.00	1.16	1.00	0.56%	300	0.305	1.048	0.077	0	19785	0.435	568%	600	450	$12,600	$17,640	IL and grade estimated
D1	MH6000	MH6079	73.00	2.00	1.42	0.79%	300	0.305	1.249	0.091	8420	8420	0.194	212%	450	315	$22,995	$32,193	IL MH6000 and pipe length estimated
D2	MH6079	MH6078	59.00	1.42	1.00	0.71%	375	0.381	1.366	0.156	9925	18345	0.414	266%	600	450	$26,550	$37,170	
E1	MH6076	MH6077	57.40	2.56	1.93	1.10%	300	0.305	1.469	0.107	4359	4359	0.100	93%					
E2	MH6077	MH6078	98.00	1.93	1.00	0.95%	375	0.381	1.578	0.180	3549	7908	0.177	98%					
Flow from Line E2 enters Line D3																			
EA1	Cesspit	MH6078	98.00	1.69	1.00	0.70%	375	0.381	1.359	0.155	2345	2345	0.054	35%					
Flow from Line EA1 enters Line D3																			
D3	MH6078	Outlet	25.00	1.00	0.92	0.32%	450	0.457	1.029	0.169	8650	37248	0.832	493%	825	675	$16,875	$23,625	
DA1	Cesspit	Outlet	10.00	1.253	0.920	3.33%	300	0.305	2.564	0.187	1275	1275	0.029	16%					
F1	Cesspit	MH6075	31.00	1.50	1.45	0.16%	375	0.381	0.648	0.074	11574	11574	0.266	361%	675	510	$15,810	$22,134	
F2	MH6075	MH6074	18.30	1.45	1.36	0.49%	525	0.533	1.409	0.314	6399	17973	0.414	132%	600	450	$8,235	$11,529	IL MH6075 estimated
	MH6074	Outlet	61.50	1.36	1.10	0.43%	525	0.533	1.314	0.293	0	17973	0.405	138%	600	450	$27,675	$38,745	
H1	MH6011	MH6008	49.00	1.98	1.76	0.45%	300	0.305	0.938	0.069	728	728	0.017	24%					
H2	MH6008	MH6009	25.00	1.76	1.64	0.48%	300	0.305	0.970	0.071	2184	2912	0.066	94%					
I2	MH6006.1	MH6009	32.00	1.77	1.64	0.40%	300	0.305	0.885	0.065	2779	2779	0.063	97%					
Flow from Line I2 enters Line H3																			
H3	MH6009	MH6006	16.00	1.64	1.44	1.25%	375	0.381	1.812	0.207	14161	14161	0.326	158%	450	315	$5,040	$7,056	
H4	MH6006	Outlet	2.00	1.94	1.41	26.50%	375	0.381	8.363	0.954	0	14161	0.326	34%					
J1	MH6061	Outlet	50.00	1.94	1.03	1.84%	300	0.305	1.902	0.139	7681	7681	0.177	127%	375	270	$13,500	$18,900	Pipe length estimated
K1	MH6072	Outlet	90.00	1.18	0.83	0.39%	600	0.610	1.366	0.399	4690	4690	0.108	27%					Pipe length estimated
L1	MH6059	MH6060	48.00	1.74	1.57	0.35%	300	0.305	0.825	0.060	14108	14108	0.325	539%	600	450	$21,600	$30,240	
L2	MH6060	MH6070	54.00	1.57	1.32	0.46%	300	0.305	0.952	0.070	6052	20160	0.453	651%	600	450	$24,300	$34,020	
								3.000											
LA1	MH6071	MH6070	20.00	1.59	1.32	1.35%	300	0.305	1.630	0.119	4689	4689	0.108	91%					
L3	MH6070	Outlet	50.00	1.32	1.14	0.36%	300	0.305	0.839	0.061	2159	27008	0.590	963%	750	600	$30,000	$42,000	Pipe length estimated
M1	MH6030	MH6068	22.00	0.95	0.90	0.23%	300	0.305	0.666	0.049	2060	2060	0.047	97%					
M2	MH6068	MH6067	13.00	0.90	0.78	0.92%	375	0.381	1.557	0.177	1200	3260	0.075	42%					
M3	MH6067	MH6066	33.00	0.78	0.75	0.09%	375	0.381	0.485	0.055	1669	4929	0.110	198%	525	375	$12,375	$17,325	
M4	MH6066	Outlet	25.00	0.75	0.69	0.24%	375	0.381	0.791	0.090		4929	0.108	120%	450	315	$7,875	$11,025	Pipe length estimated
		N2	Actual Inv.	1.15															
N2	MH6028	MH6065	18.00	1.3	1.27	0.17%	300	0.305	0.569	0.042	2190	2190	0.050	121%	375	270	$4,860	$6,804	Upstream invert modified to achieve positive grade
N3	MH6065	MH6027	18.00	1.27	1.13	0.78%	300	0.305	1.236	0.090	870	3060	0.070	78%					Pipe length estimated.
N4	MH6027	MH6053	14.00	1.13	1.05	0.57%	300	0.305	1.059	0.077	800	3860	0.088	114%	375	270	$3,780	$5,292	
N5	MH6053	Outlet	40.00	1.05	0.96	0.23%	375	0.381	0.766	0.087	3070	6930	0.154	176%	525	375	$15,000	$21,000	
O1	MH6058	MH6031	48.00	2.87	2.13	1.54%	225	0.229	1.443	0.059	1553	1553	0.035	58%					
O2	MH6031	MH6057	23.00	1.88	1.48	1.74%	300	0.305	1.851	0.135	5067	6620	0.147	109%	375	270	$6,210	$8,694	
O3	MH6057	MH6055	84.00	1.48	1.14	0.40%	450	0.457	1.158	0.190	4126	10746	0.229	121%	525	375	$31,500	$44,100	
OA1	MH6056	MH6055	12.00	1.41	1.14	2.25%	300	0.305	2.106	0.154	4110	4110	0.095	61%					
O4	MH6055	MH6054	48.00	1.14	1.07	0.15%	675	0.686	0.899	0.332	11027	25883	0.531	160%	825	675	$32,400	$45,360	IL MH6054 estimated
O5	MH6054	Outlet	6.00	1.07	0.94	2.17%	750	0.762	3.721	1.697	5400	31283	0.641	38%					Pipe length estimated
P1	MH6026	Outlet	15.00	1.71	1.00	4.73%	375	0.381	3.532	0.403	6768	6768	0.182	45%					Pipe length and outlet invert estimated

NGUNGURU CATCHMENT MODEL **FUTURE CONDITION - 20% AEP / 5 YEAR ARI**

14/08/2002

Designed By: D. Robinson 5/12/00
Checked By: D. Londer

Urban 1 tc=10min + time for pipe flow
Urban 2 tc=10min + time for pipe flow
Rural 1 tc=10min + time for pipe flow

C1 =	**0.85**	Roads
C2 =	**0.6**	Urban - Living 1
C3 =	**0.51**	Rural (bush-steep) - Living 3
C4 =	**0.46**	Rural (pasture-flat) - Living 3

Q1	MH6052	Outlet	25.00	1.39	0.95	1.76%	300	0.305	1.862	0.136	2000	2000	0.046	34%					Pipe length estimated
R1	MH6019	MH6038	8.00	1.52	1.51	0.13%	300	0.305	0.492	0.036	485	485	0.011	31%					
R2	MH6038	MH6039	25.00	1.51	1.48	0.12%	375	0.381	0.558	0.064	6975	7460	0.168	265%	600	450	$11,250	$15,750	
R3	MH6039	MH6040	7.00	1.48	1.44	0.57%	375	0.381	1.224	0.140	6894	14354	0.323	232%	525	375	$2,625	$3,675	
R4	MH6040	MH6041	29.00	1.44	1.30	0.48%	450	0.457	1.265	0.207		14354	0.320	154%	600	450	$13,050	$18,270	
R5	MH6041	MH6042	11.00	1.30	1.27	0.27%	450	0.457	0.949	0.156	1174	15528	0.344	221%	675	510	$5,610	$7,854	
R6	MH6042	MH6043	14.00	1.27	1.21	0.43%	450	0.457	1.191	0.195		15528	0.342	175%	600	450	$6,300	$8,820	
R7	MH6043	MH6020	16.00	1.21	1.15	0.38%	525	0.533	1.230	0.274	4786	20314	0.445	162%	675	510	$8,160	$11,424	Invert Level for MH6020 estimate & MH6044 estimated
R8	MH6020	MH6044	1.21	1.15	1.11	3.31%	525	0.533	3.662	0.817		20314	0.448	55%	675	510	$617	$864	
R9	MH6044	MH6045	23.00	1.11	1.06	0.22%	525	0.533	0.935	0.209		20314	0.443	212%	750	600	$13,800	$19,320	
R10	MH6045	MH6024	33.00	1.06	0.99	0.21%	600	0.610	1.007	0.294	3956	24270	0.521	177%	750	600	$19,800	$27,720	
R11	MH6024	MH6048	25.00	0.99	0.91	0.32%	675	0.686	1.335	0.493	2911	27181	0.579	117%	750	600	$15,000	$21,000	
R12	MH6048	MH6046	9.00	0.91	0.75	1.78%	675	0.686	3.153	1.165		27181	0.578	50%					
R13	MH6046	MH6025	20.00	0.75	0.71	0.20%	675	0.686	1.054	0.390	1934	17318	0.365	94%					IL MH6025 estimated; total catchment area contributing to R13 divided between Line S and Line R so that the stress on each pipe is roughly equal.
R14	MH6025	MH6050	34.00	0.71	0.65	0.18%	675	0.686	0.990	0.366		17318	0.359	98%					
R15	MH6050	MH6049	30.00	0.65	0.56	0.30%	675	0.686	1.292	0.478	1987	19305	0.396	83%					
R16	MH6049	Outlet	40.00	0.56	0.54	0.05%	750	0.762	0.561	0.256	1774	21079	0.417	163%	900	810	$32,400	$45,360	Pipe length estimated
R-S1	MH6046	MH6047	10.00	0.78	0.75	0.30%	600	0.61	1.199	0.350	11769	11769	0.250	71%					
S1	MH6022	MH6023	81.00	0.84	0.82	0.02%	300	0.305	0.216	0.016	1083	1083	0.025	158%	375	270	$21,870	$30,618	
S2	MH6023	MH6047	22.00	0.82	0.75	0.32%	300	0.305	0.789	0.058	353	1436	0.033	57%					
S3	MH6047	Outlet	55.00	0.75	0.59	0.29%	600	0.610	1.180	0.345	1748	14600	0.325	94%					Pipe length estimated
T1	MH6064	MH6063	100.00	1.70	1.40	0.30%	225	0.229	0.634	0.026	2340	1890	0.044	167%	300	225	$22,500	$31,500	Invert levels for MH6064 & MH6063 estimated from ground levels and depth to invert
T2	MH6063	Outlet	18.00	1.40	1.30	0.56%	225	0.381	1.206	0.138	3660	2730	0.062	45%					Invert levels for MH6064 & MH6063 estimated from ground levels and depth to invert
U1	MH6051	Outlet	30.00	1.01	0.31	2.35%	450	0.457	2.795	0.458	3570	3570	0.082	18%					
V1	MH6051	Outlet	35.00	1.04	0.31	2.10%	300	0.305	2.033	0.149	7099	7099	0.163	110%	375	270	$9,450	$13,230	
W1	Inlet	Outlet	20.00	2.40	1.72	3.38%	300	0.305	2.580	0.188	6936	6936	0.160	85%					Pipe size and length estimated
X1*	MH6037	MH6036	11.00	1.34	1.29	0.45%	300	0.305	0.944	0.069	17941	17941	0.359	521%	600	450	$4,950	$6,930	Invert level for MH6036 estimated
X2	MH6036	MH6018	19.50	1.29	1.20	0.46%	450	0.457	1.236	0.203	10597	28538	0.567	279%	675	510	$9,945	$13,923	
X3	MH6018	MH6034	14.40	1.20	1.02	1.25%	450	0.457	2.038	0.334	5776	34314	0.684	205%	675	510	$7,344	$10,282	
X4	MH6034	Outlet	70.00	1.02	0.78	0.34%	525	0.533	1.176	0.262	6519	40833	0.916	349%	900	810	$56,700	$79,380	
Y1	MH6016	Outlet	26.20	1.18	-0.04	4.66%	675	0.686	5.106	1.887	42345	42345	0.827	44%					
Z1	MH6017	Outlet	22.00	1.14	-0.15	5.85%	375	0.305	3.397	0.248	7145	7145	0.157	63%					Pipe length estimated
ZA1	MH6033	Outlet	30.00	1.68	0.00	5.60%	300	0.305	3.325	0.243	9623	9623	0.205	84%					Pipe length estimated
ZB1	MH6015	Outlet	41.60	0.70	0.26	1.06%	375	0.305	1.445	0.106	5765	5765	0.127	120%	375	270	$11,232	$15,725	Pipe length estimated
ZC1	MH6032	Outlet	2.00	0.16	0.11	2.25%	300	0.305	2.106	0.154	1689	1689	0.055	36%					Pipe length estimated

Construction Costs	**$694,184**
Sub Total	**$694,184**
Design Costs (20%)	$138,837
Contingency (20%)	$138,837
Sub Total	**$971,858**
TOTAL COSTS	**$971,858**

Notes:

(1) * Weighted runoff coefficient based on distribution of different land uses within catchment.
(2) Figures in BLUE indicate estimated values
(3) Figures in RED indicate overstressed pipes

NGUNGURU CATCHMENT MODEL **FUTURE CONDITION - 2% AEP / 50 YEAR ARI** **14/08/2002**

Designed By: D. Robinson 21/09/00
Checked By: D. Londer

Urban 1 in + time for pipe flow
Urban 2 in + time for pipe flow
Rural 1 in + time for pipe flow

C_1 =	0.85	Roads
C_2 =	0.6	Urban - Living 1
C_3 =	0.51	Rural (bush-steep) - Living 3
C_4 =	0.46	Rural (pasture-flat) - Living 3

LINE	UP STM MANHOLE NO.	DN STM MANHOLE NO.	LENGTH [m]	UP STM INV.	DN STM INV.	GRADE [%]	DIAM [mm]	INT DIAM	VELOCITY	CAPACITY [m3/s]	LOCAL AREA [m2]	AREA SERVED [m2]	Q 50yr ARI [m3/s]	% STRESS	DIAM Required	COST [$/m]	COST	PORTION OF TOTAL COSTS	COMMENTS
A1	Cesspit	Outlet	50	0.695	0.604	0.18%	300	0.305	0.60	0.043	5000	5000	0.185	426%	525	375	$18,750	$26,250	Pipe length and IL cesspit estimated
B1	Cesspit	Outlet	22.8	1.056	0.968	0.39%	300	0.305	0.87	0.063	4927	4927	0.182	287%	450	315	$7,182	$10,055	IL cesspit estimated
C1	MH6001	MH6004	88	2.47	1.66	0.92%	300	0.305	1.34	0.098	11536	11536	0.427	435%	525	375	$33,000	$46,200	
C2	MH6004	MH6002	67	1.66	1.26	0.60%	300	0.305	1.08	0.079	850	12386	0.445	563%	600	450	$30,150	$42,210	IL MH6002 estimated
C3	MH6002	MH6003	17	1.26	1.16	0.59%	300	0.305	1.07	0.078	7399	19785	0.706	899%	750	600	$10,200	$14,280	IL and grade estimated
C4	MH6003	Outlet	28	1.16	1.003	0.56%	300	0.305	1.05	0.077	0	19785	0.696	909%	750	600	$16,800	$23,520	IL and grade estimated
D1	MH6000	MH6079	73	2	1.42	0.79%	300	0.305	1.25	0.091	8420	8420	0.312	342%	525	375	$27,375	$38,325	IL MH6000 and pipe length estimated
D2	MH6079	MH6078	59	1.42	1	0.71%	375	0.305	1.18	0.086	9925	18345	0.663	768%	675	510	$30,090	$42,126	
E1	MH6076	MH6077	57.4	2.56	1.93	1.10%	300	0.305	1.47	0.107	4359	4359	0.161	150%	375	270	$15,498	$21,697	
E2	MH6077	MH6078	98	1.93	1	0.95%	375	0.381	1.58	0.180	3549	7908	0.284	158%	450	315	$30,870	$43,218	
Line E2 enters Line D3																			
EA1	Cesspit	MH6078	98	1.69	1	0.70%	375	0.381	1.36	0.155	2345	2345	0.087	56%					
Line EA1 enters Line D3																			
D3	MH6078	Outlet	25	1	0.92	0.32%	450	0.457	1.03	0.169	8650	37248	1.331	789%	1050	975	$24,375	$34,125	
DA1	Cesspit	Outlet	10	1.253406	0.92	3.33%	300	0.305	2.56	0.187	1275	1275	0.047	25%					
F1	Cesspit	MH6075	31	1.5	1.45	0.16%	375	0.381	0.65	0.074	11574	11574	0.429	580%	750	600	$18,600	$26,040	
F2	MH6075	MH6074	18.3	1.45	1.36	0.49%	525	0.533	1.41	0.314	6399	17973	0.666	212%	750	600	$10,980	$15,372	IL MH6075 estimated
	MH6074	Outlet	61.5	1.36	1.097	0.43%	525	0.533	1.31	0.293	0	17973	0.651	222%	750	600	$36,900	$51,660	
H1	MH6011	MH6008	49	1.98	1.76	0.45%	300	0.305	0.94	0.069	728	728	0.027	39%					
H2	MH6008	MH6009	25	1.76	1.64	0.48%	300	0.305	0.97	0.071	2184	2912	0.107	150%	375	270	$6,750	$9,450	
I2	MH6006.1	MH6009	32	1.768	1.64	0.40%	300	0.305	0.88	0.065	2779	2779	0.101	156%	375	270	$8,640	$12,096	Upstream invert estimated based on gr
n Line I2 enters Line H3																			
H3	MH6009	MH6006	16	1.64	1.44	1.25%	375	0.381	1.81	0.207	14161	14161	0.524	254%	525	375	$6,000	$8,400	
H4	MH6006	Outlet	2	1.94	1.41	26.50%	375	0.381	8.36	0.954	0	14161	0.524	55%					
J1	MH6061	Outlet	50	1.944	1.026	1.84%	300	0.305	1.90	0.139	7681	7681	0.284	205%	450	315	$15,750	$22,050	Pipe length estimated
K1	MH6072	Outlet	90	1.18	0.83	0.39%	600	0.61	1.37	0.399	4690	4690	0.174	44%					Pipe length estimated
L1	MH6059	MH6060	48	1.737	1.57	0.35%	300	0.305	0.82	0.060	14108	14108	0.522	867%	675	510	$24,480	$34,272	
L2	MH6060	MH6070	54	1.57	1.32	0.46%	300	0.305	0.95	0.070	6052	20160	0.726	1044%	750	600	$32,400	$45,360	
LA1	MH6071	MH6070	20	1.59	1.32	1.35%	300	0.305	1.63	0.119	4689	4689	0.174	146%	375	270	$5,400	$7,560	
L3	MH6070	Outlet	50	1.32	1.14	0.36%	300	0.305	0.84	0.061	2159	27008	0.945	1542%	900	810	$40,500	$56,700	Pipe length estimated
M1	MH6030	MH6068	22	0.95	0.9	0.23%	300	0.305	0.67	0.049	2060	2060	0.076	157%	375	270	$5,940	$8,316	
M2	MH6068	MH6067	13	0.9	0.78	0.92%	375	0.381	1.56	0.177	1200	3260	0.120	68%					
M3	MH6067	MH6066	33	0.78	0.75	0.09%	375	0.381	0.48	0.055	1669	4929	0.176	318%	600	450	$14,850	$20,790	
M4	MH6066	Outlet	25	0.75	0.69	0.24%	375	0.381	0.79	0.090		4929	0.173	192%	525	375	$9,375	$13,125	Pipe length estimated
		N2	Actual Inv.	1.15															
N2	MH6028	MH6065	18	1.3	1.27	0.17%	300	0.305	0.57	0.042	2190	2190	0.081	195%	450	315	$5,670	$7,938	Upstream invert modified to achieve pc
N3	MH6065	MH6027	18	1.27	1.13	0.78%	300	0.305	1.24	0.090	870	3060	0.113	125%	375	270	$4,860	$6,804	Pipe length estimated.
N4	MH6027	MH6053	14	1.13	1.05	0.57%	300	0.305	1.06	0.077	800	3860	0.141	182%	375	270	$3,780	$5,292	
N5	MH6053	Outlet	40	1.05	0.96	0.23%	375	0.381	0.77	0.087	3070	6930	0.247	283%	600	450	$18,000	$25,200	
O1	MH6058	MH6031	48	2.87	2.13	1.54%	225	0.229	1.44	0.059	1553	1553	0.056	94%					
O2	MH6031	MH6057	23	1.88	1.48	1.74%	300	0.305	1.85	0.135	5067	6620	0.236	175%	375	270	$6,210	$8,694	
O3	MH6057	MH6055	84	1.48	1.14	0.40%	450	0.457	1.16	0.190	4126	10746	0.368	194%	600	450	$37,800	$52,920	
OA1	MH6056	MH6055	12	1.41	1.14	2.25%	300	0.305	2.11	0.154	4110	4110	0.152	99%					
O4	MH6055	MH6054	48	1.14	1.07	0.15%	675	0.686	0.90	0.332	11027	25883	0.849	255%	1050	975	$46,800	$65,520	IL MH6054 estimated
O5	MH6054	Outlet	6	1.07	0.94	2.17%	750	0.762	3.72	1.697	5400	31283	1.025	60%					Pipe length estimated

NGUNGURU CATCHMENT MODEL **FUTURE CONDITION - 2% AEP / 50 YEAR ARI** **14/08/2002**

Designed By: D. Robinson 21/09/00
Checked By: D. Londer

Urban 1 in + time for pipe flow
Urban 2 in + time for pipe flow
Rural 1 in + time for pipe flow

C_1 =	0.85	Roads
C_2 =	0.6	Urban - Living 1
C_3 =	0.51	Rural (bush-steep) - Living 3
C_4 =	0.46	Rural (pasture-flat) - Living 3

P1	MH6026	Outlet	15	1.71	1	4.73%	375	0.381	3.53	0.403	6768	6768	0.292	73%					Pipe length and outlet invert estimated
Q1	MH6052	Outlet	25	1.39	0.95	1.76%	300	0.305	1.86	0.136	2000	2000	0.074	54%					Pipe length estimated
R1	MH6019	MH6038	8	1.52	1.51	0.13%	300	0.305	0.49	0.036	485	485	0.018	50%					
R2	MH6038	MH6039	25	1.51	1.48	0.12%	375	0.381	0.56	0.064	6975	7460	0.270	425%	675	510	$12,750	$17,850	
R3	MH6039	MH6040	7	1.48	1.44	0.57%	375	0.381	1.22	0.140	6894	14354	0.519	372%	675	510	$3,570	$4,998	
R4	MH6040	MH6041	29	1.44	1.3	0.48%	450	0.457	1.26	0.207		14354	0.513	247%	675	510	$14,790	$20,706	
R5	MH6041	MH6042	11	1.3	1.27	0.27%	450	0.457	0.95	0.156	1174	15528	0.552	354%	750	600	$6,600	$9,240	
R6	MH6042	MH6043	14	1.27	1.21	0.43%	450	0.457	1.19	0.195		15528	0.549	281%	675	510	$7,140	$9,996	
R7	MH6043	MH6020	16	1.21	1.15	0.38%	525	0.533	1.23	0.274	4786	20314	0.713	260%	750				Invert Level for MH6020 estimate & MH
R8	MH6020	MH6044	1.21	1.15	1.11	3.31%	525	0.533	3.66	0.817		20314	0.718	88%					
R9	MH6044	MH6045	23	1.11	1.06	0.22%	525	0.533	0.94	0.209		20314	0.709	340%	825	675	$15,525	$21,735	
R10	MH6045	MH6024	33	1.06	0.99	0.21%	600	0.61	1.01	0.294	3956	24270	0.833	283%	900	810	$26,730	$37,422	
R11	MH6024	MH6048	25	0.99	0.91	0.32%	675	0.686	1.33	0.493	2911	27181	0.924	187%	900	810	$20,250	$28,350	
R12	MH6048	MH6046	9	0.91	0.75	1.78%	675	0.686	3.15	1.165		27181	0.923	79%					
R13	MH6046	MH6025	20	0.75	0.71	0.20%	675	0.686	1.05	0.390	1934	17318	0.582	149%	825	675	$13,500	$18,900	IL HM6025 estimated
R14	MH6025	MH6050	34	0.71	0.65	0.18%	675	0.686	0.99	0.366		17318	0.572	156%	825	675	$22,950	$32,130	
R15	MH6050	MH6049	30	0.65	0.56	0.30%	675	0.686	1.29	0.478	1987	19305	0.629	132%	750	600	$18,000	$25,200	
R16	MH6049	Outlet	40	0.56	0.54	0.05%	750	0.762	0.56	0.256	1774	21079	0.661	258%	1050	975	$39,000	$54,600	Pipe length estimated
R-S1	MH6046	MH6047	10	0.78	0.75	0.003	600	0.61	1.20	0.350	11769	11769	0.400	114%	675	510	$5,100	$7,140	
S1	MH6022	MH6023	81	0.84	0.82	0.02%	300	0.305	0.22	0.016	1083	1083	0.040	254%	450	315	$25,515	$35,721	
S2	MH6023	MH6047	22	0.82	0.75	0.32%	300	0.305	0.79	0.058	353	1436	0.052	91%					
S3	MH6047	Outlet	55	0.75	0.59	0.29%	600	0.61	1.18	0.345	1748	14600	0.522	151%	750	600	$33,000	$46,200	Pipe length estimated
T1	MH6064	MH6063	100	1.7	1.4	0.30%	225	0.229	0.63	0.026	2340	1890	0.070	268%	375	270	$27,000	$37,800	
T2	MH6063	Outlet	18	1.4	1.3	0.56%	225	0.381	1.21	0.138	3660	2730	0.100	73%					
U1	MH6051	Outlet	30	1.01	0.306	2.35%	450	0.457	2.79	0.458	3570	3570	0.132	29%					
V1	MH6051	Outlet	35	1.04	0.306	2.10%	300	0.305	2.03	0.149	7099	7099	0.263	177%	375	270	$9,450	$13,230	
W1	Inlet	Outlet	20	2.397	1.722	3.38%	300	0.305	2.58	0.188	6936	6936	0.257	136%	375	270	$5,400	$7,560	Pipe size and length estimated
X1	MH6037	MH6036	11	1.34	1.29	0.45%	300	0.305	0.94	0.069	17941	17941	0.570	827%	675	510	$5,610	$7,854	Invert level for MH6036 estimated
X2	MH6036	MH6018	19.5	1.29	1.2	0.46%	450	0.457	1.24	0.203	10597	28538	0.899	443%	825	675	$13,163	$18,428	
X3	MH6018	MH6034	14.4	1.2	1.02	1.25%	450	0.457	2.04	0.334	5776	34314	1.086	325%	750	600	$8,640	$12,096	
X4	MH6034	Outlet	70	1.02	0.78	0.34%	525	0.533	1.18	0.262	6519	40833	1.469	560%	1050	975	$68,250	$95,550	
Y1	MH6016	Outlet	26.2	1.18	-0.04	4.66%	675	0.686	5.11	1.887	42345	42345	1.330	70%					
Z1	MH6017	Outlet	22	1.14	-0.146	5.85%	375	0.305	3.40	0.248	7145	7145	0.253	102%					Pipe length estimated
ZA1	MH6033	Outlet	30	1.68	0	5.60%	300	0.305	3.32	0.243	9623	9623	0.330	136%	375	270	$8,100	$11,340	Pipe length estimated
ZB1	MH6015	Outlet	41.6	0.702	0.26	1.06%	375	0.381	1.67	0.190	5765	5765	0.204	107%	450	315	$13,104	$18,346	Pipe length estimated
	0	0	0																
ZC1	MH6032	Outlet	2	0.159	0.114	2.25%	300	0.305	2.11	0.154	1689	1689	0.089	58%					Pipe length estimated

Construction Costs		**$1,027,112**	
Sub Total		**$1,027,112**	
Design Costs (20%)		$205,422	
Contingency (20%)		$205,422	
Sub Total		**$1,437,956**	
TOTAL COSTS		**$1,437,956**	**$1,437,956**