

Appendix 7 Hydraulic Calculation of the Distribution Network

LEGEND

1) Junction	NO	: Junction Number
	QDMAX	: Maximum Daily Demand (m^3/d)
	QHMAX	: Maximum Hourly Demand (l/h)
	H	: Hydraulic Level (m)
	GL	: Ground Level (m)
	HE	: Effective Head (m)
2) Pipe Line	IJ	: Number Connecting Two Points
	Q	: Rate of Discharge (l/s)
	D	: Diameter of Pipe (mm)
	L	: Length of Pipe (m)
	I	: Hydraulic Gradient ($\%_{100}$)
	H	: Loss of Head (m)
	V	: Velocity of Flow (m/s)
	C	: Velocity Coefficient (C Value)

CASE-1

DAR ES SALAAM (CASE1)

DAR ES SALAAM (CASE1)

NO	QDMAX (M**3/D)	QMAX (L/S)	H (M)	GL (M)	HE (M)	NO	QDMAX (M**3/D)	QMAX (L/S)	H (M)	GL (M)	HE (M)
1	0.0	0.000	128.43	128.43	0.00	105	8310.0	137.538	37.42	30.00	7.42
101	0.0	0.000	64.80	64.80	0.00	106	0.0	0.000	63.22	40.00	23.22
6	0.0	0.000	65.55	43.00	22.55	107	0.0	0.000	61.64	38.00	23.64
7	2790.0	46.177	63.48	52.00	11.48	108	0.0	0.000	61.64	30.00	31.64
8	0.0	0.000	63.09	53.00	10.09	109	21610.0	357.666	59.50	23.00	36.50
9	5560.0	92.023	62.10	37.00	5.10	110	2100.0	34.737	37.04	20.00	37.04
10	0.0	0.000	73.84	43.00	32.84	111	4310.0	71.334	56.93	23.00	33.93
11	0.0	0.000	82.11	49.00	33.11	112	0.0	0.000	54.31	18.00	36.31
12	0.0	0.000	84.65	49.00	35.65	113	8950.0	148.131	31.58	15.00	36.58
13	0.0	0.000	111.77	115.00	-3.23	114	3310.0	54.784	49.58	13.00	36.58
14	240.0	3.972	96.50	107.00	-10.50	115	330.0	5.462	44.80	13.00	31.80
15	3200.0	52.963	76.89	69.00	7.89	116	270.0	4.469	29.20	3.00	26.20
65	12790.0	211.686	81.04	69.00	12.04	117	660.0	11.233	25.56	3.00	22.56
16	0.0	0.000	80.00	64.00	16.00	118	0.0	0.000	28.09	10.00	18.09
17	940.0	15.338	70.59	58.00	12.59	119	0.0	0.000	25.88	10.00	15.88
67	940.0	15.338	78.97	58.00	20.97	120	460.0	7.613	13.41	10.00	3.41
18	0.0	0.000	78.12	55.00	23.12	121	7370.0	121.980	47.93	15.00	32.93
19	1600.0	26.481	75.77	69.00	6.77	122	10220.0	169.150	45.17	15.00	30.17
20	0.0	0.000	41.12	30.00	-8.88	123	2910.0	48.163	48.98	24.00	24.98
21	3550.0	58.756	40.36	67.00	-26.64	124	150.0	2.483	43.43	21.00	22.43
102	0.0	0.000	61.64	31.00	30.64	125	3150.0	52.301	37.16	15.00	22.16
103	8380.0	138.697	56.93	38.00	18.93	126	73270.0	1212.686	37.11	16.00	19.11
104	6550.0	143.166	57.11	38.00	19.11	127	6330.0	104.767	42.50	15.00	27.50

DAR ES SALAAM (CASE1)

DAR ES SALAAM (CASE1)

NO	QDMAX (M**3/D)	QDMAX (L/S)	H (M)	GL (M)	HE (M)	I J	Q (***/L/S)	D (MM)	L (M)	I (%/..)	H (M)	V (M/S)	C
128	6500.0	107.981	45.16	25.00	20.16	1 - 14	522.226	530	2730.00	11.70	31.93	2.37	110.
129	1360.0	22.509	39.37	12.00	27.37	1 - 13	919.167	530	500.00	33.32	15.66	4.17	110.
130	3090.0	51.142	37.34	12.00	25.34	101 - 106	2866.295	1370	910.00	1.74	1.58	1.54	110.
131	730.0	12.062	39.66	6.00	33.66	6 - 10	-167.671	410	2060.00	-4.99	-10.26	-1.27	110.
132	1470.0	24.330	39.08	3.00	36.08	6 - 105	51.319	300	3800.00	7.40	28.15	1.29	110.
133	1200.0	19.861	38.93	6.00	32.93	6 - 7	76.611	410	1770.00	1.17	2.07	0.58	110.
134	1210.0	20.027	33.21	5.00	28.21	7 - 8	30.429	410	1890.00	0.21	0.40	0.23	110.
184	1220.0	20.192	30.85	5.00	25.85	8 - 11	-61.590	300	5330.00	-3.57	-19.03	-0.87	110.
155	2420.0	40.053	36.93	14.00	22.93	8 - 9	92.029	410	500.00	1.64	0.96	0.70	110.
189	2420.0	40.053	31.29	14.00	17.29	11 - 12	-229.461	460	500.00	-5.08	-2.54	-1.36	110.
136	0.0	0.000	31.07	8.00	23.07	11 - 10	167.928	460	2200.00	2.85	6.28	1.01	110.
						12 - 13	-499.075	610	5000.00	-5.42	-27.11	-1.71	110.
						12 - 16	269.529	610	3770.00	1.73	6.53	0.92	110.
						13 - 65	420.131	530	3930.00	7.82	30.73	1.90	110.
						15 - 14	-516.263	530	1700.00	-11.53	-19.61	-2.35	110.
						15 - 17	360.076	530	970.00	6.49	6.30	1.72	110.
						15 - 19	26.473	300	1500.00	0.75	1.12	0.37	110.
						15 - 21	24.734	200	6450.00	5.66	36.54	0.79	100.
						15 - 20	34.016	200	3500.00	10.22	35.77	1.08	100.
						16 - 65	-208.452	530	490.00	-2.14	-1.05	-0.94	110.
						16 - 67	209.434	530	460.00	2.14	1.02	0.94	110.
						18 - 67	-192.690	530	460.00	-1.83	-0.89	-0.87	110.
						21 - 20	-34.022	410	2950.00	-0.26	-0.77	-0.26	110.
TOTAL	224000.0												
	0.0												

DAR ES SALAAM (CASE1)

DAR ES SALAAM (CASE1)

I	J	Q (****L/S)	D (MM)	L (M)	I (*/..)	H (M)	V (M/S)	C	I	J	Q (****L/S)	D (MM)	L (M)	F (*/..)	H (M)	V (M/S)	C
102	- 17	-249.756	330	3000.00	-2.98	-8.95	-1.13	110.	115	-117	6.953	150	2430.00	7.92	19.24	0.39	50.
102	-108	14.164	840	150.00	0.00	0.00	0.03	110.	116	-117	9.088	150	230.00	13.00	3.64	0.51	50.
102	-110	247.243	530	1570.00	2.93	4.60	1.12	110.	116	-118	2.824	150	740.00	1.49	1.10	0.16	50.
103	- 17	-114.767	380	2120.00	-6.45	-13.67	-1.01	80.	117	-120	4.769	150	3060.00	3.97	12.15	0.27	50.
103	-111	-18.716	760	1810.00	-0.00	-0.01	-0.04	110.	116	-119	2.823	150	740.00	2.99	2.22	0.21	50.
103	-104	-114.564	760	1530.00	-0.12	-0.19	-0.23	110.	119	-120	2.823	100	1160.00	10.75	12.47	0.36	50.
103	-128	107.210	360	2070.00	5.68	11.76	0.95	80.	121	-122	1623.006	1220	1680.00	1.65	2.77	1.39	110.
104	- 18	-462.405	530	2250.00	-9.34	-21.01	-2.10	110.	122	-127	1364.184	1070	1180.00	2.26	2.67	1.52	110.
104	-123	204.666	530	3940.00	2.06	8.13	0.93	110.	122	-128	0.849	380	2070.00	0.00	0.00	0.01	80.
105	-126	50.662	560	2600.00	0.12	0.31	0.21	110.	122	-129	89.371	380	1430.00	4.06	3.80	0.79	80.
106	-107	2266.018	1370	910.00	1.74	1.58	1.54	110.	123	-105	96.664	300	1400.00	8.26	11.56	1.37	110.
107	-109	2269.717	1370	1230.00	1.74	2.14	1.54	110.	123	-124	59.626	300	1650.00	3.36	3.55	0.84	110.
107	-108	-9.375	840	790.00	-0.00	-0.00	-0.02	110.	124	-125	57.147	300	2020.00	3.11	6.28	0.81	110.
109	-110	1910.856	1370	1940.00	1.27	2.46	1.30	110.	125	-130	-7.992	300	1220.00	-0.15	-0.18	-0.11	80.
110	-111	87.883	760	1440.00	0.07	0.11	0.19	110.	125	-135	12.834	300	1150.00	0.20	0.22	0.18	110.
110	-113	1890.062	1220	2500.00	2.18	3.46	1.62	110.	126	-127	-1259.751	1070	2760.00	-1.95	-5.38	-1.40	110.
110	-112	145.345	460	1250.00	2.18	2.73	0.87	110.	126	-135	47.248	560	1730.00	0.10	0.18	0.13	110.
112	-113	145.347	460	1250.00	2.18	2.73	0.87	110.	126	-185	50.511	380	1730.00	3.37	3.82	0.43	50.
113	-121	1744.930	1220	1940.00	1.68	3.65	1.49	110.	129	-130	59.118	300	340.00	3.97	2.03	0.84	80.
113	-114	141.857	460	360.00	2.09	2.00	0.85	110.	129	-132	7.733	300	2100.00	0.14	0.29	0.11	80.
114	-115	70.668	300	450.00	10.63	4.79	1.00	70.	131	-132	46.196	410	1280.00	0.46	0.59	0.35	110.
114	-116	16.383	200	2550.00	7.99	20.38	0.52	55.	132	-133	29.599	410	740.00	0.20	0.15	0.22	110.
115	-131	58.275	300	690.00	7.44	5.13	0.82	70.	133	-184	9.732	150	1020.00	7.91	8.07	0.55	70.

DAR ES SALAAM (CASE1)									
Effective Head Distribution									
Class Range Num. 5									
I	J	Q (mm ³ /S)	D (mm)	L (m)	I (%)	H (m)	V (m/s)	C	10
134	-136	-4.193	250	840.00	-0.26	-0.22	-0.09	50.	13 14 20 21
135	-134	20.027	300	1940.00	1.92	3.72	0.26	50.	9 15 19 105
135	-134	6.267	300	1940.00	0.22	0.43	0.09	50.	7 8 55 17
135	-136	4.193	250	840.00	0.26	0.22	0.09	50.	16 103 104 118 119 126 185
									6 67 18 105 107 117 123 124 125 126
									135 136
									116 127 129 130 134 184
									10 11 102 108 111 115 121 122 131 133
									12 109 110 112 113 114 152
Total									(57)

CASE-2

DAR ES SALAAM (CASE2)

NO	QDMAX (M**3/D)	QHMAX (L/S)	H (M)	GL (M)	HE (M)
1	0.0	0.000	128.43	128.43	0.00
101	0.0	0.000	64.80	64.80	0.00
2	0.0	0.000	120.55	120.55	89.55
3	1870.0	30.950	119.55	38.00	81.55
4	2010.0	33.267	113.14	38.00	75.14
5	6510.0	107.747	53.39	30.00	23.39
6	0.0	0.000	91.60	43.00	48.60
7	2790.0	46.177	89.71	52.00	37.71
8	0.0	0.000	89.40	53.00	36.40
9	5560.0	92.023	88.41	57.00	31.41
10	0.0	0.000	103.38	43.00	60.38
11	0.0	0.000	110.57	49.00	61.57
12	0.0	0.000	113.46	49.00	64.46
13	0.0	0.000	122.90	115.00	7.90
14	240.0	3.972	123.58	107.00	16.58
15	3200.0	52.963	120.68	69.00	51.68
55	12790.0	211.686	113.31	69.00	44.31
16	0.0	0.000	113.30	64.00	49.30
17	940.0	15.558	120.55	58.00	62.55
67	940.0	15.558	113.30	58.00	55.30
18	0.0	0.000	113.30	55.00	58.30
19	1600.0	26.481	119.56	69.00	50.56
20	0.0	0.000	84.91	50.00	34.91

DAR ES SALAAM (CASE2)

NO	QDMAX (M**3/D)	QHMAX (L/S)	H (M)	GL (M)	HE (M)
21	3550.0	58.756	84.14	67.00	17.14
102	0.0	0.000	59.05	31.00	28.05
103	6510.0	107.747	46.66	38.00	8.66
104	6640.0	109.898	45.68	38.00	7.68
105	1800.0	29.792	32.47	30.00	2.47
106	0.0	0.000	62.12	40.00	22.12
107	0.0	0.000	59.45	38.00	21.45
108	0.0	0.000	59.11	30.00	29.11
109	21610.0	357.666	56.45	23.00	33.45
110	2100.0	34.757	52.81	20.00	32.81
111	4310.0	71.334	49.69	23.00	26.69
112	0.0	0.000	49.97	18.00	31.97
113	8950.0	146.131	47.14	15.00	32.14
114	3310.0	54.784	45.11	13.00	32.11
115	330.0	5.462	40.18	13.00	27.18
116	270.0	4.469	24.68	3.00	21.68
117	680.0	11.255	21.03	3.00	18.03
118	0.0	0.000	23.58	10.00	13.58
119	0.0	0.000	21.36	10.00	11.36
120	460.0	7.613	8.89	10.00	-1.11
121	7370.0	121.980	43.33	15.00	28.33
122	10220.0	169.150	40.43	15.00	25.43
123	2910.0	46.163	39.80	24.00	15.80

DAR ES SALAAM (CASE2)

NO	QDMAX (M ³ /D)	QDMAX (L/S)	H (M)	GL (M)	HE (M)
124	150.0	2.453	36.09	21.00	15.09
125	3160.0	52.301	51.38	15.00	16.38
126	73270.0	1212.686	52.21	18.00	14.21
127	6330.0	104.767	37.71	15.00	22.71
128	6500.0	107.581	39.57	25.00	14.57
129	1360.0	22.509	34.46	12.00	22.46
130	3090.0	51.142	32.28	12.00	20.28
131	730.0	12.062	34.86	6.00	28.86
132	1470.0	24.330	34.25	3.00	31.25
133	1200.0	19.851	34.10	6.00	28.10
134	1210.0	20.027	28.24	5.00	23.24
184	1220.0	20.192	25.97	5.00	20.97
135	2420.0	40.053	31.96	14.00	17.96
185	2420.0	40.053	26.40	14.00	12.40
136	0.0	0.000	26.18	8.00	18.18
TOTAL	224000.0				
	0.0				

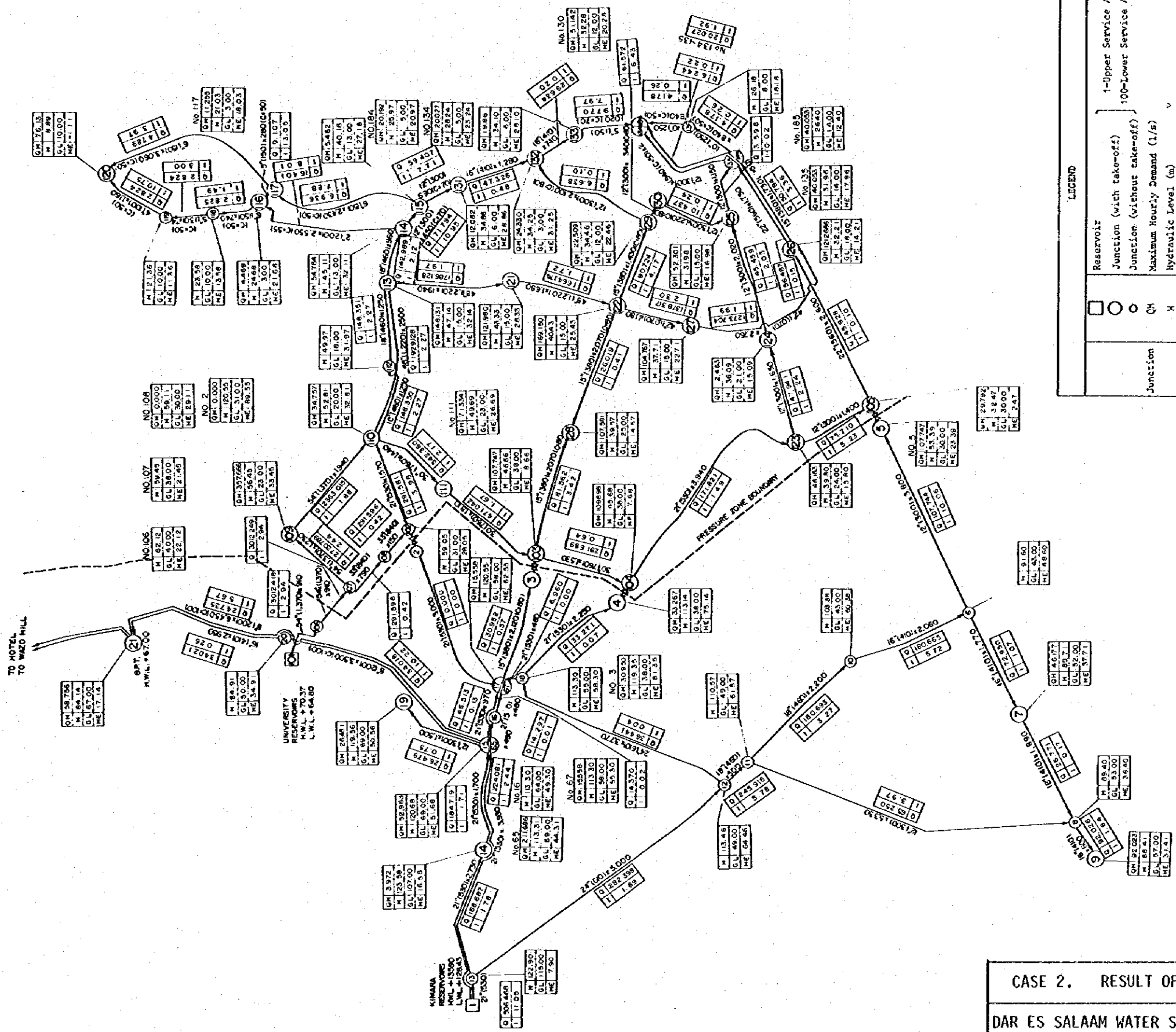
DAR ES SALAAM (CASE2)

I	J	Q (M ³ /S)	D (MM)	L (M)	I (°/°)	H (M)	V (M/S)	C
1	14	188.687	530	2730.00	1.78	4.53	0.86	110.
1	13	306.463	530	500.00	11.05	5.53	2.30	110.
101	-106	3012.418	1370	910.00	2.94	2.68	2.04	110.
2	17	0.000	530	3000.00	0.00	0.00	0.00	110.
3	17	-30.952	360	2120.00	-0.57	-1.21	-0.27	80.
4	18	-33.271	530	2250.00	-0.07	-0.16	-0.15	110.
6	10	-160.663	410	2060.00	-5.72	-11.78	-1.37	110.
6	5	107.744	300	3600.00	10.06	38.21	1.52	110.
6	7	72.950	410	1770.00	1.07	1.83	0.55	110.
7	8	26.771	410	1990.00	0.17	0.51	0.20	110.
8	11	-65.250	300	5330.00	-3.97	-21.17	-0.92	110.
8	9	92.026	410	600.00	1.64	0.38	0.70	110.
11	12	-245.916	450	500.00	-5.78	-2.89	-1.48	110.
11	10	160.693	460	2200.00	3.27	7.19	1.09	110.
12	13	-282.398	610	5000.00	-1.89	-9.45	-0.97	110.
12	18	36.441	610	3770.00	0.04	0.16	0.12	110.
13	65	224.081	530	3930.00	2.44	9.59	1.02	110.
13	14	-164.713	530	1700.00	-1.71	-2.90	-0.64	110.
15	17	46.513	530	970.00	0.13	0.13	0.21	110.
15	19	26.479	300	1500.00	0.75	1.12	0.37	110.
15	21	24.735	200	6430.00	5.67	36.54	0.79	100.
15	20	34.018	200	3500.00	10.22	35.77	1.08	100.
16	65	-14.237	530	490.00	-0.01	-0.01	-0.06	110.

DAR ES SALAAM (CASE2)

DAR ES SALAAM (CASE2)

I	J	Q (**ML/S)	D (MM)	L (M)	I (%/..)	H (M)	V (M/S)	C	I	J	Q (**ML/S)	D (MM)	L (M)	I (%/..)	H (M)	V (M/S)	C
16	- 67	14.370	530	480.00	0.02	0.01	0.07	110.	115	-117	6.936	150	2430.00	7.93	19.15	0.59	50.
18	- 67	6.960	530	450.00	0.00	0.00	0.03	110.	116	-117	9.107	150	280.00	13.05	3.65	0.52	50.
21	- 20	-34.021	410	2950.00	-0.26	-0.77	-0.26	110.	116	-118	2.825	150	740.00	1.49	1.10	0.16	50.
102	-108	-291.596	640	150.00	-0.42	-0.06	-0.53	110.	117	-120	4.789	150	3060.00	3.97	12.14	0.27	50.
102	-110	291.581	530	1570.00	3.98	6.24	1.32	110.	118	-119	2.824	150	740.00	3.00	2.22	0.21	50.
103	-111	-471.042	760	1310.00	-1.67	-3.02	-1.04	110.	119	-120	2.824	100	1160.00	10.75	12.47	0.36	50.
103	-104	261.699	760	1530.00	0.64	0.99	0.62	110.	121	-122	1664.174	1220	1680.00	1.72	2.90	1.42	110.
103	-128	61.562	380	2070.00	3.42	7.09	0.72	80.	122	-127	1378.317	1070	1180.00	2.30	2.72	1.53	110.
104	-123	171.821	530	3940.00	1.49	5.88	0.78	110.	122	-128	26.019	380	2070.00	0.41	0.85	0.23	80.
105	-126	45.928	560	2600.00	0.10	0.26	0.19	110.	122	-129	90.724	380	1430.00	4.17	5.96	0.80	80.
106	-107	3012.249	1370	910.00	2.94	2.66	2.04	110.	123	-105	75.710	300	1400.00	5.23	7.32	1.07	110.
107	-109	2720.789	1370	1230.00	2.44	3.00	1.65	110.	123	-124	47.941	300	1650.00	2.24	3.70	0.68	110.
107	-108	291.598	840	790.00	0.42	0.33	0.53	110.	124	-125	45.459	300	2020.00	2.03	4.11	0.64	110.
109	-110	2363.015	1370	1940.00	1.88	3.64	1.60	110.	125	-130	-10.437	300	1220.00	-0.24	-0.29	-0.15	80.
110	-111	542.360	760	1440.00	2.17	3.12	1.20	110.	125	-135	3.598	300	1150.00	0.02	0.02	0.05	110.
110	-113	1929.128	1220	2500.00	2.27	5.67	1.65	110.	126	-127	1273.704	1070	2760.00	-1.99	-5.50	-1.42	110.
110	-112	148.350	460	1250.00	2.27	2.83	0.89	110.	126	-135	56.487	560	1730.00	0.13	0.25	0.23	110.
112	-113	148.351	460	1250.00	2.27	2.83	0.89	110.	126	-185	50.474	380	1730.00	3.36	5.82	0.45	50.
113	-121	1786.126	1220	1940.00	1.97	3.81	1.33	110.	129	-150	61.572	300	340.00	6.43	2.19	0.87	80.
113	-114	142.989	460	960.00	2.12	2.03	0.86	110.	129	-132	6.636	300	2100.00	0.10	0.22	0.09	80.
114	-115	71.794	300	450.00	10.55	4.93	1.02	70.	131	-132	47.326	410	1260.00	0.48	0.61	0.36	110.
114	-116	16.401	200	2550.00	8.01	20.42	0.52	55.	132	-133	29.634	410	740.00	0.20	0.15	0.22	110.
115	-131	59.407	300	690.00	7.71	5.32	0.84	70.	133	-184	9.770	150	1020.00	7.97	8.13	0.55	70.



LEGEND

Reservoir	□	1-Upper Service Area 100-Lower Service Area
Junction (with take-off)	○	
Junction (without take-off)	●	
Maximum Hourly Demand (1/s)	QH	
Hydraulic Level (m)	H	
Ground Level (m)	GL	
Effective Head (m)	ME	
Distribution Pipe (existing)	—	
Distribution Pipe (proposed)	- - -	
Diameter of Pipe inch' (mm)	12" (300) X 1220 (c=80)	
Length of Pipe (m)	1,200	
Velocity Coefficient (C value)	(c=80)	
Flow Rate (1/s)	Q	
Hydraulic Gradient Line (1/1000)	∴	

CASE 2. RESULT OF HYDRALULIC CALCULATION
 DAR ES SALAAM WATER SUPPLY IMPROVEMENT PROJECT
 JAPAN INTERNATIONAL COOPERATION AGENCY

CASE-3

DAR ES SALAAM (CASE3) Ø800

NO	QOMAX (M**3/D)	QHMAX (L/S)	H (M)	GL (M)	HE (M)
1	0.0	0.000	128.43	128.43	0.00
101	0.0	0.000	64.80	64.80	0.00
2	0.0	0.000	120.55	31.00	89.55
3	1870.0	30.990	119.35	38.00	81.35
4	2010.0	33.267	113.14	39.00	75.14
5	6510.0	107.747	53.39	30.00	23.39
6	0.0	0.000	91.60	43.00	48.60
7	2790.0	46.177	89.71	52.00	37.71
8	0.0	0.000	89.40	53.00	36.40
9	5560.0	92.023	68.41	57.00	31.41
10	0.0	0.000	103.38	43.00	60.38
11	0.0	0.000	110.57	49.00	61.57
12	0.0	0.000	113.46	49.00	64.46
13	0.0	0.000	122.90	115.00	7.90
14	240.0	3.972	123.58	107.00	16.58
15	3200.0	52.363	120.68	69.00	51.68
65	12790.0	211.666	113.31	69.00	44.31
16	0.0	0.000	113.30	64.00	49.30
17	940.0	15.558	120.55	58.00	62.55
67	940.0	15.558	113.30	59.00	55.30
18	0.0	0.000	113.30	55.00	58.30
19	1600.0	26.481	119.56	69.00	50.56
20	0.0	0.000	84.91	50.00	34.91

DAR ES SALAAM (CASE3) Ø800

NO	QOMAX (M**3/D)	QHMAX (L/S)	H (M)	GL (M)	HE (M)
21	3950.0	58.756	84.14	67.00	17.14
102	0.0	0.000	60.32	31.00	29.32
103	6510.0	107.747	53.84	38.00	15.84
104	6640.0	109.898	52.77	38.00	14.77
105	1800.0	29.792	37.25	30.00	7.25
106	0.0	0.000	63.01	40.00	23.01
107	0.0	0.000	61.22	38.00	23.22
108	0.0	0.000	60.46	30.00	30.46
109	21610.0	337.666	59.27	23.00	36.27
110	2100.0	34.757	57.07	20.00	37.07
111	4310.0	71.334	57.16	23.00	34.16
112	0.0	0.000	54.30	18.00	36.30
113	8930.0	148.131	51.52	15.00	36.52
114	3310.0	54.784	49.51	13.00	36.51
115	330.0	5.462	44.66	13.00	31.66
116	270.0	4.469	29.11	3.00	26.11
117	680.0	11.255	25.46	3.00	22.46
118	0.0	0.000	28.00	10.00	18.00
119	0.0	0.000	25.79	10.00	15.79
120	460.0	7.613	13.31	10.00	3.31
121	7370.0	121.960	47.80	15.00	32.80
122	10220.0	169.150	44.98	15.00	29.98
123	2510.0	46.163	46.07	24.00	22.07

DAR ES SALAAM (CASE3) Ø800

DAR ES SALAAM (CASE3) Ø200

NO	QDMAX (M**3/D)	QHMAX (L/S)	H (M)	GL (M)	HE (M)	I J	Q (**M ³ /S)	D (MM)	L (M)	I (%/..)	H (M)	V (M/S)	C
124	150.0	2.483	41.67	21.00	20.67	1 - 14	188.687	530	2730.00	1.78	4.85	0.86	110.
125	3160.0	52.301	36.75	15.00	21.75	1 - 13	506.468	530	300.00	11.03	5.53	2.30	110.
126	73270.0	1212.566	36.90	16.00	18.90	101 - 107	588.843	300	1820.00	1.37	3.58	1.17	110.
127	6330.0	104.767	42.31	15.00	27.31	101 - 106	2423.594	1370	910.00	1.37	1.73	1.64	110.
128	6500.0	107.591	44.71	25.00	19.71	2 - 17	0.000	530	3000.00	0.00	0.00	0.00	110.
129	1360.0	22.509	39.09	12.00	27.09	3 - 17	-30.952	380	2120.00	-0.57	-1.21	-0.27	80.
130	3090.0	51.142	36.96	12.00	24.96	4 - 18	-33.271	530	2250.00	-0.07	-0.16	-0.15	110.
131	730.0	12.082	39.44	6.00	33.44	5 - 10	-180.665	410	2060.00	-5.72	-11.78	-1.37	110.
132	1470.0	24.330	38.84	3.00	35.84	6 - 5	107.744	300	3800.00	10.06	38.21	1.52	110.
133	1200.0	19.861	38.69	6.00	32.69	6 - 7	72.950	410	1770.00	1.07	1.89	0.55	110.
134	1210.0	20.027	32.95	5.00	27.95	7 - 8	26.771	410	1830.00	0.17	0.31	0.20	110.
184	1220.0	20.192	30.64	5.00	25.64	8 - 11	-65.230	300	3330.00	-3.37	-21.17	-0.92	110.
135	2420.0	40.053	36.68	14.00	22.68	8 - 9	92.026	410	600.00	1.64	0.98	0.70	110.
185	2420.0	40.053	31.07	14.00	17.07	11 - 12	-245.916	450	500.00	-5.78	-2.89	-1.48	110.
136	0.0	0.000	30.86	8.00	22.86	11 - 10	180.693	460	2200.00	3.27	7.19	1.09	110.
TOTAL	224000.0					12 - 13	-282.398	610	5000.00	-1.89	-9.45	-0.97	110.
	0.0					12 - 18	36.441	610	3770.00	0.04	0.16	0.12	110.
						13 - 65	224.081	330	3330.00	2.44	9.59	1.02	110.
						15 - 14	-184.719	530	1700.00	-1.71	-2.90	-0.84	110.
						15 - 17	46.513	530	370.00	0.13	0.13	0.21	110.
						15 - 19	26.479	300	1500.00	0.75	1.12	0.37	110.
						15 - 21	24.733	200	6430.00	3.67	36.54	0.79	100.
						15 - 20	34.018	200	3500.00	10.22	35.77	1.08	100.

DAR ES SALAAM (CASE3) 9800

DAR ES SALAAM (CASE3) 9800

I	J	Q (***L/S)	D (MM)	L (M)	I (°/..)	H (M)	V (M/S)	C	I	J	Q (***L/S)	D (MM)	L (M)	I (°/..)	H (M)	V (M/S)	C
16 - 65	-14.237	530	490.00	-0.01	-0.01	0.06	110.	114	-115	71.184	300	450.00	10.78	4.85	1.01	70.	
16 - 67	14.370	530	480.00	0.02	0.01	0.07	110.	114	-116	16.391	200	2550.00	8.00	20.40	0.52	55.	
18 - 67	6.960	530	460.00	0.00	0.00	0.03	110.	115	-131	58.788	300	690.00	7.56	5.22	0.33	70.	
21 - 20	-34.021	410	2950.00	-0.26	-0.77	-0.26	110.	115	-117	6.945	150	2430.00	7.90	19.20	0.39	50.	
102 -107	-399.679	800	940.00	-0.36	-0.30	-0.80	110.	116	-117	9.098	150	280.00	13.02	3.65	0.51	50.	
102 -111	649.047	800	1340.00	2.36	3.16	1.29	110.	116	-118	2.824	150	740.00	1.49	1.10	0.16	50.	
102 -108	-454.337	840	150.00	-0.36	-0.14	-0.82	110.	117	-120	4.789	150	3060.00	3.97	12.15	0.27	50.	
102 -110	205.010	530	1570.00	2.07	3.25	0.93	110.	118	-119	2.824	130	740.00	3.00	2.22	0.21	50.	
103 -111	-495.618	760	1810.00	-1.83	-3.32	-1.09	110.	119	-120	2.824	100	1160.00	10.75	12.47	0.36	50.	
103 -104	234.312	760	1530.00	0.70	1.07	0.65	110.	121	-122	1640.221	1220	1680.00	1.68	2.82	1.40	110.	
103 -128	93.513	530	2070.00	4.41	9.13	0.82	80.	122	-127	1365.937	1070	1180.00	2.27	2.68	1.52	110.	
104 -123	184.445	530	3940.00	1.70	6.71	0.84	110.	122	-128	14.067	380	2070.00	0.13	0.27	0.12	80.	
105 -126	53.906	560	2600.00	0.13	0.35	0.22	110.	122	-129	90.101	380	1430.00	4.12	5.89	0.73	80.	
106 -107	2423.458	1370	910.00	1.97	1.79	1.64	110.	123	-105	83.693	300	1400.00	6.30	8.82	1.18	110.	
107 -109	2138.328	1370	1230.00	1.59	1.95	1.46	110.	123	-124	52.594	300	1650.00	2.66	4.40	0.74	110.	
107 -108	454.401	840	750.00	0.96	0.76	0.82	110.	124	-125	50.102	300	2020.00	2.44	4.32	0.71	110.	
109 -110	1800.577	1370	1940.00	1.13	2.20	1.22	110.	125	-130	-9.245	300	1220.00	-0.19	-0.23	-0.15	80.	
110 -111	-82.101	760	1440.00	-0.07	-0.09	-0.18	110.	125	-135	7.048	300	1150.00	0.06	0.07	0.10	110.	
110 -113	1906.308	1220	2500.00	2.22	5.54	1.63	110.	126	-127	1262.323	1070	2760.00	-1.96	-5.41	-1.40	110.	
110 -112	146.595	460	1250.00	2.22	2.77	0.88	110.	126	-135	53.037	560	1730.00	0.13	0.22	0.22	110.	
112 -113	146.596	460	1250.00	2.22	2.77	0.88	110.	126	-165	50.324	380	1730.00	3.37	5.83	0.45	30.	
113 -121	1752.176	1220	1940.00	1.92	3.72	1.51	110.	129	-130	60.379	300	340.00	6.21	2.11	0.85	80.	
113 -114	142.363	460	960.00	2.10	2.02	0.66	110.	129	-132	7.207	300	2100.00	0.12	0.25	0.10	80.	

DAR ES SALAAM (CASES) Ø800

Effective Head Distribution

I	J	Q (L/S)	D (MM)	L (M)	I (%)	H (M)	V (M/S)	C
131 -132		46.707	410	1280.00	0.47	0.60	0.33	110.
132 -133		29.334	410	740.00	0.20	0.15	0.22	110.
133 -184		9.720	150	1020.00	7.90	8.05	0.55	70.
184 -136		-4.199	250	840.00	-0.26	-0.22	-0.09	50.
135 -134		20.027	300	1940.00	1.92	3.72	0.28	50.
185 -184		6.274	300	1940.00	0.22	0.43	0.09	50.
185 -136		4.198	250	840.00	0.26	0.22	0.09	50.

Class Range Num.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0 - 5	120																		
5 - 10		13																	
10 - 15			104																
15 - 20				14	21	103	118	119	126	128	165								
20 - 25					5	106	107	117	123	124	125	130	135	136					
25 - 30						102	116	122	127	129	134	164							
30 - 35									9	20	109	111	115	121	131	133			
35 - 40										7	8	109	110	112	113	114	132		
40 - 45										65									
45 - 50											5	16							
50 - 55													15	19					
55 - 60														67	18				
60 - 65											10	11	12	17					
65 - 70																			
70 - 75																			
75 - 80																			
80 - 85																			
85 - 90																			
90 - 95																			
Total																			

DAR ES SALAM (CASE3) #900

NO	QDMAX (M**3/D)	QHMAX (L/S)	H (M)	GL (M)	HE (M)
1	0.0	0.000	128.43	128.43	0.00
101	0.0	0.000	64.80	64.80	0.00
2	0.0	0.000	120.35	31.00	69.55
3	1670.0	30.950	119.35	38.00	81.35
4	2010.0	33.267	113.14	38.00	75.14
5	5510.0	107.747	53.39	30.00	23.39
6	0.0	0.000	91.60	43.00	48.60
7	2790.0	46.177	89.71	52.00	37.71
8	0.0	0.000	89.40	33.00	36.40
9	5360.0	92.023	88.41	57.00	31.41
10	0.0	0.000	103.38	43.00	60.38
11	0.0	0.000	110.57	49.00	61.57
12	0.0	0.000	113.46	49.00	64.46
13	0.0	0.000	122.90	115.00	7.90
14	240.0	3.972	123.58	107.00	16.58
15	3200.0	52.963	120.68	69.00	51.68
65	12790.0	211.686	113.31	69.00	44.31
16	0.0	0.000	113.30	64.00	49.30
17	940.0	15.558	120.55	58.00	62.55
67	940.0	15.558	113.30	58.00	55.30
18	0.0	0.000	113.30	55.00	58.30
19	1600.0	26.481	119.56	69.00	50.56
20	0.0	0.000	84.91	50.00	34.91

DAR ES SALAM (CASE3) #900

NO	QDMAX (M**3/D)	QHMAX (L/S)	H (M)	GL (M)	HE (M)
21	3550.0	59.756	84.14	67.00	17.14
102	0.0	0.000	60.61	31.00	29.61
103	6510.0	107.747	55.03	38.00	17.03
104	6640.0	109.938	53.95	38.00	15.95
105	1600.0	29.792	38.14	30.00	8.14
106	0.0	0.000	63.22	40.00	23.22
107	0.0	0.000	61.65	38.00	23.65
108	0.0	0.000	60.94	30.00	30.94
109	21610.0	357.666	59.87	23.00	36.87
110	2100.0	34.757	57.90	20.00	37.90
111	4310.0	71.334	58.38	23.00	35.38
112	0.0	0.000	55.14	18.00	37.14
113	6350.0	148.131	52.37	15.00	37.37
114	3310.0	54.784	50.35	13.00	37.35
115	330.0	3.462	45.52	13.00	32.52
116	270.0	4.469	29.96	3.00	26.96
117	680.0	11.255	25.32	3.00	23.32
118	0.0	0.000	28.86	10.00	18.86
119	0.0	0.000	25.64	10.00	15.64
120	460.0	7.613	14.17	10.00	4.17
121	7370.0	121.960	48.67	15.00	33.67
122	10220.0	169.150	45.85	13.00	30.85
123	2910.0	48.163	47.14	24.00	23.14

DAR ES SALAAM (CASE3)9900

NO	QDRAK (M**3/D)	QDRAK (L/S)	H (M)	GL (M)	HE (M)
124	150.0	2.483	42.66	21.00	21.66
125	3160.0	32.301	37.65	15.00	22.65
126	73270.0	1212.696	37.79	18.00	19.79
127	6330.0	104.767	43.18	15.00	28.18
128	6500.0	107.591	45.63	25.00	20.63
129	1360.0	22.509	39.97	12.00	27.97
130	3090.0	31.142	37.67	12.00	25.67
131	730.0	12.082	40.31	6.00	34.31
132	1470.0	24.330	39.72	3.00	36.72
133	1200.0	19.861	39.57	6.00	33.57
134	1210.0	20.027	33.84	5.00	28.84
134	1220.0	20.192	31.52	5.00	26.52
135	2420.0	40.053	37.56	14.00	23.56
135	2420.0	40.053	31.96	14.00	17.96
136	0.0	0.000	31.74	8.00	23.74
TOTAL	224000.0				
	0.0				

DAR ES SALAAM (CASE3)9900

I	J	Q (M**3/L/S)	D (MM)	L (M)	I (%/S)	H (M)	V (M/S)	C
1	14	168.697	530	2730.00	1.78	4.85	0.86	110.
1	13	506.469	530	500.00	11.05	5.53	2.30	110.
101	-107	749.465	300	1820.00	1.73	3.15	1.18	110.
101	-106	2262.978	1370	910.00	1.73	1.58	1.54	110.
2	17	0.000	530	3000.00	0.00	0.00	0.00	110.
3	17	-30.952	380	2120.00	-0.57	-1.21	-0.27	80.
4	16	-33.271	530	2250.00	-0.07	-0.16	-0.15	110.
6	10	-180.665	410	2060.00	-5.72	-11.78	-1.37	110.
6	5	107.744	300	3800.00	10.06	38.21	1.52	110.
6	7	72.950	410	1770.00	1.07	1.89	0.55	110.
7	8	26.771	410	1890.00	0.17	0.31	0.20	110.
8	11	-65.250	300	3330.00	-3.97	-21.17	-0.92	110.
8	9	92.026	410	600.00	1.64	0.98	0.70	110.
11	12	-243.916	460	500.00	-5.78	-2.69	-1.48	110.
11	10	180.693	460	2200.00	3.27	7.19	1.09	110.
12	13	-282.398	610	5000.00	-1.89	-9.45	-0.97	110.
12	16	36.441	610	3770.00	0.04	0.16	0.12	110.
13	65	224.081	530	3930.00	2.44	9.99	1.02	110.
15	14	-184.719	530	1700.00	-1.71	-2.90	-0.84	110.
15	17	46.513	530	970.00	0.13	0.13	0.21	110.
15	19	26.479	300	1500.00	0.75	1.12	0.37	110.
15	21	24.735	200	6450.00	5.67	36.54	0.79	100.
15	20	34.018	200	3500.00	10.22	35.77	1.08	100.

DAR ES SALAAM (CASES) #900

DAR ES SALAAM (CASES) #900

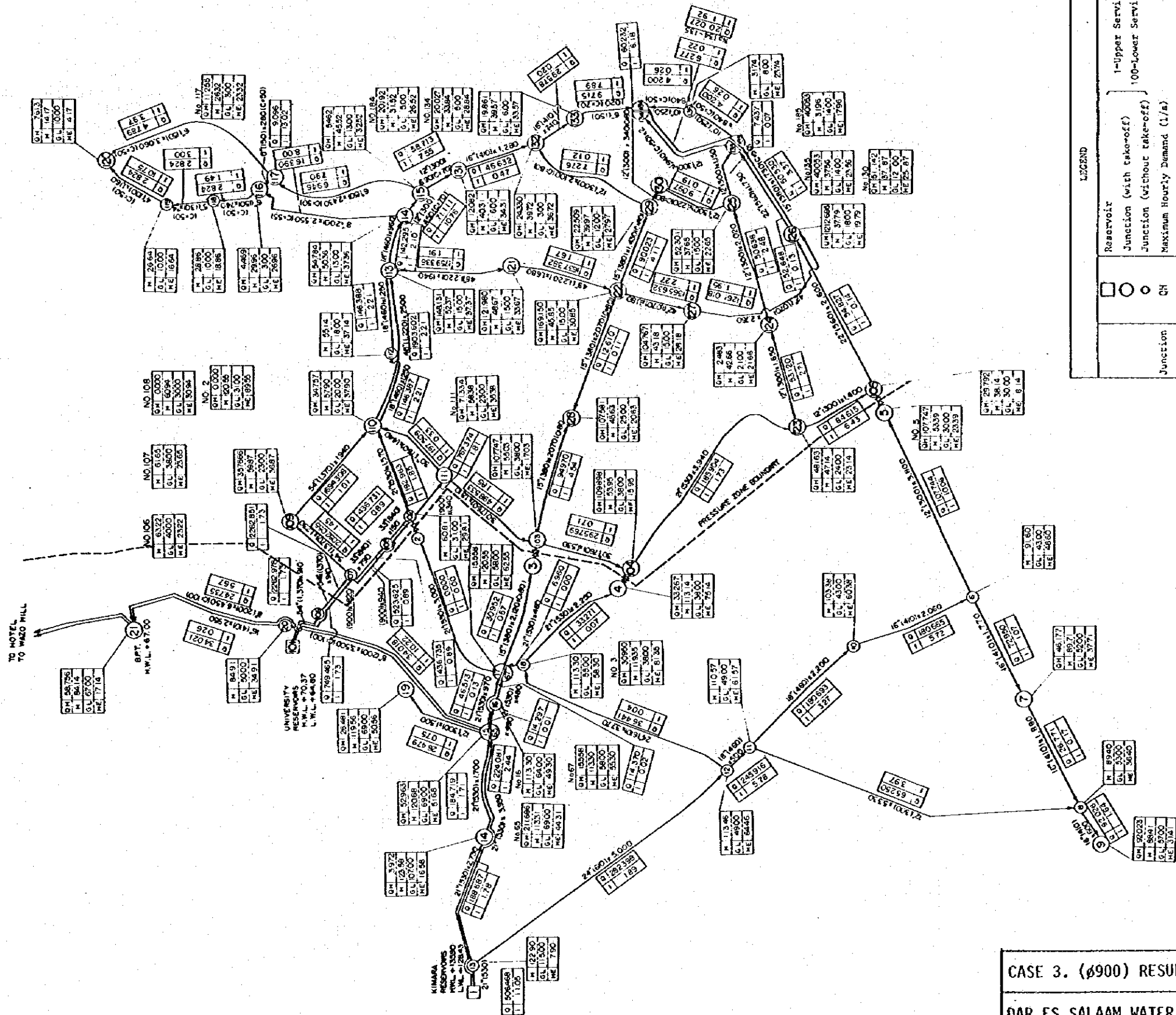
I	J	Q (**L/S)	D (MM)	L (M)	I (%/..)	H (M)	V (M/S)	C	I	J	Q (**L/S)	D (MM)	L (M)	I (%/..)	H (M)	V (M/S)	C
16	- 65	-14.297	530	490.00	-0.01	-0.01	-0.06	110.	114	-115	71.111	300	450.00	10.76	4.84	1.01	70.
16	- 67	14.370	530	460.00	0.02	0.01	0.07	110.	114	-116	16.390	200	2550.00	8.00	20.40	0.52	55.
18	- 67	6.960	530	460.00	0.00	0.00	0.03	110.	115	-131	58.713	300	690.00	7.55	5.21	0.63	70.
21	- 20	-34.021	410	2950.00	-0.25	-0.77	-0.26	110.	115	-117	6.946	150	2430.00	7.90	19.20	0.39	50.
102	-107	-523.625	300	940.00	-0.69	-0.64	-0.82	110.	116	-117	9.096	150	280.00	13.02	3.63	0.51	50.
102	-111	767.374	300	1340.00	1.81	2.42	1.21	110.	116	-118	2.824	150	740.00	1.49	1.10	0.16	50.
102	-108	-436.731	840	150.00	-0.89	-0.13	-0.79	110.	117	-120	4.789	150	3060.00	3.97	12.15	0.27	50.
102	-110	192.963	530	1570.00	1.85	2.91	0.87	110.	118	-119	2.624	130	740.00	3.00	2.22	0.21	50.
103	-111	-438.533	760	1810.00	-1.85	-3.36	-1.10	110.	119	-120	2.624	100	1160.00	10.75	12.47	0.36	50.
103	-104	295.769	760	1530.00	0.71	1.08	0.65	110.	121	-122	1637.362	1220	1690.00	1.67	2.81	1.40	110.
103	-126	94.970	380	2070.00	4.54	9.40	0.84	80.	122	-127	1565.632	1070	1180.00	2.27	2.67	1.52	110.
104	-123	185.904	530	3940.00	1.73	6.81	0.84	110.	122	-128	12.610	360	2070.00	0.11	0.22	0.11	80.
105	-126	54.827	560	2600.00	0.14	0.36	0.22	110.	122	-129	90.025	380	1430.00	4.11	5.88	0.79	90.
106	-107	2262.851	1370	910.00	1.73	1.58	1.54	110.	123	-105	84.615	300	1400.00	6.43	9.00	1.20	110.
107	-109	2052.055	1370	1230.00	1.45	1.78	1.39	110.	123	-124	53.120	300	1550.00	2.71	4.48	0.75	110.
107	-106	436.735	840	790.00	0.89	0.70	0.79	110.	124	-125	50.638	300	2020.00	2.48	5.02	0.72	110.
109	-110	1694.308	1370	1940.00	1.01	1.97	1.15	110.	125	-130	-9.097	300	1220.00	-0.19	-0.23	-0.13	80.
110	-111	-197.509	760	1440.00	-0.33	-0.48	-0.44	110.	125	-135	7.437	300	1150.00	0.07	0.08	0.11	110.
110	-113	1303.602	1220	2500.00	2.21	5.53	1.63	110.	126	-127	-1261.016	1070	2760.00	-1.95	-3.39	-1.40	110.
110	-112	146.387	460	1250.00	2.21	2.76	0.88	110.	126	-135	52.646	560	1730.00	0.13	0.22	0.21	110.
112	-113	146.388	460	1250.00	2.21	2.77	0.88	110.	126	-135	50.530	380	1730.00	3.37	5.63	0.45	50.
113	-121	1759.336	1220	1940.00	1.91	3.71	1.51	110.	129	-130	50.232	300	340.00	6.18	2.10	0.65	80.
113	-114	142.295	460	960.00	2.10	2.01	0.86	110.	129	-132	7.276	300	2100.00	0.12	0.26	0.10	80.

DAR ES SALAAM (CASE3)4900

Effective Head Distribution #900

I	J	Q (***L/S)	D (MM)	L (M)	I (°/s)	H (M)	V (M/S)	C
131 -132	46.632	410	1230.00	0.47	0.60	0.35	110.	120
132 -133	29.578	410	740.00	0.20	0.15	0.22	110.	13 105
133 -134	9.715	150	1020.00	7.89	6.04	0.55	70.	14 21 103 104 118 119 126 185
134 -135	-4.200	250	840.00	-0.26	-0.22	-0.09	50.	5 106 107 117 123 124 125 128 135 136
135 -136	20.027	300	1340.00	1.92	3.72	0.28	50.	102 115 127 129 130 134 184
136 -137	6.277	300	1940.00	0.22	0.43	0.09	50.	3 20 108 115 121 122 131 133
138 -139	4.200	250	840.00	0.25	0.22	0.09	50.	7 8 109 110 111 112 113 114 132
								65
								6 16
								15 19
								67 18
								10 11 12 17
								4
								3
								2

Total (611



LEGEND	
Reservoir	Upper Service Area
Junction (with take-off)	Lower Service Area
Junction (without take-off)	
Maximum Hourly Demand (1/a)	
Hydraulic Level (m)	
Ground Level (m)	
Effective Head (m)	
Distribution Pipe (existing)	
Distribution Pipe (proposed)	
12" (300) x 1220 (c=80)	
12" (300)	
Length of Pipe (m)	
Velocity Coefficient (C value)	
Flow Rate (1/a)	
Hydraulic Gradient Line (1/1000)	

CASE 3. (ø900) RESULT OF HYDRAULIC CALCULATION
 DAR ES SALAAM WATER SUPPLY IMPROVEMENT PROJECT
 JAPAN INTERNATIONAL COOPERATION AGENCY

CASE-4

DAR ES SALAAM (CASE4)

DAR ES SALAAM (CASE4)

NO	QDMAX (M**3/D)	QHMAX (L/S)	H (M)	GL (M)	HE (M)	NO	QDMAX (M**3/D)	QHMAX (L/S)	H (M)	GL (M)	HE (M)
1	0.0	0.000	128.43	128.43	0.00	21	3550.0	58.756	92.20	67.00	25.20
101	0.0	0.000	64.80	64.80	0.00	102	0.0	0.000	59.48	31.00	28.48
2	-19000.0	-219.907	137.28	31.00	106.28	103	6510.0	107.747	53.19	38.00	15.19
3	1870.0	30.950	129.00	38.00	91.00	104	6640.0	109.898	52.12	38.00	14.12
4	2010.0	33.267	113.14	38.00	75.14	105	1800.0	29.792	36.63	30.00	6.63
5	6510.0	107.747	53.39	30.00	23.39	106	0.0	0.000	62.76	40.00	22.76
6	0.0	0.000	91.60	43.00	48.60	107	0.0	0.000	60.72	38.00	22.72
7	2790.0	46.177	89.71	52.00	37.71	108	19000.0	219.907	59.57	30.00	29.57
8	0.0	0.000	89.40	53.00	36.40	109	21610.0	357.666	58.72	25.00	33.72
9	5560.0	92.023	88.41	57.00	31.41	110	2100.0	34.737	56.46	20.00	36.46
10	0.0	0.000	103.38	43.00	60.38	111	4310.0	71.334	56.31	23.00	33.31
11	0.0	0.000	110.57	49.00	61.57	112	0.0	0.000	53.68	18.00	35.68
12	0.0	0.000	113.46	49.00	64.46	113	8950.0	148.131	50.91	15.00	35.91
13	0.0	0.000	122.90	115.00	7.90	114	3310.0	34.784	48.89	13.00	35.89
14	240.0	3.372	128.60	107.00	21.60	115	330.0	5.462	44.04	13.00	31.04
15	3200.0	52.963	128.74	69.00	59.74	116	270.0	4.469	28.49	3.00	25.49
65	12790.0	211.686	113.31	69.00	44.31	117	680.0	11.233	24.84	3.00	21.84
16	0.0	0.000	113.30	64.00	49.30	118	0.0	0.000	27.39	10.00	17.39
17	940.0	15.358	130.21	38.00	72.21	119	0.0	0.000	25.17	10.00	15.17
67	940.0	15.358	113.30	56.00	55.30	120	460.0	7.613	12.70	10.00	2.70
18	0.0	0.000	113.30	55.00	58.30	121	7370.0	121.980	47.19	15.00	32.19
19	1600.0	26.461	127.62	69.00	58.62	122	10220.0	169.150	44.37	15.00	29.37
20	0.0	0.000	92.96	50.00	42.96	123	2910.0	48.163	45.43	24.00	21.43

DAR ES SALAAM (CASE4)

DAR ES SALAAM (CASE4)

NO	QDMAX (MM ³ /D)	QHMAX (L/S)	H (M)	GL (M)	HE (M)	I (°/°)	L (M)	D (MM)	G (MM ³ /S)	J	V (M/S)	H (M)	C
124	150.0	2.483	41.04	21.00	20.04	-0.06	2730.00	530	-31.230	1 - 14	-0.14	-0.17	110.
125	3160.0	52.301	36.13	13.00	21.13	11.03	500.00	530	506.468	1 - 13	2.30	5.53	110.
126	73270.0	1212.686	36.29	18.00	19.29	2.24	1820.00	800	631.629	101 - 107	1.26	4.08	110.
127	6330.0	104.757	41.69	13.00	26.69	2.24	910.00	1370	2600.518	101 - 106	1.76	2.04	110.
128	6500.0	107.581	44.09	25.00	19.09	2.36	3000.00	530	219.914	2 - 17	1.00	7.07	110.
129	1360.0	22.509	38.48	12.00	26.48	-0.37	2120.00	380	-30.942	3 - 17	-0.27	-1.21	80.
130	3090.0	51.142	35.37	12.00	24.37	-0.07	2250.00	530	-33.271	4 - 18	-0.15	-0.16	110.
131	730.0	12.082	38.82	6.00	32.82	-5.72	2060.00	410	-180.685	5 - 10	-1.37	-11.78	110.
132	1470.0	24.330	38.22	3.00	35.22	10.06	3800.00	300	107.744	6 - 5	1.52	38.21	110.
133	1200.0	19.861	36.07	5.00	32.07	1.07	1770.00	410	72.950	6 - 7	0.55	1.89	110.
134	1210.0	20.027	32.33	5.00	27.33	0.17	1890.00	410	26.771	7 - 8	0.20	0.31	110.
184	1220.0	20.192	30.02	5.00	25.02	-3.97	5530.00	300	-65.250	8 - 11	-0.92	-21.17	110.
135	2420.0	40.053	36.06	14.00	22.06	1.64	500.00	410	92.026	8 - 9	0.70	0.98	110.
185	2420.0	40.053	30.45	14.00	16.45	-5.78	500.00	460	-245.916	11 - 12	-1.48	-2.89	110.
136	0.0	0.000	30.24	8.00	22.24	3.27	2200.00	460	180.693	11 - 10	1.09	7.19	110.
						-1.89	5000.00	610	-282.398	12 - 13	-0.97	-3.45	110.
						0.04	3770.00	610	36.441	12 - 18	0.12	0.16	110.
						2.44	3930.00	530	224.081	13 - 65	1.02	9.59	110.
						0.08	1700.00	530	35.204	15 - 14	0.16	0.13	110.
						-1.52	970.00	530	-173.407	15 - 17	-0.79	-1.47	110.
						0.75	1500.00	300	26.479	15 - 19	0.37	1.12	110.
						5.67	6450.00	200	24.735	15 - 21	0.79	36.54	100.
						10.22	3500.00	200	34.018	15 - 20	1.06	35.77	100.
TOTAL 224000.0													
0.0													

DAR ES SALAAM (CASE4)

DAR ES SALAAM (CASE4)

I	J	O (MMML/S)	D (MM)	L (M)	I (%/s)	H (M)	V (M/S)	C	I	J	O (MMML/S)	D (MM)	L (M)	I (%/s)	H (M)	V (M/S)	C
15	- 55	-14.297	530	490.00	-0.01	-0.01	-0.06	110.	114	-115	71.192	300	450.00	10.78	4.85	1.01	70.
16	- 57	14.370	530	480.00	0.02	0.01	0.07	110.	114	-116	16.392	200	2550.00	6.00	20.40	0.52	55.
18	- 57	6.960	530	460.00	0.00	0.00	0.03	110.	115	-131	58.795	300	690.00	7.56	5.22	0.83	70.
21	- 20	-34.021	410	2950.00	-0.26	-0.77	-0.26	110.	115	-117	6.945	150	2430.00	7.90	19.20	0.39	50.
102	-107	-475.111	800	940.00	-1.32	-1.24	-0.95	110.	116	-117	9.038	150	280.00	13.02	3.65	0.51	50.
102	-111	629.028	800	1340.00	2.22	2.97	1.25	110.	116	-118	2.824	150	740.00	1.49	1.10	0.16	50.
102	-108	-350.118	840	150.00	-0.59	-0.09	-0.63	110.	117	-120	4.789	150	3060.00	3.97	12.15	0.27	50.
102	-110	197.183	530	1570.00	1.93	3.02	0.89	110.	118	-119	2.624	130	740.00	3.00	2.22	0.21	50.
103	-111	-495.321	760	1810.00	-1.63	-3.32	-1.09	110.	119	-120	2.824	100	1160.00	10.75	12.47	0.36	50.
103	-104	294.162	760	1530.00	0.70	1.07	0.63	110.	121	-122	1640.512	1220	1680.00	1.68	2.82	1.40	110.
103	-128	93.365	380	2070.00	4.40	9.11	0.82	80.	122	-127	1367.071	1070	1180.00	2.27	2.68	1.52	110.
104	-123	164.297	530	3940.00	1.70	6.70	0.84	110.	122	-128	14.216	380	2070.00	0.13	0.28	0.13	80.
105	-126	53.812	560	2600.00	0.13	0.35	0.22	110.	122	-129	90.109	380	1430.00	4.12	5.89	0.79	80.
105	-107	2600.372	1370	910.00	2.24	2.04	1.76	110.	123	-105	83.599	300	1400.00	6.29	8.80	1.18	110.
107	-109	2187.174	1370	1230.00	1.63	2.00	1.48	110.	123	-124	52.529	300	1650.00	2.66	4.39	0.74	110.
107	-106	570.051	840	790.00	1.46	1.15	1.03	110.	124	-125	50.047	300	2020.00	2.43	4.91	0.71	110.
109	-110	1829.422	1370	1940.00	1.17	2.27	1.24	110.	125	-130	-9.259	300	1220.00	-0.19	-0.24	-0.13	80.
110	-111	-61.378	760	1440.00	-0.04	-0.06	-0.14	110.	125	-135	7.009	300	1150.00	0.06	0.07	0.10	110.
110	-113	1906.585	1220	2500.00	2.22	3.55	1.63	110.	126	-127	-1262.457	1070	2760.00	-1.96	-5.41	-1.40	110.
110	-112	146.616	460	1250.00	2.22	2.77	0.88	110.	126	-133	53.077	560	1730.00	0.13	0.22	0.22	110.
112	-113	146.617	460	1250.00	2.22	2.77	0.88	110.	126	-185	50.524	380	1730.00	3.37	5.83	0.45	50.
113	-121	1762.466	1220	1940.00	1.92	3.72	1.51	110.	129	-130	60.394	300	340.00	6.21	2.11	0.85	80.
113	-114	142.377	460	960.00	2.10	2.02	0.66	110.	129	-132	7.200	300	2100.00	0.12	0.25	0.10	80.

DAR ES SALAM (CASE4)

Effective Head Distribution

10

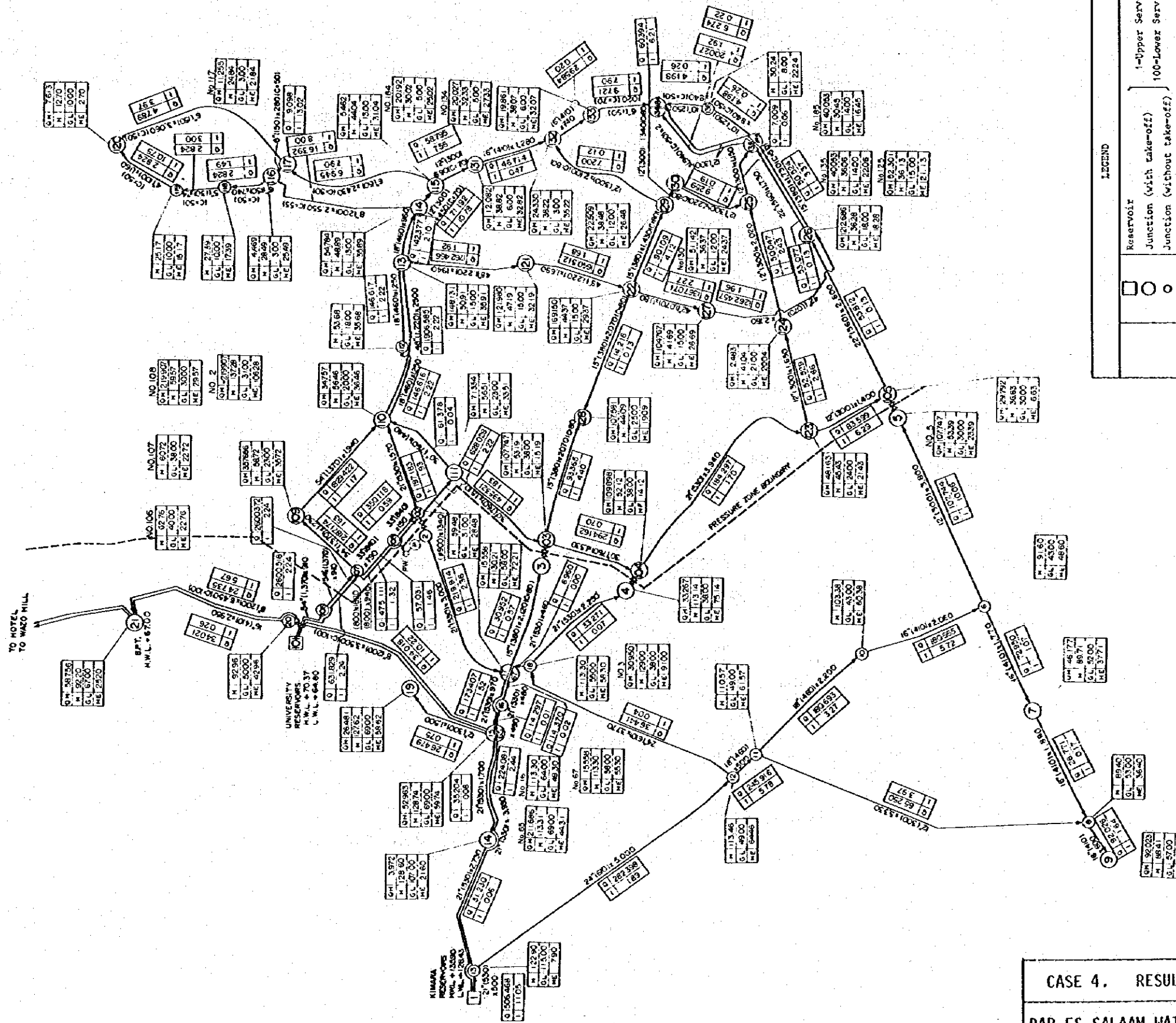
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Class Range Num-

I	J	Q (mm ³ /s)	D (mm)	L (m)	I (%)	H (m)	V (m/s)	C
131	-132	46.714	410	1280.00	0.47	0.60	0.35	110.
132	-133	29.584	410	740.00	0.20	0.15	0.22	110.
133	-184	9.721	150	1020.00	7.90	8.05	0.55	70.
184	-136	-4.198	250	840.00	-0.26	-0.22	-0.09	50.
135	-134	20.027	300	1940.00	1.92	3.72	0.28	50.
185	-184	5.274	300	1940.00	0.22	0.43	0.09	50.
185	-136	4.198	250	840.00	0.26	0.22	0.09	50.

Class Range	Num-
1 0 - 5	120
2 5 - 10	13 105
3 10 - 15	104
4 15 - 20	105 118 119 126 128 185
5 20 - 25	5 14 106 107 117 123 124 125 130 135
6 25 - 30	136
7 30 - 35	21 102 108 116 122 127 129 134 184
8 35 - 40	9 111 115 121 131 133
9 40 - 45	7 8 109 110 112 113 114 132
10 45 - 50	65 20
11 50 - 55	6 16
12 55 - 60	15 67 18 19
13 60 - 65	10 11 12
14 65 - 70	17
15 70 - 75	4
16 75 - 80	4
17 80 - 85	3
18 85 - 90	3
19 90 - 95	2
20 95 - 100	2
21 100 -	2

Total (61)



LEGEND

Reservoir	□	1=Upper Service Area 100=Lower Service Area
Junction (with take-off)	○	
Junction (without take-off)	○	
Maximum Hourly Demand (l/s)	QH	
Hydraulic Level (m)	H	
Ground Level (m)	GL	
Effective Head (m)	HE	
Distribution Pipe (existing)	—	
Distribution Pipe (proposed)	- - -	
Diameter of Pipe inch (mm)	12\"(300)x 1220(c=80)	
Length of Pipe (m)	12\"(300)	
Velocity Coefficient (C value)	1.200 (c=80)	
Flow Rate (l/s)	Q	
Hydraulic Gradient Line (1/1000)	I	

CASE 4. RESULT OF HYDRAULIC CALCULATION
DAR ES SALAAM WATER SUPPLY IMPROVEMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

JICA