Qatar Public Telecommunications Services in the past and Present, and future forecast supporting national background

Study Report (1)

February 1978

Japan International Cooperation Agency

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CONTENTS

1. INTRODUCTION

Qatar is now witnessing a rapid growth and changes in various fields, especially in industrialization, and will definitely become a wealthy country in the future if progress and development plans are carefully drawn up and implemented.

The development plan for a country is a kind of scientific action in the modern sense, with the country dynamically diversifying itself. To comprehend a country's development plan, we must first know its past and present national situations.

The fundamental action points are those which involve characteristic changes, such as architecture; living standards; and gross national product (GNP), accelerating its growth, adjusting its balance, and reorganizing its action pattern; based on national tendencies.

Development targets and their process are classified as follows:

1) Preserving natural landscapes, resources, historical monuments, and cultural inheritances, e.g., traditional arts and their conservation.

2) Preparing services promptly for social, economic, and cultural demands to make rapid progress, e.g., construction materials and economical housing.

3) Curing regional pathos and its prevention, e.g., redevelopment of high density population areas, slum area houses and buildings, i.e., creating comfortable living circumstances.

4) Planning and carrying out revolutionary development in building new towns, new industrial centers, distribution centers, land and coastal reclamation, etc.

These are very important factors in providing a good telecommunication network and new services; therefore, we must obtain more information about them.

2. POPULATION

The present world population is estimated at about 4.1 billion and the Figures below show the population growth rate and its future tendency.

(Billion)

Item	1750	1800	1850	1900	1950	1975	2000
Population Growth Rate	7.9	9.8	13	17	25	40	64

Fig. 2.1 a) World population growth rate

(Million)

Area	1972	2000	Growth Rate (%)
Africa	364	834	(129)
Latin America	300	625	(108)
Asia	2,154	3,757	(74)
(Qatar)			
Oceania	20	33	(65)
USSR	248	321	(29)
North America	233	296	(27)
Europe	469	540	(15)

Fig. 2.1 b)

The annual population growth rate including Qatar shown in "MEED," a special report on Qatar published 1 April, 1977, is 0.08. According to the Qatar Year Book for 1976, the figure is different, that is, 0.028. The 0.028 in the QYB is only for Qataris and is nearly equal 0.03 in MEED. Despite this, the 0.05 growth rate for non-Qataris is too high to use, and these figures should be rechecked in the near future in cooperation with the authorities.

No.	Item	Number	Remarks
1	Population (2000)	1 Million or more	H.H. Sheikh Khalifa Bin Hamad Al-Thani "The Gulf in the year 2000"
2	Population (1976) " (Doha) Growth Rate	180,000 80% 0.028	Qatar Press and Publication Dept. "Year Book 1976"
3	Population " (Non-Qataris) Growth Rate " (Qataris) " (Non-Qataris)	200,000 (approx.) Roughly half Qataris population, rising fast 0.08 0.03 0.05	Meed "Special Report on Qatar" 1 April, 1977

Fig. 2.2 Population growth rate in Qatar

The total population in the year 2000 is known by a quote of H.H. Sheikh Khalifa Bin Hamad Al-Thani, the Emir of Qatar.

"I imagine that Qatar will have a population of one million or more after twenty five years, so we are planning with this figure in mind." Since this figure is in the mind of H.H. the Emir, we are planning to draw up a study plan based on that figure.

To make a precise demand forecast we must obtain data on the following:

a) Present population

a-1) Absolute value

a-2) Population density

Area population density

Density as sociological and economical moves in that area.

a-3) Distribution of ages, sex, etc.

b) Population growth rate

b-1) Assorted population figures

b-2) Birth rate

b-3) Death rate

b-4) Future Qatari population growth rate etc.

c) Population dynamics

c-1) Real population moves

c-2) Sociological or industrial population moves, etc.

These figures are the main problems to be solved, including complete understanding for all workers engaged with governmental organizations. It is a fact that there are many countries around the world having no new population statistical data by census and this is true here also, making our planning job all the harder.

3. GROSS NATIONAL PRODUCTS AND LATENT DEMAND FOR TELEPHONE LINES

The GNP Economical Index is known as the Prosperity Figure for a country. But if there is inbalance in the people's wealth the GNP does not mean the average value of the people's per capita income.

Fig. 3.1 shows the per capita income around the world. Fig. 3.2 shows telephone density in relation to the Gross National Product per person in 1974, and this is not so different at the present.

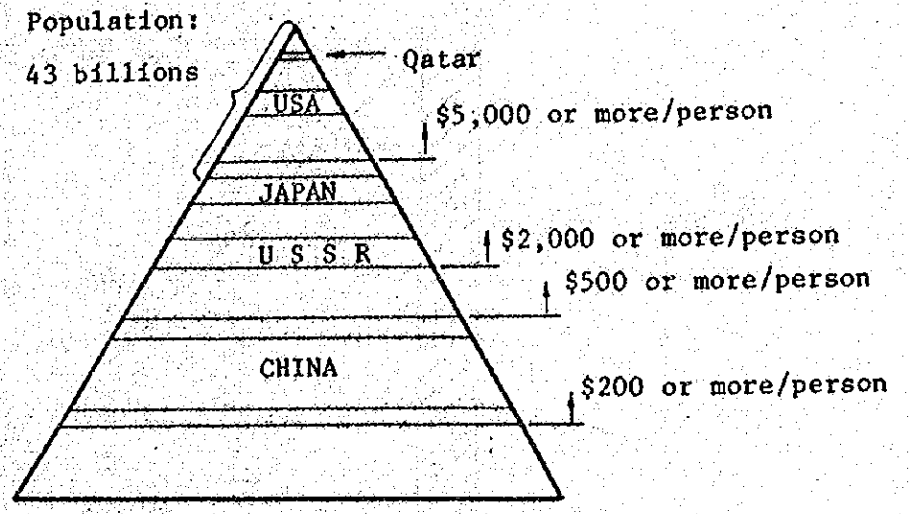


Fig. 3.1 Per capita income around the world

(per person)

	Countries	GNP		Countries	GNP
1	Kuwait	11,510	12	Luxemburg	6,050
2	UAE	10,480	13	France	5,760
3	Qatar	8,320	14	Australia	5,640
4	Switzerland	8,050	15	Iceland	5,620
5	Sweden	7,880	15	Holland	5,590
6	USA	7,060	17	Finland	5,100
7	Denmark	6,920	18	Libya	5,030
8	Canada	6,650	19	Austria	4,720
9	W. Germany	6,610	20	New Zealand	4,680
10	Norway	6,540	21	Japan	4,460
11	Belgium	6,070			

(World Bank Atlas 1975)

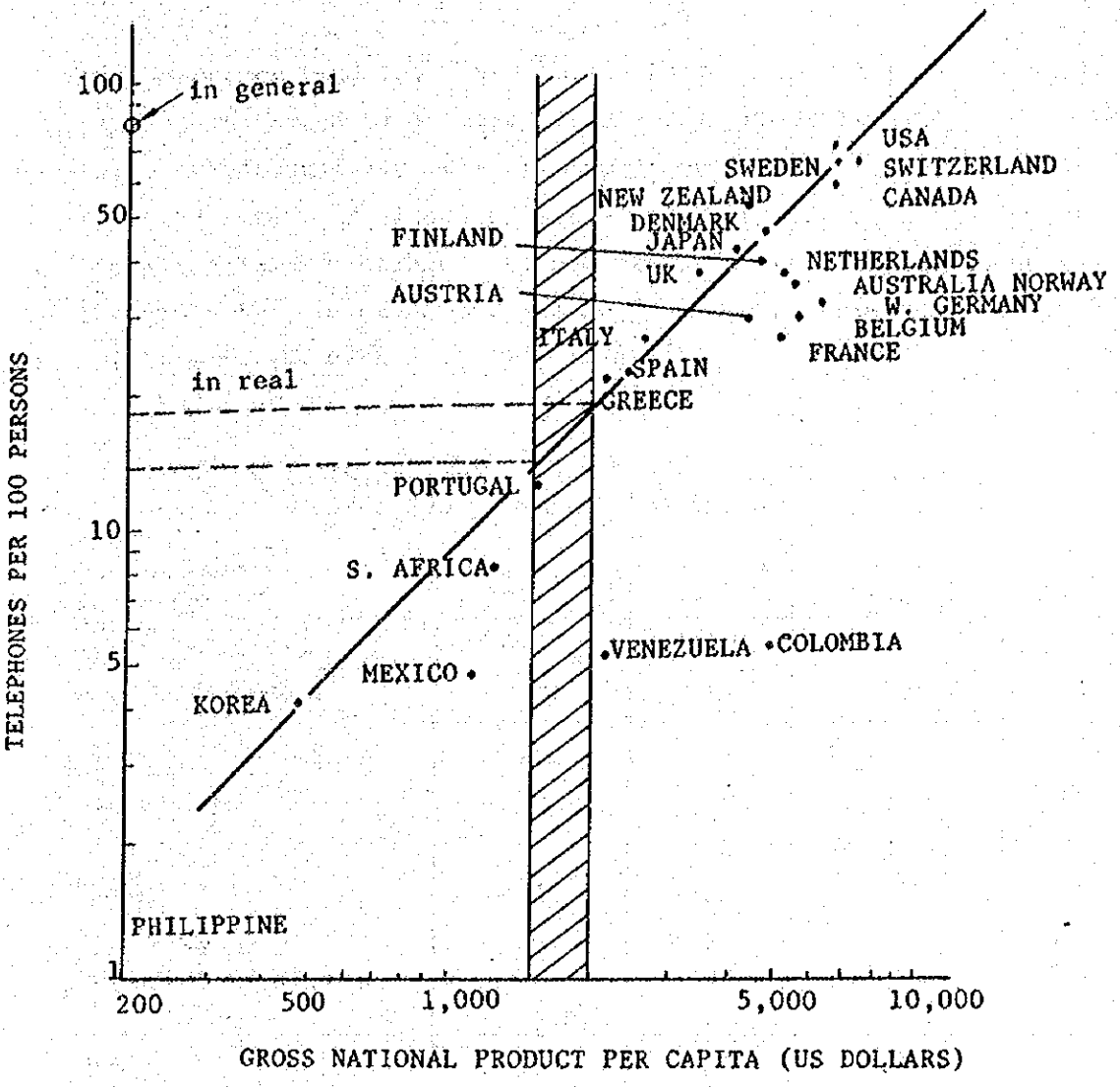


Fig. 3.2 Telephone density and the gross national product per capita 1974
(End of Fiscal 1974)

To obtain an approximate figure for latent telephone demand in Qatar, it may be estimated from this table that Qatar has a latent telephone demand of about 80 telephone lines per 100 persons. If current total population is 200,000, then total latent demand will be about 160,000 lines. However, this figure is too high since in Qatar, the salary is known to be between 9,000 Qatar Riyal ($2,300) and 6,000 Qatar Riyal ($1,540). Thus, on the basis of per capita GNP, the number of telephones per 100 person is probably 15~20. Therefore, the estimated total current demand is approximately 30,000~40,000.

4. QATAR NATIONAL INVESTMENT FOR TELECOMMUNICATION

Total investment and the distribution-ratio for each area of public works are generally regarded as indices of national public activity. In other words, the public activity of a country is determined by the selectivity of national investment. As shown on Table 4.1, investment in telecommunications is not extremely stable. According to Table 4.2, year-to-year investment increases in telecommunications in four countries are between 1.11 and 1.23 in the period of 1971~1974.

Table 4.1 Telecommunication Investment Plan in Qatar
(The Every bigining of the year)

Description		1974	1975	1976	1977
Total year-to-year investment increase		616 1.72↑	1908 3.10↑	4383 2.30↑	6300 1.44↑
Public Section	1) Electricity	74	311	Unknown	908
	2) Water Sewers	53	140		311
	3) Housing		30		80
	Loans	30	100		200
	4) Air port	15	25		46
	5) Telecommunication	55.5 (9.0)	34 (1.8)		71.6 (1.1)
	6) Road	58	18		
	7) Others				
Schools & Universities		26	120	ditto	260
Hospitals		23	64	ditto	391

(Million Qarat Riyals)

Table 4.2 Telecommunication investment in four countries

Countries	Item	1971	1972	1973	1974	1975
West Germany	Year-to-year increase	1.26	1.15	1.13	0.98	
U.K.	ditto	1.23	1.22	1.11	1.13	0.92
France	ditto	1.19	1.24	1.24	1.29	1.16
Sweden	ditto	1.03	1.15	1.09	1.10	1.00

On the other hand, the figure for Qatar varied between 9.0 and 0.8 in the 1974~1975 period.

According to the distribution of QNTS investment from 1973 to 1978, shown in Table 4.3, the investment ratio in each asset category shows a unique value from that of the six countries in Table 4.4, e.g. investment for exchange equipment in the countries excluding "F" is larger than that for line plant and junctions. In Qatar, that figure is shown to be smaller.

Table 4.3 Distribution of QNTS investments from 1973/74 to 1777/78

Items	Capital already invested			
	73/74	74/75	75/76	
Buildings	444	1,852,290	912,000	
Exchange Equip.	17,372	1,086,719	9,471,000	
Line plant	773,117	1,611,188	6,096,000	
Junctions	5,312	2,059,370	2,636,000	
Subs apparatus	741,190	1,382,560	3,000,000	
Total	1,537,435	7,992,127	22,115,000	
Labor	1,676,889	5,129,405	15,206,000	
	Planned investments			
	76/77	77/78	Total	Ratio
Buildings	690,000	127,000	3,581,734	5.5
Exchange Equip.	12,300,000	2,248,000	25,123,091	38.7
Line plant	5,931,000	2,244,000	16,655,305	25.7
Junctions	3,669,000	1,428,000	9,797,683	15.1
Subs apparatus	3,000,000	1,600,000	9,723,749	15.0
Total	25,590,000	7,647,000	64,881,562	100.0
Labor	16,184,000	4,566,000	42,762,254	-

Table 4.4 Average Ratio to the Telecommunication Investments in Six Countries

Items	A	B	C	D	E	F	Average	α
							*2	
Buildings	6	13	13	3	6	18	10 (8)	0.38
Exchange Equip.	41	32	22	39	50	2	31 (37)	1.19
Line plant *1	24	26	21	32	24	49	29 (25.5)	1.12
(including Junctions)								
Sub apparatus	26	16	43.8	23	18	30	26 (25.5)	1
Others	3	13	0.2	3	2	1	4 (4)	0.15
Total	100	100	100	100	100	100	100	-

$$\alpha = \frac{\text{Investment (by category)}}{\text{Investment (sub apparatus)}}$$

*1: Transmission, overhead line systems, underground systems, cables.

*2: Excluding F

This means that selection of a new outside plants i.e. transmission systems, will have to be more economical.

Table 4.5 shows total investment and the breakdown by category, such as extention plan, ceased, etc., in AT & T.

Table 4.5 Investments (Construction)

(Million $)

Items	1970	1971	1972	1973	1974	
	(100%)	(100%)	(100%)	(100%)	(100%)	
Total Investment	7,159	7,564	8,306	9,322	10,074	*End of fiscal year
	(68)	(68)	(66)	(65)	(62)	
Extention Plan	4,896	5,126	5,516	6,087	6,272	
	(12)	(12)	(11)	(12)	(14)	
Ceased	849	908	939	1,125	1,414	
	(15)	(15)	(18)	(18)	(19)	
Changing Equip.	1,031	1,169	1,465	1,654	1,863	
	(5)	(5)	(5)	(5)	(5)	
Modernization	383	362	386	456	525	
Total assets *	54,813	60,568	67,082	74,005	81,146	

(AT & T Annual Statistical Report)

Table 4.6 Estimated Expenditure and Investment Ratio

	System category	Equipment (including labour)		Equipment		Forecast Investment
		Q.R. (10^3)	%	Q.R. (10^3)	%	
1.	1) Subscribers Apparatus	22,000	7.2	14,700	8.0	Increase
	2) Loo-extenders/Amp/H/Carrier/Subscribers Radio	6,600	2.2	6,000	3.2	
2.	1) Switching Equipment power plant	37,752	12.3	36,947	20.0	Continuing
	2) AMA	55,872	18.3	41,904	22.7	
	3) Directory-Information Retrieval System (C.P.U.)	540	0.2	405	0.2	
3.	Line plant	69,285	22.7	46,031	24.9	Decrease or introduction of more economical systems
4.	1) Junction & Transmission	27,605	9.0	14,482	7.8	
	2) Mobile Radio	10,255	3.4	8,600	4.6	
5.	1) Building (for Plant)	15,735	5.1	4,029	2.2	Continuing
	2) Telephone Engineering Center	20,000	6.5	3,098	1.7	
	3) Administration Block	28,776	9.4	4,458	2.4	
6.	1) Transport & Mechanical Aid	2,400	0.8	2,400	1.3	Continuing
	2) Provision for escalation	2,400	0.8	1,800	1.0	
	3) Turn-key Cost	6,302	2.1	-	-	
	Total	305,522	100	184,854	100	Increase

(Qatar in 1977~1979)

According to this data, the investment ratios seem to be about 65% for the extension plan, 12% for ceased line, 18% for replacing old equipment with new equipment and 5% for modernizing supplemental equipment.

To make an effective investment plan in Qatar, it is necessary to obtain data on these categories and analyze this data. Table 4.6 shows other categories of planned investment in 1977-1979. Currently, analysis of the difference between the values shown in Tables 4.3 and 4.6 is required.

5. QATAR NATIONAL SWITCHING CAPACITY IN THE PAST AND PRESENT

As mentioned above, in industrial societies, social activities are tightly linked with the volume & quality of the information concerning these activities. Thus, telephone density definitely has a special meaning as a measure of social activity. Therefore, adequate telephone lines to support these activities are required and that is the responsibility of the government.

According to the trend of working and waiting lines now and in the past shown in Table 5.1 and Fig. 5.1, certain social factors can be determined. Until the end of 1974, the growth rate of subscribers lines was very low; between 1975 to 1976, it gradually increased and from the begining of 1977 the figure for working lines has been accelerating. In spite of the expansion of switching capacity, there are still many waiting parties.

If all Qataris seek a prosperous society, as H.H. The Amir has said, considerable amounts of money to make sufficient line capacity will be required. Furthermore the followings will be required:

1) Determination of an effective extension term which does not result in waiting lines.

2) Cease purchase of the SXS exchange which does not permit updated function.

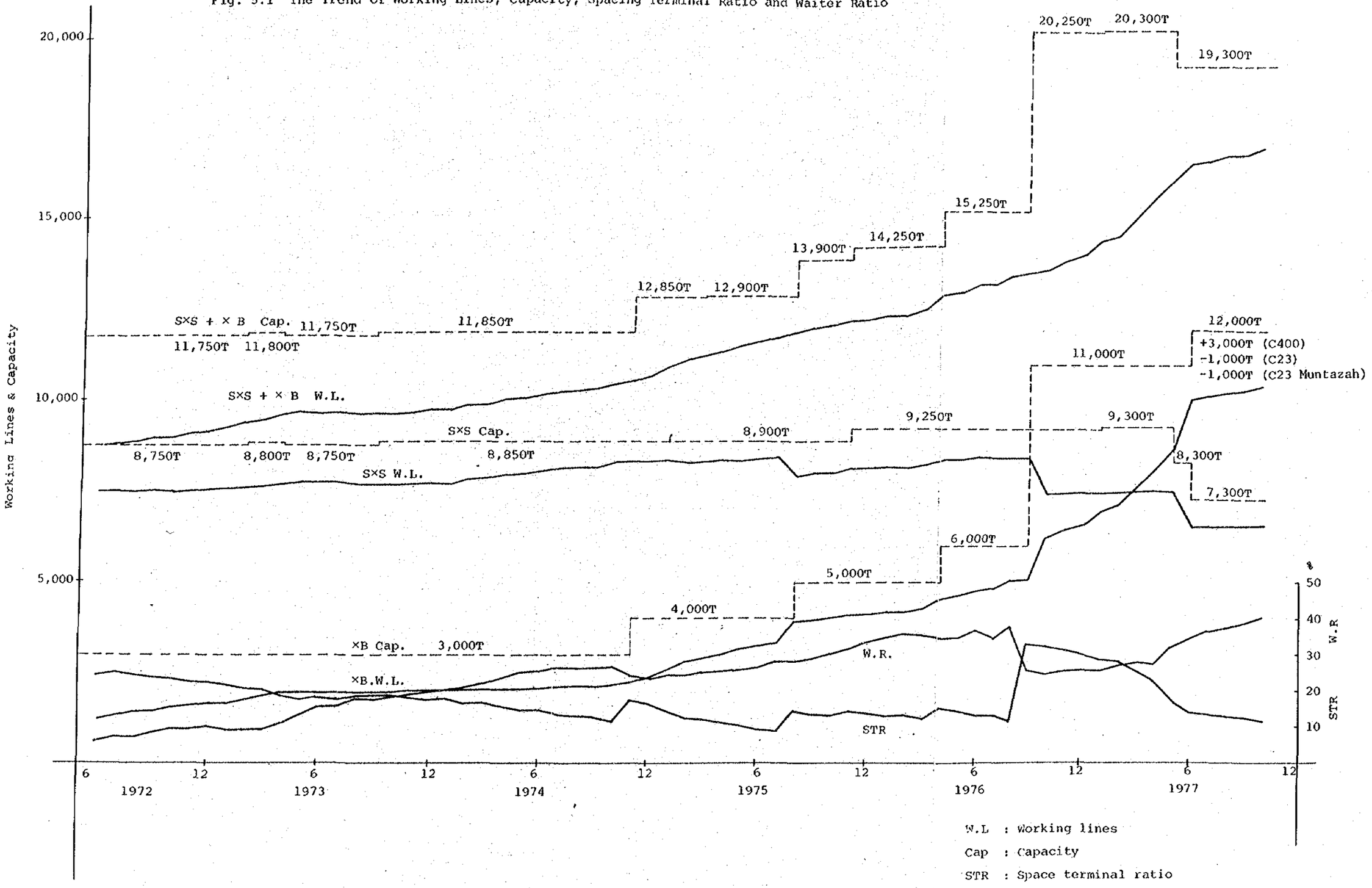
3) Reduction of waiting persons according to seniority. If reduction is caused by the waiting persons themselves, then is necessary to introduce another category.

Example: waiting line (A) because of waiting persons.
(B) because of telephone office.

LIST OF ERRATA

Page		Original	Right
12		in the past and present	in the past and the present
20	1 ↓	Fig.6.1.a)----set	Fig.6.1.a)----set in Japan
21	1 ↓	Fig.6.1.b)-----(push button)	Fig.6.1.b)-----(push button)in Japan
22	1 ↓	Fig.6.1.c)----set	Fig.6.1.c)-----set
23	10↑	is keying delayed	is being delayed
34		Fig.10.2----system	Fig.10.2----system in Japan
38	16↑	1977 measured as measured	1977 as measured
43		Doha xxS	Doha SxS
47	8 ↓	To void this,	To avoid this
52		Table 14.1----System	Table 14.1----System in Japan
60	5 ↓	Fig.16.1 (Idea A)	Fig.16.1 (Planned)
	7 ↑	figure 16.2 (Idea B)	Fig.16.2 (Proposal)
	1 ↑	(proposal B)	(proposal)
62	2 ↓	planning (proposal B)	planning (proposal)
65		Fig.12.2.d) Zone"3"&"4"	Fig.12.2.d) Zone "3" and "4"
66		wakiahi Res Al Allaj	wakrah Ras Al Allaj
80		Fig.18.1----plan	Fig.18.1----plan(planned)
81		Fig.18.2----plan	Fig.18.2----plan(proposal)
83	1 ↓	zone planning	zone planning(proposal)
102	2 ↑	Production Growth Rate	Population Growth Rate
	1 ↑	Size of Household	Average Size of Households

Fig. 5.1 The Trend of Working Lines, Capacity, Spacing Terminal Ratio and Waiter Ratio

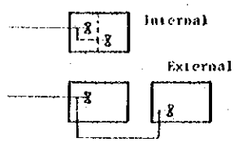


W.L : Working lines
Cap : Capacity
STR : Space terminal ratio
W.R. : Waiter ratio

The Trend of Working lines, Capacity, Spacing Terminal Ratio, and Waiter Ratio

Dec. 11th~12th, 1977

Date	Doha SXS	Doha Palace	Doha C23	Doha C400	Nunt C23	Khalifa C23	Rayyan C23	US ali SXS	US Md SXS	Um Said SXS	Wakrah SXS	Wukair SXS	Extension Internal	Extension External	Lines on PBX	Total SXS	Total XB	Total S+X	Capacity	(%) S.T.R.	Waiters (1)	Waiters (2)	(%) W. R. (1)	Remarks
	(8200T)	(50T)	(1000T)			(1000T)	(1000T)	(50T)	(100T)	(150T)	(100T)	(100T)												
June 1972	7147	21	434			368	442	37	41	90	93	42	3774	1160	87	7471	1244	8715	11750	24.13	758		6.45	
Jul.	7150	21	479			380	459	38	41	91	93	42	3733	1176	90	7476	1318	8794		25.16	884		7.52	
Aug.	7105	21	546			397	470	38	41	92	94	42	3736	1193	91	7433	1413	8846		24.72	877		7.46	
Sep.	7138	21	586			402	475	38	42	99	94	45	3773	1200	92	7477	1463	8940		23.92	999		8.50	
Oct.	7113	21	637			420	484	37	42	102	93	45	3806	1206	90	7453	1541	8994		23.46	1155		9.82	
Nov.	7137	21	699			425	484	37	42	106	93	45	3836	1210	90	7481	1608	9089		22.65	1157		9.84	
Dec.	7186	21	750			419	475	27	34	108	92	37	4087	1214	89	7505	1644	9149		22.14	1192		10.14	
Jan. 1973	7217	21	777			422	478	27	35	108	92	37	4158	1224	89	7537	1677	9214		21.59	1062		9.03	
											(150T)													
Feb.	7269	21	840			436	487	26	31	108	93	38	4256	1200	89	7586	1763	9349	11800	20.78	1086		9.20	. Wakrah extension 50T
Mar.	7271	21	907			445	491	26	34	111	94	38	4329	1271	90	7595	1843	9438		20.02	1113		9.43	
Apr.	7357	-	944			455	513	27	35	116	94	38	4462	1306	91	7667	1912	9579	11750	18.48	1326		11.28	. Doha Palace decrease 50T
May	7396		953			457	536	27	34	118	94	38	4657	1323	90	7707	1946	9653		17.85	1587		13.50	
June	7379		944			447	530	27	34	122	96	38	4675	1332	89	7696	1921	9617		18.16	1865		15.87	
Jul.	7386		940			456	549	27	36	124	96	38	4767	1360	90	7707	1945	9652		17.86	1891		16.09	
Aug.	7323		925			486	545	26	35	128	105	38	4816	1366	88	7655	1956	9611		18.21	2099		17.86	
										(250T)														
Sep.	7335		928			484	542	26	34	129	108	38	4858	1369	86	7670	1954	9624	11850	18.79	2089		17.62	. Umm Said extension 100T
Oct.	7318		925			495	551	26	34	130	111	38	4895	1369	86	7657	1971	9628		18.76	2172		18.32	
Nov.	7350		935			511	558	26	35	130	116	38	4910	1380	85	7695	2004	9699		18.16	2255		19.02	
Dec.	7345		936			531	561	27	38	131	117	39	5038	1396	89	7697	2028	9725		17.94	2345		19.78	
Jan. 1974	7348		942			534	548	26	38	130	117	39	5074	1409	91	7698	2024	9722		17.96	2378		20.06	
Feb.	7464		947			549	554	26	37	130	117	39	5154	1494	90	7813	2050	9863		16.77	2496		21.06	
Mar.	7488		939			550	553	25	38	130	115	39	5194	1497	89	7835	2042	9877		16.65	2625		22.15	
Apr.	7564		945			566	566	27	38	140	117	39	5310	1503	91	7925	2077	10002		15.60	2833		23.90	
May	7622		946			580	568	27	40	144	119	44	5404	1505	93	7996	2094	10090		14.86	3032		25.58	
Jun.	7637		939			579	560	28	41	186	119	46	5520	1516	93	8057	2078	10135		14.48	3026		25.53	
Jul.	7685		957			589	568	27	41	209	119	46	5593	1541	95	8127	2114	10241		13.58	3146		26.54	
Aug.	7691		954			608	579	29	41	219	120	46	5683	1583	97	8146	2141	10287		13.19	3125		26.37	
Sep.	7739		955			606	579	30	42	219	119	46	5750	1588	97	8195	2140	10335		12.79	3148		26.56	
Oct.	7839		962			618	586	30	45	219	127	47	5798	1596	97	8307	2166	10473		11.63	3186		26.88	
			(2000T)																					
Nov.	7862		1047			625	583	30	45	219	129	47	5849	1621	99	8332	2255	10587	12850	17.62	3137		24.41	. Doha C23 extension 1000T
Dec.	7862		1137			645	587	28	45	219	131	50	5959	1623	104	8335	2369	10704		16.71	3017		23.47	
Jan. 1975	7880		1245			745	588	27	42	222	129	50	6034	1633	104	8350	2578	10928		14.96	3171		24.67	
Feb.	7870		1411			821	593	29	42	222	131	49	6113	1635	107	8343	2825	11168		13.09	3196		24.87	
											(200T)													
Mar.	7864		1484			847	591	29	43	222	134	51	6151	1634	108	8343	2922	11265	12900	12.68	3236		25.08	. Wakrah extension 50T
Apr.	7885		1545			861	594	31	42	223	151	51	6220	1639	109	8383	3000	11383		11.76	3297		25.55	
May	7862		1667			874	600	32	43	229	156	52	6321	1658	107	8374	3141	11515		10.74	3354		26.00	
Jun.	7890		1733			881	611	36	45	229	163	52	6369	1654	108	8415	3225	11640		9.77	3449		26.73	
Jul.	7936		1768			912	627	37	45	229	165	51	6427	1688	106	8463	3307	11770		8.76	3612		28.00	



Date	Doha SXS	Doha Palace	Doha C23	C400	Munt C23	Khalifa C23	Rayyan C23	US Ali SXS	US Md SXS	Um Said SXS	Wakra SXS	Wukair SXS	Extension Internal	Extension External	Lines on PBX	Total SXS	Total XB	Total S+X	Capacity	(%) S.T.R.	Waiters (1)	Waiters (2)	(%) W.R. (1)	Remarks
	(8200T)		(2000T)		(1000T)	(1000T)	(1000T)	(50T)	(100T)	(250T)	(200T)	(100T)												
Aug. 1975	7435		1798		570	934	636	37	47	231	170	53	6564	1715		7973	3938	11911	13900	14.31	3897		28.03	
Sep.	7479		1814		590	942	646	40	47	232	170	53	6661	1731		8021	3992	12013		13.58	4036		29.03	
Oct.	7497		1822		627	946	652	41	47	241	174	53	6703	1738		8053	4047	12100		12.95	4188		30.12	
										(600T)														
Nov.	7552		1839		663	954	663	41	49	251	174	54	6809	1740		8121	4119	12240	14250	14.11	4505		31.61	. Umm Said extension 350T
Dec.	7572		1849		687	961	663	42	53	252	175	54	6852	1748		8148	4160	12278		13.84	4820		33.82	
Jan. 1976	7595		1865		700	960	672	42	55	254	176	54	6972	1749		8176	4197	12373		13.18	4962		34.82	
Feb.	7579		1861		697	956	674	41	55	272	172	54	7067	1744		8173	4188	12361		13.26	5121		35.93	
Mar.	7638		1863		768	956	707	43	55	272	172	54	7181	1751		8234	4294	12528		12.09	5047		35.41	
						(2000T)																		
Apr.	7751		1903		818	1082	755	44	55	295	174	56	7369	1818		8375	4558	12933	15250	15.20	5286		34.66	. Khalifa Town extension 1000T
May	7751		1909		824	1144	770	44	54	304	173	56	7719	1823		8382	4647	13029		14.57	5333		34.97	
Jun.	7810		1970		848	1180	785	44	53	309	171	55	7820	1835		8442	4783	13225		13.28	5640		36.98	
Jul.	7796		1952		853	1217	798	44	52	317	171	54	7984	1854		8434	4820	13254		13.09	5257		34.47	
Aug.	7815		1959		853	1310	809	44	53	324	170	53	8054	1863		8459	5031	13490		11.55	5775		37.86	
				(5000T)																				
Sep.	7775		1947	77	856	1357	834	44	53	334	171	54	8251	1906		8481	5071	13552	20250	33.08	5121		25.28	. Doha C400 extension 5000T
Oct.	6784		1934	1287	766	1379	853	44	54	337	172	54	8588	1949	841	7445	6219	13664		32.53	4942		24.40	
Nov.	6797		1935	1463	766	1399	859	47	54	345	172	54	8664	1979	858	7469	6422	13891		31.41	5125		25.30	
Dec.	6811		1937	1750	767	1437	886	48	54	353	174	56	8824	1998	857	7496	6597	14093		30.41	5225		25.80	
											(250T)													
Jan. 1977	6805		1928	1900	770	1459	901	48	55	355	174	56	8811	1985	877	7493	6958	14451	20300	28.82	5161		25.42	. Wakrah extension 50T
Feb.	6808		1936	2031	776	1480	902	48	55	358	175	56	8906	2007	902	7500	7125	14625		27.96	5476		26.97	
Mar.	6803		1915	2462	814	1533	906	48	54	375	183	58	9183	2035	923	7521	7630	15151		25.37	5680		27.98	
Apr.	6802		1901	2887	852	1612	914	48	55	385	190	59	9216	2064	974	7539	8166	15705		22.64	5522		27.20	
	(7200T)																							
May	6754		1880	3357	858	1661	913	48	57	391	196	59	9699	2083	1003	7505	8669	16174	19300	17.20	6222		32.23	. Doha SXS decrease 1000T
	(6200T)		(1000T)	(8000T)																				
Jun.	5810		932	6466	-	1721	919	48	58	401	202	60	10068	2126	1055	6579	10038	16617	19300	13.91	6670		34.55	. Doha SXS, C23 & Muntazah C23 decrease 3000T & C400 extension 3000T
Jul.	5805		931	6598		1717	914	48	60	407	202	61	10237	2139	1113	6583	10150	16733		13.31	7022		36.38	
Aug.	5786		929	6696		1733	918	48	60	419	204	61	10305	2170	1127	6578	10276	16854		12.68	7205		37.33	
Sep.	5783		927	6724		1746	923	48	60	418	205	61	10429	2281	1139	6575	10320	16895		12.47	7465		38.67	
Oct.	5777		926	6806		1774	929	48	60	422	207	64	10550	2300	1148	6578	10435	17013		11.85	7663		39.70	

1. Name Muntazah, Khalifa Town, Al Rayyan, Umm Salal Ali, Umm Salal Mohammed, Umm Said, Wakra, Wukair.

2. (T): Lines setting at the moment

3. S.T.R.: Spacing Terminal Ratio = $1 - \frac{\text{Working lines}}{\text{Total capacity}}$, W.R.: Waiting Ratio = $\frac{\text{Waiters}}{\text{Total capacity}}$

4) Preparation of a report on the present state of Qatar telecommunications. Such report shall be made by M.O.C.T. at the beginning of every Fiscal Year.

In this table, figures i.e. the waiter ratio and the Space Terminal Ratio are denoted as follows.

$$\text{Waiter Ratio} = \frac{\text{Total number of waiting lines}}{\text{Total capacity}} \ (\%)$$

$$\text{Space Terminal Ratio} = \frac{\text{Total number of spacing terminals}}{\text{Total capacity}} \ (\%)$$

Despite the fact that in Sept. 1976, XB system capacity was extended to 11,000[T], the values of the Waiter Ratio were merely reduced from 40 percent to 25 percent. And eight Months later, this figure was unchanged.

The other factor i.e. the Spacing Terminal Ratio, has been about 15 percent, which was expected to be somewhat higher in nine months i.e. from Sept. 1976 to May 1977. Furthermore, the figure is expected to be 10% or less in the near future.

The switching capacity at present is only 19,300. The number of subscribers was 17,013 at the end of October 1977 and the number of waiters was 7,663. The growth rate of total line indicates that the total was increased 35 percent to 24,676 lines on Oct. 1977.

This figure includes 17,013 lines and 7,663 waiters. The comparable figure for 1976 was 18,606 lines, including 13,664 lines and 4,942 waiters. In October of 1976, this was increased 16 percent to 18,606 lines from the 16,288 lines a year earlier. In Oct., 1975 this was increased 12 percent to 16,288 lines from the 13,659 lines a year earlier.

Table 5.1

Items	Oct. 1974	Oct. 1975	Oct. 1976	Oct. 1977
Lines (L)	10,473	12,100	13,664	17,013
Waiters (L)	3,186	4,188	4,942	7,663
Total (L)	14,659	16,288	18,606	24,676
Growth Rate	1	1.02	1.16	1.35

These figures mean there are significant latent traffic needs. This view is justified by the fact that we find many people use extension phones in hotel and pay phones.

As mentioned below the next extension plan will start in 1978 and traffic congestion may continue until completion next year.

6. INTERNAL AND EXTERNAL EXTENSION OF TELEPHONE SETS

If most houses and offices are without any effective way of using telephone sets, they often induce traffic congestion for calling parties.

According to data taking from the Qatar Telephone Directory 1976/1977, the number of subscribers who have more than two exclusive telephone lines is approximately 480 parties (1340L) occupying about 8% of total lines.

Table 6.1 Number of Subscribers who have more than 2 exclusive telephone lines

Item		2^L	3^L	4^L	5^L	6^L	7^L	8^L	9^L	10^L	11^L	12^L
Official	Government	64	16	7	2			1	1			
	Others	174	32	17	2	2	1	2	1	1		
Residential		106	22	25	7	6	2		2	1	3	1
Total subs		344	70	49	11	8	3	3	4	2	3	1
Total Lines		688	210	196	55	48	21	24	36	20	33	12

Total subs 478

Total lines 1343

There are some houses having 20 or more lines though this is not shown in Table 6.1.

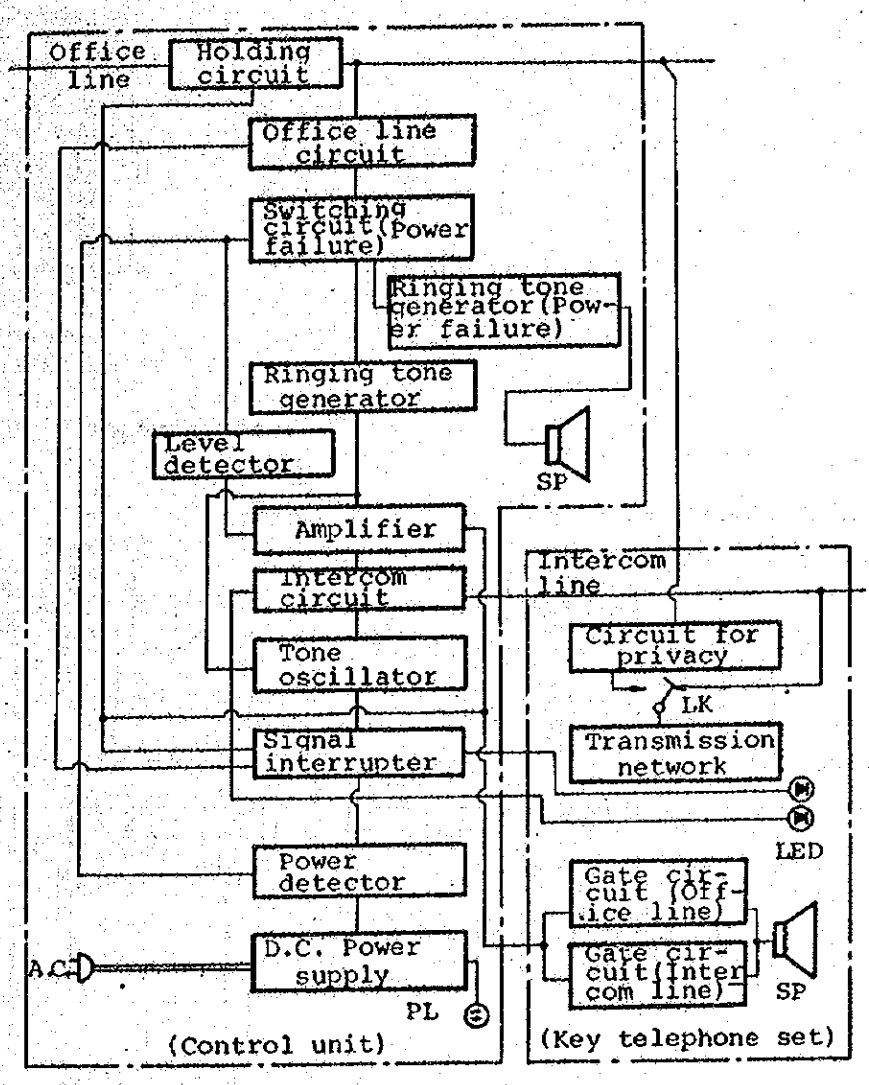
Table 6.2 shows the efficiency of line hunting service. If a 2-line party gets the line hunting service, it can carry 2.5 times the traffic of similarly a 4 line party can carry 4.1 times the traffic, a 5-line party can carry 4.6 times the traffic volume than a party without such service.

Table 6.2 Efficiency of Line Hunting Service,

Item	2^L	3^L	4^L	5^L
Traffic carried (Exclusive line) ①	erl 0.21	erl 0.32	erl 0.42	erl 0.53
(Line hunting) ②	0.53	1.10	1.74	2.43
Service efficiency ② ÷ ①	2.5	3.4	4.1	4.6

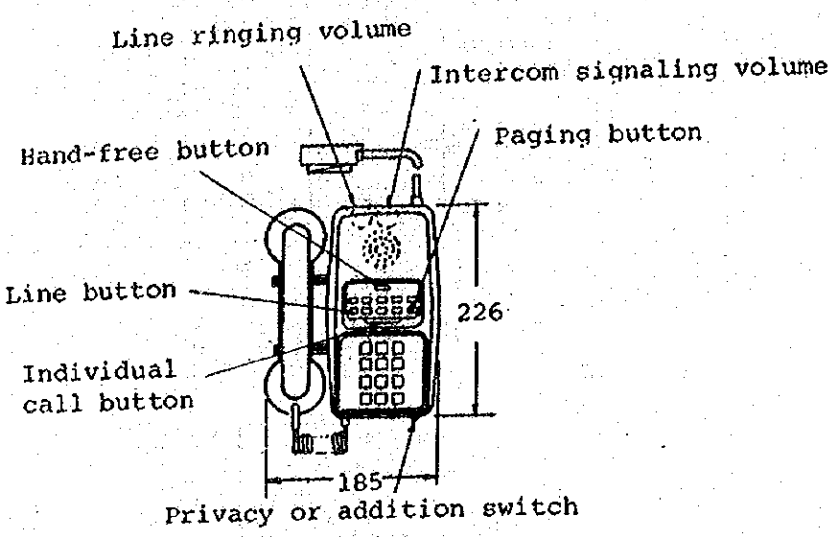
Thus, it is necessary to introduce more line hunting service and more effective service. This includes key telephone set as shown in Fig. 6.1 a)~ c), covering both houses and businesses.

Fig. 6.1.a) Key Telephone Set

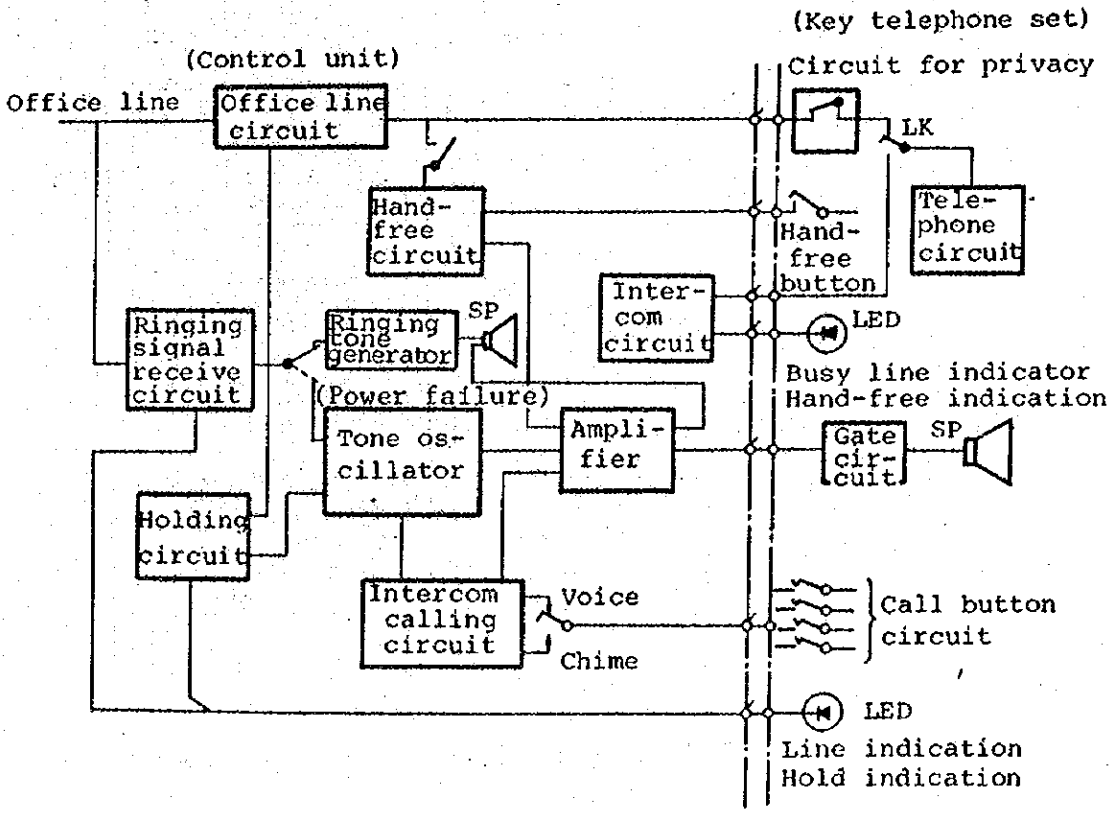


Schematic Diagram of the 104 Key Telephone System

Fig. 6.1.b) Key Telephone Set (Pushbutton)



Structure of Key Telephone Set

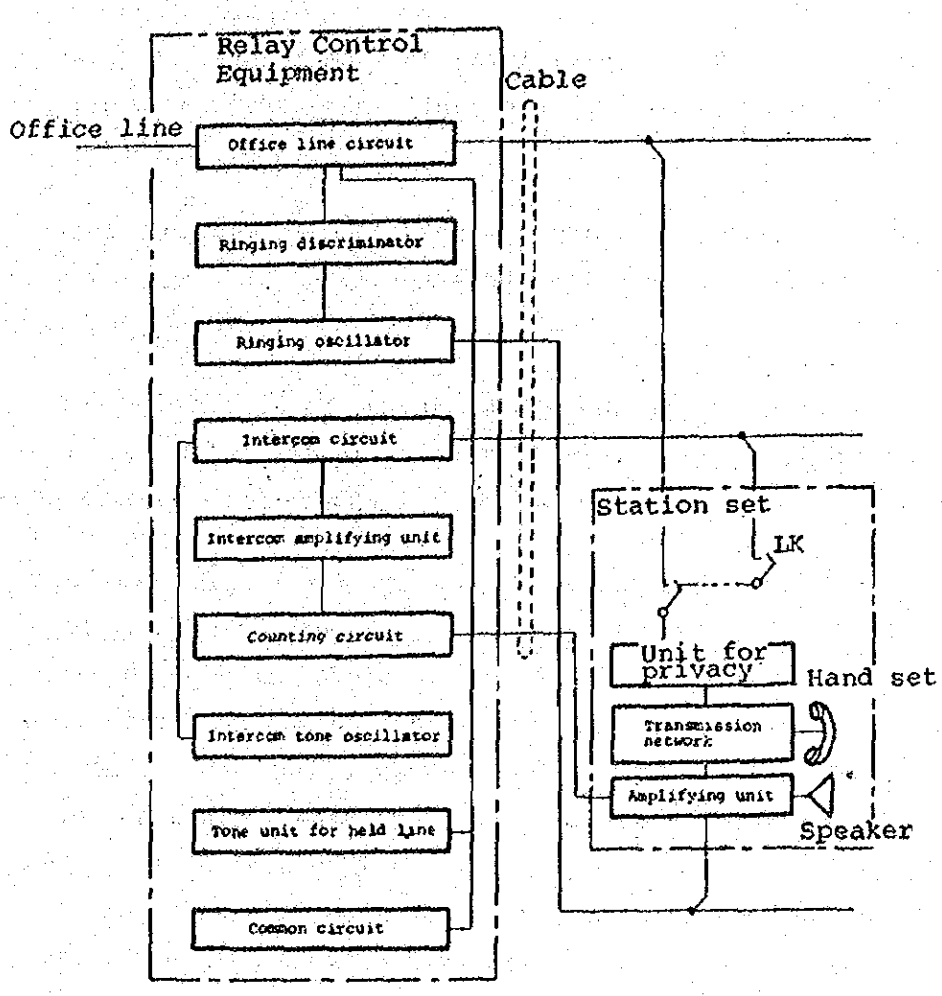


Schematic Diagram of the 104 Push-button Dial Key Telephone System

Fig. 6.1.c) Key Telephone Set

Types of push button dial key telephone systems

Items / Type	Number of station sets	Relay control equipment				Number of keys (station set)		
		Exchange line circuit		Intercom. circuit		Line pick-up key	Intercom. key	Hold key
		Capacity	Initially equipped	Capacity	Initially equipped			
206-P	6	2	2	1	1	2	0	1
410-P	10	5	4	1	1	5	0	1
620-P	20	8	6	3	1	8	3	1



Schematic diagram of push-button dial key telephone system

7. NATIONAL SWITCHING NETWORK IN THE PAST AND THE PRESENT

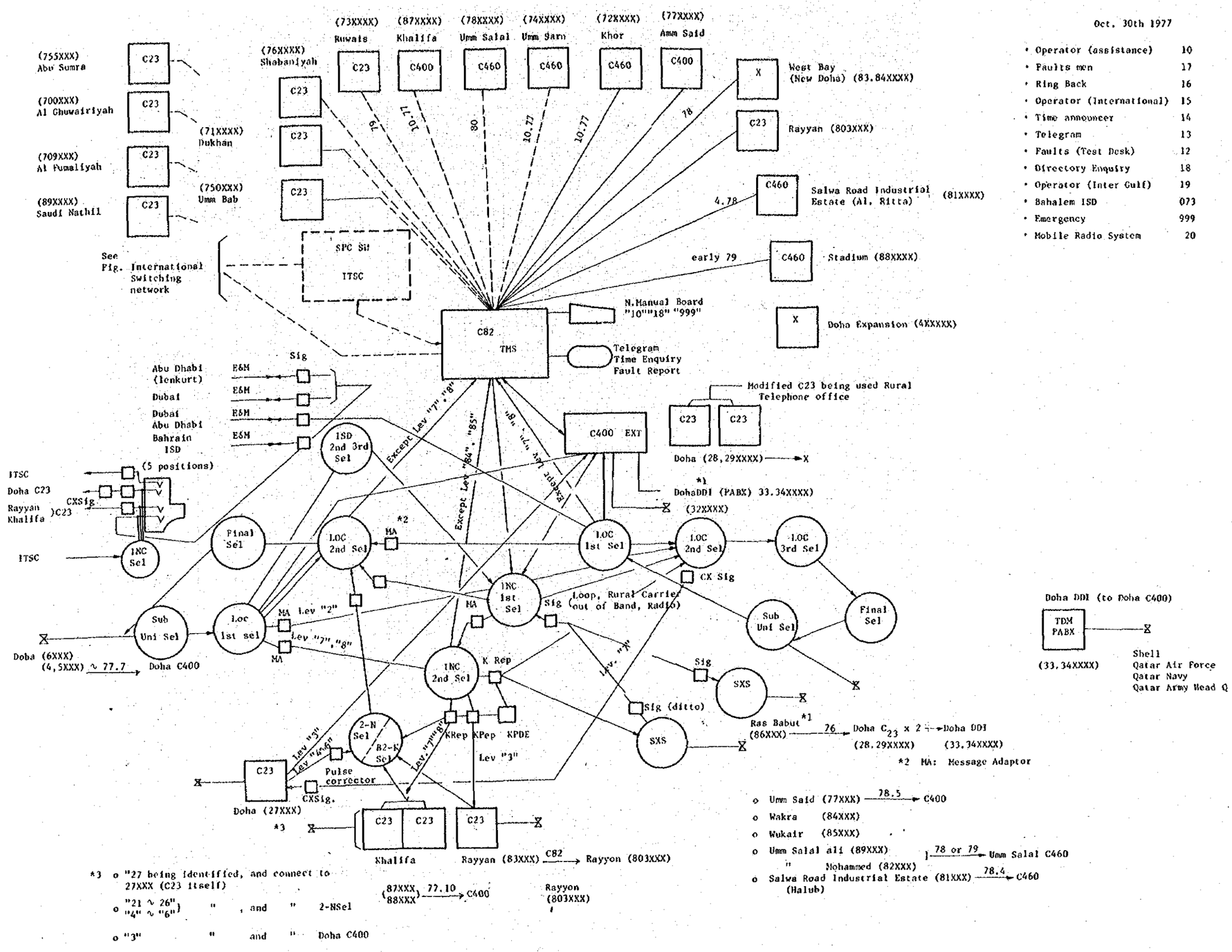
According to statistical data compiled by the QNTS as of June, 1972, total switching lines consisted of 8,715 lines and 8 offices, i.e., Doha SXS, 7,147 lines, Doha Palace SXS 21 lines, Doha C_{23} 434 lines, Khalifa Town C_{23} 308 lines, UmmSalal Mohammed SXS 41 lines, Rayyan C_{23} 442 lines, UmmSalal Ali SXS 37 lines, Umm Said SXS 90 lines, Wakhrah SXS 93 lines, Wukair SXS 42 lines. These switches were made by Rulux (U.K.) and Hitachi (Japan).

Until now, the number of total telephone offices were all counted similarly, but the total lines are different, that is 17,013 lines, including SXS 6578 lines.

As the number of subscribers was growing, the switching grade was changing so often that traffic passed well and the current trunking scheme is shown in Fig. 7.1.

The top part of the figure shows the new trunking scheme. Tables 7.1 and 7.2 show the installation schedule. However, because of outside plant installation, the schedule is keing delayed at the moment.

Turning back, for a considerable time after these new XB SW systems were placed in service, the SXS switching system was in service continued for reasons of economy. This figure shows the history of the Trunking Scheme. To delineate the communication history, it is very important to know "How did we make the Trunking plan?", "where & how did the traffic congestion happen?", "what is or will be the problem and what will have to be done?". This is useful for fresh Engineers who will work in this area in the coming years. Thus government must keep records and other reports such as the White Papers on communications in the U.K. and Japan.

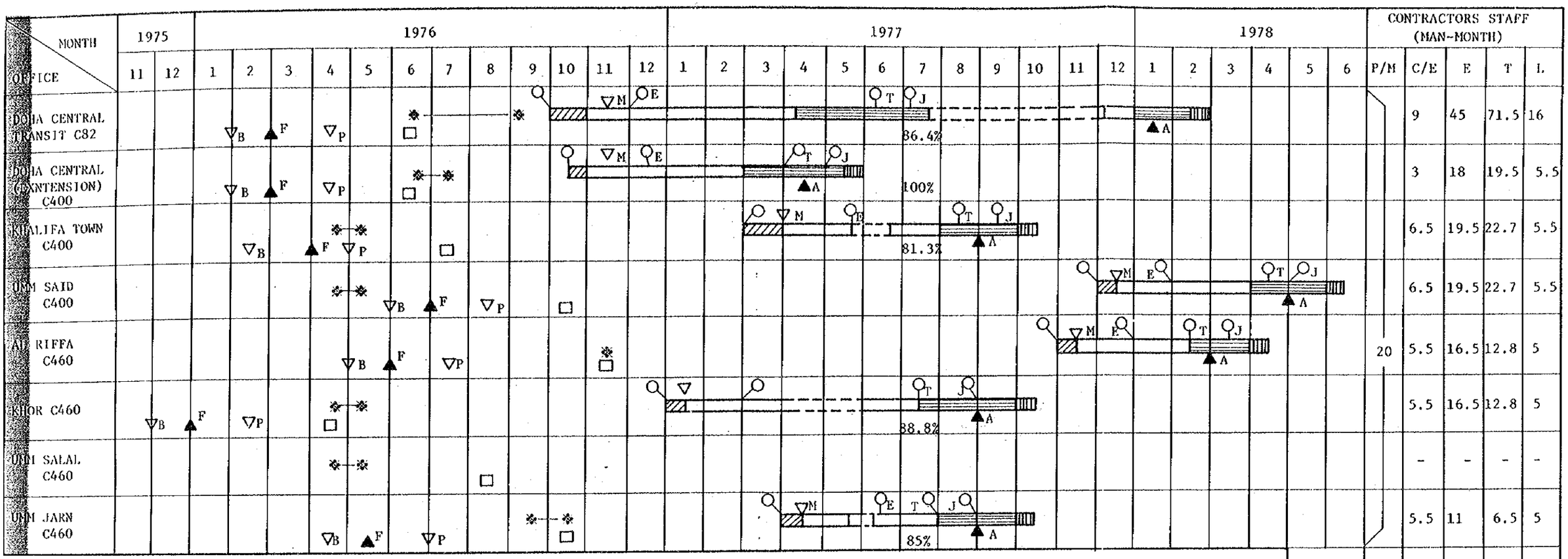


Oct. 30th 1977

• Operator (assistance)	10
• Faults men	17
• Ring Back	16
• Operator (International)	15
• Time announcer	14
• Telegram	13
• Faults (Test Desk)	12
• Directory Enquiry	18
• Operator (Inter Gulf)	19
• Bahalem ISD	073
• Emergency	999
• Mobile Radio System	20

Fig. 7.1 TRUNKING SCHEME IN QATAR

Table 7.1 INSTALLATION SCHEDULE



CONTRACTORS STAFF (MAN-MONTH)	P/M	C/E	E	T	L
DOHA CENTRAL TRANSIT C82		9	45	71.5	16
DOHA CENTRAL (EXTENSION) C400		3	18	19.5	5.5
KHALIFA TOWN C400		6.5	19.5	22.7	5.5
UMM SAID C400		6.5	19.5	22.7	5.5
AL RIFFA C460	20	5.5	16.5	12.8	5
KHOR C460		5.5	16.5	12.8	5
UMM SALAL C460		-	-	-	-
UMM JARN C460		5.5	11	6.5	5
G.TOTAL	20	41.5	146	168.5	47.5

REMARKS 1 : P/M : PROJECT MANAGER
C/E : CHIEF ENGINEER
E : ENGINEER
T : TECHNICIAN
L : LABOURER

REMARKS 2 : ■ : TERMS OF ACCEPTANCE TEST

REMARKS 3 : ▽B : FINAL BUILDING PLAN
LAYOUT OF MDF
ALLOCATION OF MDF

REMARKS 3 : ▽F : NUMBERING & ROUTING PLAN
CATEGORY OF SUBSCRIBER

○ : BUILDING AIR CONDITIONING & A.C POWER SUPPLY SHALL BE COMPLETED.

▲F : FINAL FLOOR PLAN
▽M : MDF COMPLETED
○E : EARTHING COMPLETED
○T : JUNCTION FOR TEST COMPLETED AND AVAILABLE
○J : JUNCTION COMPLETED
▲A : INFORMATION OF DATE OF ACCEPTANCE TEST

※ : SHIPMENT FOR INSTALLATION MATERIAL

1977.12.12

Table 7.2 Installation Schedule

	1977								1978												1979											
	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Doha C400			extension 2000^{L} new exchange 10,000^{L}																													
C82																																
Abu Samra			new exchange 25^{L}																													
Dukham																																
Ghuwairiyah			new exchange 200^{L}																													
Jumailiyah			new exchange 200^{L}																													
Khalifa Town			new exchange 3000^{L} extension 2000^{L}																													
Khor			new exchange 1000^{L}																													
Rayyan			new exchange 2000^{L}																													
Ruwais			new exchange 300^{L}																													
Salwa Road			new exchange 1000^{L}																													
Saudi Nathil			new exchange 50^{L}																													
Shahaniyah			new exchange 300^{L}																													
Stadium																																
Umm Bab			new exchange 200^{L}																													
Umm Jarn			new exchange 300^{L}																													
Umm Said			new exchange 2000^{L}																													
Umm Salal			new exchange 300^{L}																													
Wakrah																																
New Doha			new exchange 3000^{L}																													

8. FUNDAMENTAL APPROACH TO TRAFFIC ENGINEERING

In the past, traffic engineers did their job by simply calculating the number of switch and changing the grading pattern when congestion or an irregular state occurred. Presently in modern industrial societies, traffic is growing and changing in character. Thus, skillful traffic engineers are needed to do the following jobs.

1) Recognition of the nature of traffic.
2) In putting suitable measurements to the switching network.
3) Multilateral analysis of the data given by these tools of complaints to the test desk.
4) Quick response when the need for action arises.
5) Systematically setting up enough equipment to deal with traffic as it develops.
6) Getting more skillful workers and training them regularly.

Apparently, the problem noted above has been identified in QNTS.

It is known that the main reasons for traffic congestion and interference in the telephone network are:

1) calling parties misdialing.
2) Lack of switching capacity, especially in middle stage of SXS system trunking or common control equipment in the XB system.
3) Lack cable and transmission equipment.
4) Circumstances of the called party when called.

9. CONCENTRATING CALL AND COMPLETED CALL RATIO AND AVERAGE TIMES OF DIALING

It is well known that traffic flow has a time base characteristic. To obtain this characteristic, it is necessary to determine a day-long call, week-long call, month-long call, season-long call, etc. Despite the fact that QNTS still needs measurement equipment such as an "Automatic Pen Recorder," this equipment is not available.

The "concentrating call ratio" is an artificial way to get a "day-long call" by using "busy hour call". If we obtain a total call of 60 minutes to the busy hour, we can estimate an "all day call" by using the concentrating call ratio which is denoted as follows.

$$\text{Concentrating call ratio} = \frac{\text{Busy hour call (B.H.C.)}}{\text{All day call (A.D.C.)}} \ (\%)$$

The C400 switching system has registers to count the number of operations by stages i.e. CM Reg: for Completing marker call, OG Reg: for Outgoing trunk call, IC Reg: for Incoming trunk call, DM Reg: for Dialtone marker call and so forth. Using these registers we can get C.C.R. value that

$$\frac{\text{CM Reg B.H.C.}}{\text{CM Reg A.D.C.}} \ (\%)$$

The table shows the C.C.R. value during the time between 4th June to 30th October, 1977 from which the average CCR of 11.5% can be obtained.

The "completed call ratio" is an artificial way to get the finished connection between calling and called subscribers line. It does not mean that a calling subscriber can talk with the called party but refers, rather, to the switching bases.

$$\text{Completed Call Ratio} = \frac{\text{OG Reg} + \text{IC Reg}}{\text{CM Reg}} \ (\%)$$

Table shows that the completed call ratio is about 80% or 90% for day-long calls.

When a calling subscriber encounters a busy line, the calling subscriber will probably soon redial. During busy hours, traffic volume increases quickly. By using the register, we can determine the frequency of subscriber dialing during these hours. If we put the value α into the equation,

$$\alpha = \frac{\text{OG Reg} + \text{IC Reg}}{\text{CM Reg}} \ (\%)$$

then, the average frequency of dialing will be

$$\beta = \frac{\text{DM Reg}}{\text{CM Reg} - \frac{\text{IC Reg}}{\alpha}} \ (\%)$$

Numerical data gives us $\beta = 1.5 \sim 1.6$. This is the average value for the whole day. During busy hours, this figure will be almost the same or somewhat less.

$$\beta \leq 1.5X \ \frac{1}{\text{concentrating call ratio}}$$

$$\leq 1.5X \ \frac{1}{0.115}$$

$$\leq 13$$

This means that calling parties have to dial 13 or fewer times to make a connection during busy hours.

Table 9.1 Completed Call Ratio and Average Times of Dialling

Date	C_M(Call)	O_G(Call)	I_C(Call)	D_M(Call)	L_B(Call)	α_o (%)	β (%)
Feb. 20 1977	54421	33667	16294	55495	———	91.8	1.513
27	63869	40980	16506	63869		90.6	1.764
Mar. 6	61212	39670	16502	64719		91.7	1.475
13	62665	41847	16443	69847		93.0	1.574
20	61643	40334	16617	65002		92.4	1.469
27	56073	36412	15420	61743		92.4	1.568
April 2	54779	34596	15791	70188		92.0	1.865
9	63797	38000	18779	65766		89.8	1.534
16	71884	40151	25100	86599		90.8	1.957
23	73385	38754	27649	77027		90.5	1.798
May 1	79659	54618	17617	92471		90.7	1.535
9	77824	51799	18798	87025		90.7	1.524
15	85211	59018	19858	95004		92.6	1.499
22	87258	60999	19308	100638		92.0	1.519
28	102770	62571	19055	116357		79.4	1.477
Jun. 4	160323	92851	136705	54103		85.3	
11	146783	85293	29962	191214		78.5	1.760
18	126437	76739	27902	151495	———	82.8	1.634
25	118556	70435	26669	137379	10428	81.1	1.604
July 3	113723	70880	25680	131453	14696	84.9	1.575
9	107346	63237	25462	143331	11895	82.6	1.873
16	104518	63332	24574	120169	11359	84.2	1.595
24	105796	66503	24474	124533	11568	86.0	1.610
31	101479	66660	23959	115679	9892	89.3	1.550
Aug. 7	105709	68871	23677	123088	11064	87.6	1.564
14	110043	71564	24337	130751	11240	87.2	1.592
20	91437	58697	21614	105754	8123	87.8	1.583
28	93716	61056	21334	117829	8666	87.9	1.700
Sept. 5	93827	60331	21631	113043	9594	87.4	1.636
11	105551	63670	23915	129798	9684	83.0	1.691
19	135784	78743	28330	158762	12148	78.9	1.590
25	138129	80697	28783	163566	11803	79.3	1.382
26	140350	81115	28988	168086	13077	78.5	1.625

Date	$CM^{(Call)}$	$OG^{(Call)}$	$IC^{(Call)}$	$DM^{(Call)}$	$LB^{(Call)}$	αo (%)	β (%)
Oct. 2 1977	140045	81439	29012	164584	13095	78.8	1.594
9	139425	78890	30076	159476	13690	78.2	1.580
16	137315	79409	29283	155109	12829	79.2	1.546
24	132325	78450	28517	148161	25868	80.8	1.527
30	130757	77008	28030	147381	12594	80.3	1.548
Nov. 7	131043	79674	28467	148861	14604	82.5	1.542
13	123757	73091	28825	131103	14279	82.4	1.477
23	112502	69854	26608	140937	11055	95.5	1.665
26	84496	54735	21112	99703	6764	85.8	1.852

$$\alpha o = \frac{OG\ Reg + IC\ Reg}{CM\ Reg}\ (\%) \propto \text{Completed Call Ratio}$$

$$\beta = \frac{DM\ Reg}{CM\ Reg\left(1 - \frac{IC\ Reg}{IC\ Reg + OG\ Reg}\right)} = \frac{CM\ Reg}{CM\ Reg - \frac{IC\ Reg}{\alpha}}\ (\%) \propto \text{Average times of Dialling}$$

OG, IC, CM, DM: ADC

Date	CM (ADC)	CM (BMC)	CCR (%)	OGT (erl)	IUT (erl)	γ (%)	δ (ADC)	ϵ (ADC)	ζ (%)	θ	B
1977 June 4	160323	16049	10.0	108.86	59.66	54.8	50882	187587	—		
11	146783	16841	11.5	111.48	61.84	55.5	47338	77300	)		
18	126437	15477	12.2	117.1	66.11	56.5	43358	71260	—		
25	118556	13537	11.4	118.47	61.89	52.2	36767	63436	16.4	1.88	(1283)
Jul. 16	104518	13335	12.8	116.67	53.18	45.6	28879	53453	21.3	1.55	(2543)
24	105796	10999	10.4	110.09	52.43	47.6	31655	56129	20.6	1.61	(1090)
31	101479	11392	11.2	108.03	55.64	51.5	34330	58289	17.0	1.80	(1364)
Aug.14	110043	12902	11.7	114.7	60.55	52.8	37786	62123	18.0	1.84	(1689)
28	93716	11651	12.4	114.97	49.86	43.4	26498	47832	18.1	1.38	(1354)
Sep. 5	93827	12167	13.0	114.04	51.41	45.1	27209	48840	19.6	1.47	(1385)
〃 11	105551	12070	11.4	113.52	56.95	50.1	31899	55814	17.4	1.77	(1356)
25	138129	18594	13.5	122.2	67.43	55.2	44545	73328	16.1	2.03	(1558)
Oct.16	137315	16355	11.9	116.16	68.61	59.0	46851	76134	16.9	2.34	(1658)
30	130757	12255	9.4	122.55	67.73	55.3	42585	70615	17.8	2.05	(1544)

CCR: Concentrating call ratio = $\frac{BHC}{ADC}$ (%)

$\gamma = \frac{IUT\ (erl)}{OGT\ (erl)}$ (%) (erl at Busy Hour)

$\delta = OGT^{(ADC)} \times \gamma = IUT^{(ADC)}$

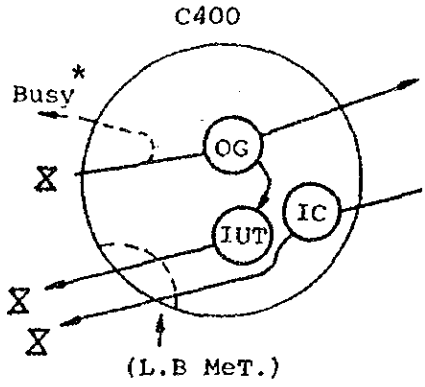
$\epsilon = IC^{(ADC)} + \delta$

$= IC^{(ADC)} + IUT^{(ADC)}$

$\zeta = \frac{LB(ADC)}{\epsilon} = \frac{LB(ADC)}{IC(ADC)+IUT(ADC)}$

$\theta = \frac{\epsilon}{OG(1-\gamma)}$

* B: { CM all busy / Trouble



10. MAIN REASONS FOR TRAFFIC CONGESTION

Traffic congestion in the telephone network mentioned above is shown more precisely in Fig. 10.1

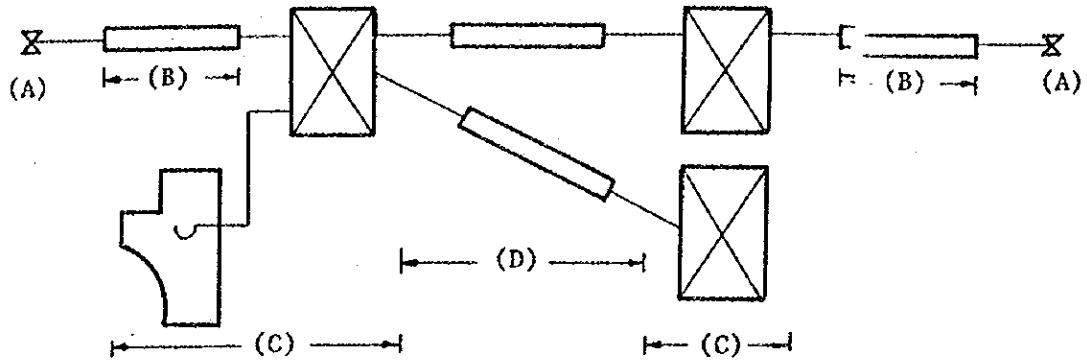


Fig. 10.1 Caused of traffic congestion in the telephone network

Group (A) ... 1) Subscribers mishandling
- a) Hanging up while calling party dials
- b) Hanging up halfway
- c) Hanging up before fast dialing delay
- d) Hanging up before response
- e) No response from called subscriber

2) Misdialing
e.g. hooking dial, forced release of the dial plate to the finger stop...

3) Forgetting to hang up

4) Connection to dead level or dead number

5) Wrong telephone set...

Group (B) ... 1) Wrong insulation to seath

2) Failure caused by a related public construction work e.g. gas, water.

Group (C) ... 1) Lack of common equipment

2) Unbalanced traffic in the common control equipment e.g. line link frame

3) Wrong pulse-generating sender or register

Group (D)... Lack of lines or junctions

The data for investigating Groups (A) and (B) can be obtained introducing service observation equipment and examining the data from the test desk section shown in Fig. 10.2.

For Groups (C) & (D), the approach will be described in the next chapter.

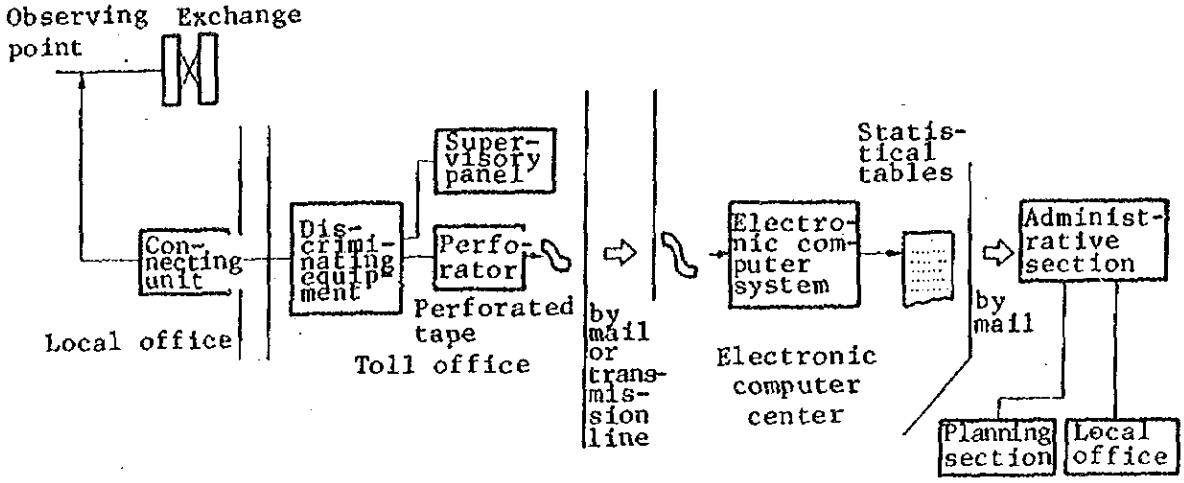


Fig. 10.2 Outline of the No.3 observation system

Supervisory Items

Completed call	
Incompleted call	Subscriber-busy
	Trunk-busy
	Hanging up halfway
	Misdialing
	Hanging up before receiving signal tone
	Hanging up before answering
	Non-answering of called party
	Incompleted calls of semi-automatic office
	Dead level
	Dead number
	Fault in connection
	Hanging up without dialing
	Long pre-pause

11. COMMON CONTROL EQUIPMENT IN THE C400 SYSTEM

The trunking scheme of the C400 XB switching system is shown in Fig. 11.1. This is mainly composed of the speech path and common control equipment, i.e. TRUNK, DIALTONE MARKER, COMPLETING MARKER, NUMBER GROUP, TRANSLATOR, TRUNK-NUMBER GROUP, OUTGOING SENDER, INCOMING REGISTER, LINE LINK and TRUNK LINK, FRAME and SUB METER.

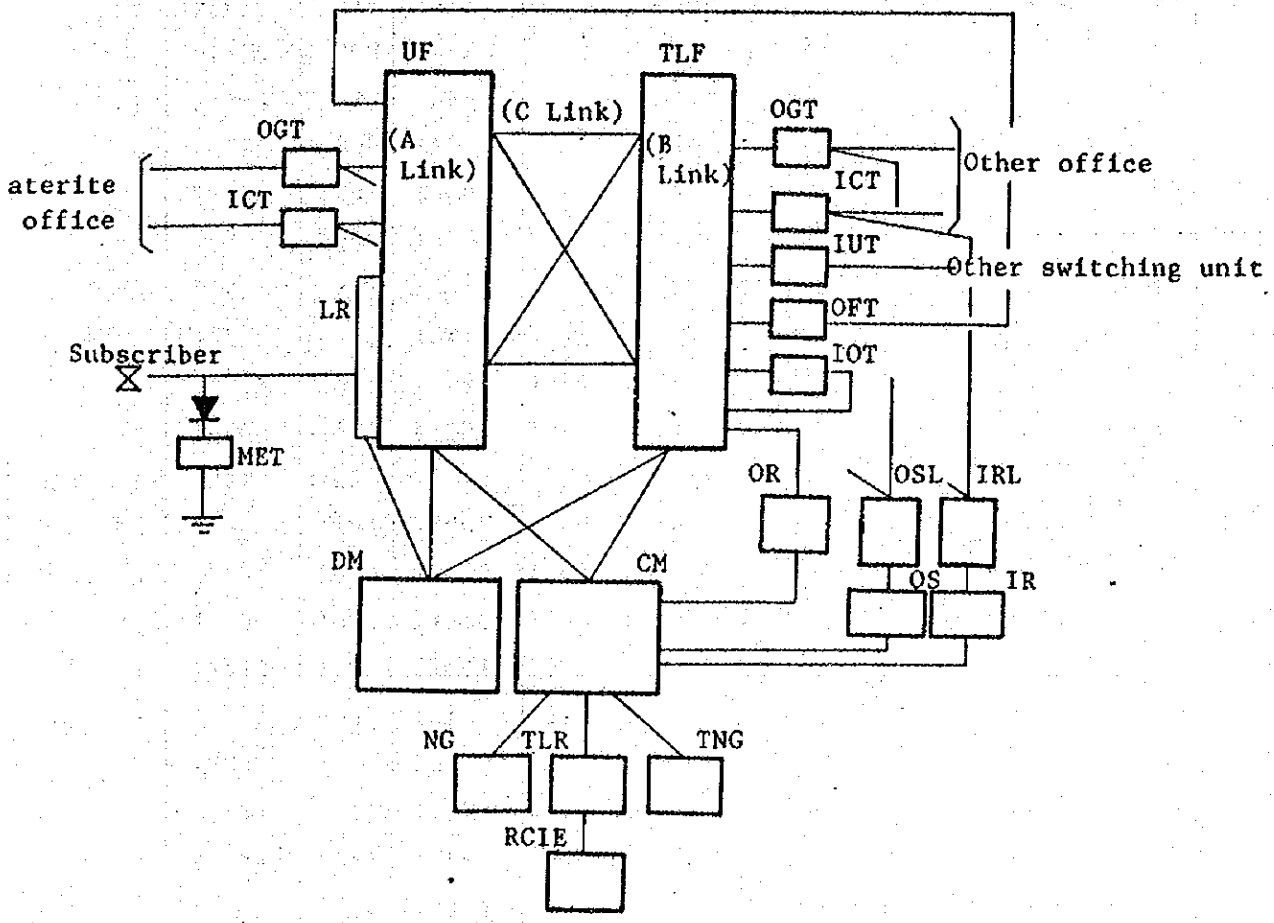


Fig. 11.1 C400 Trunking Scheme

In particular, the DIALTONE MARKER, COMPLETING MARKER, OUTGOING SENDER and LINE LINK FRAME induce traffic congestions if the capacity of this equipment is not enough to carry the traffic.

Table 11.1 C400 Exchange Traffic Record

(One hour)

Time of Record 9:00 - 11:00

1977	DM No. (0.1)	DM Busy	CM No. (0,1,2)	CM Busy (Line Busy)	OG	IC	DROP (50)	DPIR (15)	OS (12)	(%) α_1
June 1	16181	1993	14181		7303	2230	47.74	1.02	9.53	
4	23123	191	16049		8892	2971	47.86	10.61	9.95	
5	21565	217	15233		8288	2707	45.93	9.73	9.84	
6	21628	208	14824		8136	2519	46.22	9.16	9.95	
11	22290	222	16841		8654	3256	45.66	11.41	10.34	
18	18971	808	15477		8262	2831	42.93	10.70	9.95	
21	16486	1293	13388		7695	2630	37.27	9.30	9.64	
22	15753	1400	13635		8408	2747	40.45	10.39	9.68	
23	15467	1317	13517		7687	2846	39.14	11.62	10.65	
July 2	14117	1490	12924	1969	7795	2770	36.95	10.68	10.52	25.26
24	12152	1681	10999	1256	7159	2336	28.93	8.61	9.77	17.54
31	12562	1639	11392	1313	7576	2498	30.14	9.11	9.34	17.33
Aug. 1	12219	1630	11541	1858	7113	2561	27.41	10.55	8.98	26.12
13	14468	1491	12902	1663	8296	2640	32.25	9.18	10.16	20.05
15	11951	1670	10696	1363	6918	2356	27.72	8.75	8.64	19.70
22	12504	1635	11388	1303	7307	2540	25.46	8.98	8.06	17.83
29	13473	1499	11651	1287	7557	2556	34.07	8.66	9.61	17.03
Sep. 5	13982	1558	12167	1330	7846	2628	34.07	9.77	11.16	16.95
11	13842	1520	12070	1315	7741	2598	34.80	10.27	9.73	16.99
24	22889	711	19081	1614	9377	3205	47.52	10.91	10.73	17.21
25	24254	553	18594	1537	9256	3337	46.04	11.18	10.52	16.61
Oct. 15	18293	1012	16355	1644	-070	2941	38.25	10.14	10.86	20.37
29	18789	1486	17008	1530	8574	3028	39.18	9.95	10.34	17.84
Nov. 5	16398	1584	15762	2213	8553	3042	36.27	11.5	10.68	25.87

$$\alpha_1 = \frac{\text{CM Busy}}{\text{CM O/G Calls}} \times 100\ (\%)$$

Calls in June .... extension 3000T & transfered SXS or C_{23} sub into C_{400}.

1) Dial Tone Marker (DM)

According to the traffic record of the C400 system during the period from June 1 to November 5, 1977 (Table 11.1), the DM Reg shows 12,000 ~24,000 calls. The Doha C400 XB switching system has two DMs in the present and its traffic capacity is 15,000 calls or less than the traffic carried. In other words, the Doha XB switching system requires the addition of one or more DM units.

Table 11.2 Dial Tone Markers Required

Item	Sept. 24	Sept. 25	Oct. 15	Oct. 29	Nov. 5
DM Register	22,889	24,254	18,293	18,789	16,398

No. of DMs	Design		Capacity (erl)	Capacity (Call)
2	Standard	a	0.950	13,700
	Lower Limit	1.1a	1.045	15,000
3	Standard	a	1.80	25,900
	Lower Limit	1.1a	1.98	28,500

2) Completing Marker (CM)

Similar to item 1), the number of CMs is 3 in the same system. But present call traffic requires the addition of one more unit.

Table 11.3 Completing Markers Required

Item	Sept: 24	Sept. 25	Oct. 15	Oct. 29	Nov. 5
Total	19,081	18,594	16,355	17,008	15,762
OG	9,377	9,256	8,070	8,574	8,553

No. of CMs	Design		Capacity (erl)	Capacity (Call)
3	Standard	a	1.72	17,900
	Lower Limit	1.07a	1.84	19,200
4	Standard	a	2.59	27,000
	Lower Limit	1.07a	2.77	28,900

3) International Telephone Equipment Outgoing Sender (ITEOS)

As in item 2), the number of OS is 12 in this system, but present OS call traffic requires that the system be expanded by 7 or more units.

Table 11.4 International Telephone Equipment Outgoing Senders Required

Item	Sept. 24	Sept. 25	Oct. 15	Oct. 29	Nov. 5
ITEOS Traffic (erl)	10.73	10.52	10.86	10.34	10.68

No. of ITEOS	12	13	14	15	16	17	18	19
Capacity (erl)	5.88	6.61	7.35	8.11	8.88	9.65	10.44	11.23

4) A-LINK

If there is a call unbalance in the A-LINK Frame, traffic congestion will first occur in the same stage. Table 11.5 shows LLF Traffic volume from the 15th to the 24th of August, 1977 measured as measured automatically "Link A Traffic Measurement." In that frame, there was no unbalance in the traffic volume except for that of LLF Nos. 11, 20, 30 and 31.

Table 11.5 LLF Traffic (Doha C400)

(15th~24th Aug. 1977)

LLF No.	Traffic (erl)	No. of Working Lines	No. of PBX Lines
00	59.77	983	54
01	58.55	847	75
10	55.85	1,013	75
11	47.32	567	54
20	40.63	633	89
21	54.03	1,002	70
30	47.21	1,002	35
31	40.04	991	20

This unbalanced traffic between XB frames occurred because many subscribers have been changing their residence from central Doha to the suburbs e.g. Khalifa Town. Shortly thereafter, new subscribers may be placed in that same frame. And if traffic congestion continues in that frame, QNTS is required to take act on.

In general, the tendency to change one's residence from the center of the capital city to the suburbs is continuing. Thus to decrease traffic congestion caused by ineffective calls, the passing call flow of the frame must be constantly checked. If there is unbalanced traffic, subscribes to the LLF should be placed in another frame.

In the case of C23, Table 11.6 shows the LSF traffic volume in Rayyan C23, 8-13 October, 1977. Apparently, traffic is unbalanced between $LSFA_2$ and $LSFA_3$.

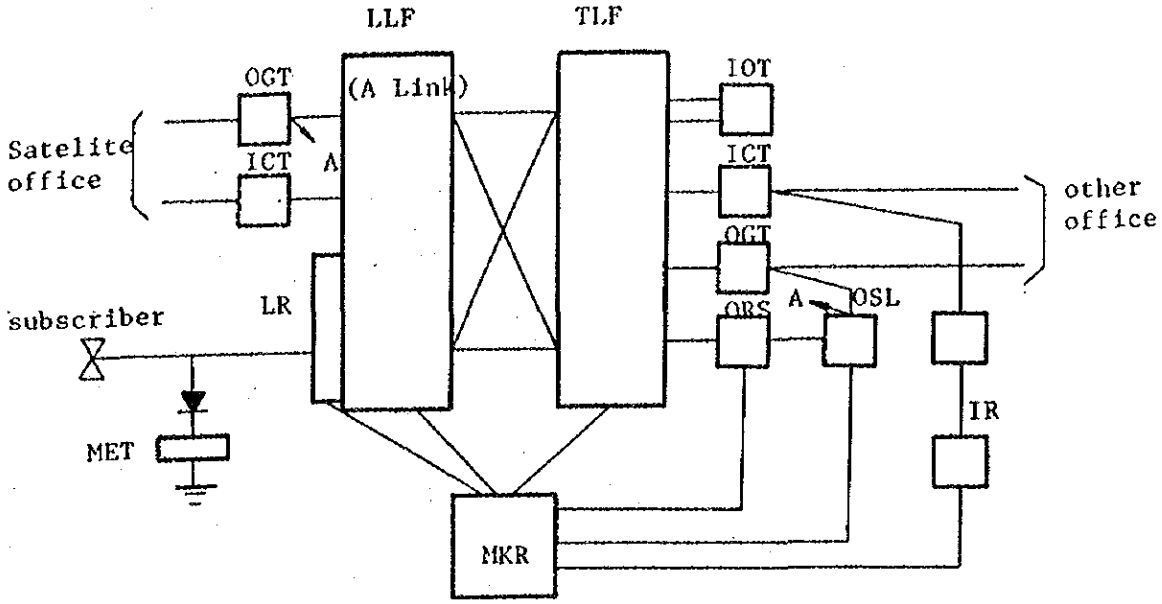
The subscriber cannot be placed in another frame without changing the telephone number. When we place a subscriber, the traffic must be thoroughly considered.

Table 11.6 LSF Traffic Volume (Rayyan C_{23})

8 - 13 Oct., 1977

LSF	Traffic
A_0	14.08
A_1	14.68
A_2	7.92
A_3	25.00
B	14.79

Fig. 11.2 C_{23} Trunking Scheme



12. LACK OF LINE AND JUNCTION CAPACITY

By analyzing the traffic record and service observation record, the lack of lines and junctions can be determined. According to the service observation data measured using a Doha SXS telephone set in February 1977, the effective call rate for each telephone office, i.e. the Doha C400, Khalifa Town (87XXX, 88XXX), Rayyan, Umm Salal Ali, Wakhrah, and Wukair offices, were 76 to 82%, and the busy call rate was 16.67% to 24%. See figure 12.1. Traffic is apparently unbalanced on these lines.

1) Doha SXS - other switching offices

Table 12.2 shows that calls between these offices and the Doha SXS office are conjested.

e.g. a) Doha C_{23} ∿ Doha central SXS: -8^{L} (Jan. 1977)
b) Khalifa I(87XXX) ∿ Doha Central SXS : -4^{L} (Feb. 1977)
c) Khalifa II(88XXX) ∿ Doha Central SXS : -4^{L} (Feb. 1977)
d) Rayyan C_{23} ∿ Doha Central SXS : -20^{L} (Oct. 1977)

The above data, i.e. cases a), b) and c) were measured in January and February of this year, and traffic volume has been growing. In addition to that, the number of waiting lines has been growing rapidly since June 1977.

(see chapter 5, Fig. 5.1. "The trend of working lines, capacity, spacing terminal ratio, and waiter ratio)

2) Doha C400 - Doha SXS

Table 12.3 shows the traffic congestion from October 1976 to September 1977.

a)	Doha SXS (new) A ∿ Doha C400 :	$-7 \sim -8^{L}$	(Feb. 1977)
		-4^{L}	(Mar. 1977)
		-1^{L}	(Apr. 1977)
b)	Doha SXS (new) B ∿ Doha C400 :	-4^{L}	(Feb. 1977)
	:	-2^{L}	(Mar. 1977)
	:	-3^{L}	(Apr. 1977)
c)	Doha SXS (new) C ∿ Doha C400 :	-2^{L}	(Jun.-July. 1977)
d)	Doha SXS (old) A ∿ Doha C400 :	$-5 \sim -6^{L}$	(Feb. 1977)
e)	Doha SXS (old) B ∿ Doha C400 :	$-1 \sim -6^{L}$	(Feb. 1977)
f)	Doha SXS ∿ Doha C400 :	-7^{L}	(Jun.-July. 1977)

Furthermore, during November 1977 to March or April 1978 (when C82 switching system will be cut over) a lack of junctions is anticipated.

a)	Doha C400 ∿ Doha SXS (new) C*	-1^{L}	(* call 1XX, 9XX)
b)	Doha C400 ∿ Doha SXS	-9^{L}	

In spite of quick action in changing the grading, there is nothing that can be done until the next extension of these junctions can be accomplished.

Fig. 12.1 Service Observation Network

Feb. 1977.

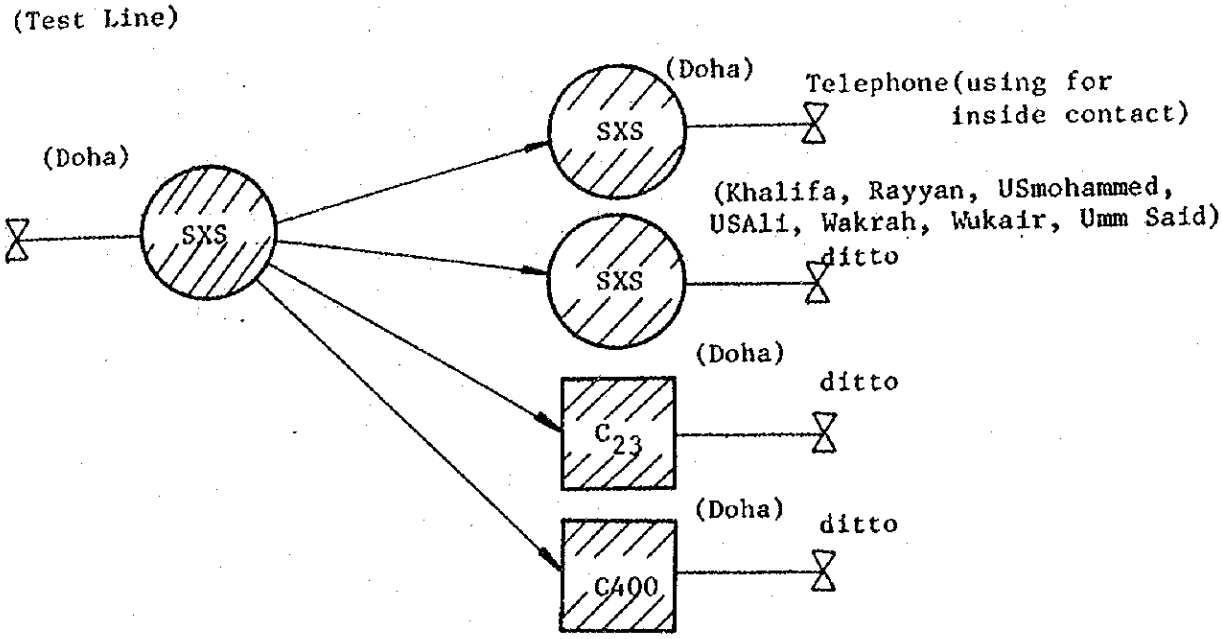
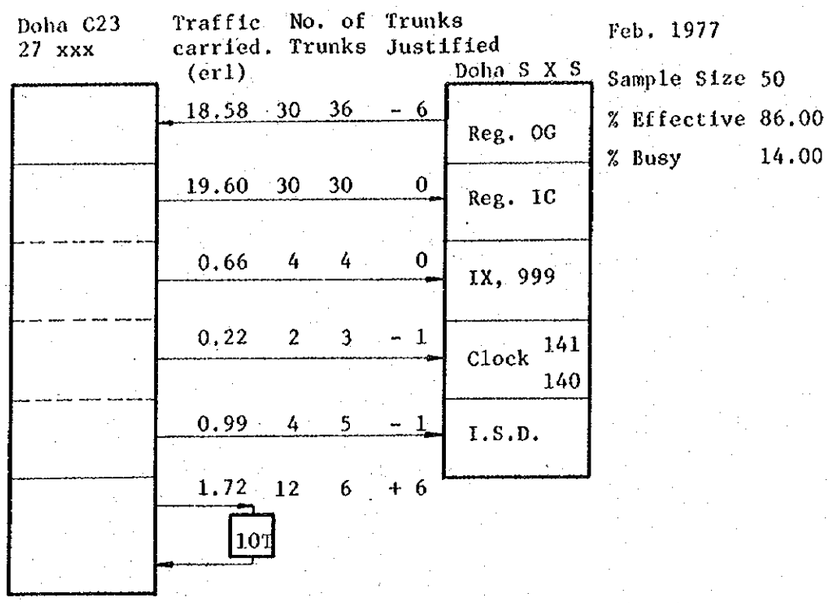


Table 12.1 Service Observed Value

Offices	Sample size	Effective(%)	Busy (%)	No tone (%)	Remarks
Doha SXS	252	88.89	11.11	-	-
Doha C400	30	80.00	20.00	-	-
Khalifa I	50	78.0	22.00	-	87XXX
Khalifa II	50	76.00	24.00	-	88XXX
Rayyan	51	76.47	23.53	-	83XXX
U.S.Mohd	47	91.49	8.51	-	82XXX
U.S.Ali	50	78.00	22.00	-	892XXX
Wakrah	50	82.00	18.00	-	84XXX
Wukair	42	83.33	16.67	-	85XXX
Umm Said	53	92.46	3.77	3.77	77XXX
Doha C_{23}	50	86.00	14.00	-	27XXX

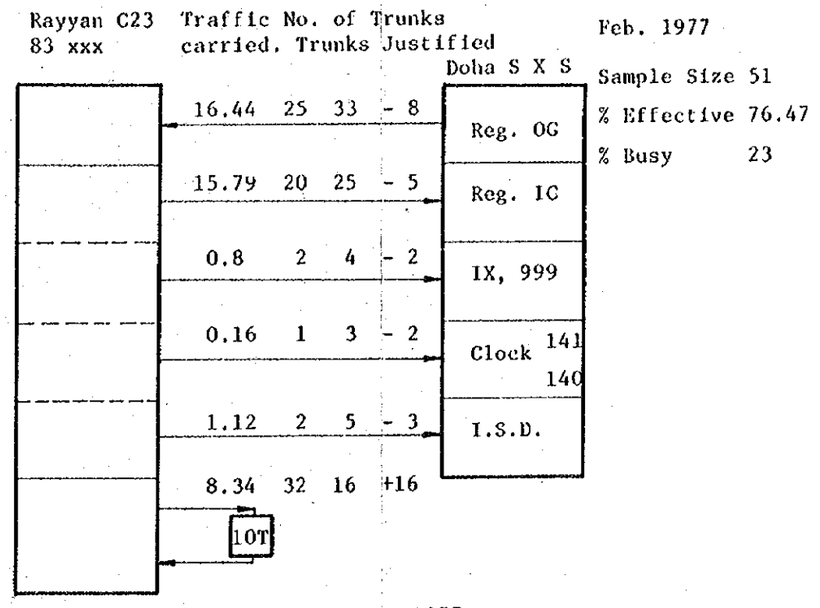
Table 12.2 Traffic Record Between Doha C23, Khalifa T. I, II C23, Rayyan C23 and Doha S X S

29.30,31, Jan. 1977.



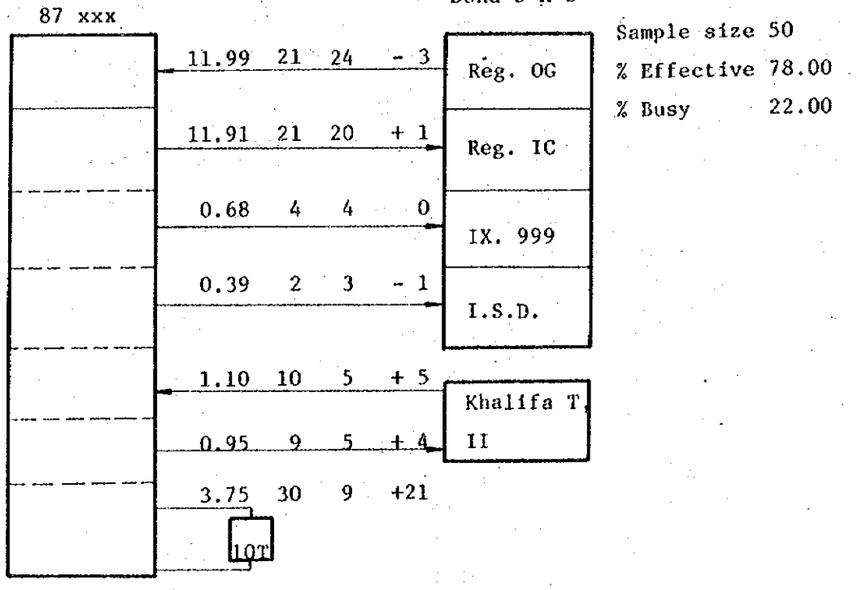
Feb. 1977
Sample Size 50
% Effective 86.00
% Busy 14.00

8,9,10 Oct. 1977.



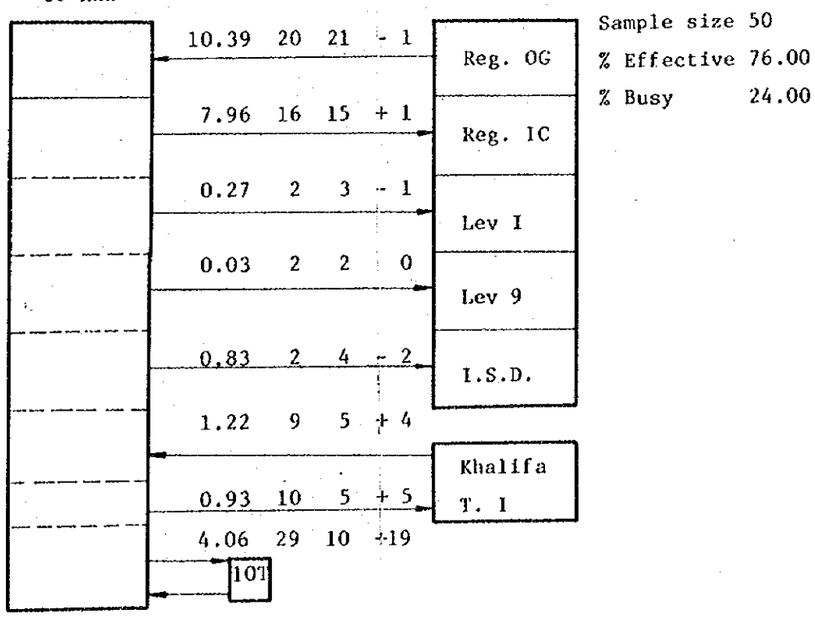
Feb. 1977
Sample Size 51
% Effective 76.47
% Busy 23

14,16,21 Feb.1977



Feb. 1977
Sample size 50
% Effective 78.00
% Busy 22.00

16,21,23 Feb. 1977



Feb. 1977
Sample size 50
% Effective 76.00
% Busy 24.00

TABLE 12.3 TRAFFIC FLOW FROM C400 EXCHANGE (NO. 1)

		September 1976 ∿ May 1977															
		Traffic carried (erl) Feb. 9	Number of Trunks	Trunks Justified	Traffic carried (erl) Feb. 14	Number of Trunks	Trunks Justified	Traffic Carried (erl) Mar. 19.20.21	Apr. 2	Apr. 9	Apr. 23	Average	Number of Trunks	Trunks Justified	Traffic carried (erl) Apr. 30	Number of Trunks	Trunks Justified
To Doha SXS (New) A 21 ∿ 26xxx 141, 140		38.40	44	51	39.65	44	52	44.64	46.16	46.23	48.35	46.35	56	60	53.32	66	67
To Doha SXS (New) B I.S.D. Regular, 1XY,999 21 ∿ 26xxx		5.62	7	12	4.83	7	11	6.30	5.36	5.58	8.27	6.38	11	13	7.12	11	14
To Doha SXS (New) C 13, 15, 18, 10, Regular, 1XY I.S.D. 999		5.05	11	11	3.70	11	9	2.87	2.72	2.83	6.25	3.67	11	9	3.97	11	10
To Doha SXS (Old) A 86xxx, 5xxx, 6xxx, Regular		5.90	7	13	5.57	7	12	8.11	6.78	8.82	8.93	8.16	12	16	7.34	12	14
To Doha SXS (Old) B 7xxxx, 8xxxx, 86xxx, Regular		10.27	12	18	8.00	14	15	9.11	7.20	6.73	10.87	8.48	18	16	8.87	18	16
From Doha SXS		58.10	157	109	60.43	157	113	65.88	68.56	63.67	67.35	66.37	157	124	71.91	157	133
Working Subscribers	C400	3100						3500									
	SXS	New 5900 + G.I.S.D.						Old 1300 + Satellite									

TABLE 12.3 TRAFFIC FLOW FROM C400 EXCHANGE (NO. 2)

June , 1977 ~ October, 1977

	Traffic Carried (erl)														Number of Trunks	Trunks Justified
	Jun. 1	Jun. 4	Jun. 5	Jun. 6	Jun.11	Jun.12	Jun.18	Jun.21	Jun.22	Jul. 2	Jul. 9	Jul.10	Jul.17	Jul.24	Average		
To Doha SXS (New) A 21~26xxx, 6xxx, 86xxx Regular, 141, 140	80.93	77.00	80.63	74.25	78.66	78.12	84.18	83.95	83.21	80.64	80.30	74.78	77.68	80.27	79.39	139	96
To Doha SXS (New) B 21~26xxx, 6xxx, 7xxxx 8xxxx, ISD, 141, 140	29.36	28.81	27.89	23.27	26.75	29.12	25.69	27.72	28.25	31.87	28.75	30.84	26.13	25.48	27.84	50	39
To Doha SXS (New) C 13, 15, 10, 999, 910, 909 21~26xxx, 141, 140, ISD	1.89	3.05	6.00	7.50	6.07	9.41	7.23	6.80	5.95	7.50	7.61	6.93	6.34	5.34	6.15	11	13
From Doha SXS	95.49	105.61	108.98	104.14	118.18	111.05	109.82	114.87	109.57	109.36	108.16	101.50	95.52	88.14	103.66	186	193
	Jul.30	Jul.31	Aug. 1	Aug.13	Aug.15	Aug.22	Aug.29	Sep. 5	Sep.11	Sep.24	Sep.25	Oct.15	Oct.29	Nov. 5			
To Doha SXS (New) A 21~26xxx, 6xxx, 86xxx Regular, 141, 140	70.38	73.39	71.77	77.91	80.05	70.42	82.75	80.95	84.00	78.09	86.23	80.77	83.21	89.18			
To Doha SXS (New) B 21~26xxx, 6xxx, 7xxxx 8xxxx, ISD, 141, 140	24.04	27.46	27.79	30.22	25.81	21.56	24.72	26.25	24.18	28.59	31.06	30.46	33.36	34.09			
To Doha SXS (New) C 13, 15, 10, 999, 910, 909 21~26xxx, 141, 140, ISD	5.84	7.18	7.11	6.57	5.25	4.54	7.50	6.84	5.34	7.41	4.91	4.93	5.98	5.14			
From Doha SXS	92.18	96.64	95.89	96.18	90.00	87.18	92.32	92.80	103.11	117.52	119.70	114.36	109.32	114.93			
Working Subscribers C400	6900																
Working Subscribers SXS	New 5900 + C.I.S.D.								Old 300 + Satellite								

TABLE 12.3 TRAFFIC FLOW FROM C400 EXCHANGE (NO. 3)

November 1977 ∿ March or April 1978							
	Traffic carried (erl) Nov.27	Number of Trunks	Trunks Justified	March or April 1978 ∿ End of 1979	End of 1979 ∿ Middle of 1980	Middle of 1980 ∿
To Doha SXS (New) A 6xxx, 81xxx, 86xxx	4.43	19	10	To Doha SXS A 6xxx, 82xxx, 86xxx, 89xxx	To Doha SXS D 21 ∿ 26xxx (2nd Sel)	To Doha SXS 21 ∿ 26xxx
To Doha SXS (New) B 7xxx, 8xxx, IGSD (Incl. 0965)	33.35	50	45	To Doha SXS D 21 ∿ 26xxx (2nd Sel)	To Doha C82 1xx, 9xx, 7xxxx, 8xxxx	To C82
To Doha SXS (New) C 1xx, 9xx	5.22	11	12	To C82 E 1xx, 9xx, 7xxxx, 8xxxx	From Doha SXS	To New SPC Doha
To Doha SXS (New) D 21 ∿ 26xxx, (2nd Sel.)	76.09	120	92	From Doha SXS		From Doha SXS
From Doha SXS	104.15	186	195			
Working Subscribers — C400	7700					
Working Subscribers — SXS	New 5900 G.I.S.D; Old 300 Satellite			New 5900 G.I.S.D; Old 300	New 5900	New 5900

13. TRAFFIC ACTION PLANNED FOR THE NEAR FUTURE

Forecasting of the future traffic is very difficult but advance calculation of telephone network is essential. QNTS is considering future traffic action plan shown in Tables 13.1 and 13.2. In this case, it is believed that after the C82 switching system is cut over, traffic congestion may be decreased. But is this correct? One can only guess at the moment, as mentioned above, waiting lines and latent traffic is anticipated to increase.

To void this, the following items are important.

1) Whether or not the cutover time of C82 will be started earlier.
2) Whether or not the announcement tone service equipment to avoide effectiveness calls will be introduced.
3) Whether or not Doha C_{23} can be kept on.
4) Whether or not the preceding investment to the junctions will be allowed.

TABLE 13.1 ACTION OF EACH EXCHANGE

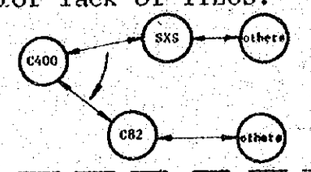
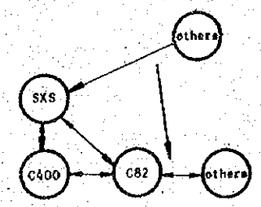
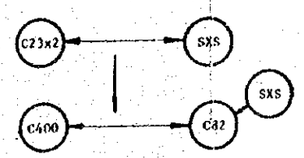
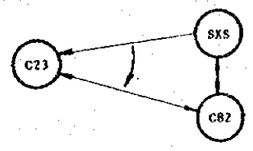
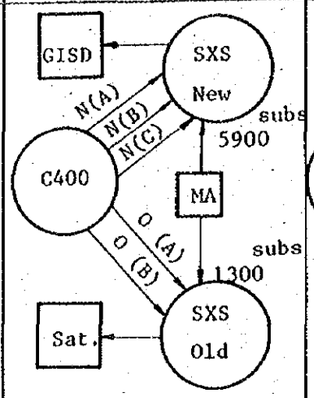
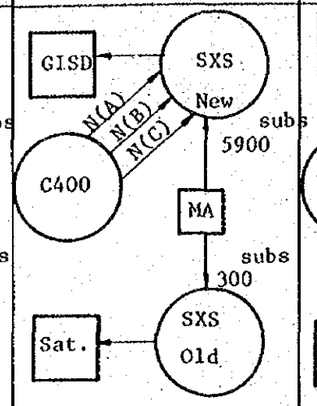
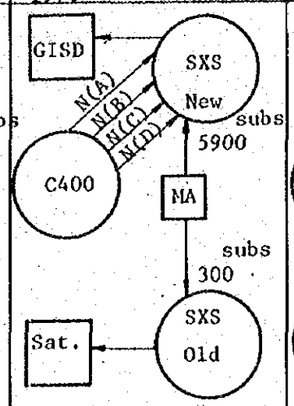
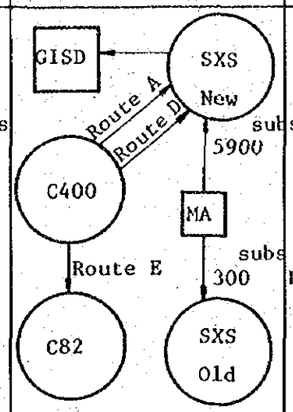
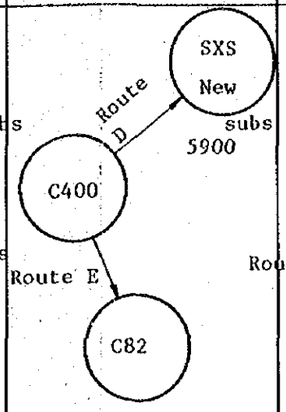
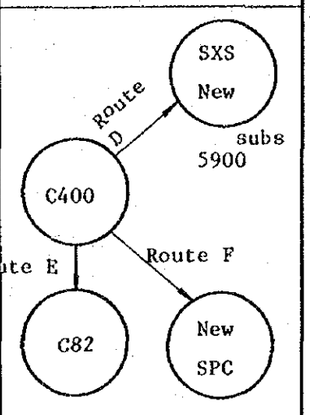
	C82	C400	SXS	Khalifa Town	Rayyan
1977 Dec.		Order { DM × 1, CM × 1, ITEOS × 7			
1978 Jan.			Lack of junction between Doha SXS and C400.	Lack of junction between Khalifa Town and Doha SXS.	Lack of junction between Rayyan and Doha SXS.
Feb.					
Mar.					
Apr.	bring into service	Traffic congestion partly dissolved between C400 and SXS for lack of ITEOS. 		· C400 will be brought into service making a junction between Khalifa T. C400 and C82. · Lack of junction dissolved. 	Junction between Rayyan C23 and C82. (PCM) Lack of junction dissolved. 
May					
June					
July		DM × 1, CM × 1, ITEOS × 7 } arrive.			
Aug.					
Sep.					
Oct.		Installation of DM.CM.ITEOS completed to relieve traffic congestion between C400 and SXS.			
Nov.					
Dec.					
1979 Jan.					

TABLE 13.2 TRAFFIC FLOW FROM C400 EXCHANGE

		Sep. 1976 ∿ May 1977	June 1977 ∿ Oct. 1977	Nov. 1977 ∿ Mar. or Apr. 1978	Mar. or Apr. 1978 ∿ End of 1979	End of 1978 ∿ Mid. of 1980	Mid. of 1980 ∿
Route							
Traffic Carried	Erlang	70.16	113.38	119.09			
	Rate of increase from last year	1	1.62	1.70			

14. GENERAL COUNTERMEASURES FOR TRAFFIC CONGESTION

As mentioned above in chapter 8, skillful traffic engineers are hoping to accomplish the following:

1) Recognition of the nature of the traffic.

2) Placing a suitable system for measurement into the switching network.

More precisely, the following items must be noted.

1) Development of a systematic organization to deal with traffic congestion.

   Fig. 14.1 shows one example of this scheme.

2) Taking action to decrease the congestion.

   a) Introducing traffic measurement for traffic administration.

   b) Changing wrong dials

      Telephone sets having a wrong dial sometimes generate a wrong impulse.

      C400 has a feature for checking the wrong dial by using a trouble recorder when necessary.

      e.g. December 4th, 1977
      Total punched tape ..... 42 pieces.
      RK punched tape ..... 19 pieces.
      RK indicates a wrong dialling subscriber checked by register.

   c) Information from analysis of about special subscriber claimed by calling parties as being always "busy".

      i) Effective use of line hunting service.
      ii) Extension of main wire and telephone set (including PBX).
      iii) Installation of leased circuit, small size key telephone, automatic answering telephone set, automatic dialling set, extension bell, plug-in telephone system, or temporary line.

   d) Using announcement machine.

   e) Accellerating construction work.

   f) Designing period of S + 2 years.

   g) Introducing far to near rotation, etc.

Fig. 14.1
Diagram of Traffic Congestion
- organization, tool and mean -

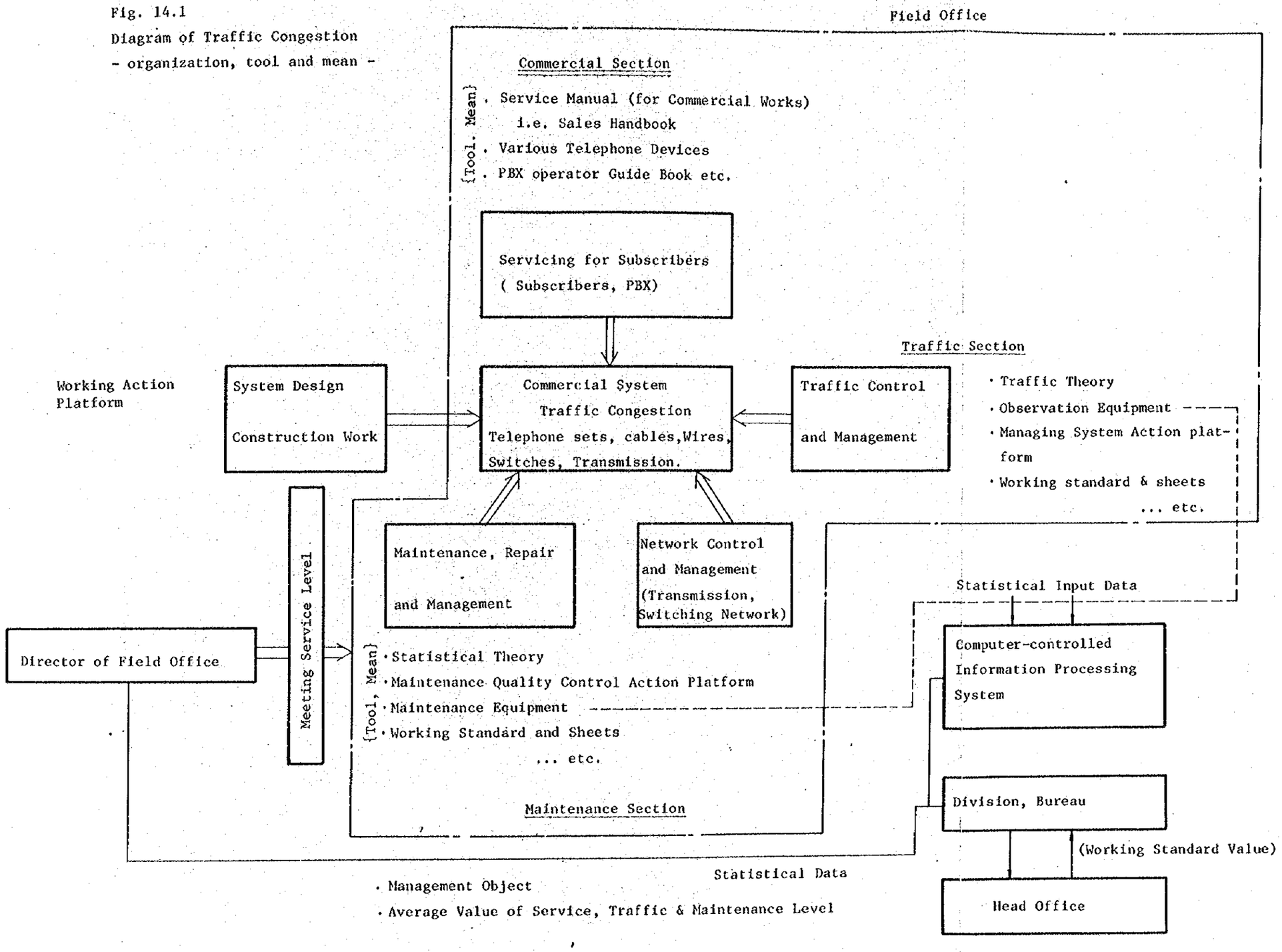


Table 14.1 Traffic Measurement System

[Management]	[Object of Investigation]	[Item for Investigation]		[Measurement]
Management of partial group	Investigation of switching system (Switching frame common control Frame/Trunk)	Traffic volume	Traffic volume per circuit	No.1B Traffic Measurement
				Traffic observation Equipment.
			Traffic volume of Link	Link A Traffic Measurement
		Traffic calls	Traffic calls per switching Frame	Statistical Meter Frame
				No.1B Traffic call Measurement
			Traffic calls per route	No.1A Traffic call Measurement
	Investigation for subscriber's set.		Traffic volume per circuit	No.1 Subscriber's Traffic volume Measurement
				No.2 Subscriber's Traffic volume Measurement.
				No.2 Recording Meter for Subscribers busy status.
Management of total system	Investigation of total system	Conditions of connection between switches and lines. Holding time of circuit		No.3 observation Equipment

Table 14.2 A List of Traffic Measuring Equipment

Items / Designation	Offices equipped with the measurement equipment	Utilization purpose	Indication of result	Measurement capacity	Remarks
No.1A traffic observation equipment	Offices equipped with TOS and TIS.	Traffic volume measurement in respect to incoming and outgoing trunks and senders	· Perforation tape · Monitoring printer · Numerical display device	20 groups × 50 routes. Maximum number of trunks per route is 1,000 trunks	
No.1B traffic recording equipment	Toll center and district center equipped with C400.	Traffic volume measurement in respect to incoming and outgoing trunks, registers and senders.	· Perforation tape · Monitoring printer	Basic frame -5,700 trunks Extension frame - 9,600 trunks	Accommodates incoming and outgoing trunks and common control equipment and measures traffic volume by scanning method at intervals of 12 sec. 3 min. or 6 min.
Type A traffic observation equipment	SXS(Type A) switching offices.	Average holding time(by traffic peg count and traffic density).	Traffic meter	20 trunks per set	Extracts one switch frame, one section or one shelf and connects it to traffic meter.
No.1A traffic peg count equipment	Local XB switching offices and toll XB switching offices.	Measurement of number of calls on a destination by destination basis.	Traffic meters	20 destinations	Classifies the traffic on a called station by called station basis.

Item / Designation	Offices equipped with the measurement equipment	Utilization purpose	Indication of results	Measurement capacity	Remarks
No.1 subscriber's traffic volume measurement equipment	SXS switching offices and C4.5 or C400 XB switching offices	Incoming and outgoing traffic volume on subscriber's circuits	Traffic meter	30 circuits	
No.2 subscriber's traffic volume measurement equipment	SXS switching offices and XB switching offices	Subscriber's traffic volume (total of incoming and outgoing traffic)	Traffic meter	20 circuits	Remote control is available
No.2 subscriber's traffic volume measurement equipment for small switching offices	SXS switching offices and XB switching offices	Traffic volume measurement in small switching offices.	Traffic meter	20 routes	
No.3 observation equipment	SXS switching offices, XB switching offices and electronic switching offices.	Quality of service and holding time	Perforation tape		
No.1B traffic peg count equipment	Local XB switching offices and Toll XB switching offices	Special usage count of common control equipment.	Traffic meter	20 items	Portable traffic meters which are simplified remodel of fixed traffic meters attached to C400 (C460) XB switching system

Items / Design-nation	Offices equipped with the measure-ment equipment	Utilization purpose	Indication of results	Measurement capacity	Remarks
Link A traffic volume measure-ment equipment	C400 XB switching offices	Traffic volume of link A in HG of LLF.	Traffic meter	20 channels per one frame	
No.2C holding time recorder	XB switch-ing offices	Holding time	Teledeltos type paper	20 circuits	
Traffic meters	SXS switch-ing offices and XB switching offices.	Traffic peg count in respect to switches and frames and markers.	Traffic meter	All sections, frames and	
Subscrib-er's meter observa-tion equipment	SXS switch-ing offices and XB switching offices.	Record of message (holding time, des-tination etc.)	Paper tape	1 circuit	

[Measuring item]

(1) Busy hour traffic volume ... for calculation of trunks and switch frame.

(2) Busy hour calls ... for calculation of common control equipment.

(3) All day calls ... for calculation of man-power and enterprise income.

(4) Number of calls classified by terminating area
... to discriminate the terminating area of alternative route.

(5) Holding time ... for conversion of traffic volume to the number of calls or vice versa.

(6) Completion rate ... for check service grade and to verify busy hour traffic.

[Measuring Points]

(1) Trunk ... measurement of route traffic

(2) Common control equipment (marker or decoder in crossbar system)
... measurement of daily calls and the number of calls for each terminating area.

(3) Subscriber's line ... business telephone and residential telephone traffic volume measured separately.

[Measurement]

(1) Traffic flow in manual operation

Manual service traffic like "delayed service" and "operator dialing service" can be measured by referring to traffic cards recording conversation time called party, time period, etc. are entered.

(2) Traffic flow in automatic operation

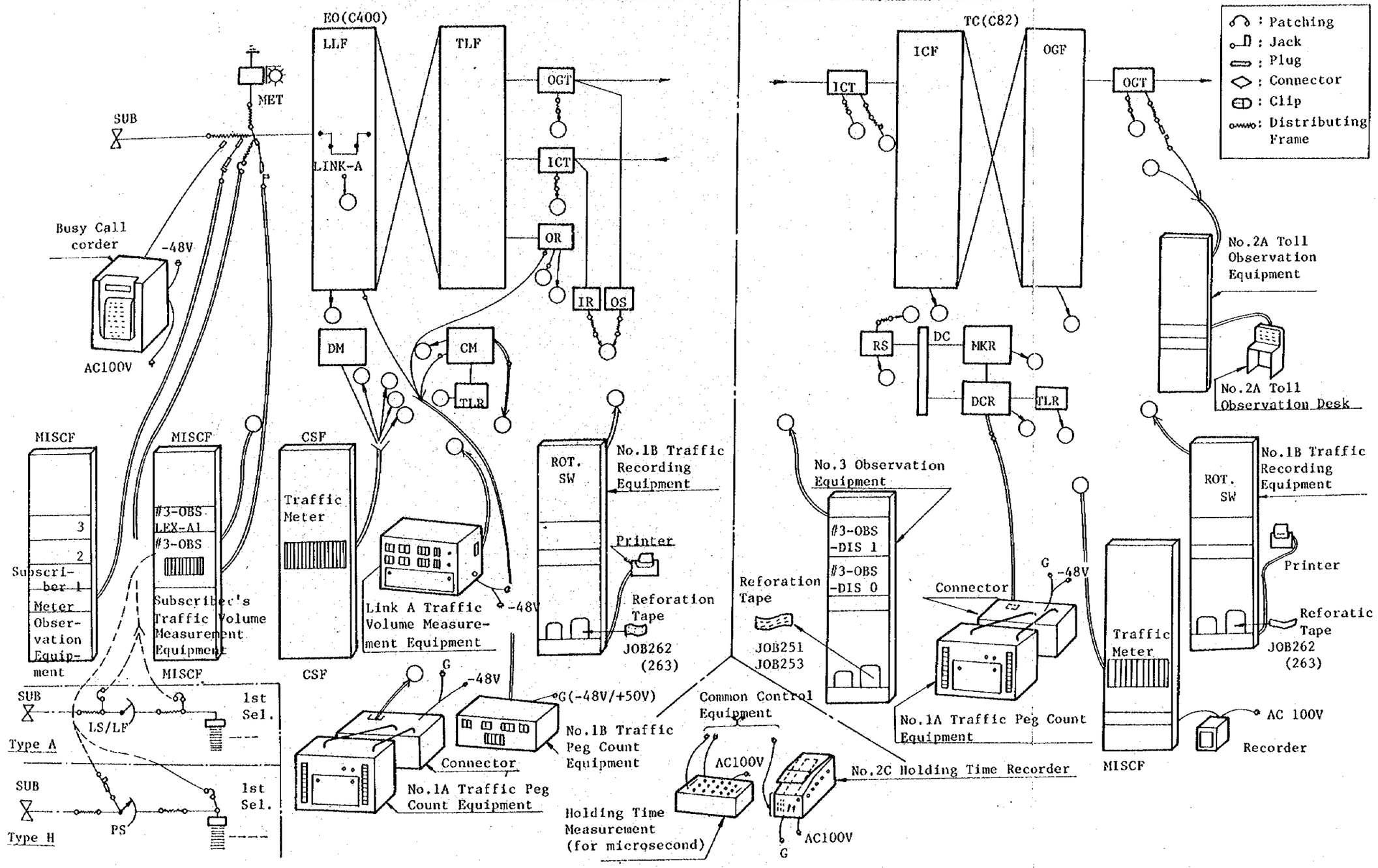
a. Traffic volume

Generally, traffic volume is measured on the basis of each route using the number of simultaneous operating circuits method. The traffic is measured by automatic measuring equipment or visually. Generally, the scanning period is 3 minutes or 6 minutes.

b. Number of calls to each area

The traffic carried by an alternative route consists of traffic to many areas, so the terminating area should be discriminated according to the numbering code on the marker or decoder.

Fig. 14.2 PICTURE OF THE MEASUREMENT EQUIPMENTS FOR TRAFFIC ADMINISTRATION



15. MAKING THE QATAR TELECOMMUNICATION NETWORK IN THE FUTURE

In the past and now as well, the Qatar telecommunication network has been very simple in form and structure due to low traffic; it is technically simple since introduction of such a system was economical to introduce.

Regardless of whether or not an organization wants to maintain the same situation, public works, especially infrastructure, i.e. electric power, gas, oil, water, and communications accelerate changes in their lifestyles and they need to get information and communication; thereafter the telecommunication traffic volume will grow and the concepts will be change. The telecommunication network then must be changed in respect to capacity, call processing speed, and other services. High labour cost in manufacture will raise the equipment cost, and then, despite the high cost at the moment, a wired logic switching system would be changed to a non-wired and packaged type switching system for the advantages in the future.

In the next 20 years, the electronic switching system will change in respect to architecture, i.e., from a space division type SPC system to time division modulation type SPC system.

To introduce a new switching system, we must first study some fundamental problems, i.e., zone planning, the signalling system, the numbering plan, the demand forecast, SPC and rural communication systems, new telephone services including with SPC controlled mobile and maritime system services, and data processing services. These items will be mentioned below.

16. ZONE PLANNING IN THE FUTURE

In order to effectively and orderly pass information consisting of telephone calls, signals, and data calls through the telecommunication network, "zone planning" is generally required around the country.

QNTS is considering one plan shown in Fig. 16.1 (Idea A). Owing to this plan, "Doha and Greater Doha" are denoted as Zone "1" and the semi-capital city Khor and the suburb an area are denoted as Zone "2" and so on. The method of delineating each zone is apparently based on the longitude and latitude lines of the globe.

Generally speaking, it is very simple to delineate the zone, but, since many people are living in near or along the road or want to live there, network planning must be executed accordingly figure 16.2 (Idea B) shows another method of delineation.

1) Delineating the zone mostly along the main road.
2) Naming the numerical code clockwise.
3) Making a balance of zone power.
4) Taking into account the numbering plan.

Fig. 16.3 shows a switching hierarchy based on zone planning (Proposal B).

Figure. 16.1

Zone Planning (Proposal A)

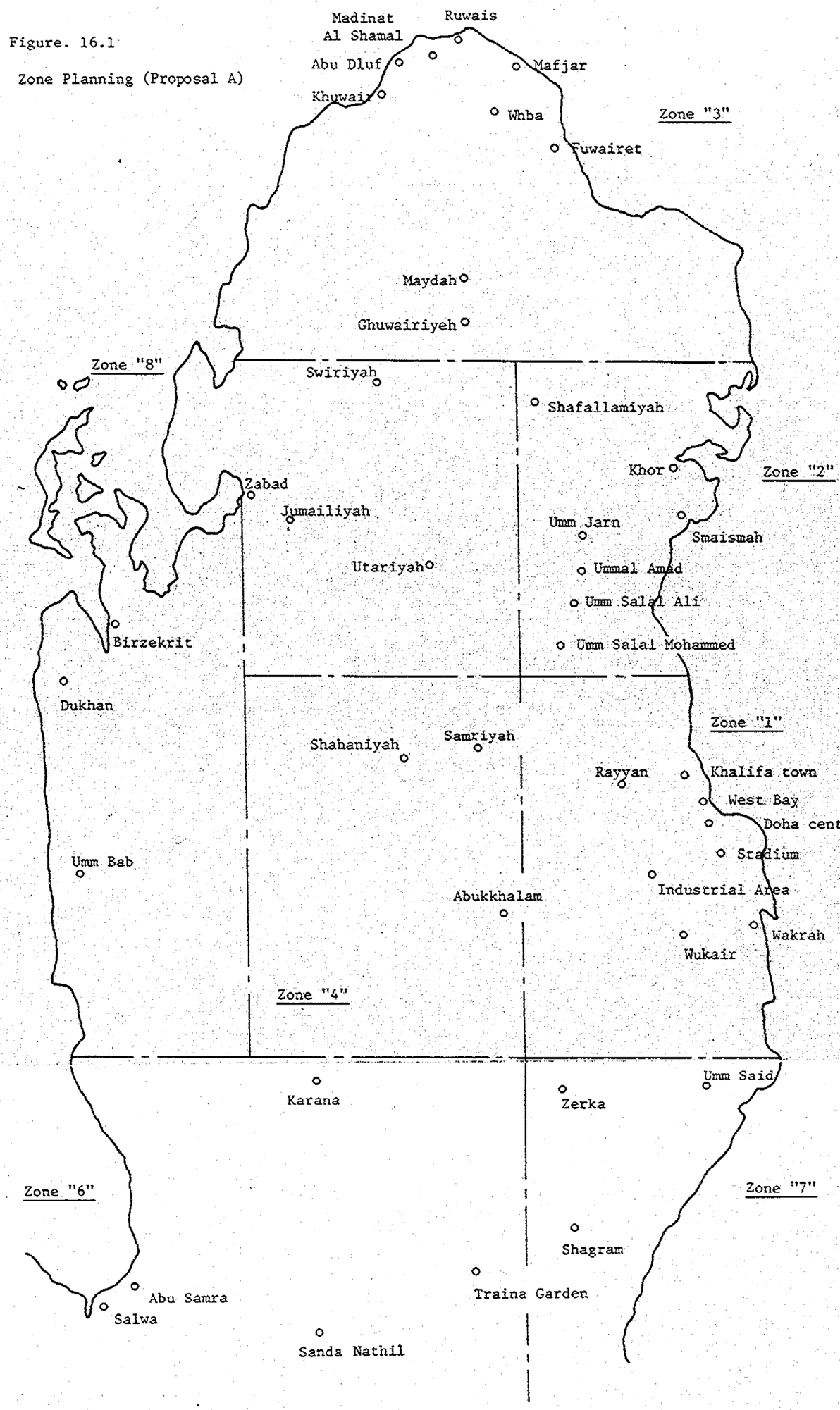


Fig. 16. 2. a)

Zone Planning (Proposal B)

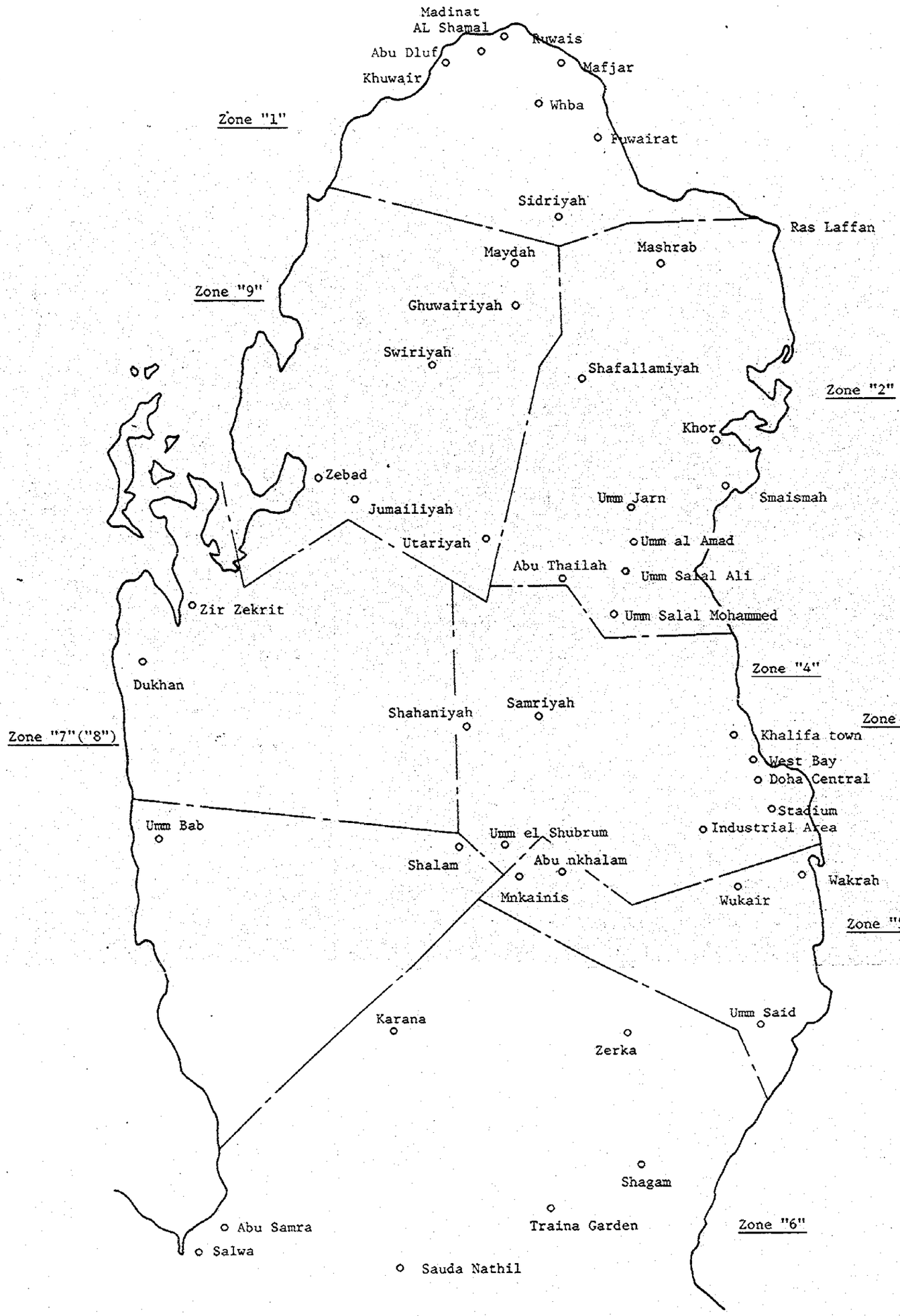


Fig. 12.2.b) Zone "1" Shamal Area.

0 2,5 12,5 Km

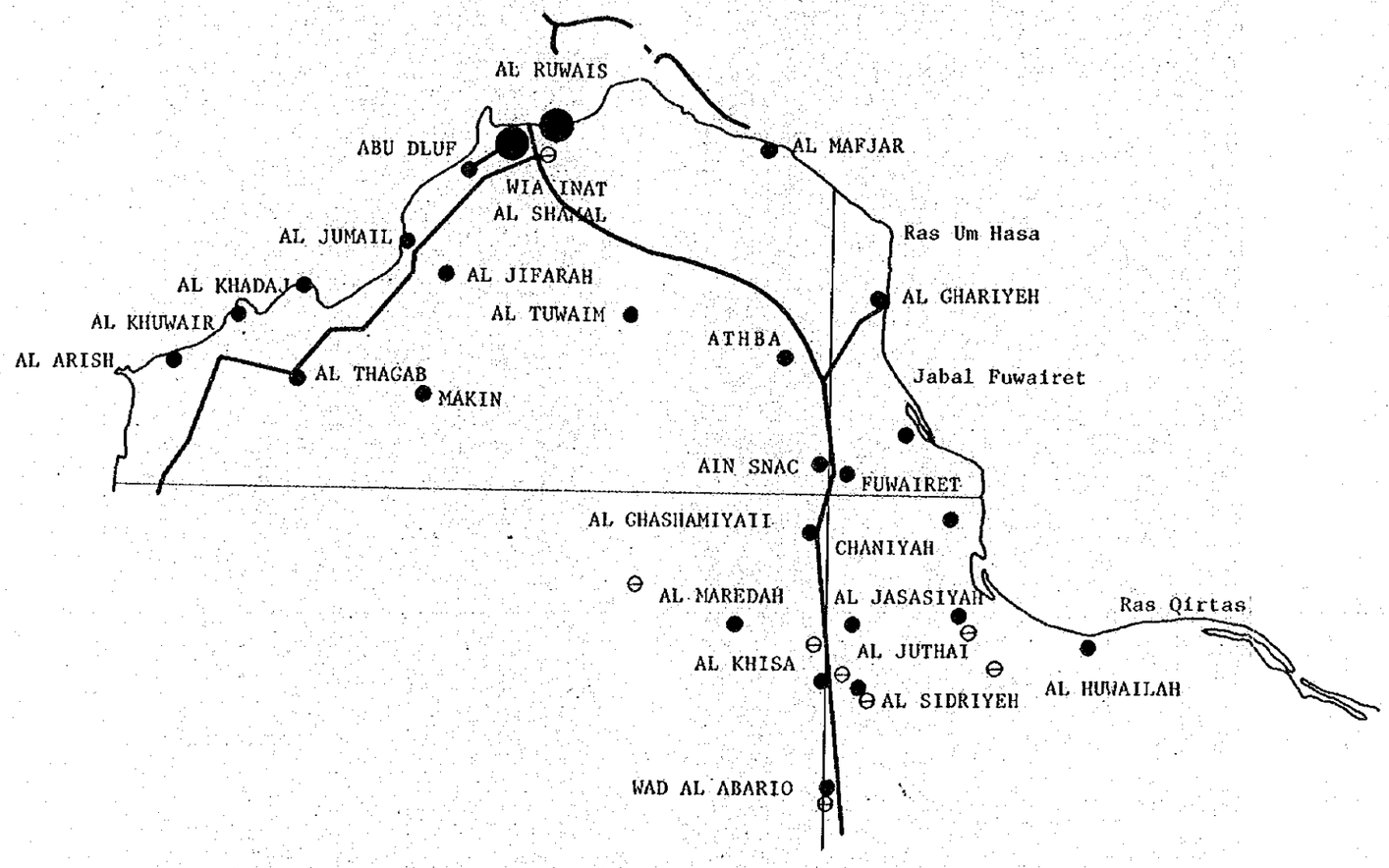


Fig. 12.2. c)

Zone "2" Khor Area

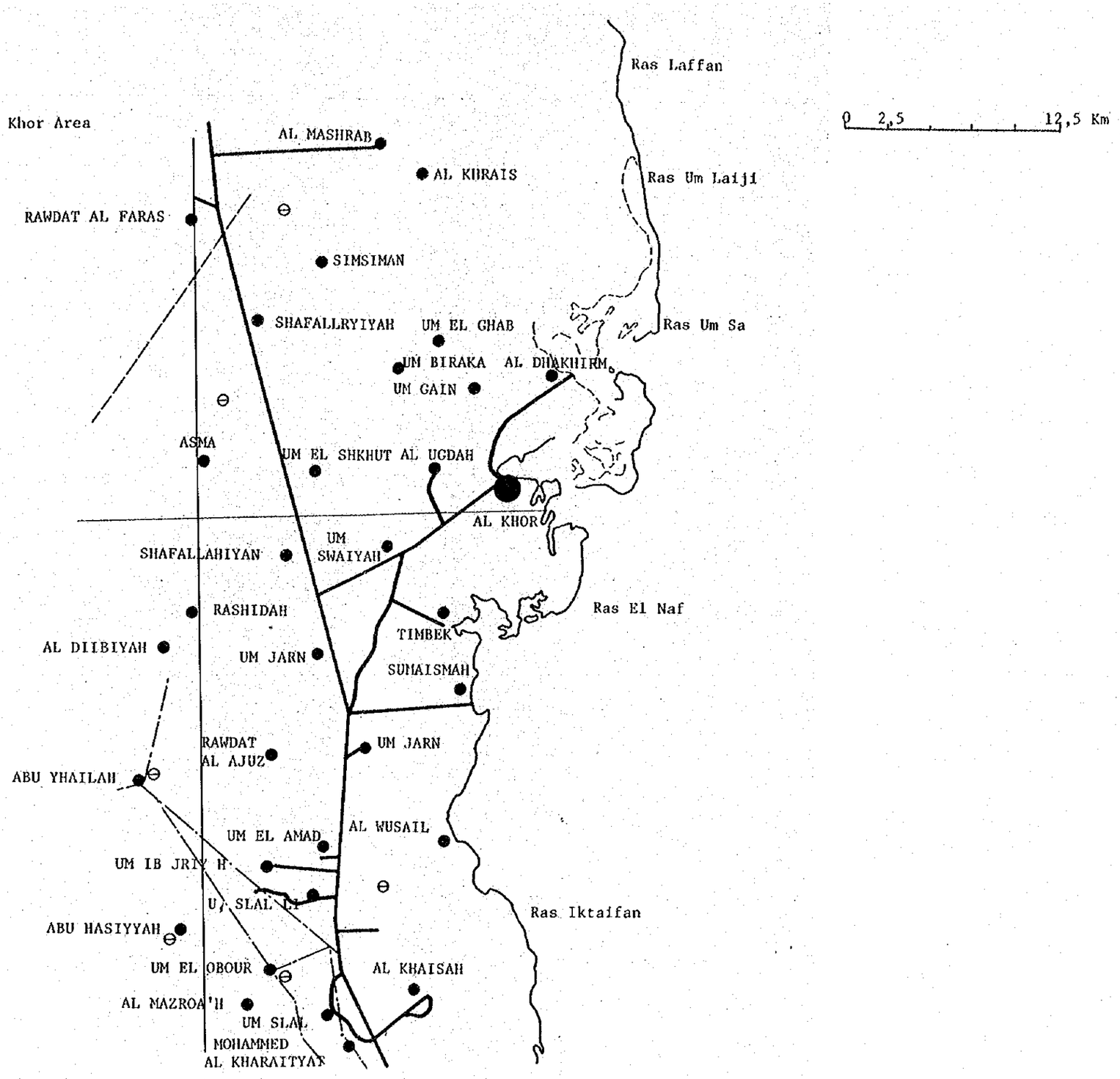


Fig. 12.2. d) Zone "3" d "4"

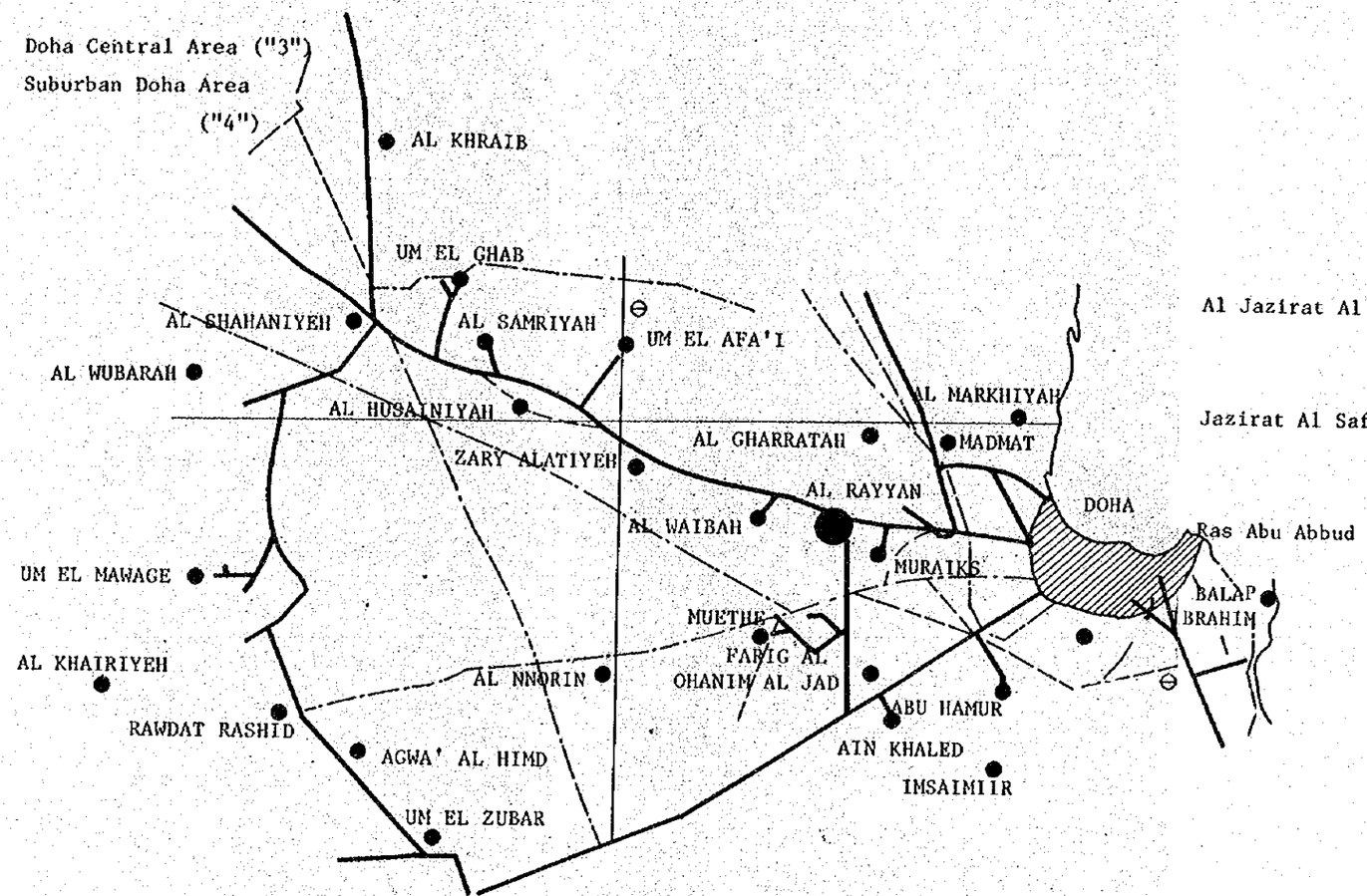


Fig. 12.2. e) Zone "5"

0 2,5 12,5 Km

Wakiahi Said Area.

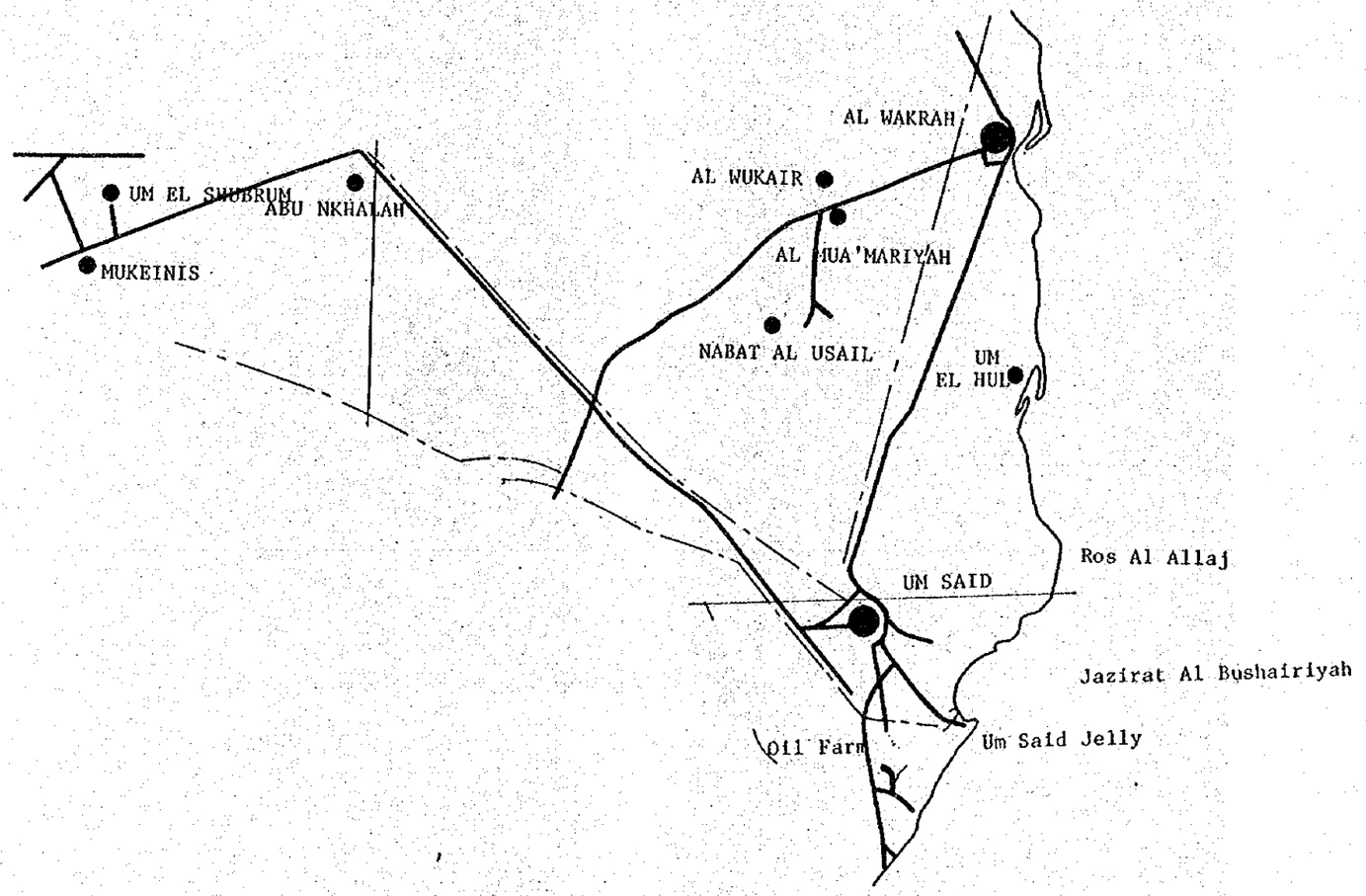


Fig. 12.2 f) Zone "6"

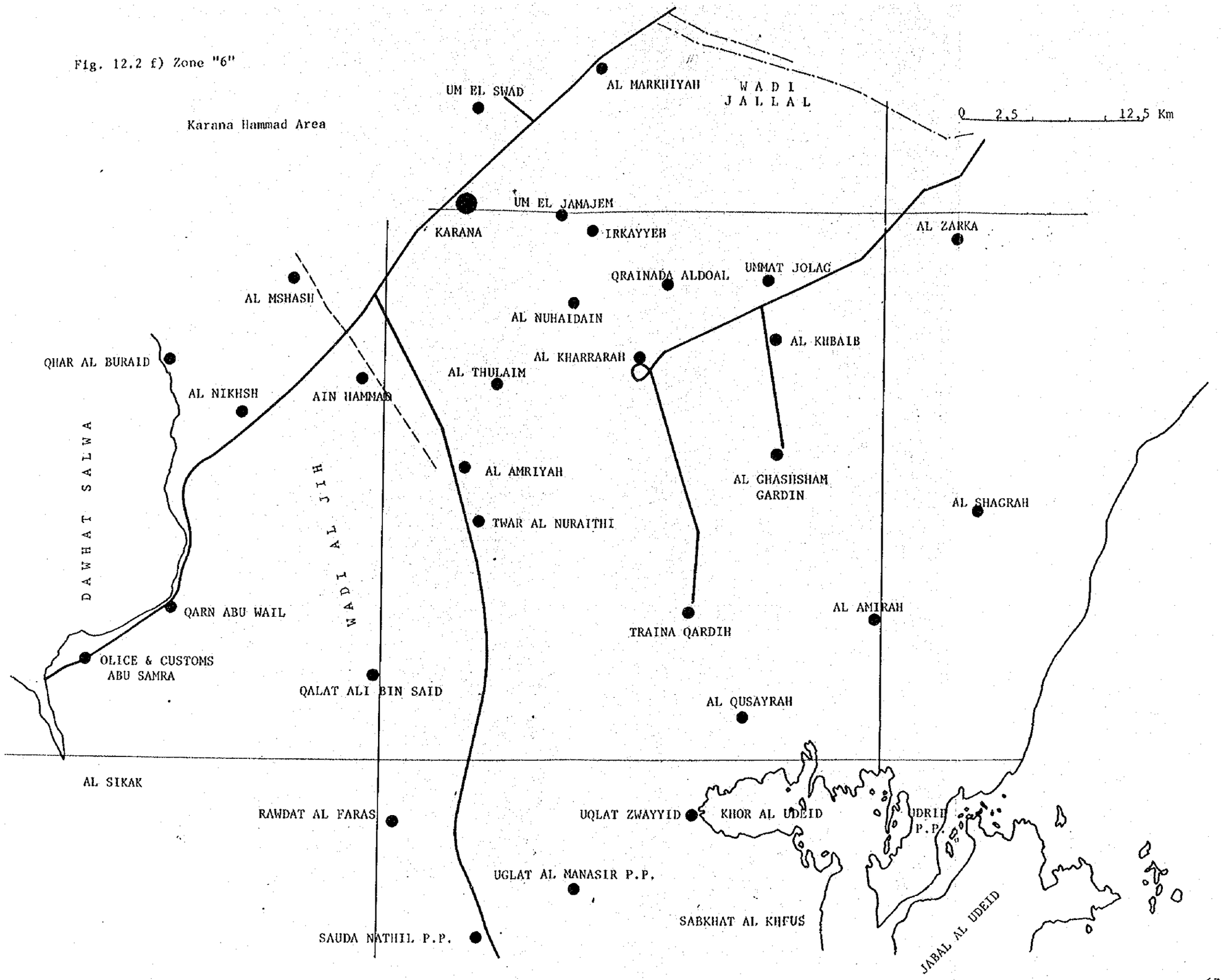


Fig. 12.2. g) Zone "7" ("8")

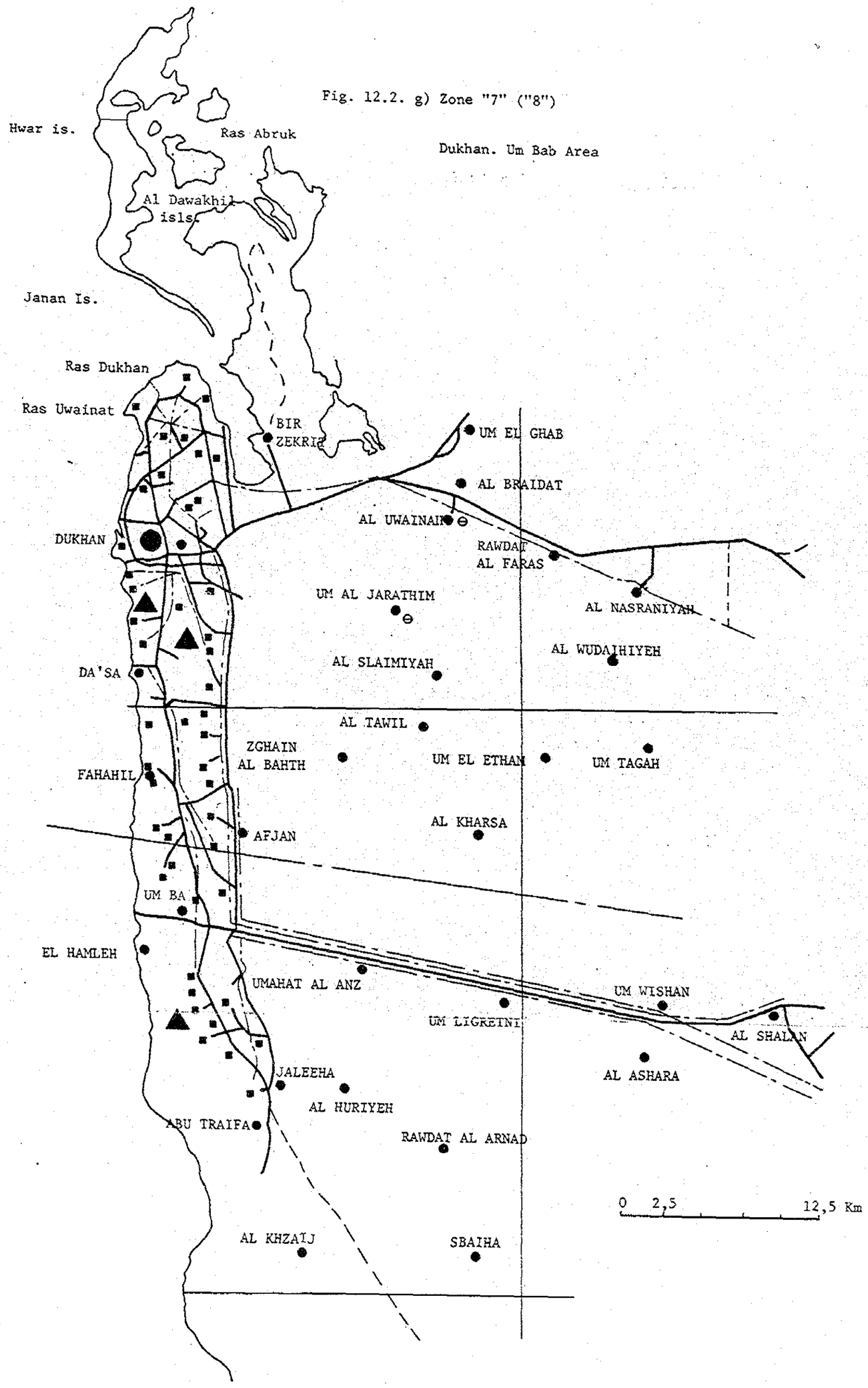


Fig. 12.2. h) Zone, "9"

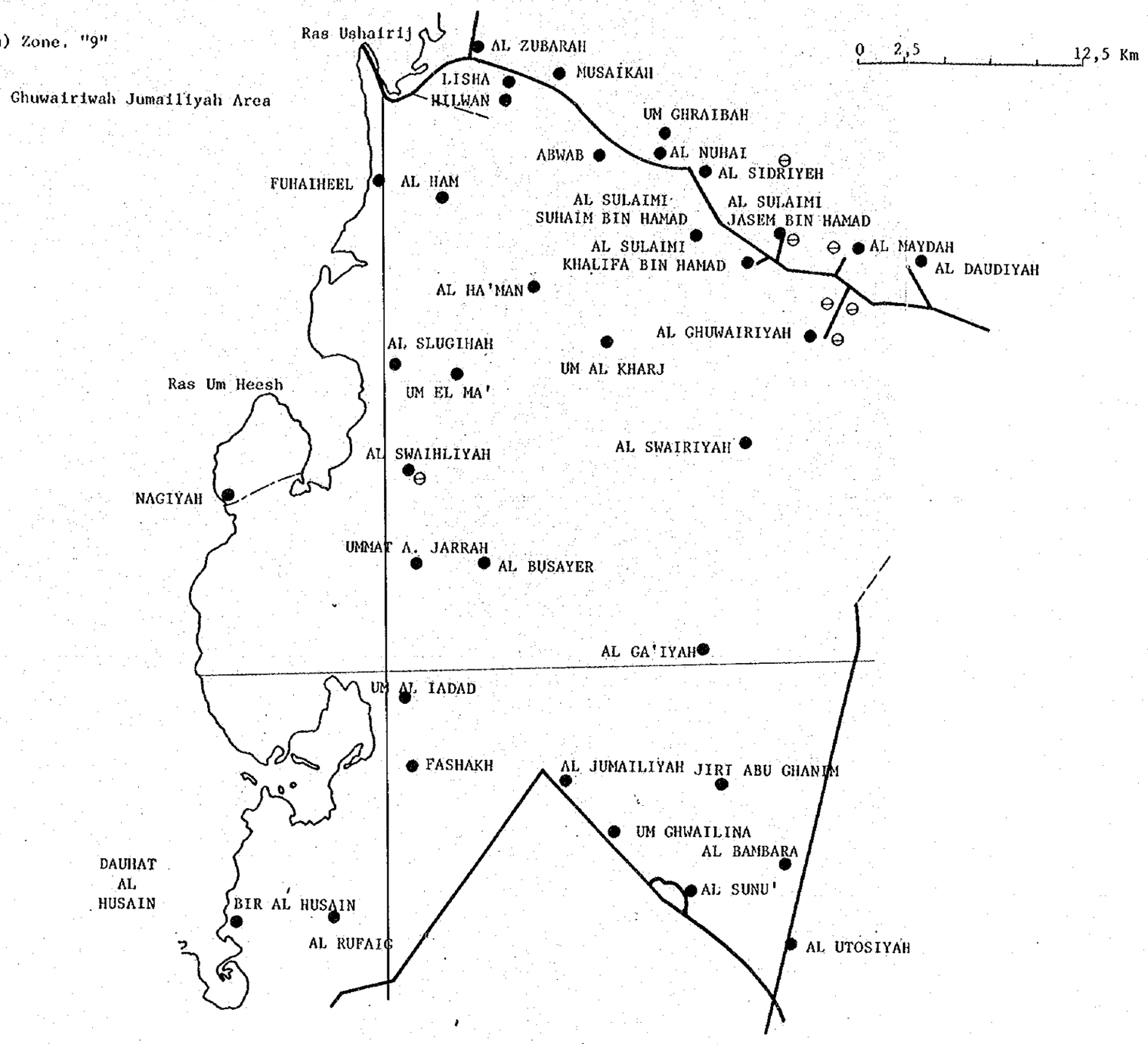
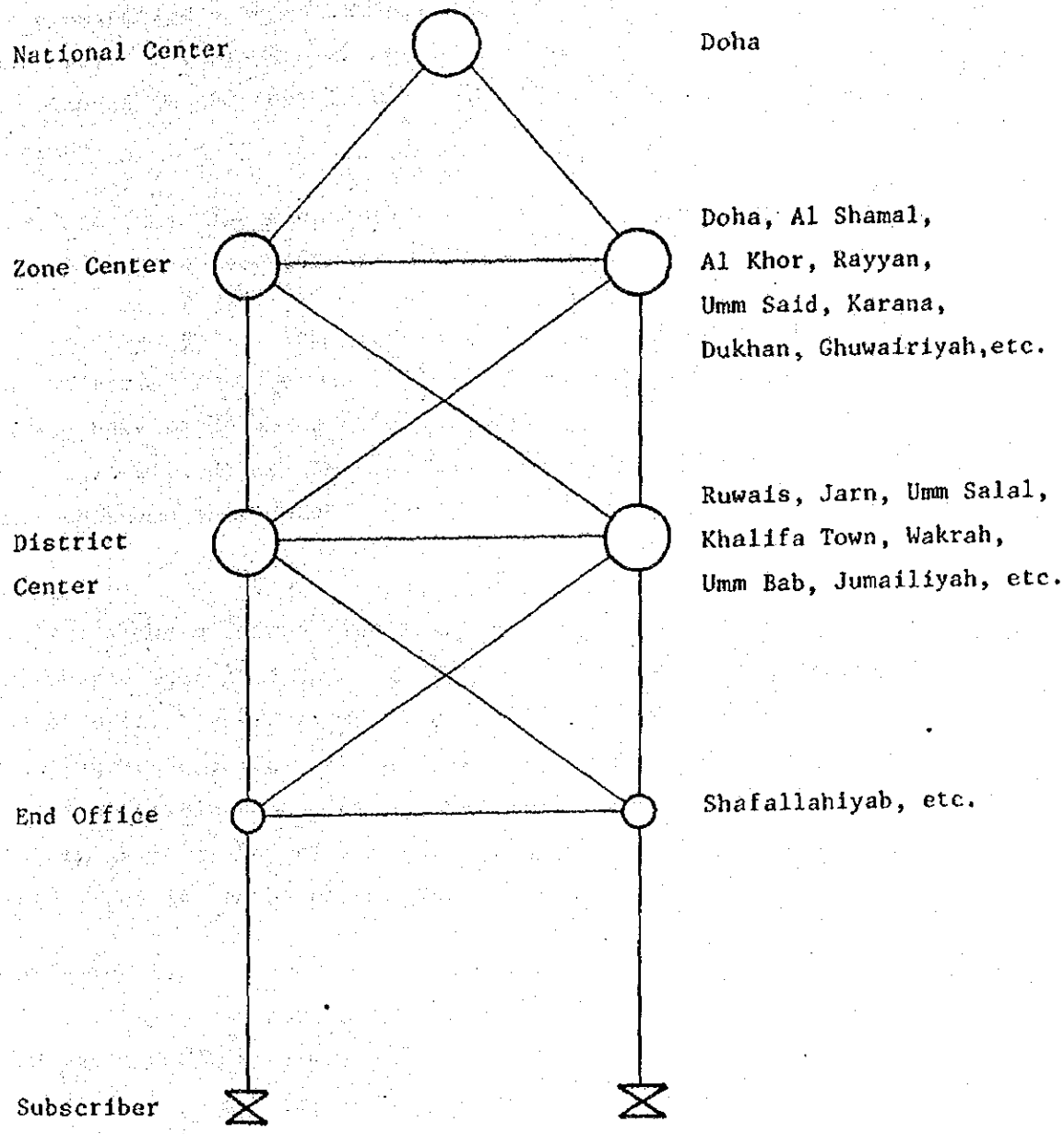


Fig. 16.3 Switching hierarcky based on Zone Planning (Proposal B)



17. SIGNALLING IN THE PRESENT AND NEAR FUTURE

A signalling system is well known as the interface in the switching network. And a desirable setting switching network has only one or two standardized automatic switching systems having same design principle or hierarchy in the same network. If there are three kinds of switching systems, renewal of one will be planned in the near future. In other words, this network is designated as transient.

These interfaces are also simple enough to maintain and operate the system and to introduce new services in the same network.

In spite of using the same signalling system, if the communication network has many switching systems made different countries the circuits of these systems may have to be changed in the field or require design changes in the factory. This will delay construction work or the shipment directly and result in higher construction costs.

(Inland)

Fig. 17.1 shows a future signalling system in the inland switching network based on the Gulf Area signalling plan. These switching systems have two kinds of system architecture, i.e., SXS in U.K and XB in Japan and single signalling system, i.e., MFC R_2. If introduction of systems having the same system architechture or another which is designed by the organization having the same technical know-how is continued, it will be easy to construct and maintain the network.

(International)

Similarly, Fig. 17.2 and Table 17.1 show the signalling system in the international switching network in the near future, and in this case, No.5 and No.6 DPE & M (OB) continuous-type signalling will be used.

Fig. 17.1 Inland Switching Network

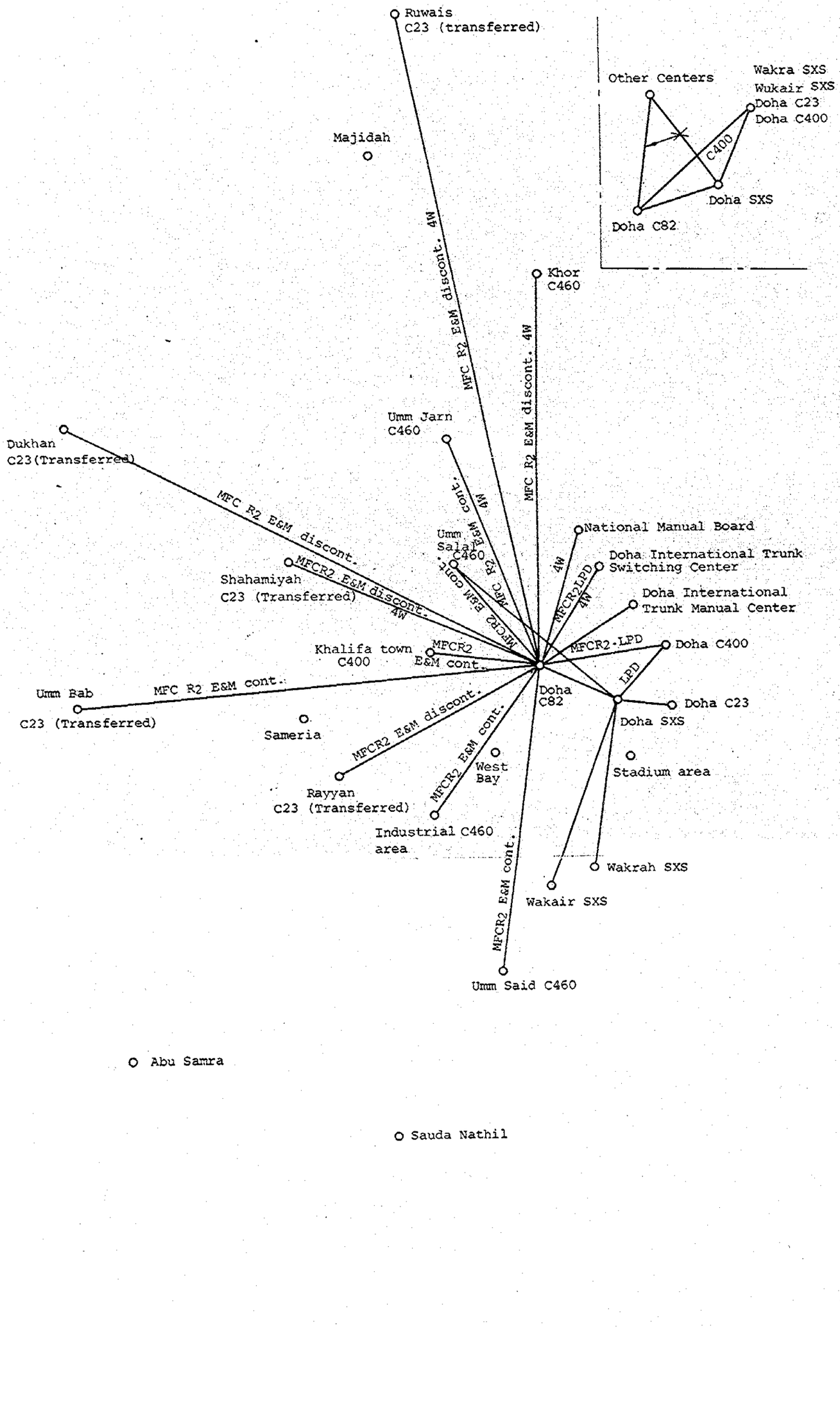


Fig. 17.2 International Switching Network

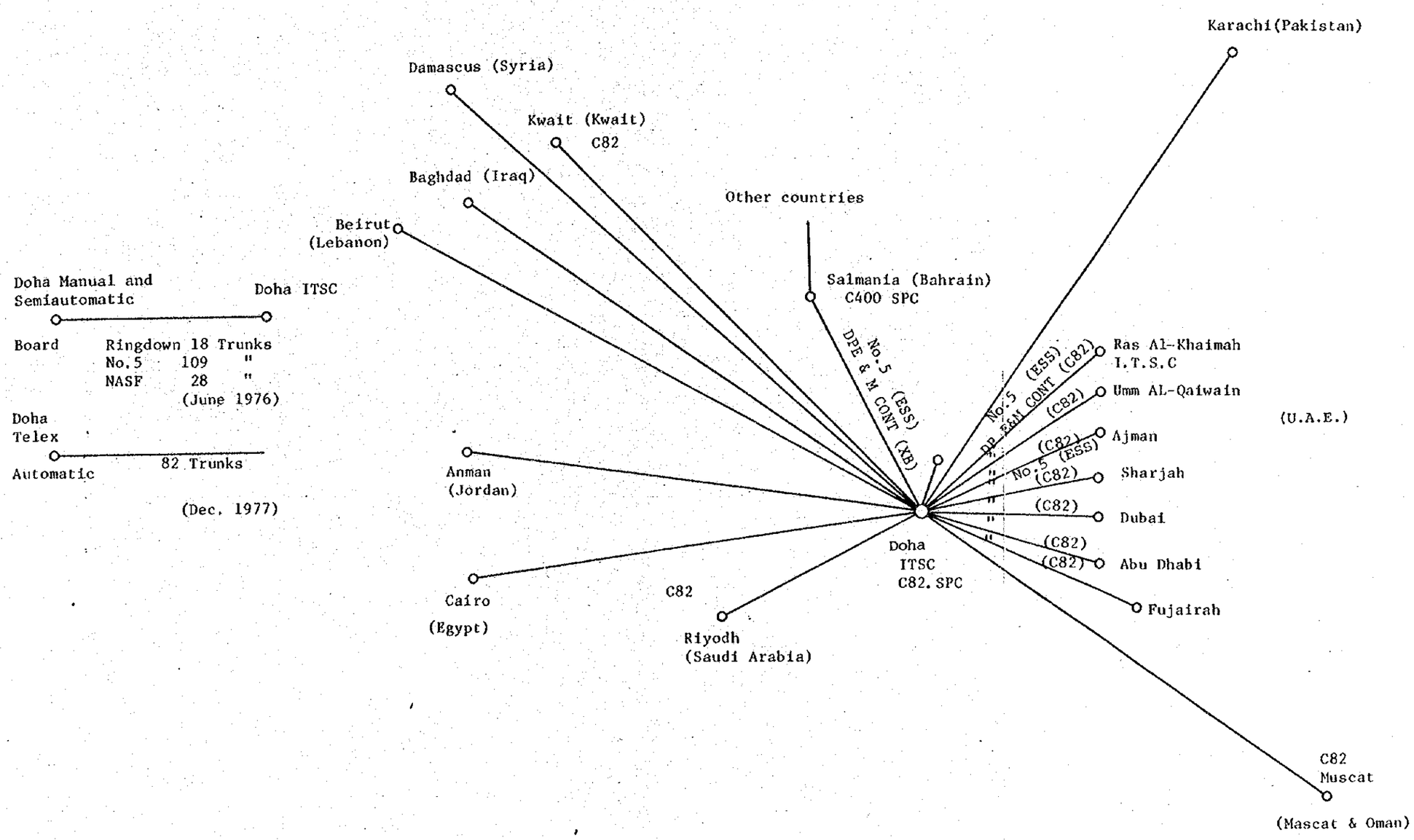


Table 17.1 Signalling Systems in the Gulf Area

Switching system	Service area	Signalling System	Cut over
Doha I.T.S.C. (ESS)	Bahrain Dubai Kuwait Riyadh Teheran Muscat Amman Baghdad Beirut Cairo Damascus Karachi	No.5	1980
Doha Transit (C82)	Kuwait Riyadh Muscat Fujairah Shariab Umm Al Quwain Ras Al Khaimah Dubai Ajman Bahrain Abu Dhabi	DP. E & M (OB) Continuous	1978
Bahrain I.T.S.C. (ESS)	Abu Dhabi Doha Dubai Kuwait Muscut Ras Al Khaimah Riyadh	No.5	1980
Bahrain Central (C400 TLS)	Doha Riyadh Kuwait Ras Al Khaimah Abu Dhabi, Shrjah	DP. E & M (OB) Continuous	Under-service
Ras Al Khaimah I.T.S.C.	Kuwait Riyadh Bahrain Dubai Cairo Beirut Karachi	No.5	1980
	Abu Dhabi Dubai Shariab Bahrain Doha	DP. E & M (OB) Continuous	

In considering the introduction of an SPC system into the network, the signalling system approach mentioned below will be necessary.

1) The SPC signalling system being considered is shown Table 17.2.

Table 17.2 SPC Signalling System MFC-R_2 Under Consideration

Item	Register signal	Line signal
Case 1	MFC — R_2	Loop, E & M continuous
Case 2	ditto	Loop, E & M discontinuous
Case 3	MFC — R_2 & DP	Loop, E & M continuous
Case 4	ditto	Loop, E & M discontinuous

2) Introducing SPC as LS

If only the final route between the SPC and C82 systems is set up the signalling system will require no special operations.

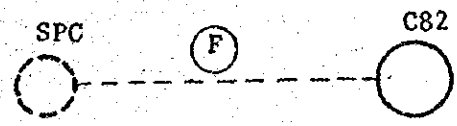


Fig. 17.3

On the other hand, if a high usage route between present switching systems is set up the following will be required.

(Cases 1 and 2, Table 17.2)

- Addition of signal transfer function MFC-R_2 DP in the SXS system.
- Extending trunks in the SXS and C82 systems to connect with the SPC Trunks.

(Cases 3 and 4, Table 17.2)

- Extending trunks in the SXS and C82 systems to connect with the SPC Trunks.

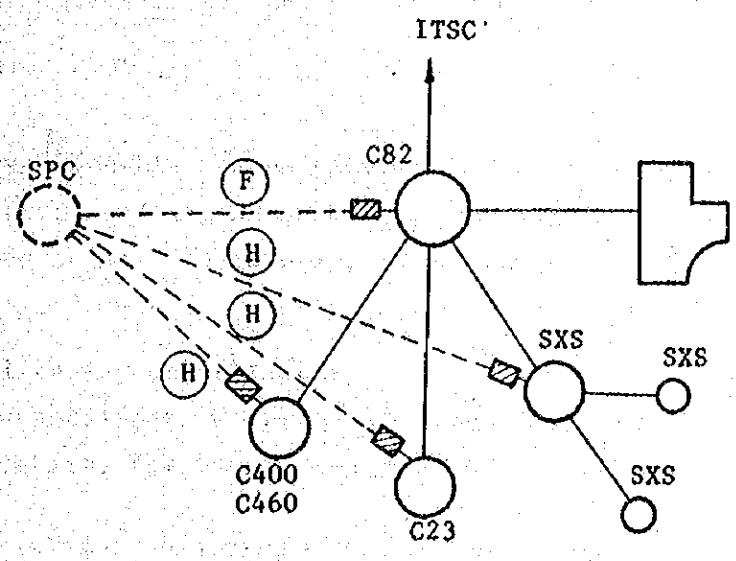


Fig. 17.4

3) Introducing SPC as TLS

This case is the same as case 2 and requires the same function between the Manual Board and SPC.

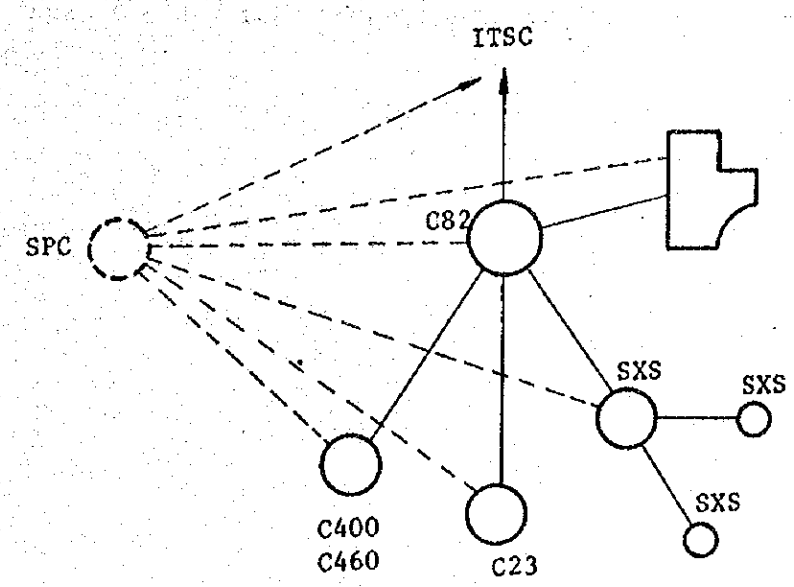


Fig. 17.5

In regard to the signalling systems shown in Fig. 17.1, case 3 i.e. Register signal: MFC-R_2 & DP, Line signal: Loop, E and M continuous should be used.

18. NUMBERING PLAN

To achieve adequate communication services, the numbering plan is a very important factor and a good numbering plan must be provided for the telephone service areas. In general, a good numbering plan is characterized by the following.

1) Facilitating memorization.
2) Corresponding to variable telephone demand in the area.
3) Flexibility for the introduction of new services.

According to the numbering plan for the present and future shown in Table 18.1 and Fig. 18.1, there are mixed digits, including 4 ∿ 6 digit offices in the network. That may cause subscribers difficulty in memorizing the numerical area code and result in confusion.

Special numbers are different in each exchanges and should be unified in all exchanges. Digits of special numbers should be as small as possible.

It is desireable that the numbering plan not be changed for 20 or more years. Thus, the present and future numbering plan of QNTS needs to be reviewed.

Table 18.1 Qatar Numbering Plan

Areas	Existing Numbering Scheme	Ultimate Numbering Scheme
Doha SXS	21 - 26XXX	-
	6XXX	-
Doha C23	27XXX	-
Doha C400	32XXXX	32XXXX
Doha DDI	33XXXX	33XXXX
Direct Dial In	34XXXX	34XXXX
Doha Expansion		4XXXXX
Abu Sumra		755XXX
Dukhan		71XXXX
Al Ghumairiyah		700XXX
Al Jumaliyah		709XXX
Khalifa Town	87XXX	87XXXX
	88XXX	
Khor	-	72XXXX
New Doha	-	83XXXX (84XXXX)
Rayyan	83XXX	803XXX
Ruwais		73XXXX
Salwa Road	-	81XXXX
Saudi Natheel		89XXXX
Shahaniyah		76XXXX
Stadium Area		88XXXX
Umm Bab		750XXX
Umm Jarn		74XXXX
Umm Said	77XXX	77XXXX
Umm Salal Mohd	82XXX	78XXXX
Umm Salal Ali	89XXX	
Wakrah	84XXX	85XXXX
Wukair	85XXX	

Table 18.2 Numbering Plan

	ABCDEF	Existing Numbering Scheme	ABCDEF	Ultimate Numbering Scheme
Local Calls	□ΔXXXX	32: Doha C400 33; 34; } Doha DDI	□ΔXXXX	32XXXX; Doha C400 33XXXX; 34XXXX; } Doha DDI 4XXXXX; Doha Expansion 700XXX; Al Ghuwairiyah 709XXX; Al Jumaliyah 71XXXX; Dukhan 72XXXX; Khor 73XXXX; Ruwais 74XXXX; Umm Jarn 750XXX; Umm Bab 755XXX; Abu Sumra 76XXXX; Shahaniyah 77XXXX; Umm Said 78XXXX; { Umm Salal Mohd / Umm Salal Ali 803XXX; Rayyan 81XXXX; Salwa Road 83XXXX; (84XXXX) } New Doha 85XXXX; { Wakrah / Wukair 87XXXX; Khalifa Town 88XXXX; Stadium Area 89XXXX; Saudi Nathil
	□ΔXXX	21∿26; Doha SXS 27; Doha C23 77; Umm said 82; Umm Salal Mohd 83; Rayyan 84; Wakrah 85; Wukair 87; 88; } Khalifa Town 89; Umm Salal Ali		
	□XXX	6; Doha SXS		

Fig. 18.1 Zone Numbering Plan

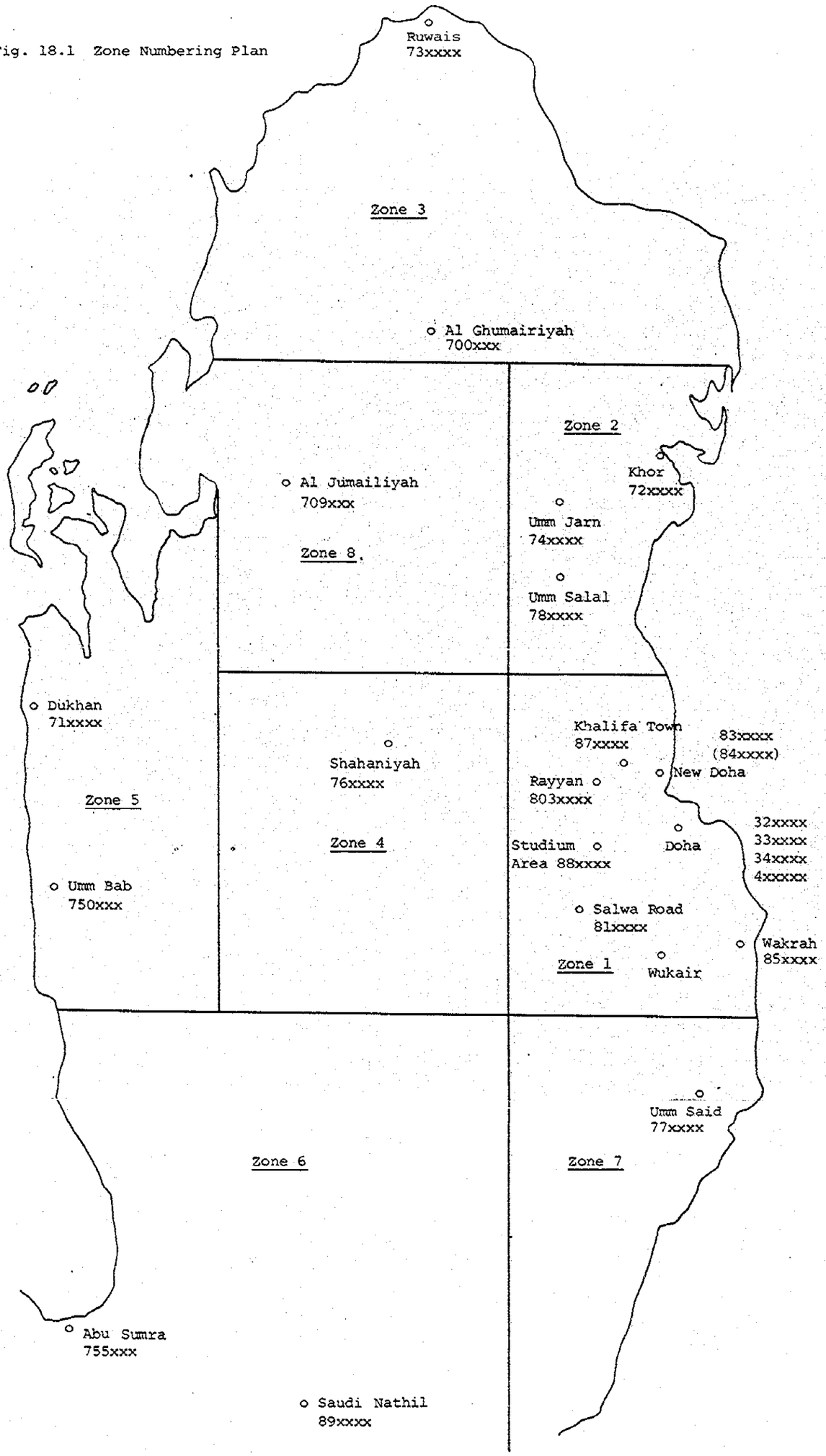


Fig. 18.2 Zone Numbering Plan

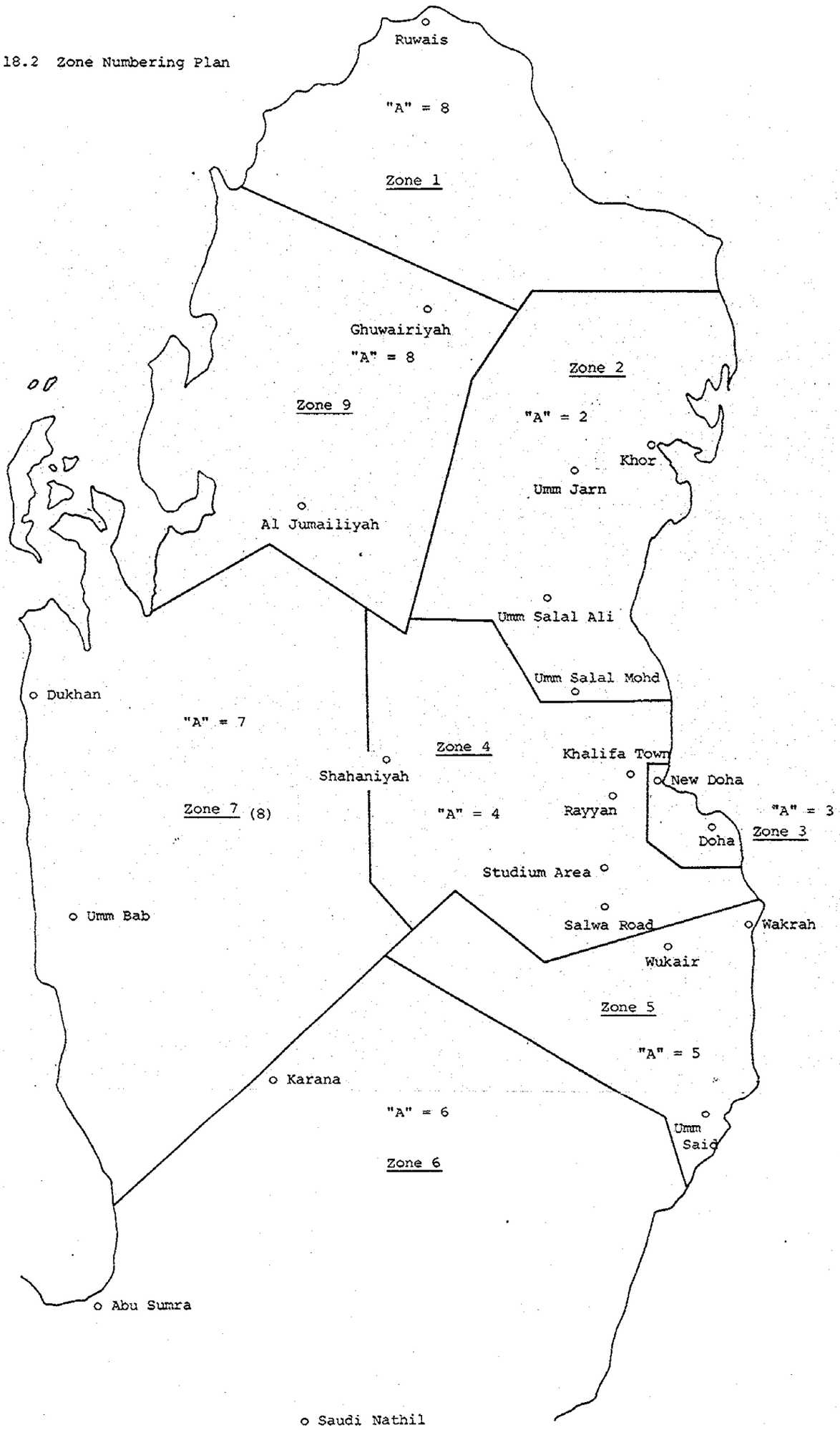


Table 18.3 Special Number

Doha Khalifa Town Rayyan	Other Exchanges	Services
10	010	Operator Assistance (Local Calls)
12	012	Faults
13	013	International Telegraph Service
15	015	International Telephone Service
18	018	Directory Enquiries
141	0141	Time-In Arabic
140	0140	Time-In English
999	0999	Fire Ambulance Plice

Table 18.4 International Call

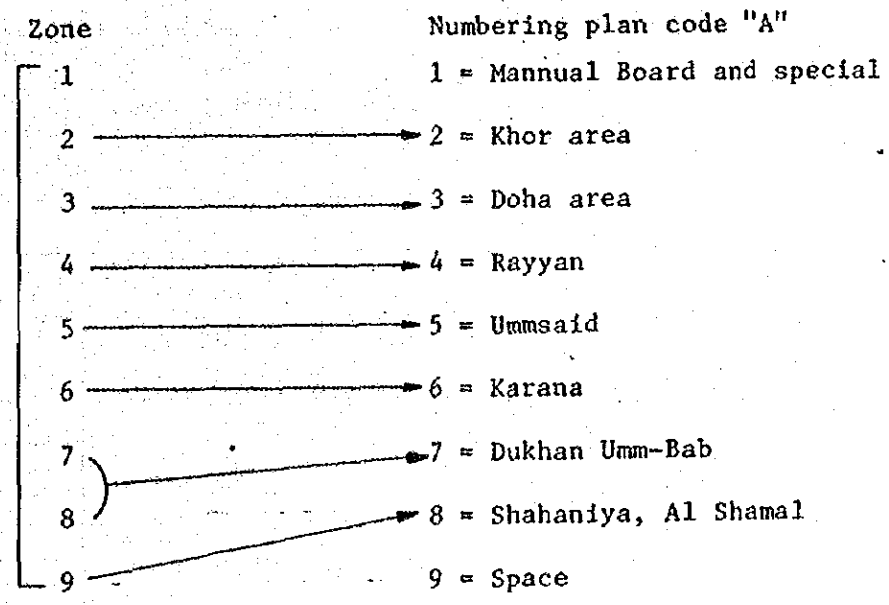
I.S.D. Calls (Within Gulf/UAE Area)	0+□□	65; Kuwait 66; Arabia 68; Oman 71; Fujairah 72; Ajman 73; Bahrain 75; Sharjah 76; Umm Al Quwain 77; Ras Al Khaimah 78; Dubai 79; Abu Dhabi
I.S.D. Calls (Outside Gulf/UAE Area)	00+XX	

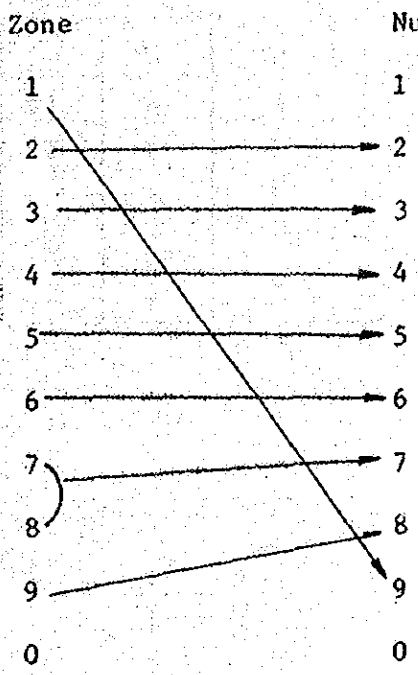
Table 18.5 and Fig. 18.2 are based on zone planning. Theoretically, zone planning has to be coordinated the numbering plan.

Table 18.5 a) A New Numbering Plan

A	B	C	(B)	(C)	D	E	F	G
□			△	△	×	×	×	×
□	□			△	×	×	×	×
□	□	□			×	×	×	×

According to the International Call numbering scheme shown in Table 18.4, the destination code "0" as the first digit for ISD calls is required. Thus, "0" cannot be used in the zone identifying code. As an alternative, the "shifting code system" is possible.





If a new numbering plan is adopted by the government, the changeover time requires that this be implemented as soon as possible.

Table 18.6.b) shows numbering plans based on Ideas A and B.

Table 18.5.b)

A Code	Present	1981
1	Manual Board Service Miscellaneous	Manual Board Service Miscellaneous
2	Local Calls in Qatar	Local Calls in Qatar
3		
4		
5		
6		
7		
8		
9	Manual Board Service & Miscellaneous	
0	I.S.D. Calls within Gulf/UAE Area	I.S.D. Calls within Gulf/UAE Area
00	I.S.D. Calls outside Gulf/UAE Area	I.S.D. Calls outside Gulf/UAE Area

e.g. Khor area; "A"=2. Zone=2.

Table 18.6.a) One Example Based on Proposal

A	B	C	D	E	F	G	Area
2	1	2	X	X	X	X	Khor
2	2	2	X	X	X	X	Umm Jarn
2	2	3	X	X	X	X	Rawdat Alajuz
2	3	2	X	X	X	X	Umm Salal Mohd
2	3	3	X	X	X	X	Umm Salal Ali

Table 18.6.b) Numbering Plan

Idea A: Planned
Idea B: Proposed

Exchange Office	Idea A	Idea B	
		1990	2000
Khor	72XXXX	21XXXX	
Umm Jarn	74XXXX	22XXXX	
Umm Salal Mohd Umm Salal Ali	78XXXX	23XXXX	
Doha C400	32XXXX	31XXXX	311XXXX ⋮ 313XXXX
Doha Expansion	4XXXXX	32XXXX 33XXXX	
Doha DDI	33XXXX 34XXXX	34XXXX 35XXXX	314XXXX 315XXXX
New Doha	83XXXX 84XXXX	37XXXX 38XXXX	355XXXX ⋮ 358XXXX
Rayyan	803XXXX	41XXXX	411XXXX ⋮ 413XXXX
Khalifa Town	87XXXX	42XXXX 43XXXX	422XXXX ⋮ 425XXXX
Studium	88XXXX	44XXXX	444XXXX 445XXXX
Salwa Road	81XXXX	45XXXX	465XXXX
Shahaniyah	76XXXX	46XXXX	496XXXX
Umm Said	77XXXX	51XXXX	
Wakrah Wukair	85XXXX	53XXXX	
Saudi Natheel	89XXXX	64XXXX	
Abu Samra	755XXX	65XXXX	
Dukhan	71XXXX	71XXXX	
Umm Bab	750XXXX	73XXXX	
Ruwais	73XXXX	82XXXX	
Al Ghuwairiyah	700XXX	86XXXX	
Al Jumailiyah	709XXX	87XXXX	

19. TARIFFS AND CHARGES

At present, QNTS has been using the time metering system currently in service. Table 19.1 shows present tariffs. According to the table, the format is quite complex. For example, at a distance of 23 km, two kinds of metering systems are used, i.e. 25 Dirams per 60 sec and the other is 5 multi-metering.

Table 19.1 Tariff Principle in the Present

a) The present

(25 Dirams)

Distance	Time or multi meter
5.5 km ∿ 23 km	60 sec
12.5 km ∿ 37 km	30 "
49 km (Mohd/Ali Umm Said)	18 "
20.5 km ∿ 49 km	6 multi meter *
23 km (Wak/Wuk ∿ Rayyan)	5 " *
15 km ∿ 21 km	4 " *
(Wakrah ∿ Wukair)	3 " *
Same Exchange	1 (untimed)
Bahrain	5.0 sec (6.3 sec)
U.A.E.	4.2 (5.0)
U.K.	1.25 (Cheap rate)

* Application for SXS system except for US-Mohd & Ali.

Table 19.2 shows the distance between each office and Table 19.3 shows the tariff based on the principle in Table 19.1.

Table 19.2 Distances Between Offices

	Doha	Khalifer Town	Rayyan	Stadium	New Doha	Wak/Wuk	Salwa Road	Abu Sumra	Dukhan	Al-Guwairiyah	Al-Jumaliyah	Khor	Ruwais	Saudi-Natheel	Shahaniyah	Umm Bab	Umm Jarn	Umm Salal	Umm Said
Doha		7,000	9,500	8,250	4,500	15,000	12,500	92,500	76,500	66,500	57,500	45,000	100,000	92,000	31,000	73,500	31,500	19,000	32,000
Khalifa Town			5,500	7,100	5,500	21,500	13,250	93,000	71,000	60,500	51,000	40,250	94,000	94,000	25,000	69,000	25,500	22,500	37,000
Rayyan				4,600	10,000	23,000	10,500	86,500	66,500	57,000	50,000	44,000	96,000	89,500	21,500	64,000	28,000	12,500	36,500
Stadium					11,000	19,000	5,500	84,500	70,000	66,500	54,500	48,000	101,500	86,000	25,500	65,000	33,000	18,500	31,000
New Doha						18,500	16,000	96,000	76,000	63,000	55,500	40,500	96,500	97,000	30,000	74,000	27,000	16,000	36,500
Wak/Wuk							19,000	92,500	89,000	82,000	73,000	58,500	115,500	87,000	44,500	81,500	46,500	34,000	20,500
Salwa Road								80,000	71,000	71,500	58,500	54,000	106,500	81,000	27,500	63,500	38,500	23,500	26,500
Abu Sumra									75,500	125,500	101,000	125,000	160,500	34,500	81,000	53,000	109,000	95,500	79,000
Dukhan										66,500	38,500	80,000	92,500	102,500	46,500	23,500	68,000	64,000	91,500
Al-Guwairiyah											28,500	30,500	35,000	143,000	51,000	82,000	36,000	49,000	97,500
Al-Jumaliyah												43,000	59,500	119,000	31,000	53,500	36,000	40,000	84,000
Khor													58,500	133,500	44,500	88,500	17,000	31,500	77,000
Ruwais														117,500	86,000	112,000	69,000	83,500	132,500
Saudi Nathil															92,500	80,500	116,500	102,000	68,000
Shahaniyah																47,000	28,500	18,500	53,000
Umm Bab																	75,000	65,000	79,000
Umm Jarn																		15,500	63,000
Umm Salal																			49,000
Umm Said																			

Table 19.3 Tariff between Offices

	BAH	UAE	UK	DOHA MAIN	C400	C23 27XXX	82 MOHD	83 RAYAN	84 WAK	85 WUK	SHELL	87KT	88KT	89 ALI	77 U.SAID
Doha Main	F5.0 C6.3	F4.2 C5.0	1.25	1	1	1	30	60	4	4	1	60	60	30	30
C400	F5.0 C6.3	F4.2 C5.0	1.25	1	1	1	30	60	60	60	11	60	60	30	30
C23 27XXX	F5.0 C6.3	F4.2 C5.0	1.25	1	1	1	30	60	60	60	1	60	60	30	30
82XXX U.S.MOHD				30	30	30	1	30	30	30	30	30	30	60	18
84XXX RAYYAN	F5.0 C6.3	F4.2 C5.0	1.25	60	60	60	30	1	60	60	60	60	60	30	30
84XXX WAK				4mm	4mm	4mm	6mm	5mm	1	3mm	4mm	4mm	4mm	6mm	6mm
85XXX WUK				4mm	4mm	4mm	6mm	5mm	3mm	1	4mm	4mm	4mm	6mm	6mm
SHELL PABX				1	1	1	30	60	4mm	4mm	1	60	60	30	30
87 KT 1	F5.0 C6.3	F4.2 C5.0	1.25	60	60	60	30	60	60	60	60	1	1	30	30
88 KT 11	F5.0 C6.3	F4.2 C5.0	1.25	60	60	60	30	60	60	60	60	1	1	30	30
89 U.S.ALI				30	30	30	60	30	30	30	30	30	30	1	18
77 U.SAID				6mm	6mm	6mm	6mm	6mm	6mm	6mm	6mm	6mm	6mm	6mm	1

mm = Multi meter 1 = 1 unit untimed 60 30 18 PPs in seconds.

Table 19.4 Zone Metering in the Near Future

		Zone 1 Doha Khalifa Town Rayyan Wakrah/Wukair Salwa RD	Zone 2 Umm Salal Mohd Umm Salal Ali Khor Umm Jarn	None 3 Ruwais Al. Chuwariyah	Zone 4 Shahaniyan	Zone 5 Dukhan Umm Bab	Zone 6 Abu Sumra Saudi Natheel	Zone 7 Umm Said
Zone 1	Doha Khalifa Town Rayyan Wakran/Wukair Salwa RD	1 unit + 1 Every 60 secs	1 unit + 1 Every 30 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 30 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 30 secs
Zone 2	Umm Salal Mohd Umm Salal Ali Khor Umm Jarn	1 unit + 1 Every 30 secs	1 unit + 1 Every 60 secs	1 unit + 1 Every 30 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs
Zone 3	Ruwair Al Ghuwariyah	1 unit + 1 Every 18 secs	1 unit + 1 Every 30 secs	1 unit + 1 Every 60 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs
Zone 4	Shahaniyah	1 unit + 1 Every 30 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 60 secs	1 unit + 1 Every 30 secs	1 unit + 1 Every 30 secs	1 unit + 1 Every 18 secs
Zone 5	Dukhan Umm Bab	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 30 secs	1 unit + 1 Every 60 secs	1 unit + 1 Every 30 secs	1 unit + 1 Every 18 secs
Zone 6	Abu Sumra Saudi Natheel	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 30 secs	1 unit + 1 Every 30 secs	1 unit + 1 Every 60 secs	1 unit + 1 Every 30 secs
Zone 7	Umm Said	1 unit + 1 Every 30 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 18 secs	1 unit + 1 Every 30 secs	1 unit + 1 Untimed

CALLS WITHIN SAME EXCHANGE ARE UNTIMED

1 unit: 1 pulse when called parity answers

The charging plan is closely connected with the zone and numbering plan technically and sorting the output data from the CPU system is required. According to the long-term plan shown in Table 4.6, introduction of the AMA system is planned. For management and technical performance in the near future, a part of the system, e.g. an Automatic Number Identifier and Originating Number Sender should incorporate semiconductor technology as shown in Fig. 19.6.

Same Exchange	Untimed
Same Zone	60 sec
Ajacent Zone	30 sec
Non-Ajacent Zone	18 sec

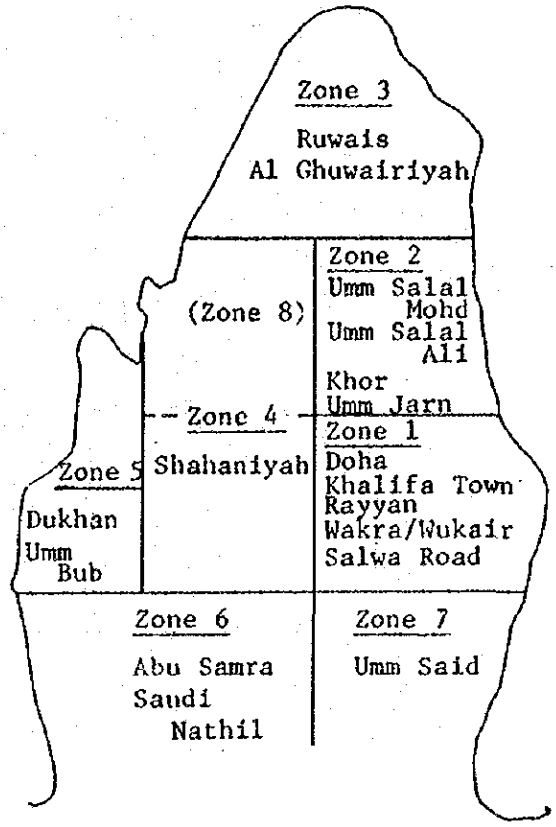


Fig. 19.5 Zone metering in the near future

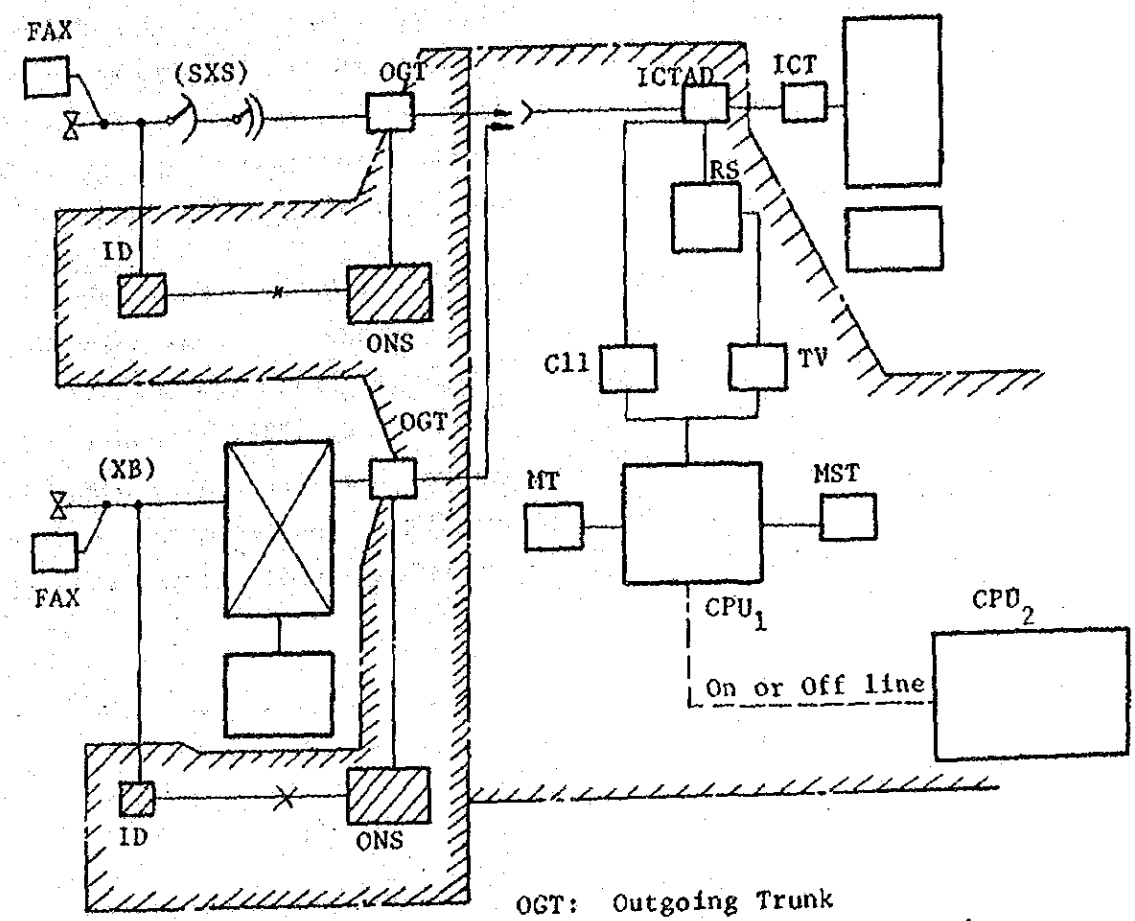


Fig. 19.6 Centralized message accounting system

20. DEMAND FORECAST

The rapid growth in demand and waiting lines described in Chapters 2 and 7 are expected to be hard to calculate. Many social factors, e.g. speed of demand, rapid increase of population, and rapid change of life styles and consiousness of living standards, make forecasting more difficult.

Obtaining these statistical factors is very important to the success of the work but it is difficult to obtain this data from sources other than the yearbook and by meeting with Qataris officials, schoolmaster and teachers. To cooperate with the activities other governmental organizations, a report on the forecast of future demand and correcting of the data based on appropriate discussions should be made.

Table 20.1 and Fig. 20.1.a) ∿ h) show the total number of telephone lines in each zone. If the population grows and an industrial society is realized the estimated figures for total telephone lines per 100 persons are 22.3 lines in 1985, 23.4 lines in 1990, 24.1 lines in 1995, 28.5 lines in 2000, and total estimated pouplation in 200 year is 120,000. This is almost the same mentioned by figure H.H. the Emir: "I imagine Qatar after twenty five years with a population exceeding one million or more."

Table 20.1 Forecast of Future Telephone Lines (Zone)

Area	Center	1977	1981	1985	1990	1995	2000
"1"	Al. Shamal	850	1,160	1,960	3,220	5,000	8,700
"2"	Al. Khor	1,170	1,647	2,683	4,291	7,702	13,332
"3"	Doha	21,000	32,000	50,000	76,000	115,000	160,000
"4"	Rayyan	6,500	10,800	195,000	(29,900) 31,900	(44,500) 59,500	(60,500) 102,500
"5"	Ummsaid	1,290	3,190	6,180	10,070	15,100	22,830
"6"	Karana	105	120	180	265	370	570
"7"	Dukhan	300	375	470	690	900	1,120
("8")	(Bab)	260	430	540	790	1,040	1,290
"9"	Ghuwairiyah	210	310	470	675	940	1,270
(Line)					(125,211)	(189,652)	(268,492)
Total Telephone		31,385	49,663	81,513	127,211	204,652	310,492
Population		204,375	271,200	365,679	543,170	846,283	1,214,372
(Line) Tel.per 100 persons		15.3	18.3	22.3	23.4	24.1	25.5

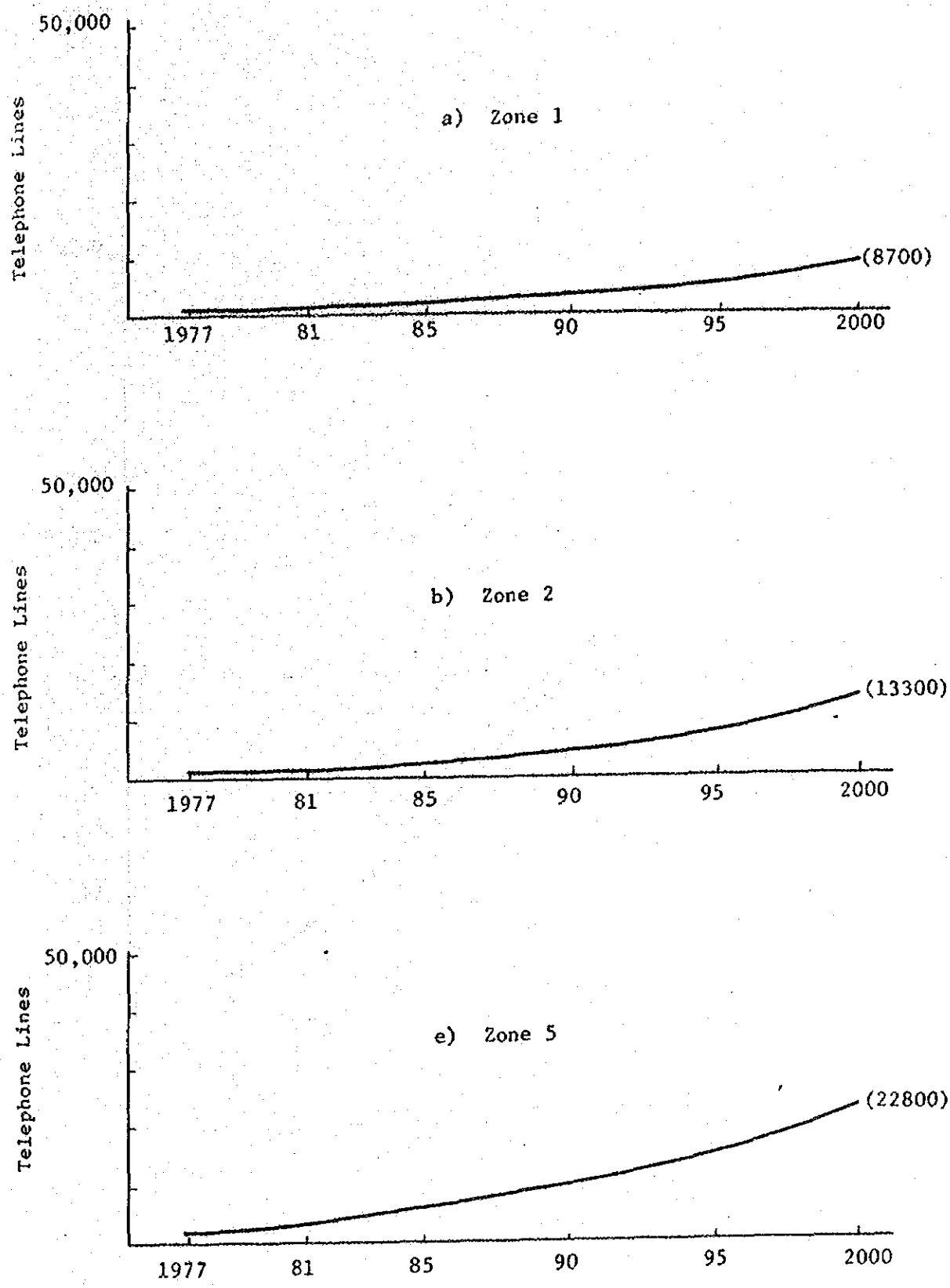
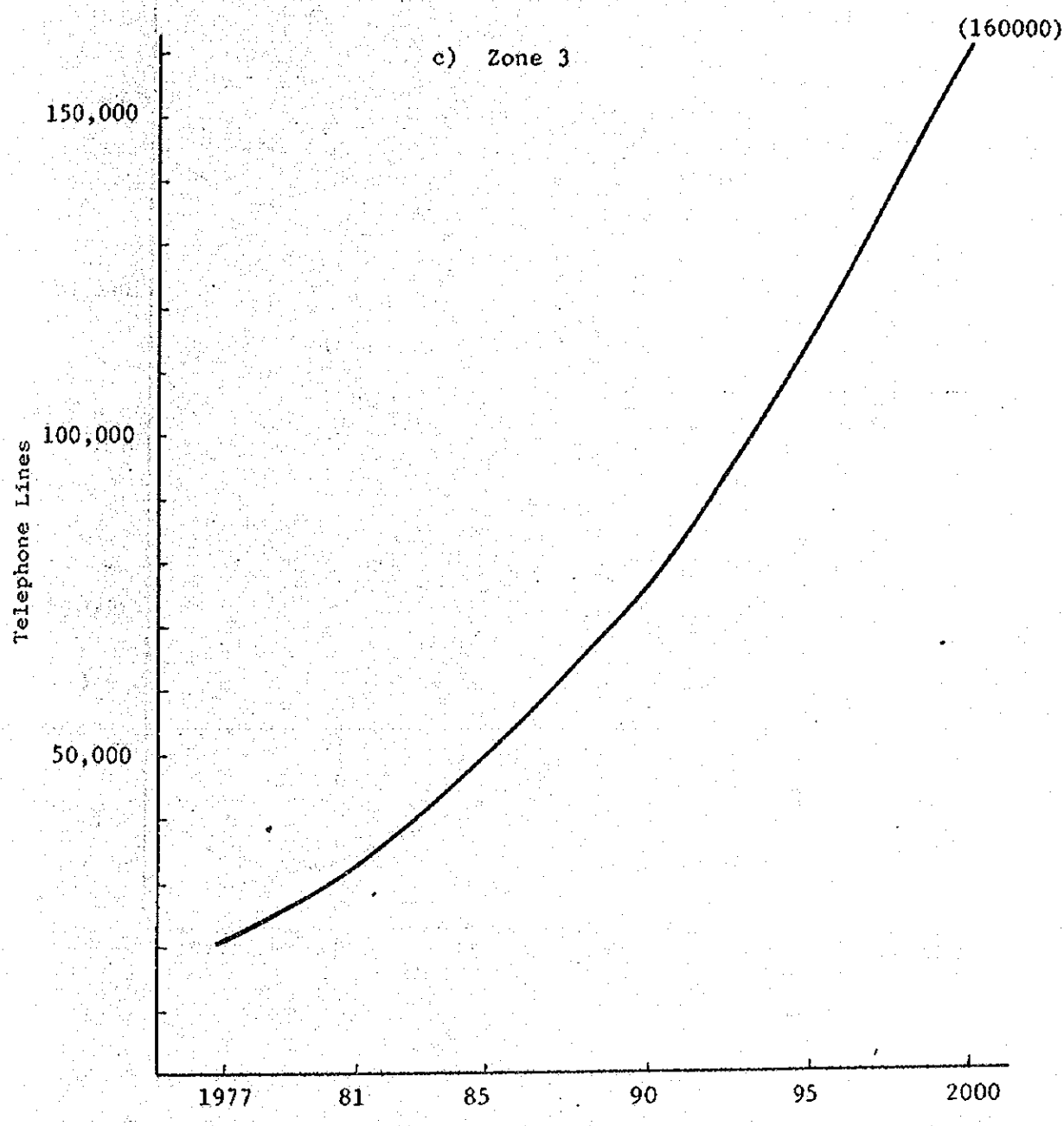
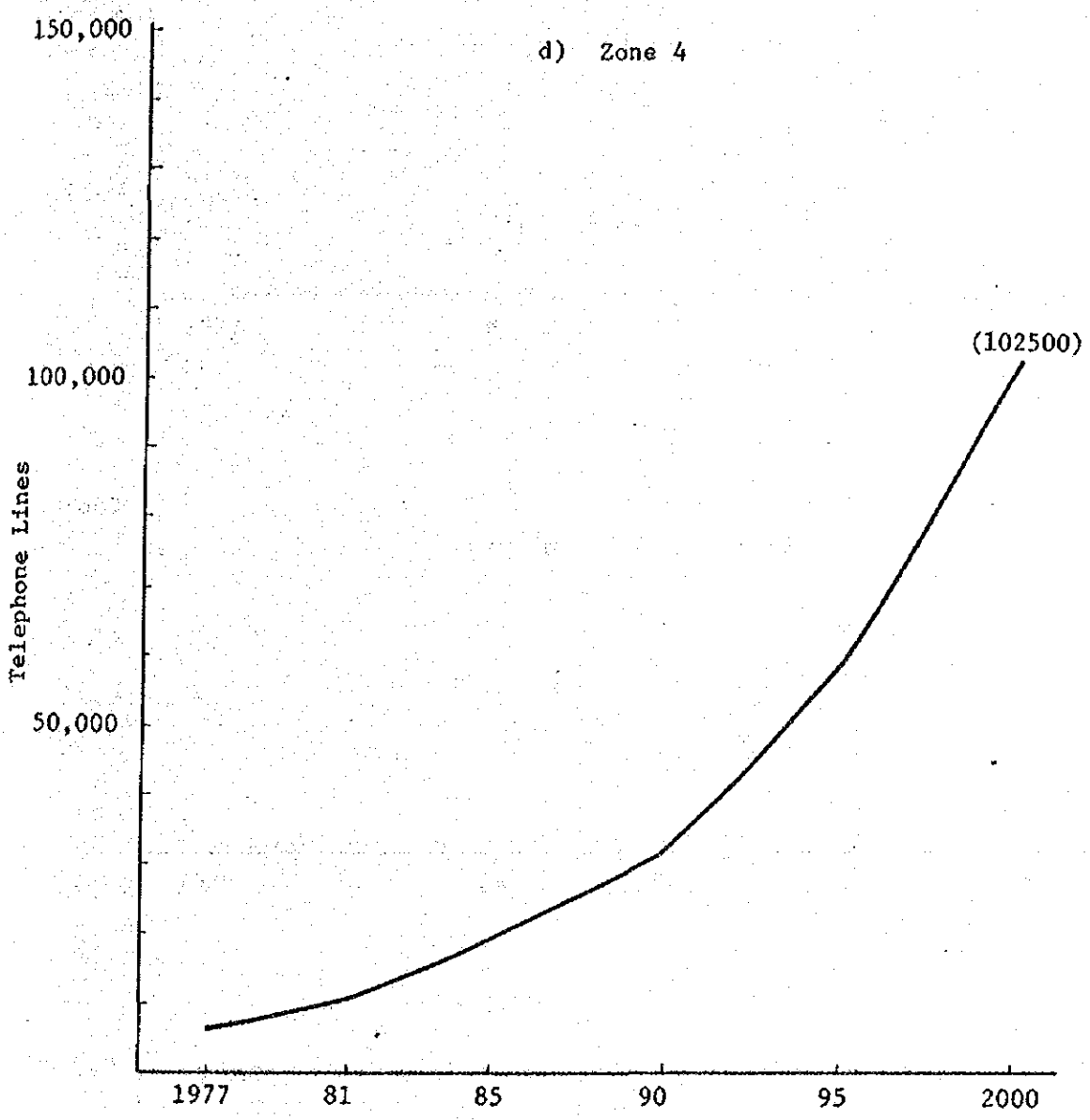
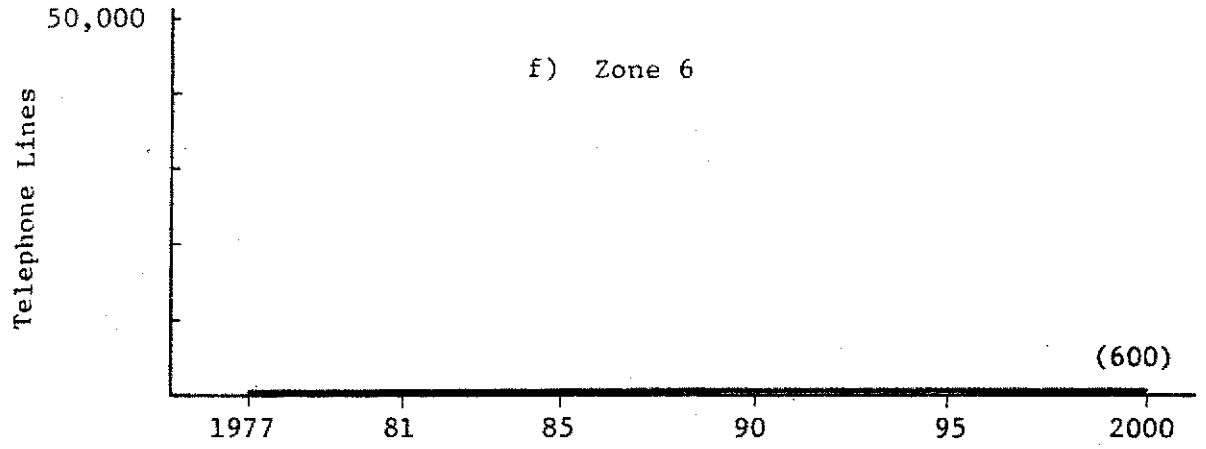


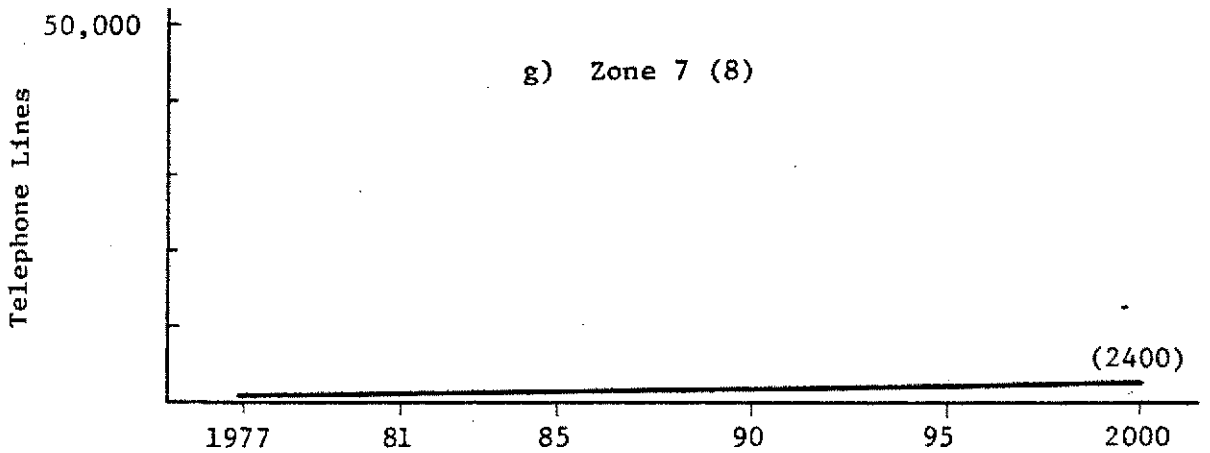
Fig. 20.1 Forecast of future telephone lines


c) Zone 3
(160000)
150,000
100,000
50,000
Telephone Lines
1977
81
85
90
95
2000

d) Zone 4


150,000
100,000
50,000
Telephone Lines
(102500)
1977
81
85
90
95
2000


50,000
Telephone Lines
f) Zone 6
(600)
1977
81
85
90
95
2000


50,000
Telephone Lines
g) Zone 7 (8)
(2400)
1977
81
85
90
95
2000

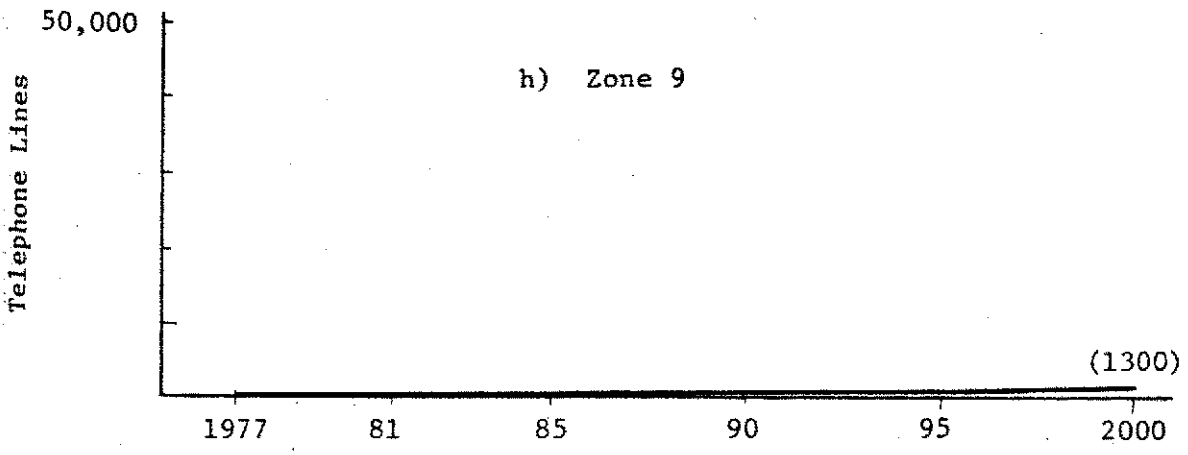

50,000
Telephone Lines
h) Zone 9
(1300)
1977
81
85
90
95
2000

Fig. 20.2 shows the number of telephones and business-use density in the main countries of the world. By using this figure, a forecast of the number of business telephone sets required in Qatar in the future can be obtained.

Table 20.2 shows each zone in Table 20.1 more precisely.

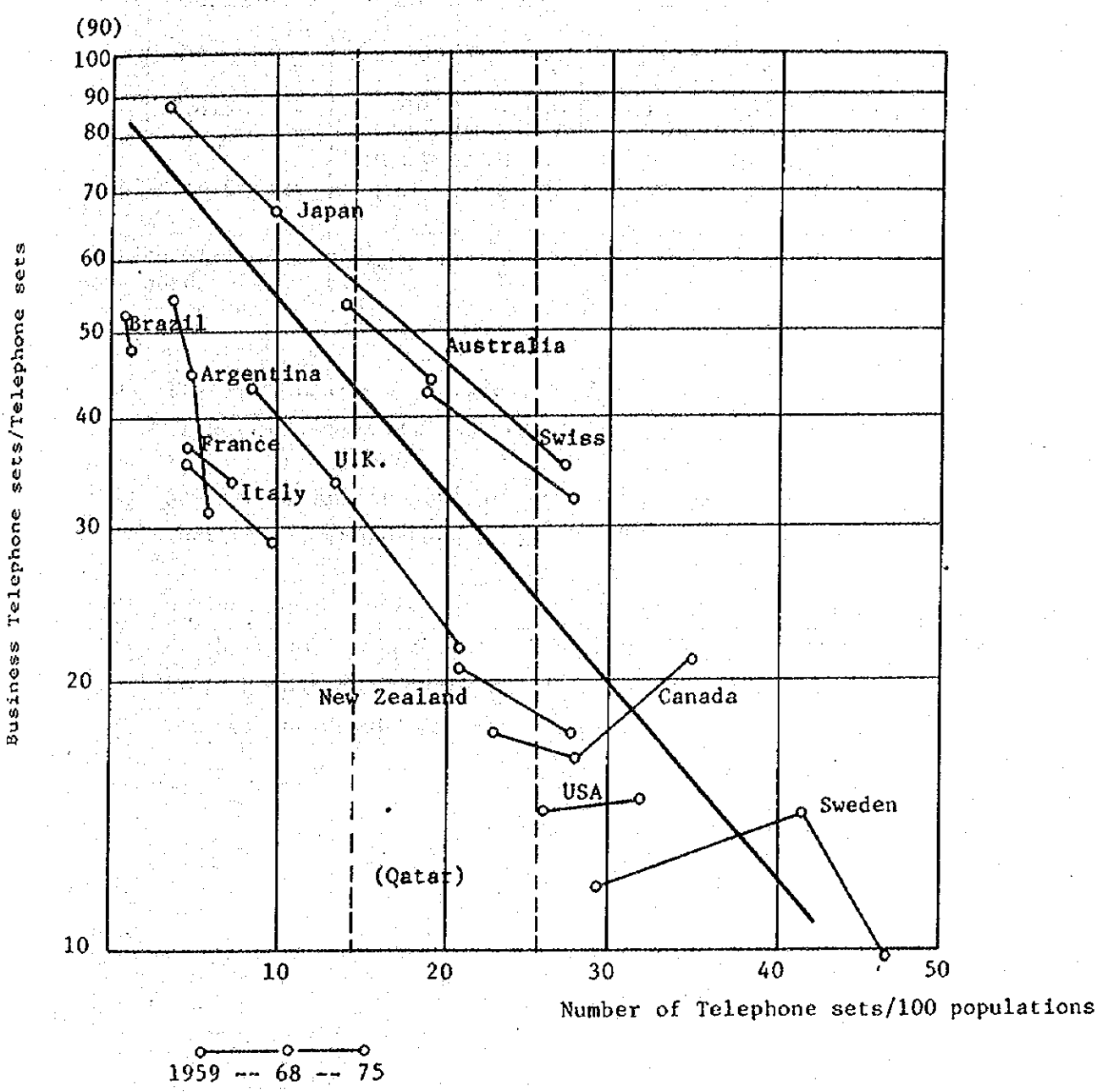


Fig. 20.2 Telephone and business use density

Table 20.2 Forecast of Future Telephone Lines (Office)

Area	Offices	1977	1981	1985	1990	1995	2000
"1"	Al Shamal	400	560	960	1,520	2,360	4,100
	Ruwais	200	270	420	750	1,180	2,100
	Abu Dluf	170	220	390	640	980	1,700
	Other	80	110	190	310	480	800
	Total	850	1,160	1,960	3,220	5,000	8,700
Population Growth Rate		(0.03) 1.03	(0.03) 1.126	(0.05) 1.28	(0.05) 1.28	(0.05) 1.28	(0.08) 1.5
Average Size of Households		6.8	6.7	6.6	6.4	6.2	6.0

(1) Residential concentration from rural areas to the center will occur in the Ruwais and Shamal regions.

2) Developing Ruwais port and seafood production will be ongoing. Thereafter, those regions will resemble Khor city in scale.

3) A plan for intensive use of LNG in the Northwest seabed, a plan for high quality agricultural production in the well-water area, i.e., Ruwais and Sidriyah, and a tourism development plan will trigger the demand for more telephones.

Area	Offices	1977	1981	1985	1990	1995	2000
"2"	Al Khor	450	633	953	1,524	2,825	4,801
	Umm Jarn	288	405	692	1,107	1,992	3,485
	Umm Salal	330	465	793	1,268	2,283	3,992
	Other	100	140	240	380	600	1,054
	Total	1,170	1,647	2,683	4,291	7,702	13,332
Population Growth Rate		1.03	(0.03) 1.126	(0.05) 1.28	(0.05) 1.28	(0.08) 1.5	(0.08) 1.5
Average Size of Households		6.8	6.7	6.6	6.4	6.2	6.0

1) Around 1990, Khor and its suburbs will be like the capital city Doha in population and Arabs working in the Shamal and Khor areas will live here at some distance from Doha.

2) Development including the main port of Khor and the subordinate port of Sumaismah and its seafood production facilities, development of dairy farms and food production areas along the road from Doha to Khor, setting up the handicrafts and traditional arts center in Umm salal and Mohammed, and planning of high quality agricultural production in the well-water area from the Shafallabiyah to the Faras regions will be trigger a demand for more telephones.

3) Around the year 2000, the suburb of Khor will resemble greater Doha in population and character.

Area	Offices	1977	1981	1985	1990	1995	2000
"3"	Doha Block "A"	10,500	14,500	20,000	25,000	32,500	45,000
	Doha Block "B"	4,200	5,800	8,000	10,000	13,000	18,000
	Doha Block "C"	2,500	3,500	4,800	6,000	7,800	10,800
	Doha Block "D"	3,800	5,200	7,200	9,000	11,700	16,200
	Total	21,000	29,000	40,000	50,000	65,000	90,000
	New Doha Block "A"		3,000	7,500	16,000	30,000	40,000
	New Doha Block "B"			2,500	10,000	20,000	30,000
	Total		3,000	10,000	26,000	50,000	70,000
	Total	21,000	32,000	50,000	76,000	115,000	160,000
Production Growth Rate		1.08	(0.08) 1.36	(0.08) 1.36	(0.08) 1.5	(0.08) 1.5	(0.08) 1.5
Size of Household		5.8	5.7	5.5	5.3	4.9	4.9

1) The Doha and New Doha areas will grow bigger as metropolitan zones having cooperative relations, administratively and otherwise.

2) Doha

- o Block "A" will grow and have a role mainly as an economical center around Qatar.
- o Blocks "B" ∿ "D", will develop as bedroom town of Doha.
- o When Khalifa, Stadium, Najedah, Wakra, and Wukair develop as bedroom towns of Doha, around 1990, Doha "B" ∿ "D" blocks will develop into a city, and the population growth rate will increase.
- o On the other hand, the tendency of production of development in the Umm Said and Khor regions will motivate the workers living in Doha to change their houses from Doha to these regions and this process will continue until the year 2000.

- The growth rates selected in the blocks are 50, 20, 12, and 18 percent, respectively.

3) New Doha

- This area is regarded as a symbolic zone of Qatar in the future in which the citizen's Hall, hotels, embassies, a university and buildings of International affairs are being planned by an international architecture group. These would give the people visiting here, some idea of Qatar renewal and will be enlarged as an international city dealing with academic, social, cultural, artificial affairs in the Gulf Area.
- To support the activities of industrial and economical affairs and to avoid communication traffic congestion, some separate telephone offices should be set up in this zone.

Area	Offices	1977	1981	1985	1990	1995	2000
					(10,000)	(15,000)	(20,000)
"4"	Khalifa Town	3,000	5,000	7,000	12,000	25,000	40,000
						(12,000)	(15,000)
	Rayyan	2,000	3,000	5,000	8,000	15,000	30,000
	S.R.I.E.	500	1,000	3,000	5,000	7,000	10,000
						(8,000)	(12,000)
	Stadium	500	1,000	3,000	5,000	10,000	20,000
	Najedah	500	800	1,000	1,200	1,500	2,000
	Air port			500	700	1,000	1,500
					(29,900)	(44,500)	(60,500)
	Total	6,500	10,800	19,500	31,900	59,500	103,500
Population Growth Rate		1.08	(0.08) 1.36	(0.08) 1.36	(0.08) 1.5	(0.08) 1.5	(0.08) 1.5
Average Size of Households		5.8	5.7	5.5	5.3	4.9	4.9

1) This area can be characterized as a satellite of the capatal city, having administrative ties with zone 3.

2) For reasons of transportation and warehousing, many circulating centers will be set up as cushions to handle the things sent from S.R.I.E. (Salwa Road Industrial Estate: Light Industry), Umm Said (Heavy Industry) and agricultural and dairy farms on the Northwest side of Qatar.

3) The new International Airpot, planned for opening in 1985, is going to be the front door of Qatar and many buildings will be constructed to deal with foreign affairs, sales of goods, and providing information on the affairs of Qatar. These activities will necessitate an internation airport here.

4) Around the year 2000, the situation will resemble that in Doha in 1981.

Area	Offices	1977	1981	1985	1990	1995	2000
"5"	Wakrah Wukair	430	690	1,260	2,350	4,200	7,400
	Recount (Wukair)	(130)	(200)	(350)	(700)	(1,300)	(2,500)
	Others Rural Area of Wakrah & Wukair	360	500	920	1,720	3,100	5,430
	Total (Greater Wakrah)	790	1,190	2,180	4,070	7,100	12,830
	Umm Said	500	2,000	4,000	6,000	8,000	10,000
	Recount (Residence phone)	(400)	(600)	(1,050)	(2,000)	(3,600)	(6,000)
	Total	1,290	3,190	6,180	10,070	15,100	22,830
Population Growth Rate		1.03	(0.05) 1.126	(0.08) 1.36	(0.08) 1.5	(0.08) 1.5	(0.08) 1.5
Average Size of Households		4.8	5.7	5.5	5.3	4.9	4.9

1) If Doha port is restarted as a general port and its present commercial function is transferred into Umm Said ports, this area will grow as a commercial and industrial city having a transshipment function. Thereafter, the population will incease considerably here.

2) If super markets or department stores having restaurants and facilities supporting cultural and physical exercising activities are set up, that is enough for the youth living here and in Doha, and in the future, in Umm Said. Thus, communication traffic growth will further increase.

Area	Offices	1977	1981	1985	1990	1995	2000
"6"	Karana	5	5	10	15	20	30
	Others	100	115	170	250	350	370
	Total	105	120	180	265	370	500
Population Growth Rate		1.03	(0.03) 1.126	(0.03) 1.16	(0.03) 1.16	(0.03) 1.16	(0.03) 1.16
Average Size of Households		6.8	6.7	6.6	6.4	6.2	6.0

1) Salwa, Sauda Nathil, Umm El Swab, and ain Hammad will tend to develop with carrepair shops, shops which sell dairy products traditional arts, etc.

2) A International Research Center will be started to study the desert and its improvement, such as by reclamation, and another to study the usage of the shallow seabed, such as by making seafood products near the Khoral Udeid area.

3) The Zakra, Shagrab, and Sauda Nathil regions have many sandbanks to use as natural sights for tourism.

All of these developments will trigger activities in this zone which is being ignored at the present time.

Area	Offices	1977	1981	1985	1990	1995	2000
"7"	Dukhan	200	320	350	500	650	800
"8"	Bab	60	110	190	290	390	490
	Total	260	430	540	790	1,040	1,290
Population Growth Rate		1.03	(0.03) 1.126	(0.03) 1.16	(0.03) 1.16	(0.03) 1.16	(0.03) 1.16
Average Size of Households		6.8	6.7	6.6	6.4	6.2	6.0

This area is mainly devoted to oil resources but the amount of that resource is unknown. Thus it will be necessary to introduce some industry. A cement factory in Bab provides some guidelines for the development of this area.

Area	Offices	1977	1981	1985	1990	1995	2000
"9"	Ghuwairiyah	80	115	175	250	350	470
	Zubarah	25	35	50	75	100	140
	K.B. Hamad	35	45	70	100	140	190
	Jumailiyah	80	115	175	250	350	470
	Total	210	310	470	675	940	1,270
Population Growth Rate		1.03	(0.03) 1.126	(0.03) 1.16	(0.03) 1.16	(0.03) 1.16	(0.03) 1.16
Average Size of Households		6.8	6.7	6.6	6.4	6.2	6.0

Ghuwairiyah, Jumailiyah and the West side of Qatar have many small-scale Wadi and Well which can possibly be used for dairy farms. These will be developed around 1990.

21. TRANSMISSION LOSS DISTRIBUTION STANDARD

Loss distribution standards are set a shown in Fig. 21.1.

1) From subscriber to satellite or telephone office 8.5dB
2) From telephone office to C82 switching center 3.5dB
3) From C82 Switching center to ITSC 0 dB

After the zone numbering system is set up, this will be revised according to the Hierarchy of the telephone office stages.

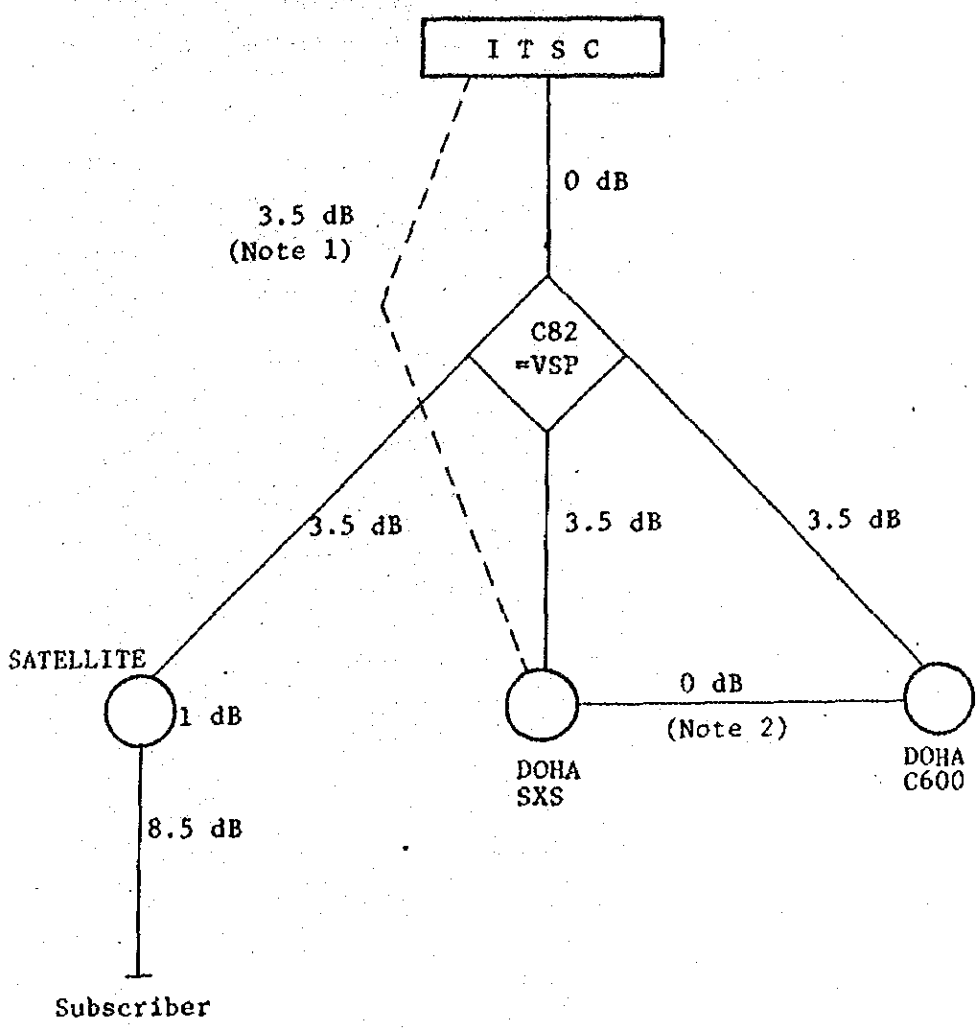


Fig. 21.1 Qatat Allocation of Send Reference Equipment

*1. For traffic reasons, there is a direct route here.
This route will be set up when the new ITSC is introduced.

*2. This route for calls between C400 & SXS only.

*3. Maximum S.R.E = 13 dB.

22. TRANSMISSION NETWORK

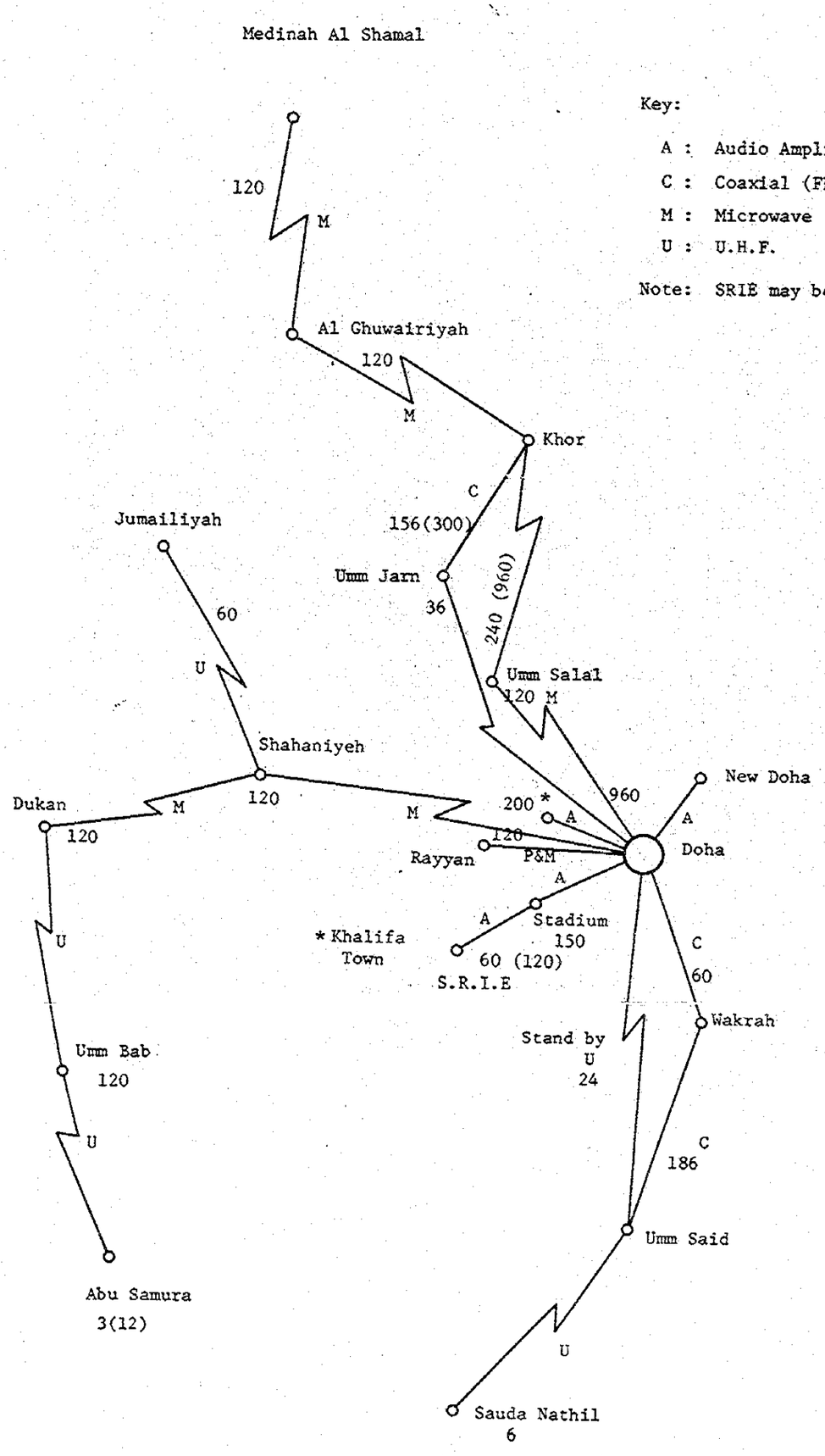
The inland transmission network proposed is shown in Fig. 22.1. Estimated total capacity will be rechecked after measuring the routing traffic volume by a suitable measurement system not yet available to the Doha Central Telephone office.

Table 22.1 shows the present transmission equipment including with two projected systems, i.e. Doha ∿ Rumailah and Doha ∿ Rayyan. Fig. 22.2 shows the private wire network which is not yet finished. Fig. 22.3 shows the gulf area transmission network.

Table 22.1 Transmission Equipment

No.	Name of section	Length (km)	Type	Number of system	Capacity (ch)	Date of installation	Name of maker	Remarks
1	Doha - Khor (& umm Jarn)	60	coax		300	July 77	S.A.T.	Not yet in Traffic
2	Doha - umm Said (& WAKRAH)	35	coax		960	Being installed	S.A.T.	
3	Doha - Rumailah	5.2	P.C.M.		(initially) 60	Projected		
4	Doha - Rayyan	11	P.C.M.		(initially) 120	Projected		
5	Doha - Khalifatown	10.25	Audio(amplified)		200	Being installed	Howells Radio	At present subject to cable

Fig. 22.1 Inland Transmission Network (Proposed)



Key:

A : Audio Amplified (4W)
C : Coaxial (FDM)
M : Microwave
U : U.H.F.

Note: SRIE may be PCM in the longer term

Fig. 22.2 Private Wire Network
(Police Post, G.H.Q.
Qatar Air Force, Fire)

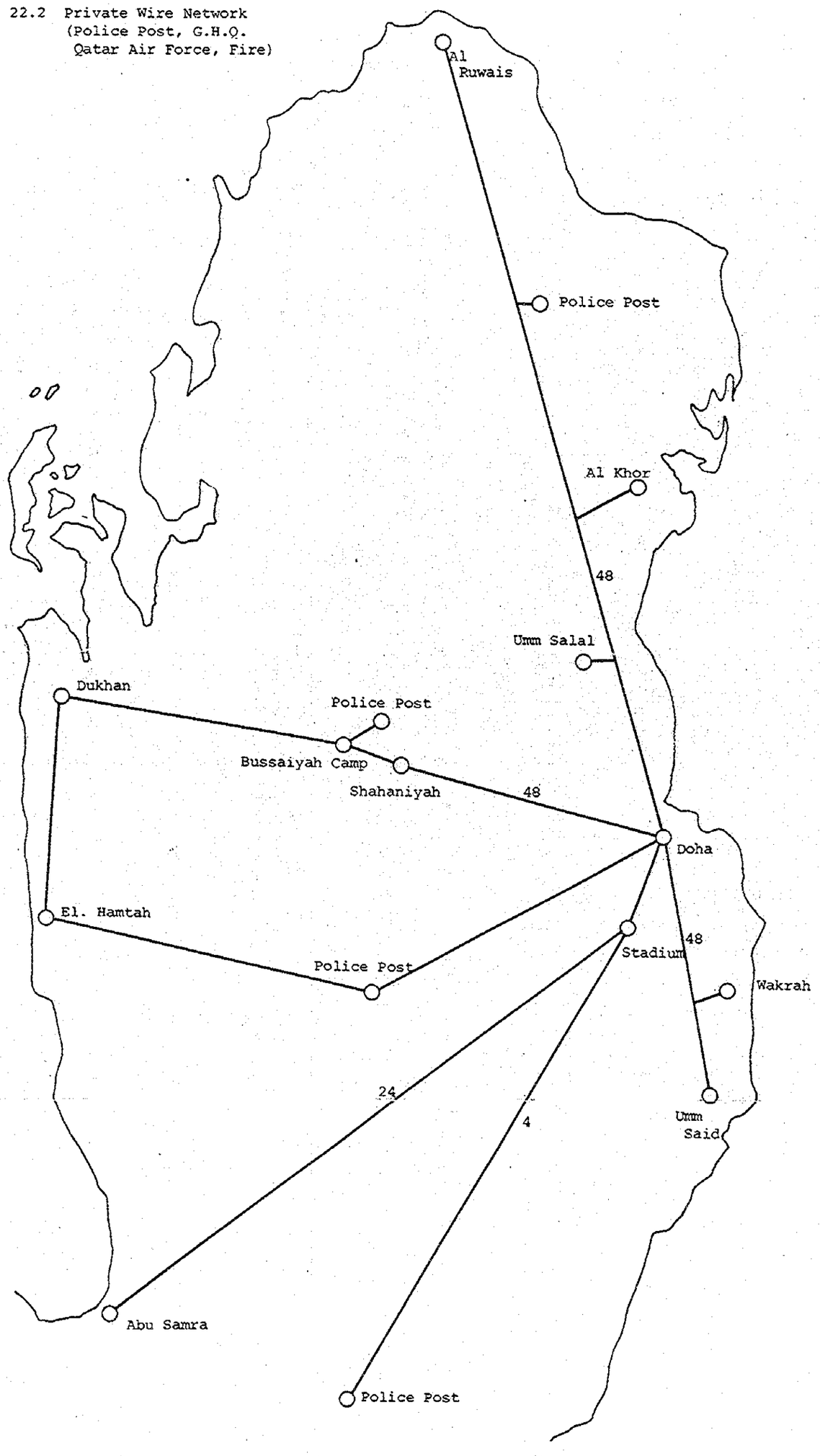
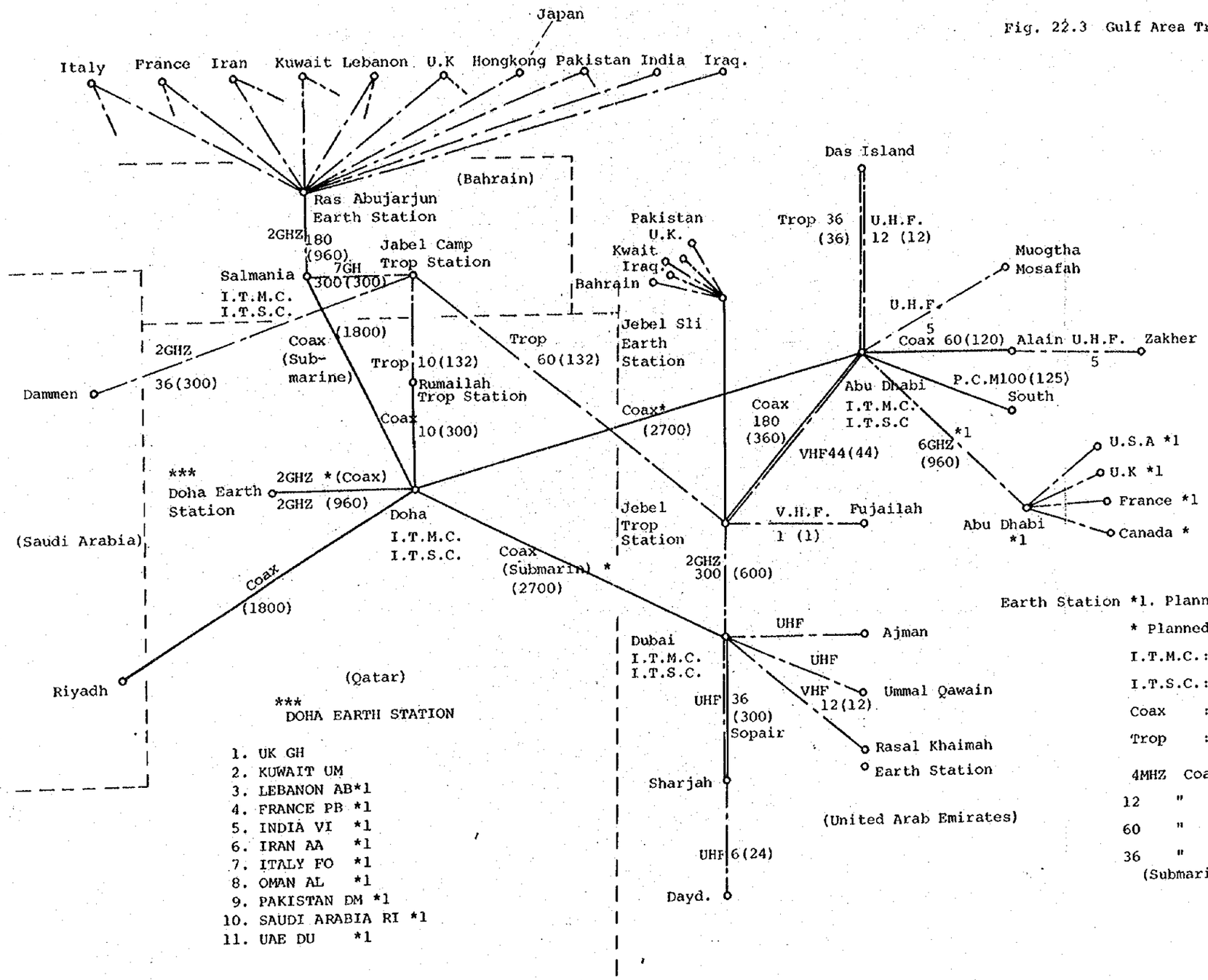


Fig. 22.3 Gulf Area Transmission Network



*** DOHA EARTH STATION

1. UK GH
2. KUWAIT UM
3. LEBANON AB*1
4. FRANCE PB *1
5. INDIA VI *1
6. IRAN AA *1
7. ITALY FO *1
8. OMAN AL *1
9. PAKISTAN DM *1
10. SAUDI ARABIA RI *1
11. UAE DU *1

Earth Station *1. Planned (cutover March, 1978)

* Planned

I.T.M.C.: International Trunk Manual Center

I.T.S.C.: International Trunk Switching Center

Coax : Coaxial cable

Trop : Troposcatter

4MHZ	Coax	900 (960)	ch
12	"	2,700	"
60	"	10,800	"
36	"	2,700	"
(Submarine)			

23. THE ERA OF OPENING THE NEW CAPITAL CITY "DOHA AND NEW DOHA"

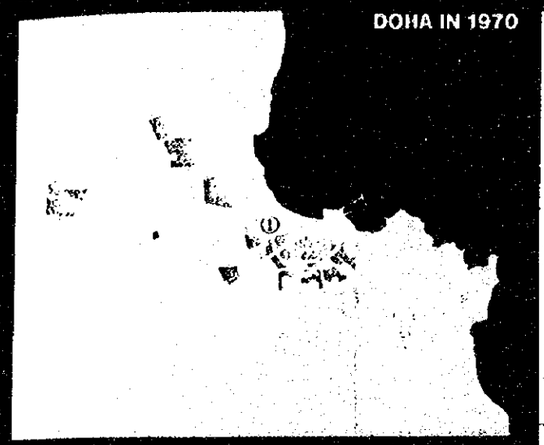
The famous consultant planners "LLEWELYN, DAVIES, WEEKS, FORESTIER, WALKER and BOR" have been making the Doha Evolving Master Plan for 1970, 1972, 1974, and 1975 and it is still progress. Figs. 23.1 and 23.2 shows one of the plans for 1975.

According to that master plan, Doha and New Doha and those suburbs clearly delineated as blocks, i.e. the government area, core area, trading area, and residential area, are included.

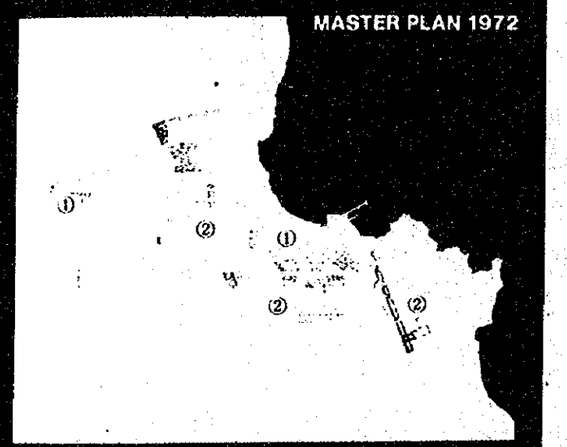
Fig. 23.3 shows six telephone service blocks in zone "3". In considering new telephone services and data transmission, it is very impotant to establish the locations where the new equipments will be installed. Fig. 23.4 indicates some of these locations.

DOHA THE EVOLVING MASTER PLAN

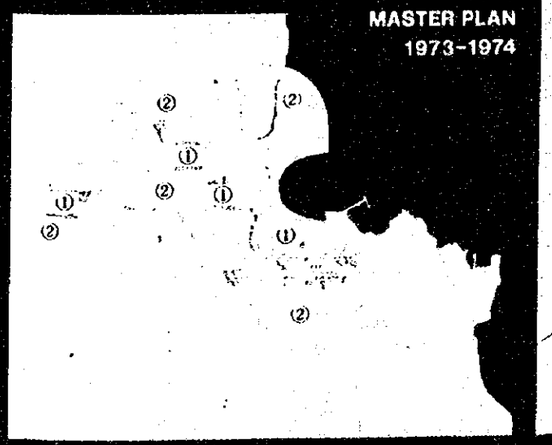
DOHA IN 1970



MASTER PLAN 1972



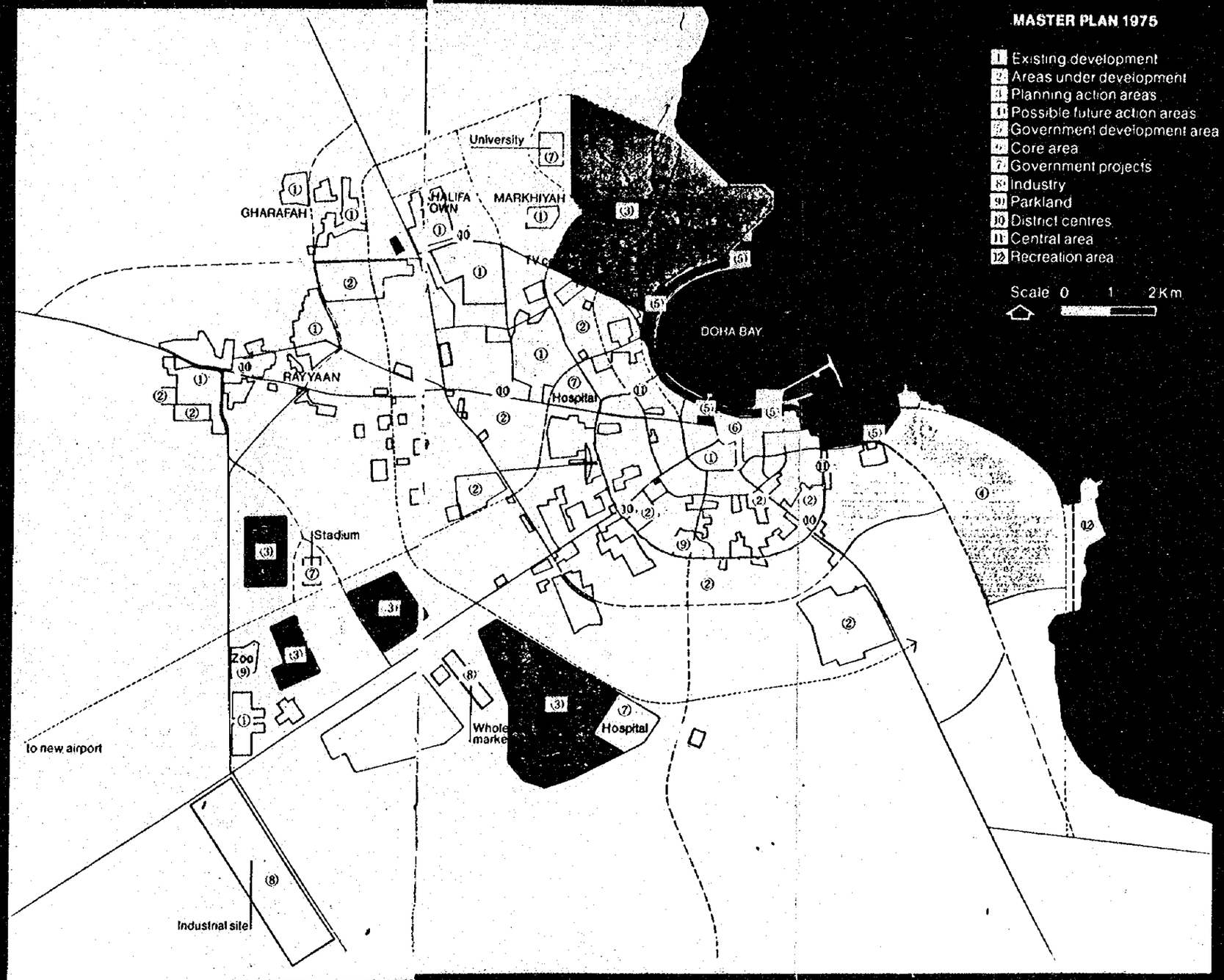
MASTER PLAN 1973-1974



MASTER PLAN 1975

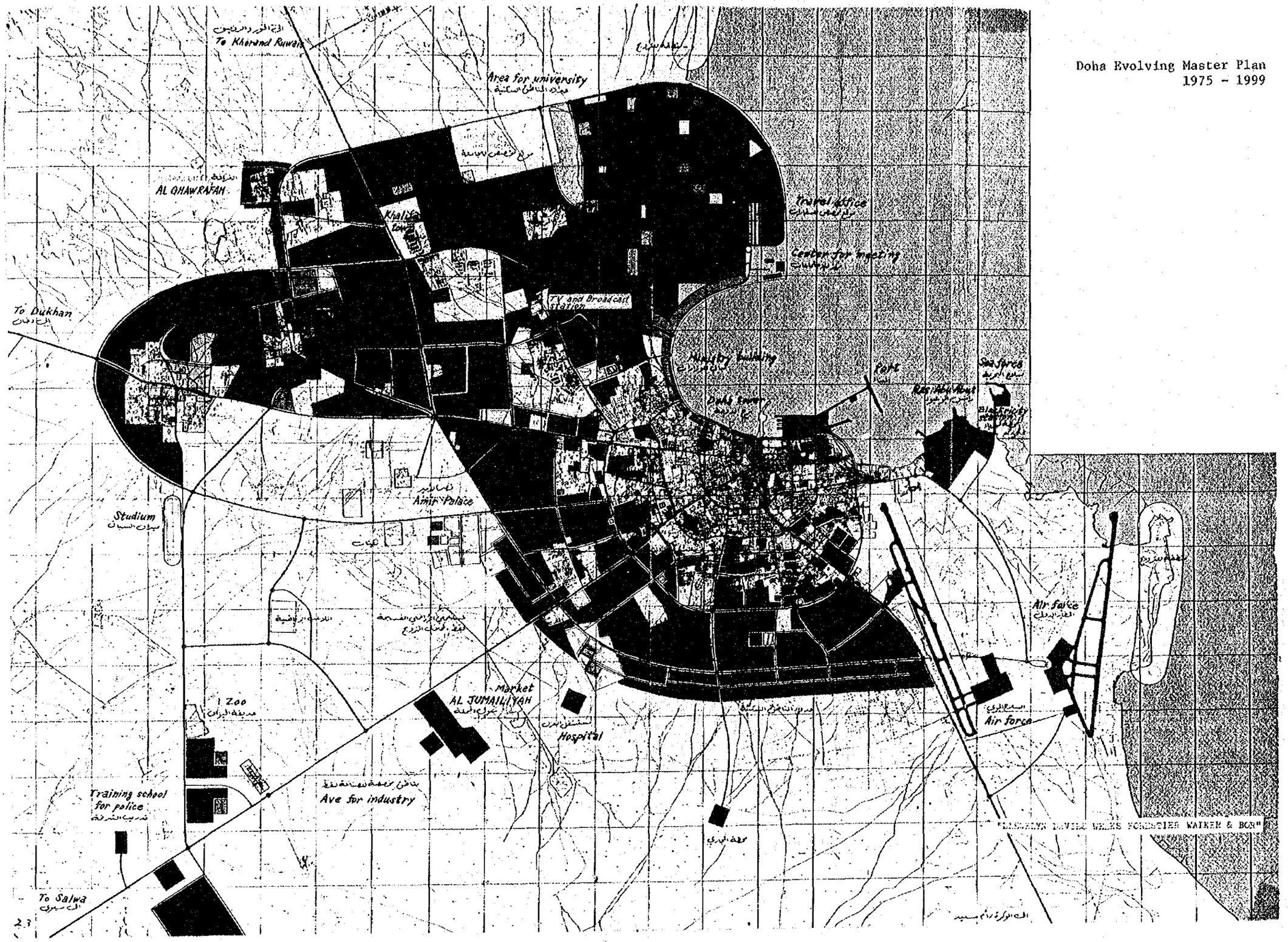
1. Existing development
2. Areas under development
3. Planning action areas
4. Possible future action areas
5. Government development area
6. Core area
7. Government projects
8. Industry
9. Parkland
10. District centres
11. Central area
12. Recreation area

Scale 0 1 2Km



"DESIGNED BY DAVIS WEBB PORTNER WALKER & BOG"

Doha Evolving Master Plan
1975 - 1999



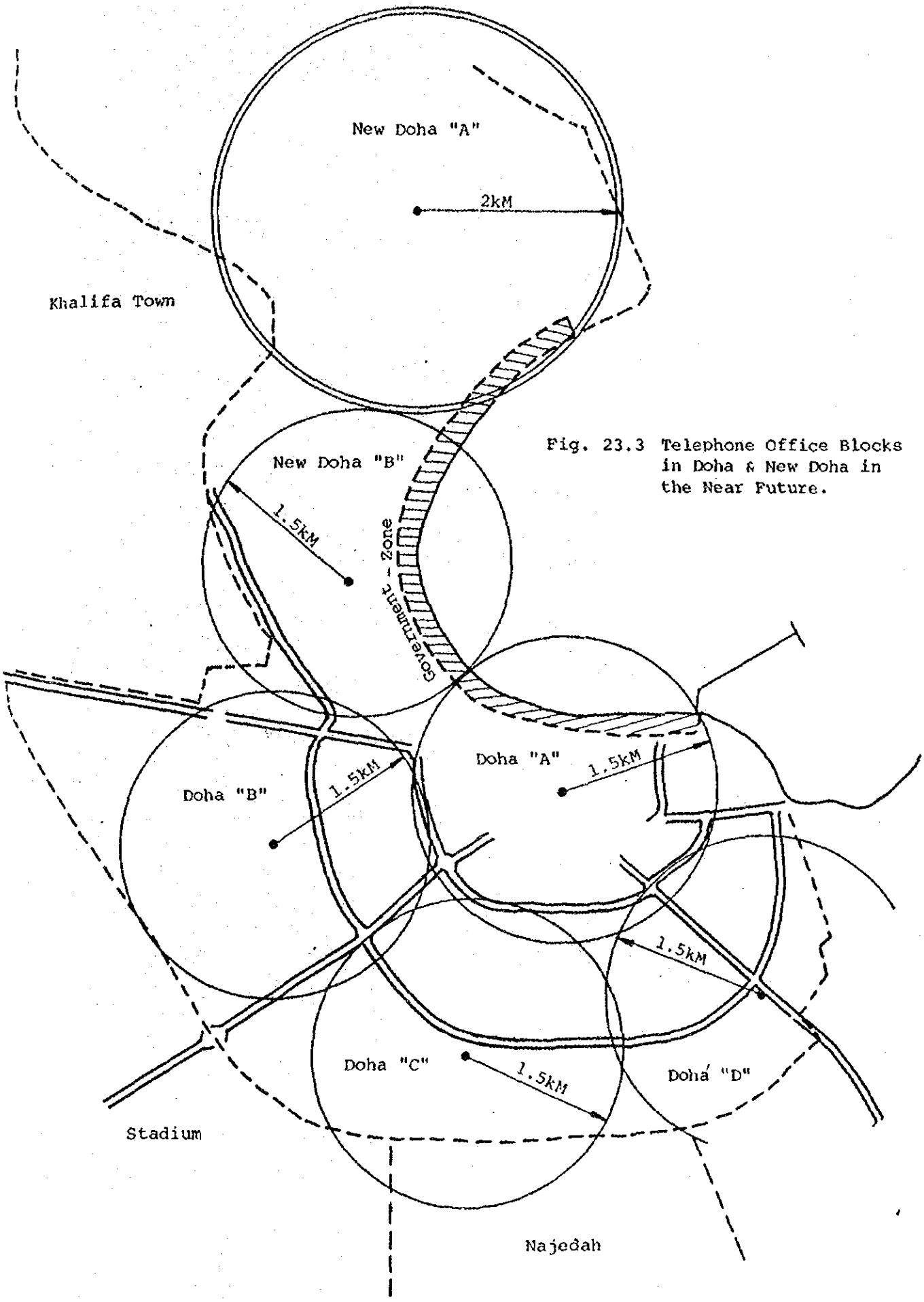
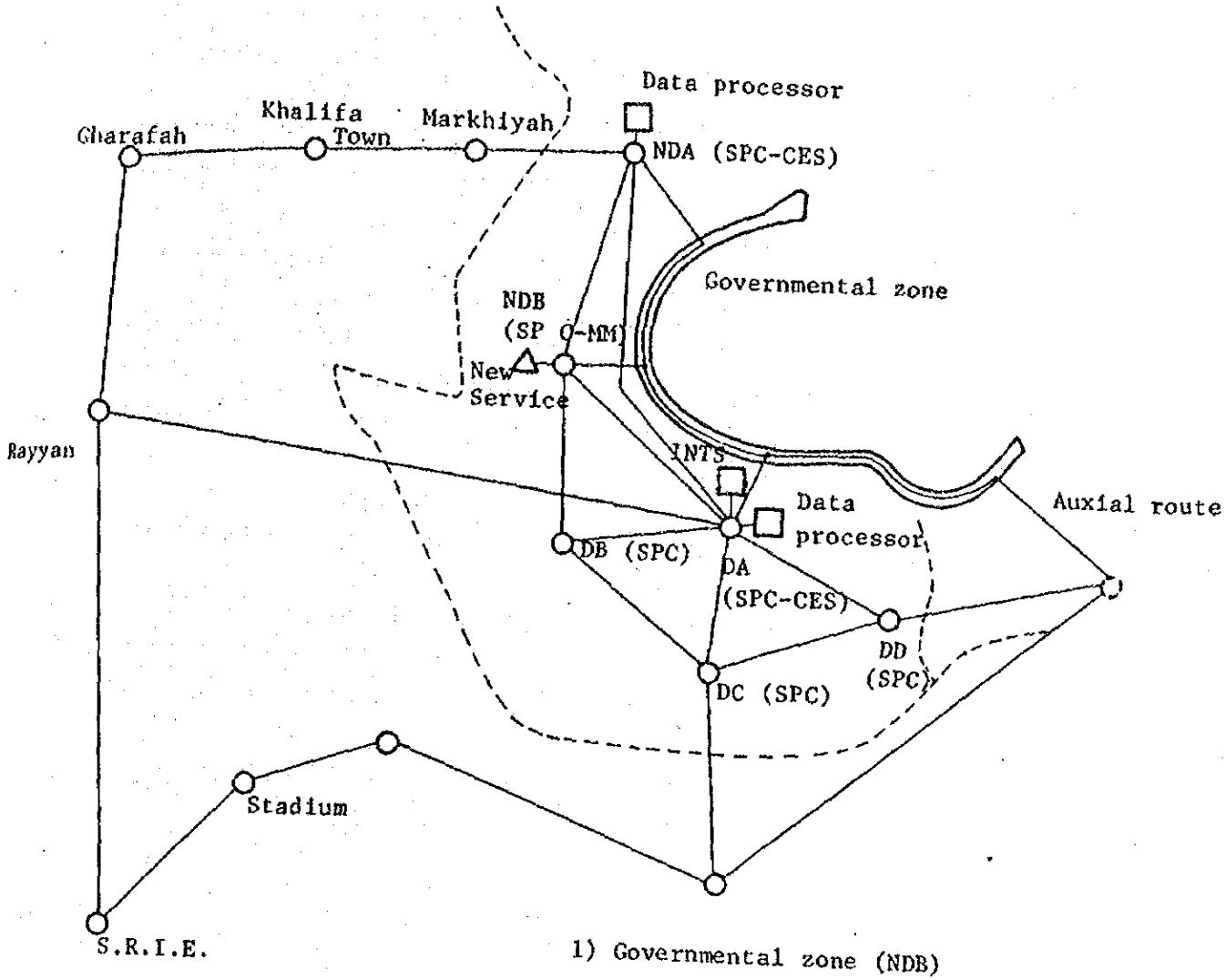


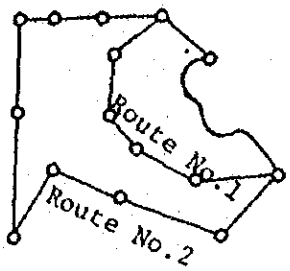
Fig. 23.3 Telephone Office Blocks in Doha & New Doha in the Near Future.

Fig. 23.3 Example of Switching Office Sites



1) Governmental zone (NDB)
2) Data processor (NDA): National proj
" (DA) : Without " "
3) New Service (NDB) : Whole area
4) O: Switching office.
5) SPC-CES: SPC-Centrex
6) SPC-MM: SPC-Mobile & Maritime
7) Emergency route.

7) Emergency route



24. DEVELOPING THE INLAND

Recently, many nations tend to concentrate on Doha or central Qatar because of the excitement concerning matters which affect these countries.

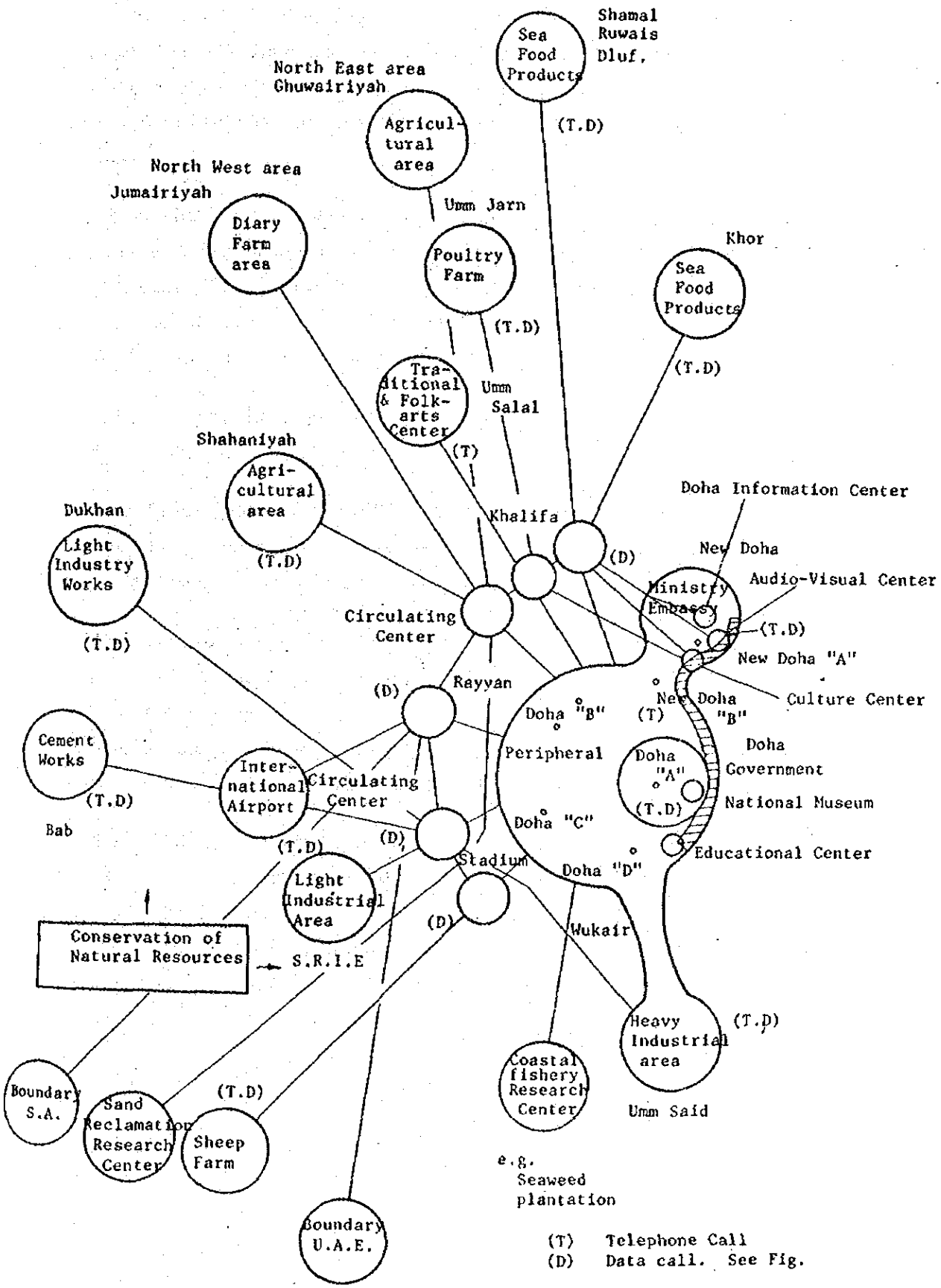
This tendency will continue until people's minds are aimed outside of the capital city where naturalness in the culture and traditional arts remains due to psychological reasons. From the Government point of view, foresight is required to develop the country.

Presently, the people who are living around the country outside of Central Doha provide support by way of vegetables, fishes, well-water, electric energy, diary products, etc. which are transported to the center.

To facilitate their productive activity, we must offer our communication techniques and support the national activities around the country.

Thus, Geometrical engineering city engineering and what we call "social engineering" will be very important. Fig. 24.1 shows an approach way of them. It is not completed but at the moment just have set about to study.

Fig. 24.1 An approach to single and multiple feature regions



25. INTRODUCING THE NEW SPC SWITCHING SYSTEM

As a result of the opening of the new capital city of Doha and New Doha and the evolving Inland, the introduction of an SPC switching system and rural communication system will be needed to facilitate communications in the society and build the intra-structure in Qatar quickly by using software technology.

Based on the demand forecast (see chapter 20), we can now roughly estimate new system and its capacity. Table 25.1 shows the total lines of SPC systems up to the year 2000, including an estimate on the extension of telephone service. Now is the time to determine to stop buying SXS switching systems, as these estimates indicate.

The figures for 1980 and 1986 this will be a very important time to determine the following.

1) The first judgement (1980) is whether the number of XB switching systems should be constantly increased or not, in connection with how many SPC switching system will be introduced.

2) The second judgement (1986) is how to decrease the number of XB SW systems and how to increase Spc's, including the introduction of the SPC-TDM system.
   The secondary judging points are 1978, 1983, 1985, 1989, 1990 and 1992 as shown in the details in the same figure.

   Table 25.1 a) ∿ d) shows forecast for the introduction of switching systems until the year 2000.
   Table 25.2 shows some services to be put into the network using XB switching systems planned by QNTS. However, in considering the introduction of a SPC switching system, the new services mentioned below must be added.

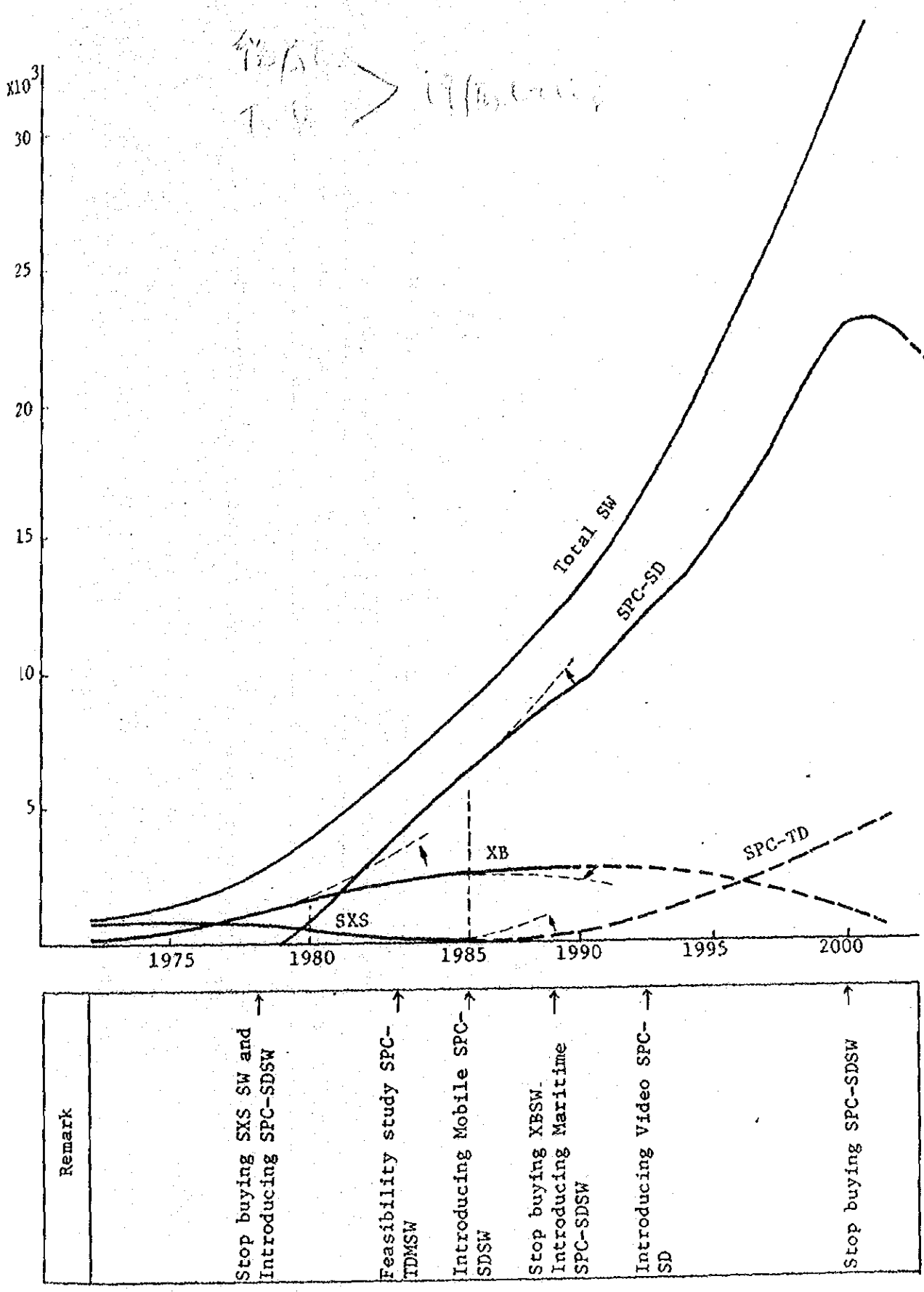


Fig. 25.1 Introduction of new SPC switching system

Table 25.1.a) Forecast for the introduction of switching systems

Area code	1981	1985	1990	1995	2000	Remarks
"1"	Xsh 560T XDl 220T RW 270T RCC(X) 110T	Dsh 960T DDl 390T RW 420T RCC(D) 190T (Mobile)	Dsh 1520T DRW 750T Dl 640T RCC(D) 310T (Maritime)	Dsh 2360T DDl 980T RW 1180T RCC(D) 480T	Dsh 4100T DRW 2100T Dl 1700T RCC(D) 800T (Video)	
"2"	XK 630T XJ 400T XS 470T RCC(X) 140T	XK 950T XJ 700T DS 800T RCC(D) 240T (Mobile)	XK 1000T XJ 1100T DS 1270T RCC(X) 380T (Maritime)	XK 1500T DK 1320T XJ 1990T DS 2280T RCC(X) 600T	XK 2000T DK 2800T XJ 3480T DS 3990T RCC(X)1050T (Video))	
"3"	SDsh 5900T XDoh 8600T DB 5820 DD 5200T DND 3000T (Mobile)	DA (11000T 4800T XDoh 9000T DB 8000T DD 7200T DNA 7500T DNB 2500T (Data)	DA 15000T XDoh 10000 T DB 10000T DC 6000T DD 9000T DNA 16000T DNB 10000T (Maritime)	DA 22500T XDoh 10000T DB 13000T DC 7000T DD 11700T DNA 30000T DNB 20000T (Video)	DA 35000T XDoh 10000T DB 18000T DC 10800T DD 16200T DNA 40000T DNB 30000T	
"4"	DR 3000T XKh 5000T XSRIE 1000T DST 2000T XNaj 1000T (500watt)	DR 5000T XKh 7000T XSRIE 3000T DST 3000T DNaj 3000T DAir 1000T RCC	DR 8000T XKh 7000T DKh 5000T XSRIE 5000T DST 5000T DNaj 5000T DAir 1500T RCC	DR 15000T XKh 10000T DKh 15000T DSRIE 2000T XSRIE 5000T DST 10000T DNaj 12000T DAir 2000T SRIE Video)	DR 30000T XKh 10000T DKh 30000T DSRIE 5000T XSRIE 5000T DST 20000T DNaj 20000T DAir 2500T (Video)	
"5"	Xu 2000T XWak 700T Wuk RCC(X) 360T	Xu 4000T DW 1000T XWuk 350T RCC(X) 920T (Mobile)	Xu 4000T Du 2000T DWa 1650T XWu 700T RCC(X)1720T (Maritime)	Xu 4000T Du 4000T DWak 2940T DWuk 1300T RCC(D) 3100T	Xu 4000T Du 6000T DWak 4900T DWuk 2500T RCC(D) 5400T	
"6"	X 120T RCC(X)	X 180T RCC(X)	X 260T RCC(X) (Mobile)	X 370T RCC(X)	X 500T RCC(X)	
"7"	XDuk 320T XBab 110T RCC(X)	DDuk 350T XBab 190T RCC(X) Duk Mobile	DDuk 500T XBab 290T RCC(X) Bab Mobile	DDuk 650T XBab 390T	DDuk 800T XBab 490T	
"9"	-	XGh 290T XJ 170T RCC(X)	XGh 420T XJ 250T RCC(X)	XGh 590T XJ 350T RCC(X)	XGh 800T XJ 450T RCC(X)	
Total	S. 5900T X. 22010T D. 19020T (T) 46930T	X. 26750T D. 57350T (T) 84100T	X. 32120T D. 99140T (T) 131260T	X. 34790T D. 180790T (T) 215580T	X. 36720T D. 292590T (T) 329310T	

Table 25.1.b)

Area code	Center of area	1981	1985	1990	1995	2000
"1"	Al Shamal	C23 x 1 conc CX x 2	SPC_C x 2 * R SPC_C x 2 RCC x 3 Mobile SPC 2*	SPC_B x 1 * SPC_C x 1 * RCC x 2 Maritime SPC x 2*	SPC_C x 1 (or SPC-TD)	SPC_C x 1 (or SPC-TD) Video SPC x 1
"2"	Al Khor	C23 x 1 RCC x 5	SPCCx 1 * RCC x 1 Mobile SPC1 *	SPC_B x 1 * RCC x 1 Maritime SPC 1*		Video SPC x 1
"3"	Doha	SPC_B x 3 Mobile SPC x 2	SPC_A x 1 SPC_B x 1 Data SPC 1	SPC_B x 1* Maritime SPC 1*	SPC_B x 4 (or SPC-TD) Video SPC x 2	SPC_B x 3 (or SPC-TD)
"4"	Rayyan	SPC_B x 1	C400 + 4000T SPC_B x 1 SPCC x 1 RCC x 3	SPC_B x 1 RCC x 3	SPC_C x 1 Video SPC x 1	SPC_B x 4 (or SPC-TD) Video SPC x 3
"5"	Umm Said	C23 x 1 conc CX x 1 RCC x 1	SPC_C x 1 Mobile SPC1	SPC_C x 1* Maritime SPC*1	SPC_C x 1	Video SPC x 1
"6"	Karana	C23 x 1 RCC x 5		SPC_C x 1 Mobile SPC 5		Video SPC x 2
"7" ("8")	Dukhan (Umm Bab)	RCC x 3	SPC_C x 1* Conc CX x 1 Mobile SPC*	SPC_C x 1 Mobile SPC1		Video SPC x 1
"9"	Ghuwairiyah		C23 x 2 RCC x 4			D30 x 1
Total		C23 x 4 SPC_B x 4 RCC x 21	SPCB x 2 SPC_C x 6* RCC x 11 Conc CX x 1 Mobile SPC 5* Data SPC 1	SPCB x 4* SPC_C x 4* RCC x 6 Mobile SPC x 6* Maritime SPC x 5*	SPC_B x 4 SPCC x 3 Video SPC 3	SPCB x 7 SPC_C x 2 Video SPC x 9

Table 25.1.c)

Area code	Center. of area	1981	1985	1990	1995	2000
"1"	Al Shamal	Al Shamal C23 Abu Dluf. Ruwais. conc CX Al Shamal & Ghashamiyah RCC	Al Shamal C23 → SPC_C* Abu Dluf, Ruwais. R.SPC_C Athba Jifrah RCC Al Shamal Mobil SPC*	Ruwais R.SPC → SPC_C Thagas. RCC Al Shamal Maritime SPC	Abu Dluf. R.SPC → SPC_C (or SPC-TD)	Al Shamal +SPC_C (or SPC-TD) Al Shamal Video SPC
"2" Al Khor C460(77.10) Umm Jarn C460(78.M)	Al Khor	Umm Salal C23* *Changing C460 (80) plan into C23 Al Khor, Umm Jarn, Farus, Mashrab Umm Salal RCC	Umm Salal C23 → SPC_C* *using for new service Shayallakiyah RCC Umm Jarn Mobil SPC*	Al Khor C460 → SPC_B* *using for new service Biraka Dhakhira RCC Al Khor Maritime SPC*		Al Khor Video SPC

Area code	Center of area	1981	1985	1990	1995	2000
"3" Doha SXS 8000T (0.300 N.5900) Doha C400 10000T Doha C23 (27XXX) 1000T	Doha central	Doha "B" SPC_B Doha "D" SPC_B New Doha SPC_B Doha New Doha Mobile SPC	Doha SXS → SPC_A C23 "A" New Doha "A" "B" SPC_B New Doha Data SPC	Doha "C" SPC_B New Doha "A" +SPC_B Doha Maritime SPC	Doha "B" +SPC_B (or TDM SPC) Doha "D" +SPC_B (or TDMSPC) New Doha "A" + SPC_B (or SPC-TD) New Doha "B" + SPC_B (or SPC-TD) Doha New Doha Video SPC	Doha "C" +SPC_B (or SPC-TD) New Doha "A" + SPC_B (or SPC-TD) New Doha "B" + SPC_B (or SPC-TD)
"4" Khalifa C23x2 → C400 3000T (77.10) Rayyan C23 SRIE C460(78.4) Stadium SPC_B *Changing C460 (79.3) plan into SPC_B Najedah C23?	Rayyan	Rayyan (Muraikh) C23 SPC_B	Khalifa (Gharalah, Markliyah) +4000T Najedah C23 → SPC_B Air port SPC_C Shakaniyah SRIE Stadium RCC	Rayyan +SPC_B Alatiyah Mustahar Rawdat Rashid RCC	SRIE +SPC_B SRIE Video SPC	Rayyan +SPC_B (or SPC-TD) Khalifa +SPC_B (or SPC-TD) Stadium +SPC_B (or SPC-TD) Najedah +SPC_B (or SPC-TD) Rayyan Kalifa Stadium Video SPC

Area code	Center of area	1981	1985	1990	1995	2000
"5"	Umm Said			Umm Said SPC_C *using for new service		Umm Said Video SPC
		Wakrah C23	Wakrah C23 → SPC_C			
Wakrah SXS 250T						
Wukair SXS 100T		Wukair conc CX	Wukair conc CX→C23		Wukair C23 → SPC_C	
Umm Said SXS → C400 600T 3000T			Wakrah Mobile SPC	Wakrah Maritime SPC		
		Wukair RCC				
"6"	Karana	Karana C_{23}		Karana C_{23} → SPC_C *used for new service.		Salwa Sawdi Nathil Video SPC
	Sauda Nathil	Karana Salwa Sauda Nathil Kharrarah Haraichi RCC		Karana Salwa Saudi Nathil Kharrarah Haraichi Mobile SPC		
"7" ("8")	Dukhan		Dukhan C_{23} → SPC_C			Dukhan Video
Dukhan C_{23}(78)		Dukhan Ghab	(Khatiyah) conc CX	Umm Bab C23 → SPC_C		
Umm Bab C_{23}(78)		Umm Bab. RCC	*using for new service	*using for new service		
	"8" (Umm Bab) in the Future		Dukhan Mobile SPC	Umm Bab Mobile SPC		
"9"	Ghuwairiyah		Ghuwairiyah C23 Jumailiyah C23			Ghuwairiyah C23 → SPC_C* (or SPC-TD) *using for new service
			Ghuwairiyah Jumailiyah Zubarah SS.Bin Hamad RCC			

Table 25.1.d)

Item	1981	1985	1990	1995	2000
Switching system	C23 x 4 Conc CX x 3 SPC_B*2 x 4 RCC*3 x 21	SPC_B x 2 SPC_C x 6*1 C23 x 4 RCC x 11 conc CX x 1 Mobile SPC x 5*1 Data SPC x 1	SPC_C x 4 SPC_C x 4*1 RCC x 6 Mobile SPC x6*1 Maritime SPC x 5	SPC_B x 4 SPC_C x 3 Video SPC x 3	SPC_B x 7 SPC_D x 2 Video SPC x 9
*4 Switching capacity	S. 5,900T X. 22,010T D. 19,020T T. 46,930T	X. 26,750T D. 57,350T T. 84,100T	X. 32,120T D, 99,140T T.131,260T	X.34,790T D.180,790T T.215,580T	X. 36,720T D.292,590T T. 329,310
Services	See Table	Mobile comm. by SPC system Data processing system	Maritime comm by SPC system	Video comm. by SPC system	

*1. Conmmon use of SPC to provide the services.

*2. Stored program control switching system.

B: 2500T ∿ 20,000T

C: 300T ∿ 4,500T

*3. Rural communication system.

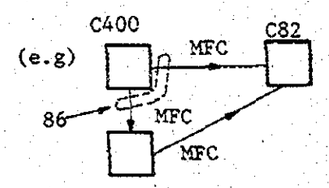
*4. SXS:S, XB:X D:SPC T:Total

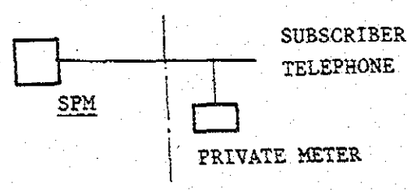
Table 25.2 Some service to be put in planning by QNTS

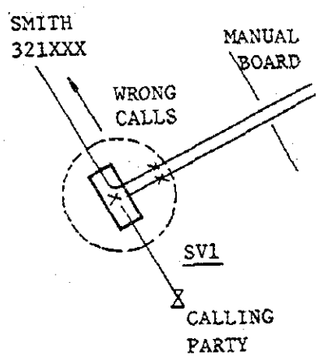
OFFICE	MFC		DP/LP				PABX	TKO	LINE TEST	SV1	CN1	ICT	SPM	ALARM	CCB
	OG	IC	OG(A)	OG(B)	OG(C)	OG(D)									
Doha (8000) C400 (13000) X	86	72	(140) 120	50	(12) 11	19		2(SXS) 4(ITSC) 2(C82)		15	4	10	60	12	
Khalifa	100	66					300		2	18	4	100	102		15
Khor	38	28						2	2	12	4	20	204		
Umm Said	108	80						2	2	18	4	100	102		
Umm Jarn	16	14					30	2	2	6	4	10	12		5
Salwa R.I.E.	50	42					700	2	2	12	4	20	204		5
Umm Salal	16	14					80	2	2	6	4	10	12		5

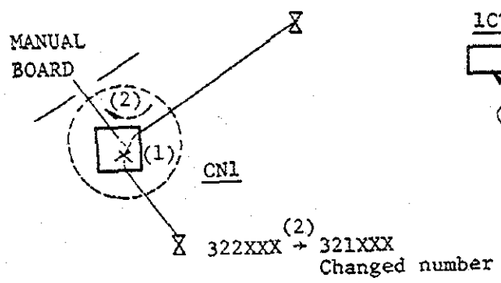
BLANK: NUMBER OF TRUNKS NOT DETERMINED.

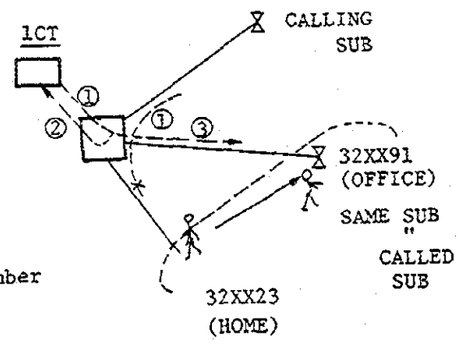
1) MFC R2 DISCONTINUOUS/CONTINUOUS.
2) DP OG(A) Lev 2,6, 2nd SEL in Doha
   (B) Lev 7,8, GSD.
   (C) Lev 1, 9
   (D) Lev 6, 86, 87
3) TKO TRUNK OFFER
4) SV1 SERVICE INTERCEPTION
5) CN1 CHANGING NUMBER INTERCEPTION CALL TO THE MANUAL BOARD.
6) ICT INCOMING CALL TRANSFER
7) SPM SOBSCRIBER'S PRIVATE METER
8) CCB COIN COLLECTING BOX TRUNK







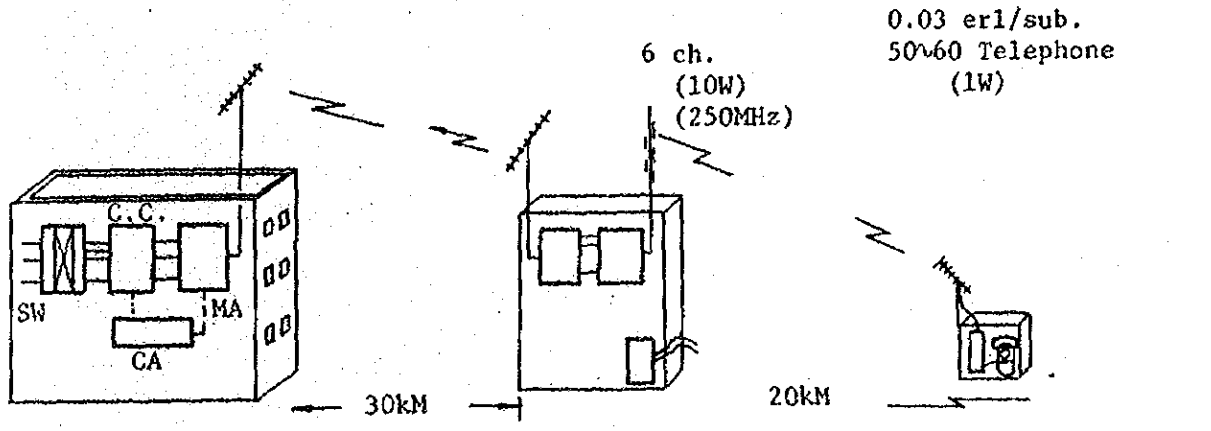




26. RURAL COMMUNICATION SYSTEM

For evolving in the country side, the land is apparently being planned as three kinds of administrative zones i.e. a) city b) centralized rural town, and c) rural area in which living patterns are unchanged or the supply of public activities e.g. power supply, well water supply, is being pursued.

In the case of a) and b), introducing a switching system will not be technically difficult, but in the case of c), some systematic technology will be needed. Topologically, introducing the wireless rural communication technology is advantageous. Fig. 25.1 shows one example of this technology.



CC: Circuit control
MA: Multi Access Equipment
CA: Alarm Control Equipment
BSE: Base Station Equipment

Fig. 26.1 Wireless rural communication system

27. REGIONAL SWITCHING SYSTEM PLAN

Setting the service area of the telephone offices requires an investigation of the circumstances and administrative factors in the area.

Presently, it is difficult to accomplish this because of a lack of recognition from cooperative organizations. To make a more precise and effective plan, to avoid a loss time and money, it is necessary to have the meetings with such organizations to deal with public activities as soon as possible.

The settlement plans for the switching system shown in Fig. 27.1 a) ∿ g), especially zones "6" ∿ "9", require extensive further investigation.

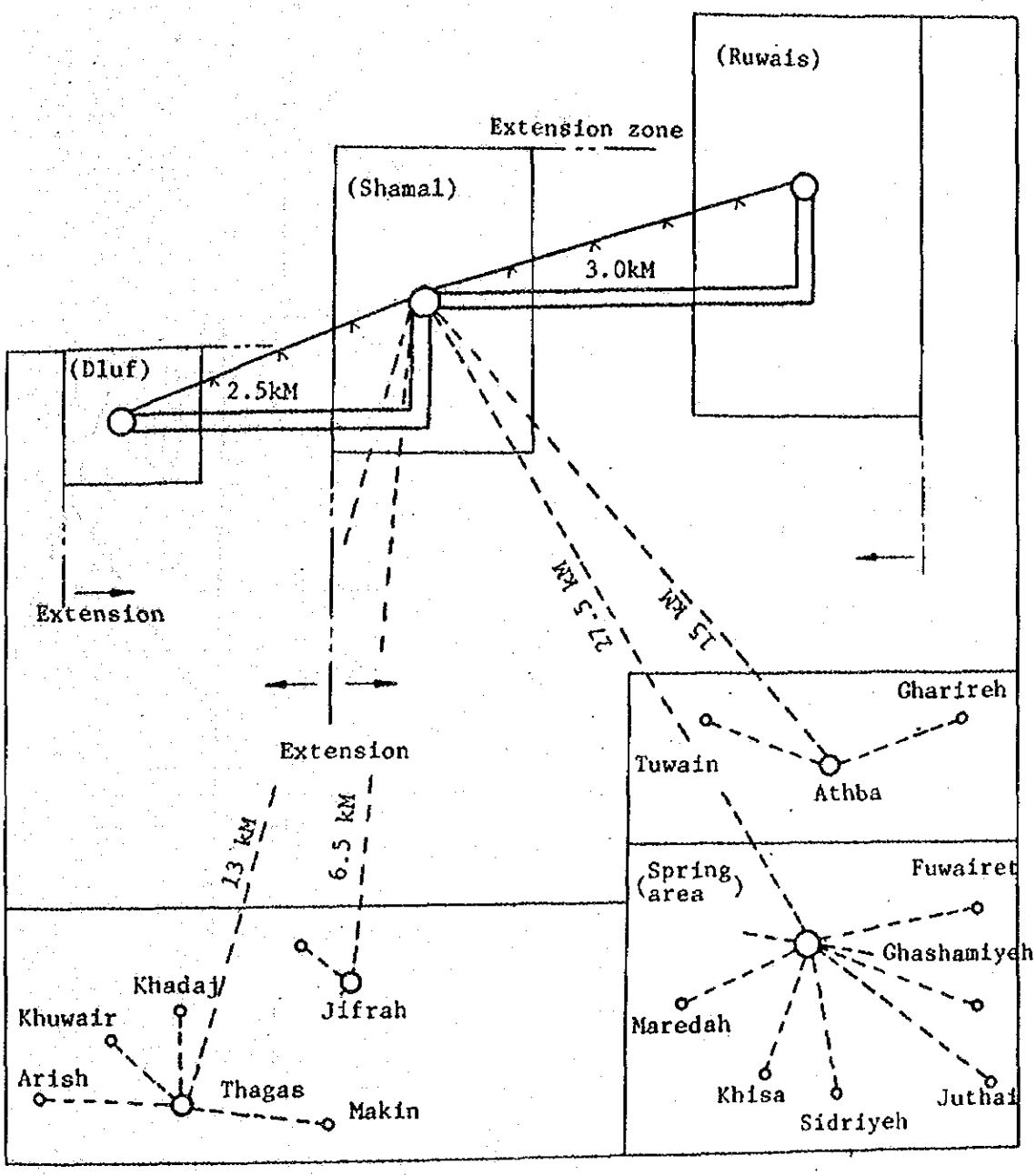


Fig. 27.1.a) Zone "1" Shamal area

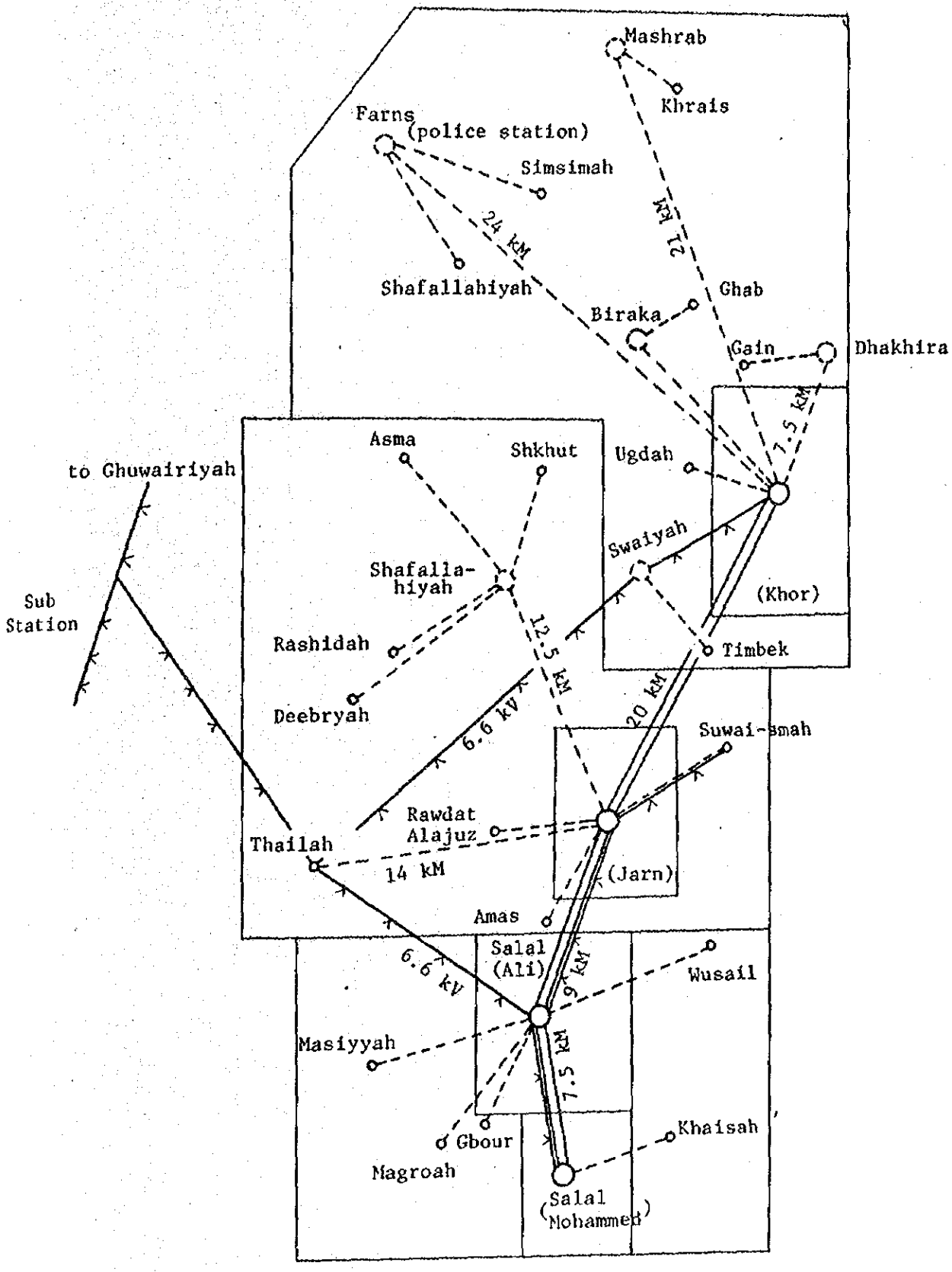
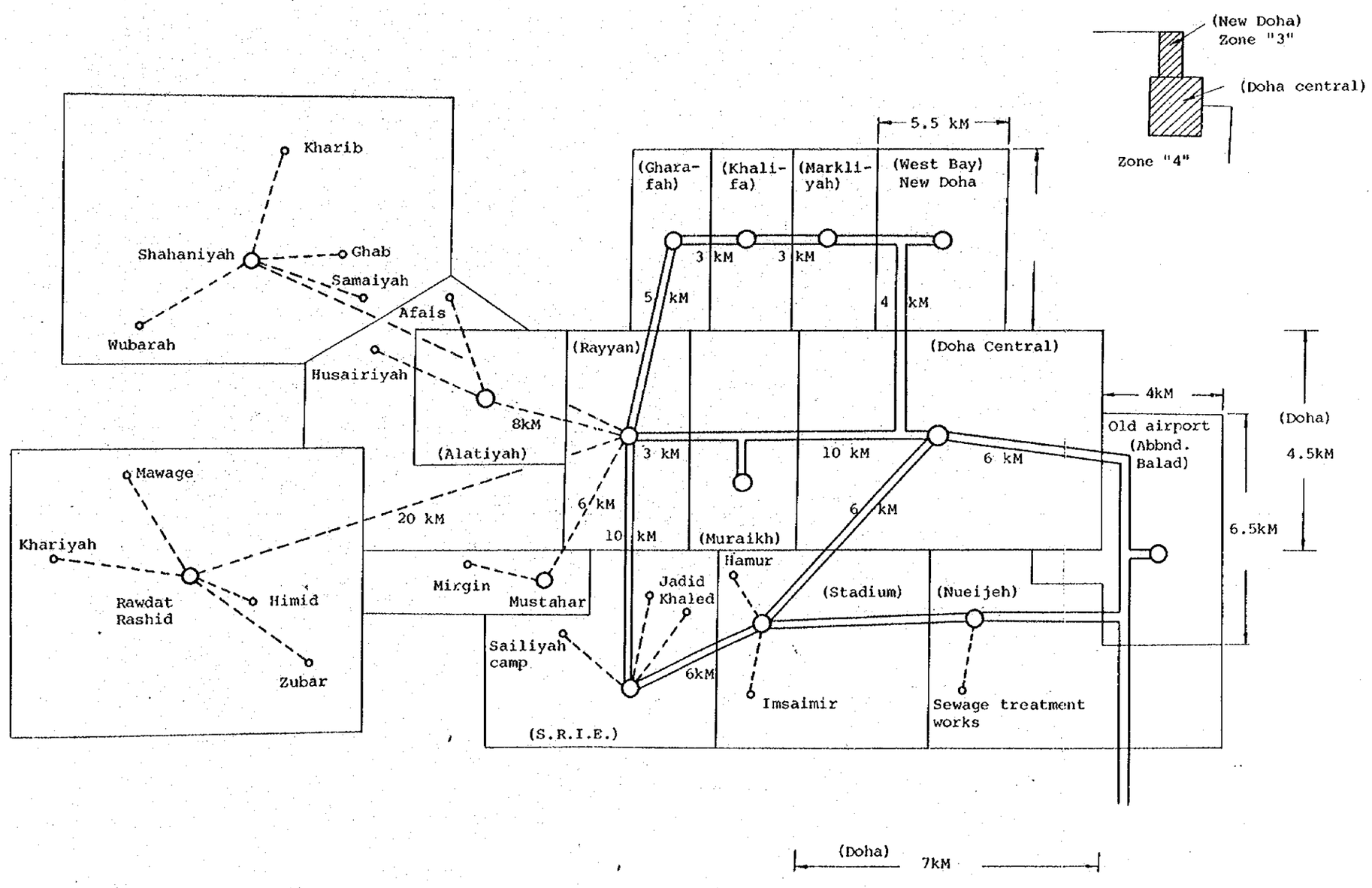


Fig. 27.1.b) Zone "2" Khor area

Fig. 27.1.C) Zone "3" Doha Area
Zone "4" Rayyan Area



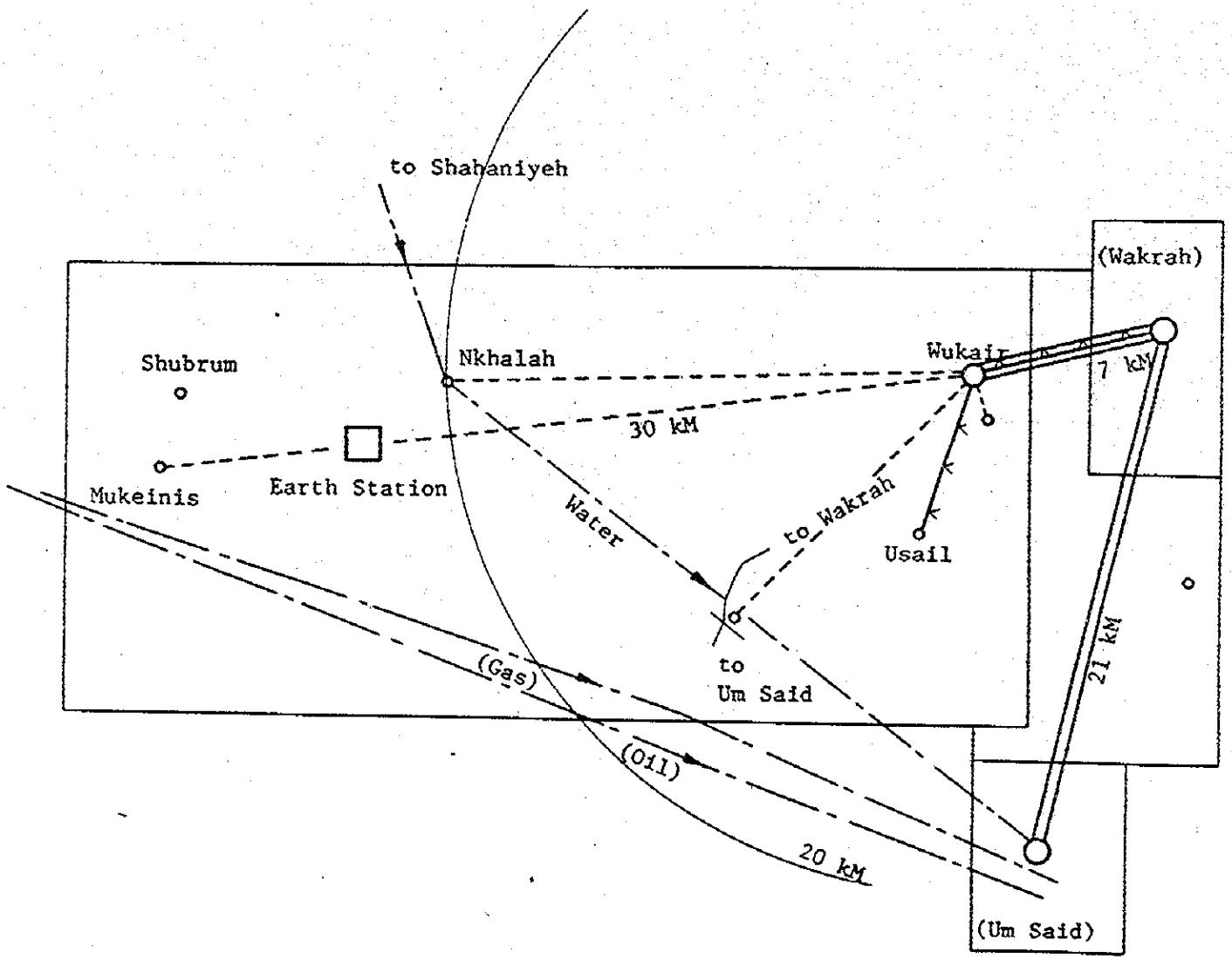
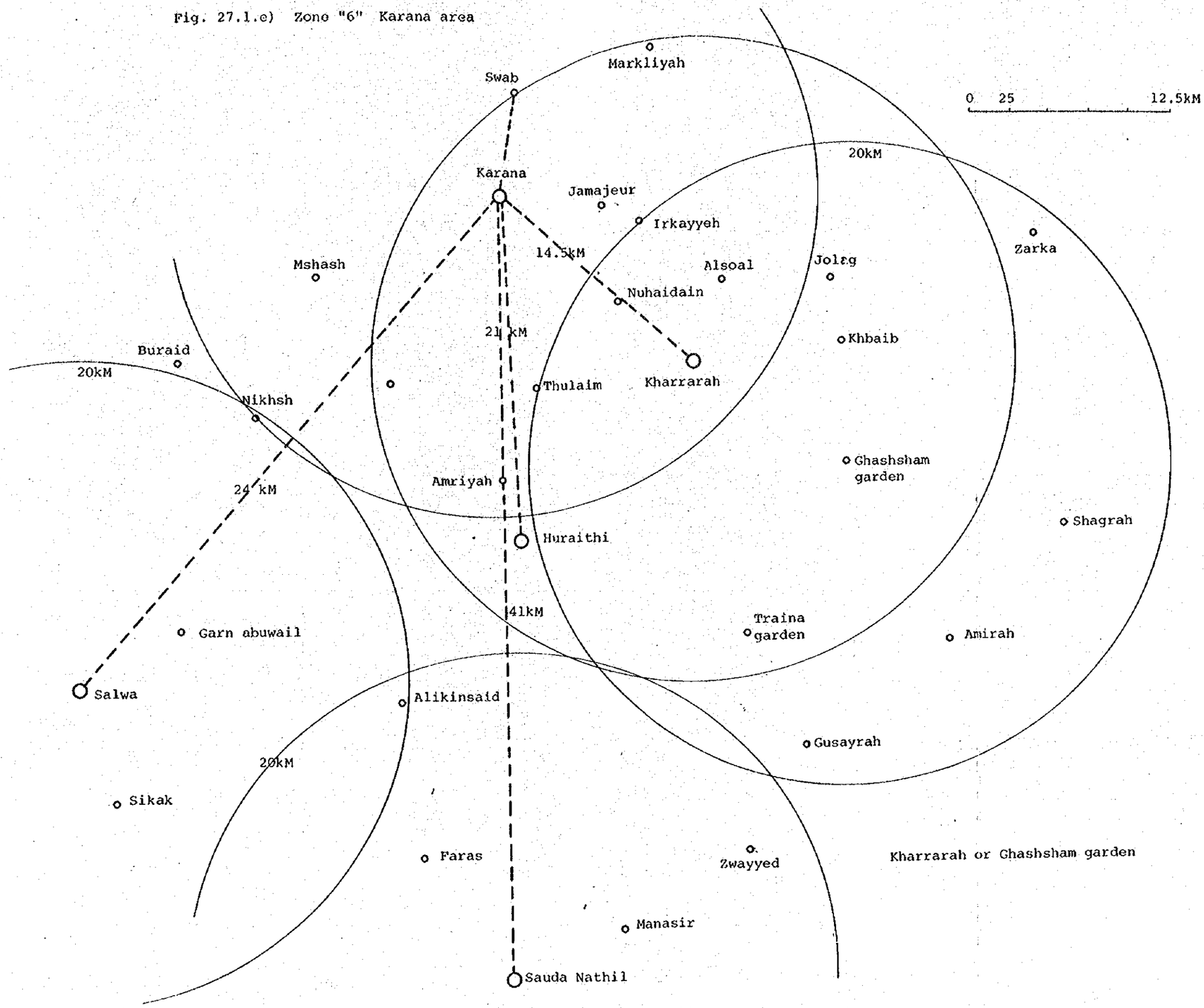


Fig. 27.1.d) Zone "5" Um Said area

Fig. 27.1.e) Zone "6" Karana area



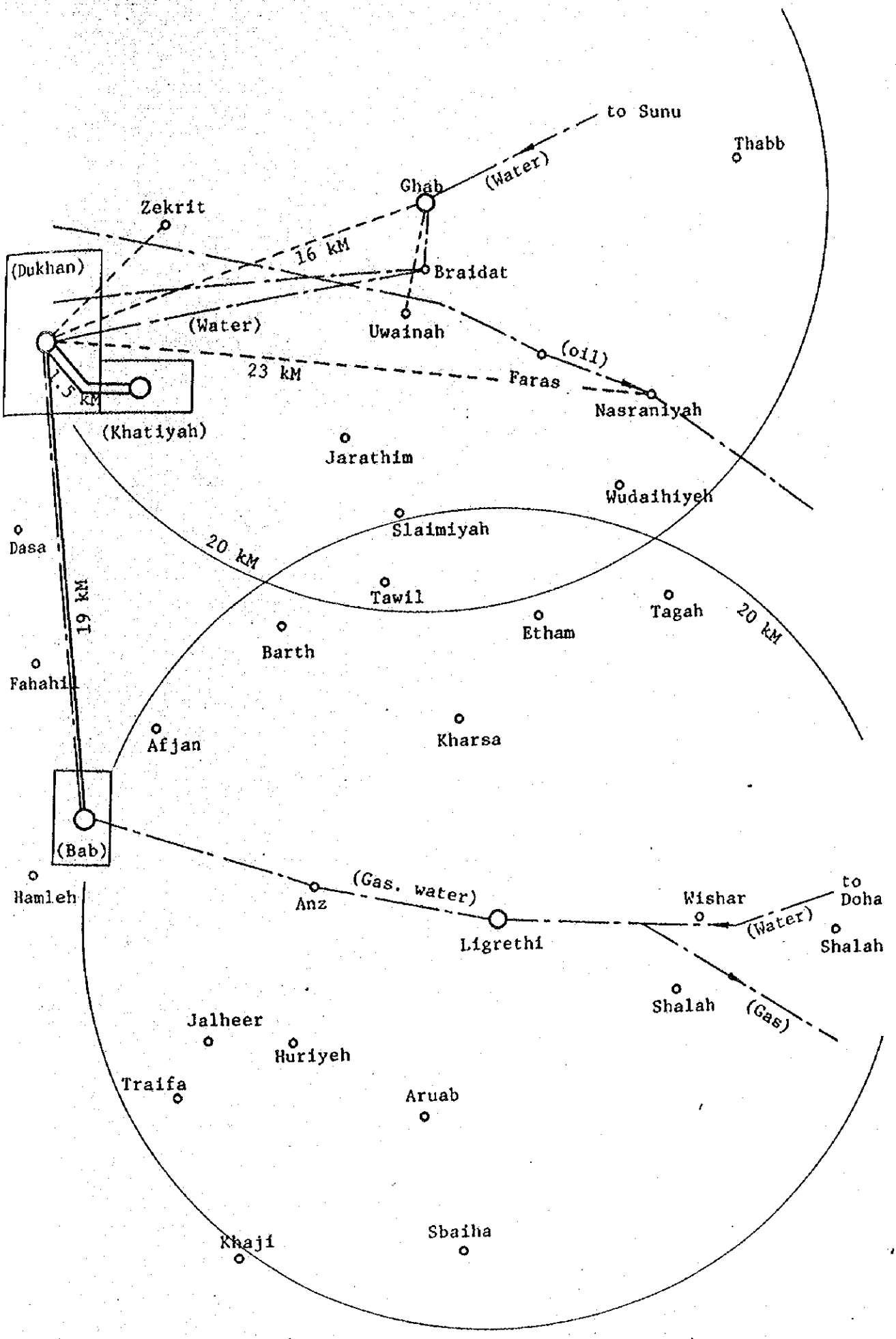


Fig. 27.1.f) Zone "7"("8") Dukhan Um Bab area

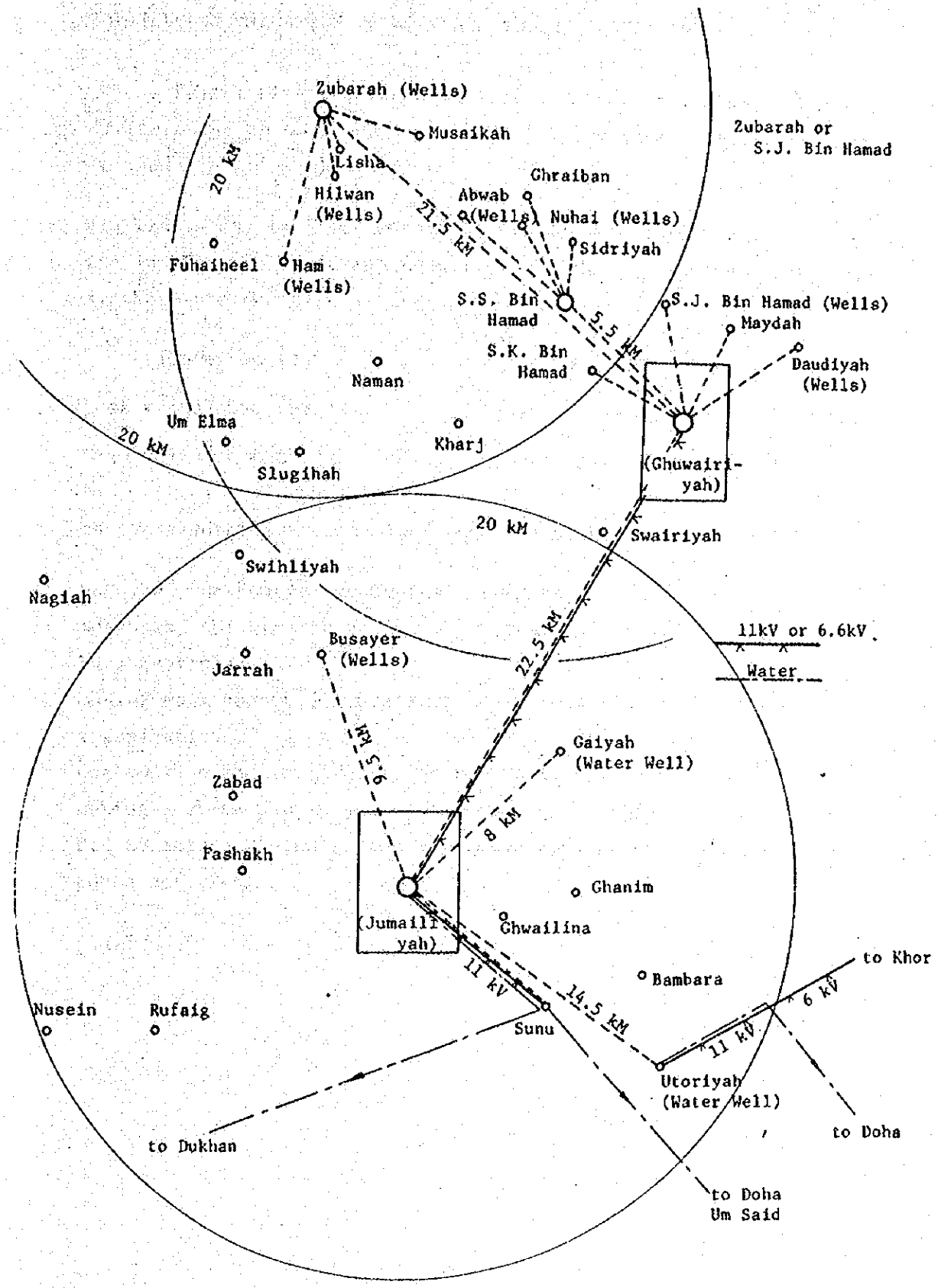


Fig. 27.1.g) Zone "9" Ghuwairiyah Jumailiyah area

28. QATAR TELECOMMUNICATION NETWORK AND FUTURE TRAFFIC VOLUME

From those feasibility studies of traffic congestion in the past and present, we can estimate the network and its traffic volume in the future as shown in Fig. 28.1, and Fig. 28.2 a) ∿ c).

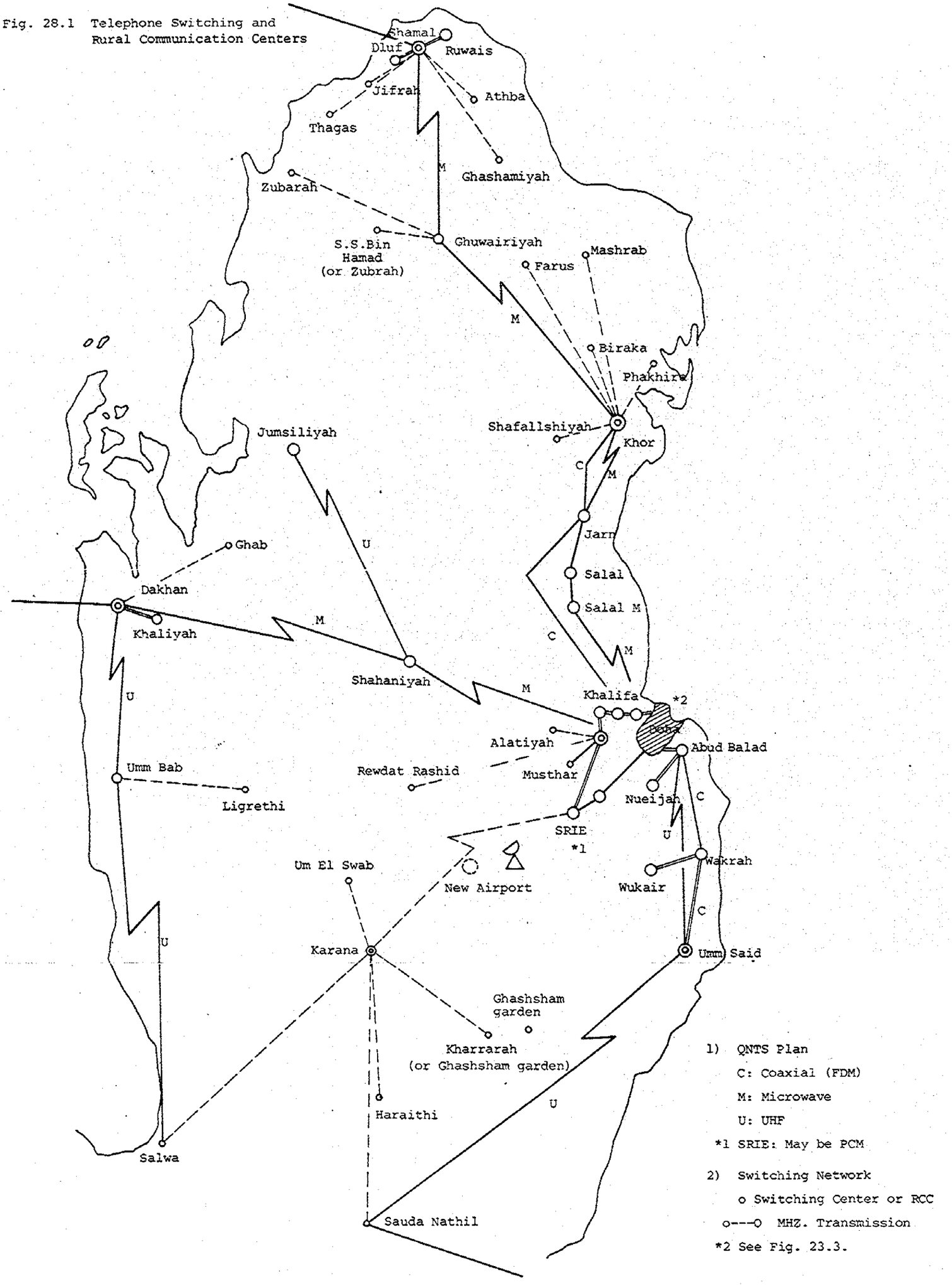
The traffic volume is based on the population and telephone line forecasts dealt with in chapter 20 and Appendix 1. If the population growth rate declines, there are two alternatives.

	(Investment)	(Telephone diffusion rate)
1)	Less value than the plan	Same value as the plan or less.
2)	Same value as the plan	Higher value than the plan.

To achieve a working action plan, the following items will be required:

1) Study of the general geological dynamics,
2) measuring the traffic volume every year and providing feedback to the Equipment-plan,
3) making well controlled public plan in relation to the multi-cooperative organizations,
4) Controlling the long term plan backed by continued investment,
5) making a white paper such as the documents produced in Japan and the U.K to inform the nation on governmental activities and the effects of these activities.

Fig. 28.1 Telephone Switching and Rural Communication Centers



1) QNTS Plan
C: Coaxial (FDM)
M: Microwave
U: UHF
*1 SRIE: May be PCM

2) Switching Network
o Switching Center or RCC
o---o MHZ. Transmission
*2 See Fig. 23.3.

Fig. 28.2.a) Traffic Flow Between Each Zone (1981)

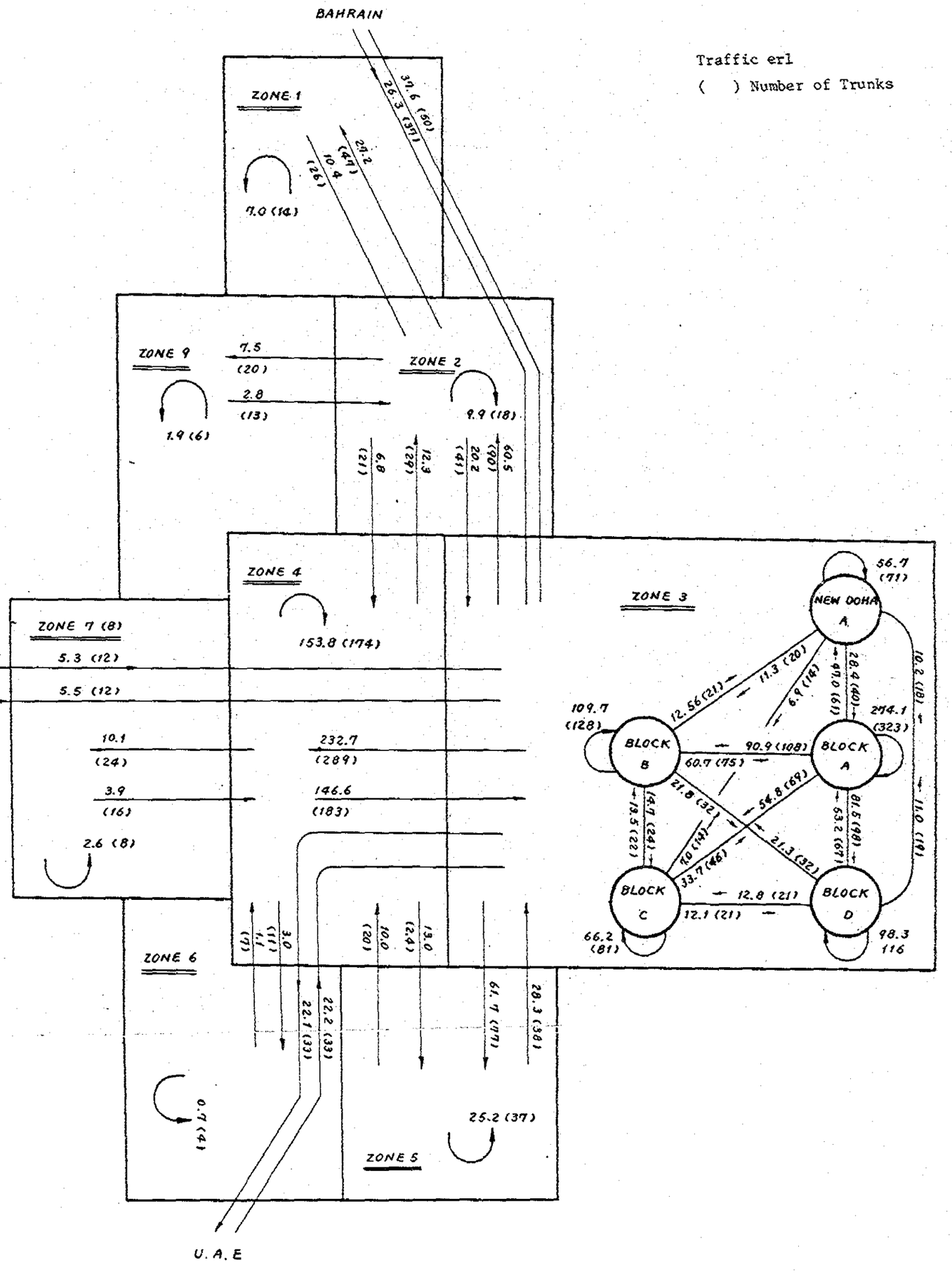


Fig. 28.2.b) Traffic Flow Between Each Zone (1990)

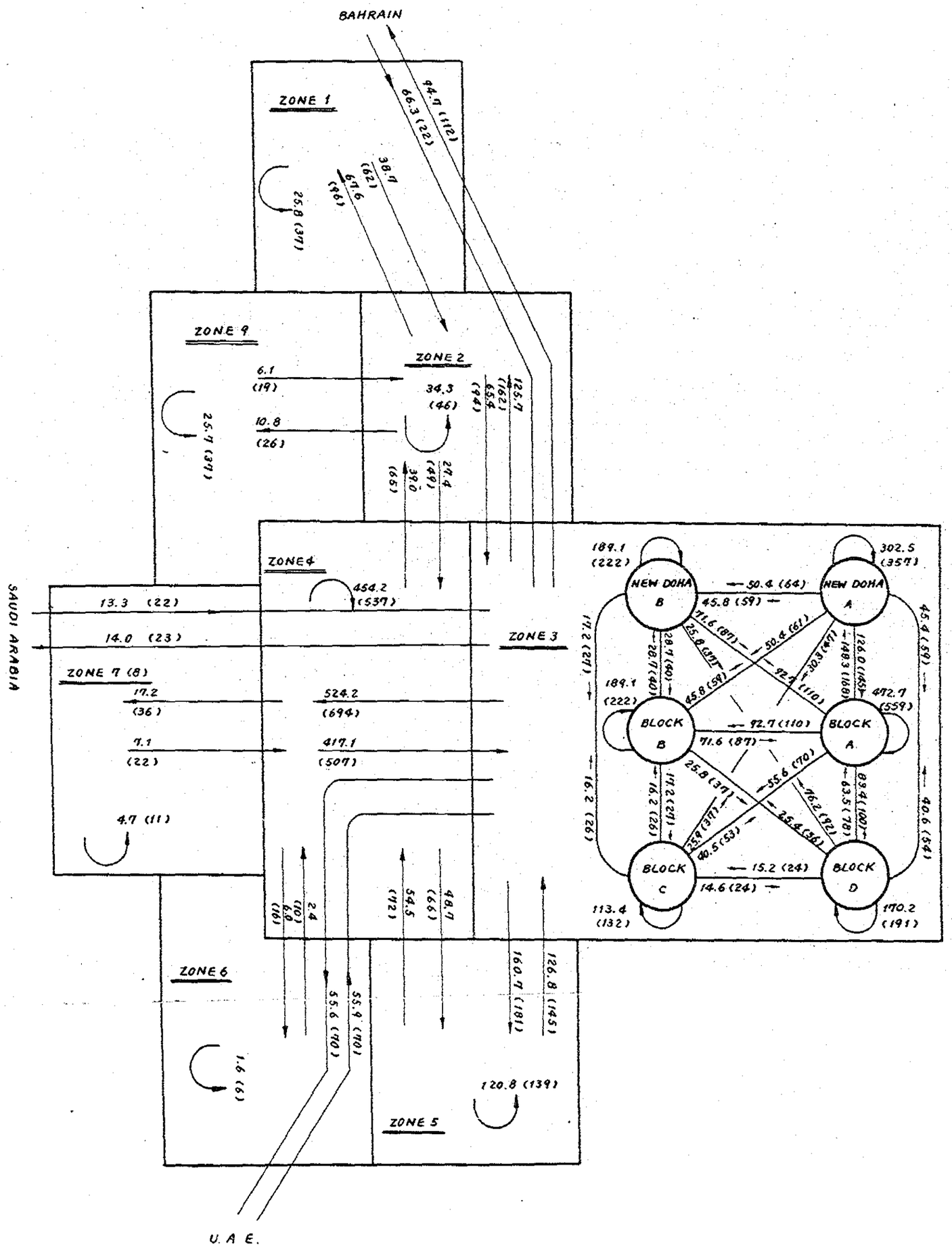
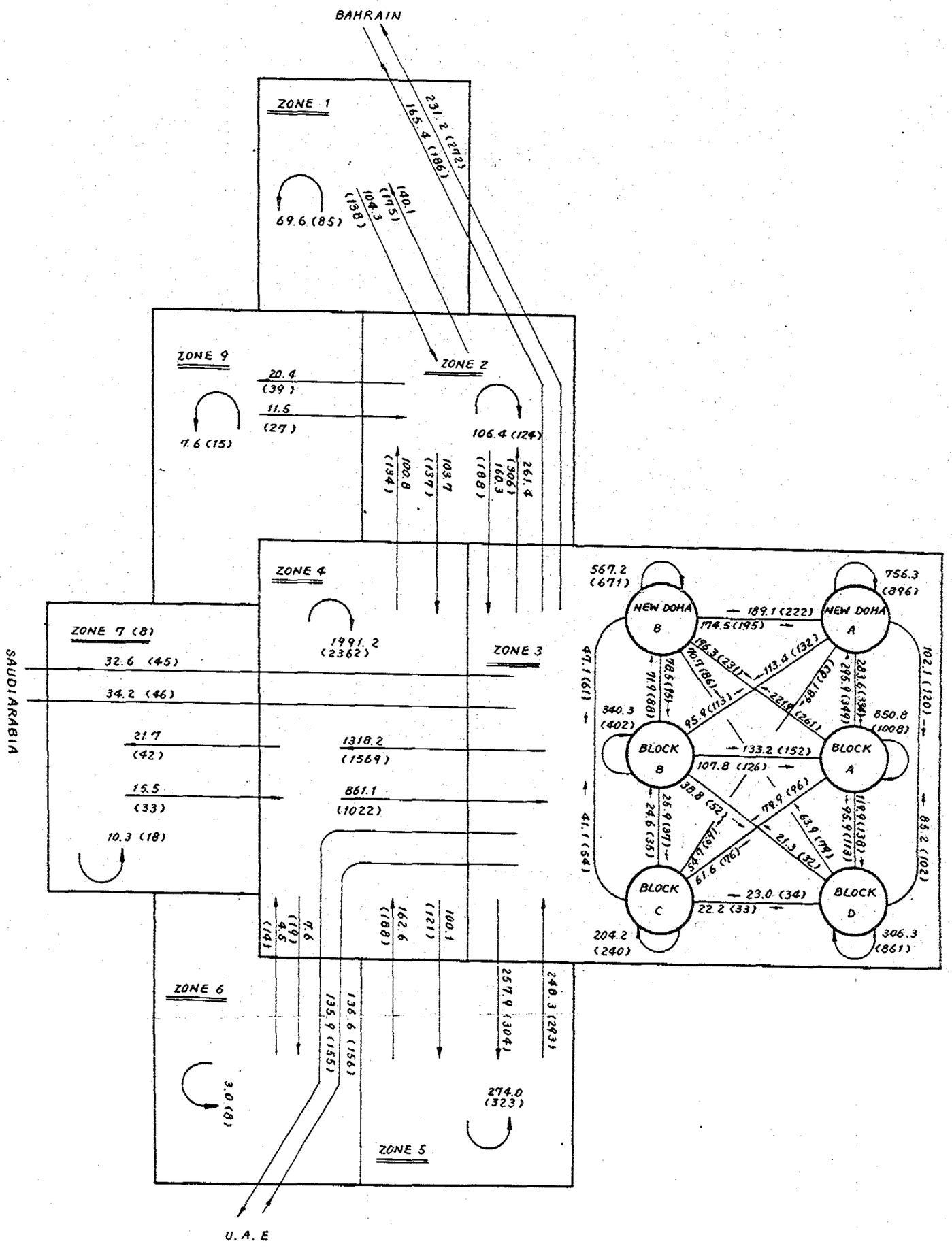


Fig. 28.2.c) Traffic Flow Between Each Zone (2000)



29. SUMMARY

The matters discussed in this volume are summarized below.

1) According to the value of the GNP, present, telephones per 100 persons is estimated as 15 ∿ 20. If total population is presently about 200,000, the estimated number of telephone lines should be about 40,000; however, at the moment the number is only 20,000 lines or less.

2) National investment for telecommunications has been instable so that setting up a long term telecommunications plan with according to the plan for the national developments of Qatar should be completed rapidly.

3) To decrease traffic congestion, the items mentioned below must be accomplished.

   a) introduction of the key telephone set
   b) introduction of more pilot number service
   c) introduction of traffic measurement and its management system
   d) extension of frames into the XB switching system.

      i.e. o Dial tone Marker ..... one or more.
      o Completing Marker .... one or more.
      o International Telephone Equipment outgoing sender ..... 7 or more
      o Grading balance of traffic volume in LLF and LSF
      o Extension lines and junctions.

      See chap 12. "Line and junction capacity."

4) The present zone delineating plan should be reconsidered, taking into account the following:

   o Delineating zones along main roads
   o naming the numerical code clock-wise.
   o balancing zone power
   o considering numbering plan

   See chap. 16. "Zone planning in the future".

5) When the SPC switching system is introduced into the network,

a) as the LS stage

Old stage switching systems i.e. C82, C400, C460, C23 and Rulax SXS, should be supplemented by a signal transfer function MFCR2 $\overset{\rightarrow}{\leftarrow}$ DP.

b) as the TLS stage

Old stage, Board, and ITSC should be supplemented by the same function in themselves.

6) The present numbering plan must be changed.

a) memorizing the scheme geographically must be easier.

b) it must correspond to variable telephone demand in the area.

c) it must retain flexibility for the introduction of new services.

7) Telephone forecast in the future: For 1981, 1985, 1990, 1995, and 2000, the estimate in about 50,000, 80,000, 127,000, 205,000 & 310,000 lines or more, respectively. And business telephone sets at that time is expected to account for 45% to 25% of the total.

8) In consideration of the opening of the new capital city-Doha & new Doha", six telephone office service zones will be required here.

9) The amount of new SPC switching system capacity needed in the year 2000 will be about 290,000 lines or more.

10) Introducing Rural communication system topologically will be very important as infractructure for promoting the prosperity of the country.

11) Estimated traffic volume in 1981, 1990 and 2000 is shown in Fig. 28.2. a) ∿ c).

This report also discusses the following questions.

1) What do we think of population growth?
2) Why do we have to know national investment?
3) How did QNTS members make efforts to face with the Qatar Telecommunication network in the past?
4) What is the main reason for the traffic congestion at the moment and what kind of action is needed?
5) How is the telecommunication network in the present and near future to be understood?
6) What is the prospect for introducing new switching systems into Qatar in the long range?

The following items will be required in the future.

1) New electronic switching system dynamics
2) New electronic switching system objects
3) New services to meet social needs
4) PABX in the present and the near future
5) Data information processing system dynamics
6) Mobile and maritime services using SDC systems
7) Total communication networks for Qatar in the future
8) Telecommunication system maintenance and operation
9) Total communication system including video system in the future
10) Global training plan and capacity for expansion
11) Total scheduling and a commitment to observe the schedule

ANNEX 1

Forecasting an alternate traffic flow between each zone.

The figures and tables show the alternate traffic volume and number of trunks between each zone from 1981 to the year 2000 based on the categories mentioned below.

1) The calling rate in each zone, except for zone 3, applies the same value used in Japan as shown Table 1.

Table 1 Calling Rate

(erl)

Number of Terminals	Originating Calling Rate
∿ 2000	0.015
2000 ∿ 10000	0.02
10000 ∿ 50000	0.03
50000 ∿	0.04

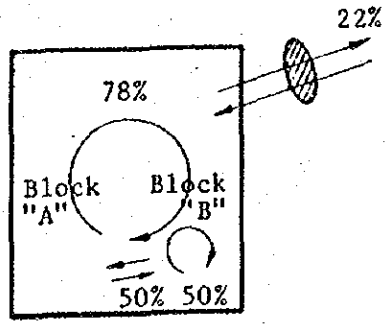
In the case of zone 3, the value is"0.05 erl" which QNTS used in the design for the following.

2) the traffic volume between each zone or block is propotional to the number of terminals

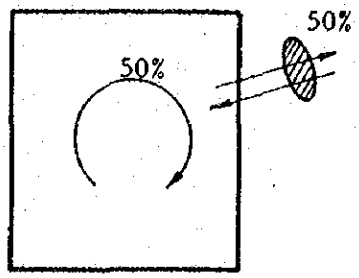
3) the traffic volume in the same zone is reference to the volume noted a above

a) the Intraffice connection rate is 40 ∿ 60% in the Doha switching system. see chapter 8.

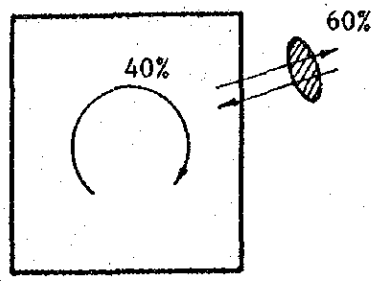
b) zone 3



zone 4



zones without 3 and 4



4) International calls are forecast by using the traffic volume shown in the Middle East and Mediterranean Telecommunication Project "(June 1977)

5) The concentrating call ratio during busy hours is 10%

6) The international exchange is in zone 3.

7) The Loss-call-probability is 0.01.

International Traffic (Outgoing)

Year	1980			1981	1990	2000
No. of Terminals of Zones 3 + 4				42800	107900	263500
	$x10^3$ mins/ year	erl	Growth rate per year %	erl	erl	erl
Bahrain	3900	17.81	20	21.37	53.87	131.55
Kwait	1050	4.79	30	6.23	15.71	38.37
Egypt	750	3.42	30	4.45	11.22	27.41
U. K.		4.58	20	5.50	13.86	33.84
Bahrain en-route		30.60	-	37.55	94.66	231.17
Saudi Arabia	900	4.11	35	5.55	13.99	34.17
U. A. E.	3718	16.98	30	22.07	55.64	135.87

$$53.87^{erl} = \frac{107900}{42800} \times 21.37^{(erl)}$$

International Traffic (Incoming)

Year	1980			1981	1990	2000
No. of Terminals of Zones 3 + 4				42800	107900	263500
	$x10^3$ mins/ year	erl	Growth rate %	erl	erl	erl
Bahrain	2400	10.96	20	13.15	33.15	89.95
Kwait	840	3.84	30	4.99	12.58	30.71
Egypt	450	2.05	30	2.67	6.74	19.87
U. K.				5.50	13.86	33.84
Bahrain en-route				26.31	66.33	165.37
Saudi Arabia	859	3.92	35	5.29	13.34	32.57
U. A. E	3738	17.07	30	22.19	55.94	136.61

Zone 1

1981	Originating Calling Rate	erl 0.015
	No. of Terminals	1160T
	Traffic	17.4erl
1990	Originating Calling Rate	0.02
	No. of Terminals	3220
	Traffic	64.4
2000	Originating Calling Rate	0.02
	No. of Terminals	8700
	Traffic	174

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
6.96	14	25.76	37	69.60	85	Zone 1 (40%)
-	-	-	-	-	-	
0.39	3	1.48	6	5.02	11	Zone 2
0.39	3	1.11	5	5.08	11	
7.52	15	26.17	37	60.34	75	Zone 3 (Bahrain)
22.22	33	50.73	65	97.41	114	
26.31	37	66.33	82	165.37	186	
37.55	50	94.66	112	231.17	272	
2.51	8	10.99	19	39.04	52	Zone 4
4.57	11	15.36	25	37.60	50	

Zone 2

1981	Originating Calling Rate	0.015
	No. of Terminals	1650
	Traffic	24.75
1990	Originating Calling Rate	0.02
	No. of Termin als	4290
	Traffic	85.8
2000	Originating Calling Rate	0.02
	No. of Terminals	13300
	Traffic	266

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
0.39	3	1.48	6	5.08	11	Zone 1
0.39	3	1.48	6	5.02	11	
9.9	18	34.32	46	106.4	124	Zone 2 (40%)
-	-	-	-	-	-	
10.73	19	35.01	47	93.38	110	Zone 3
32.09	44	67.65	83	149.72	169	
3.62	9	14.67	24	60.4	75	Zone 4
6.54	13	20.38	31	57.75	72	
0.1	2	0.32	3	0.74	4	Zone 9
0.1	2	0.23	3	0.55	4	

Zone 3

1981	Originating Calling Rate	0.05 erl
	No. of Terminals	32000T
	Traffic	1600 erl
1990	Originating Calling Rate	0.05
	No. of Terminals	76000
	Traffic	3800
2000	Originating Calling Rate	0.05
	No. of Terminals	160000
	Traffic	8000

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
22.22	33	50.73	65	97.41	114	Zone 1
7.52	15	26.17	37	60.34	75	
37.55	50	94.66	112	231.17	272	(Bahrain)
26.31	37	66.33	82	165.37	186	
32.09	44	67.65	83	149.72	169	Zone 2
10.73	19	26.25	37	93.38	110	
1210.0	1435	2873.75	3410	6049.97	7182	Zone 3
-	-	-	-	-	-	(78%)
208.59	245	507.34	600	1167.06	1384	Zone 4
126.63	145	362.20	428	692.09	820	
61.71	77	160.66	181	257.94	304	Zone 5
28.33	38	126.75	145	248.29	293	
2.47	7	4.83	11	5.41	12	Zone 6
0.81	4	1.71	6	2.73	8	
22.07	33	55.64	70	135.87	155	(UAE)
22.19	33	55.94	70	136.61	156	
8.02	15	12.08	21	14.43	23	Zone 7(8)
3.59	9	6.11	13	8.65	16	
5.55	12	13.99	23	34.17	46	(Saudi Arabia)
5.29	12	13.34	22	32.57	45	
6.17	13	7.25	14	14.43	23	Zone 9
2.01	7	4.15	10	6.61	13	

Zone 3

Block A

	No. of Terminal
1981	14500
1990	25000
2000	45000

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Truffic	Trunks	
274.14	323	472.66	559	850.78	1008	Block A(50%)
90.86	108	92.68	110	133.17	152	Block B
54.83	69	55.61	70	79.90	96	Block C
81.46	98	83.41	100	119.85	138	Block D
47.0	61	148.29	168	295.92	349	New Doha A
-	-	92.68	110	221.94	261	New Doha B
94.52	112	166.89	187	328.24	388	"4"
27.96	39	52.85	67	72.55	88	"5"

Block B

	No. of Terminals
1981	5800
1990	10000
2000	18000

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
60.69	75	71.61	87	107.84	126	Block A
109.66	128	189.06	222	340.31	402	Block B(50%)
14.65	24	17.19	27	25.88	37	Block C
21.76	32	25.78	37	38.82	52	Block D
12.56	21	45.82	59	95.86	113	Now Doha A
-	-	28.65	40	71.90	88	New Doha B
37.81	50	66.76	82	131.29	150	"4"
11.18	19	21.14	31	29.02	41	"5"

Zone 3

Block C

	No. of Terminals
1981	3500
1990	6000
2000	10800

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
33.67	46	40.51	53	61.59	76	Block A
13.47	22	16.21	26	24.63	35	Block B
66.17	81	113.44	132	204.19	240	Block C(50%)
12.07	21	14.59	24	22.17	33	Block D
6.97	14	25.93	37	54.74	69	New Doha A
-	-	16.21	26	41.06	54	New Doha B
22.81	33	40.05	53	78.78	95	"4"
6.75	14	12.68	21	17.41	27	"5"

Block D

	No. of Terminals
1981	5200
1990	9000
2000	16200

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
53.20	67	63.49	78	95.85	113	Block A
21.28	32	25.40	36	21.31	32	Block B
12.84	21	15.24	24	23.0	34	Block C
98.32	116	170.16	191	306.28	361	Block D (50%)
11.01	19	40.64	54	85.20	102	New Doha A
-	-	76.19	92	63.9	79	New Doha B
33.90	46	60.08	75	131.48	150	"4"
10.03	18	19.03	29	26.12	37	"5"

Zone 3

New Doha A

	No. of Terminals
1981	3000
1990	16000
2000	40000

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
28.36	40	126.04	145	283.59	334	Block A
11.34	20	50.42	61	113.44	132	Block B
6.85	14	30.25	42	68.06	83	Block C
10.17	18	45.38	59	102.09	120	Block D
56.72	71	302.5	357	756.25	896	New Doha A(50%)
-	-	50.42	64	189.06	222	New Doha B
19.56	30	106.81	125	291.77	344	"4"
5.79	12	33.82	46	64.49	80	"5"

New Doha B

	No. of Terminals
1981	-
1990	10000
2000	30000

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
-	-	71.61	87	196.33	231	Block A
-	-	28.65	40	78.53	95	Block B
-	-	17.19	27	47.12	61	Block C
-	-	25.78	37	70.68	86	Block D
-	-	45.83	59	174.52	195	New Doha A
-	-	189.06	222	567.19	671	New Doha B(50%)
-	-	66.76	82	218.82	258	"4"
-	-	21.14	31	48.36	62	"5"

Zone 4

1981	Originating Calling Rate	0.03
	No. of Terminals	10800
	Traffic	324
1990	Originating Calling Rate	0.03
	No. of Terminals	31900
	Traffic	957
2000	Originating Calling Rate	0.04
	No. of Terminals	103500
	Traffic	4140

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
4.57	11	15.36	25	37.60	50	Zone 1
2.51	8	10.99	19	39.04	52	
6.51	13	20.38	31	57.75	72	Zone 2
3.62	9	11.00	19	60.4	75	
126.63	145	362.2	428	692.09	820	Zone 3
208.59	245	507.34	600	1167.06	1384	Bahrain
16.45	26	48.58	62	157.58	178	USA
13.57	22	40.09	54	131.41	150	Saudi: Arabia
153.78	174	454.21	537	1991.21	2362	Zone 4
-	-	-	-	-	-	(50%)
12.61	21	48.05	62	98.93	116	Zone 5
9.56	17	53.20	67	160.63	181	
0.47	4	1.22	5	2.24	7	Zone 6
0.27	3	0.72	4	1.77	6	
1.71	6	3.81	10	5.37	12	Zone 7(8)
1.21	5	2.56	8	5.60	12	
1.24	5	3.19	9	5.37	12	Zone 9
0.68	4	1.74	6	4.27	10	

Zone 5

1981	Originating Calling Rate	0.02 erl
	No. of Terminals	3190 T
	Traffic	63.8 erl
1990	Originating Calling Rate	0.03
	No. of Terminals	10070
	Traffic	302.1
2000	Originating Calling Rate	0.03
	No. of Terminals	22830
	Traffic	684.9

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
28.33	38	126.75	145	248.29	293	Zone 3
61.71	77	160.66	181	257.94	304	
9.56	17	53.20	67	160.63	181	Zone 4
12.61	21	48.05	62	98.93	116	
25.52	37	120.84	139	273.96	323	Zone 5 (40%)
-	-	-	-	-	-	
0.39	3	1.31	5	2.02	7	Zone 7
0.36	3	0.81	4	1.23	5	

Zone 6

1981	Originating Calling Rate	0.015 erl
	No. of Terminals	120 T
	Traffic	1.8
1990	Originating Calling Rate	0.015
	No. of Terminals	270
	Traffic	4.05
2000	Originating Calling Rate	0.015
	No. of Terminals	500
	Traffic	7.5

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
0.81	4	1.71	6	erl 2.73	8	Zone 3
2.47	7	4.83	11	5.41	12	
22.19	33	55.94	70	136.61	156	UAE
22.07	33	55.64	70	135.87	155	
0.27	3	0.72	4	1.77	6	Zone 4
0.47	4	1.22	5	2.24	7	
0.72	4	1.62	6	3.0	8	Zone 5 (40%)
-	-	-	-	-	-	

Zone 7(8)

1981	Originating Calling Rate	0.015erl
	No. of Terminals	430T
	Traffic	6.45erl
1990	Originating Calling Rate	0.015
	No. of Terminals	790
	Traffic	11.85
2000	Originating Calling Rate	0.015
	No. of Terminals	1290
	Traffic	19.35

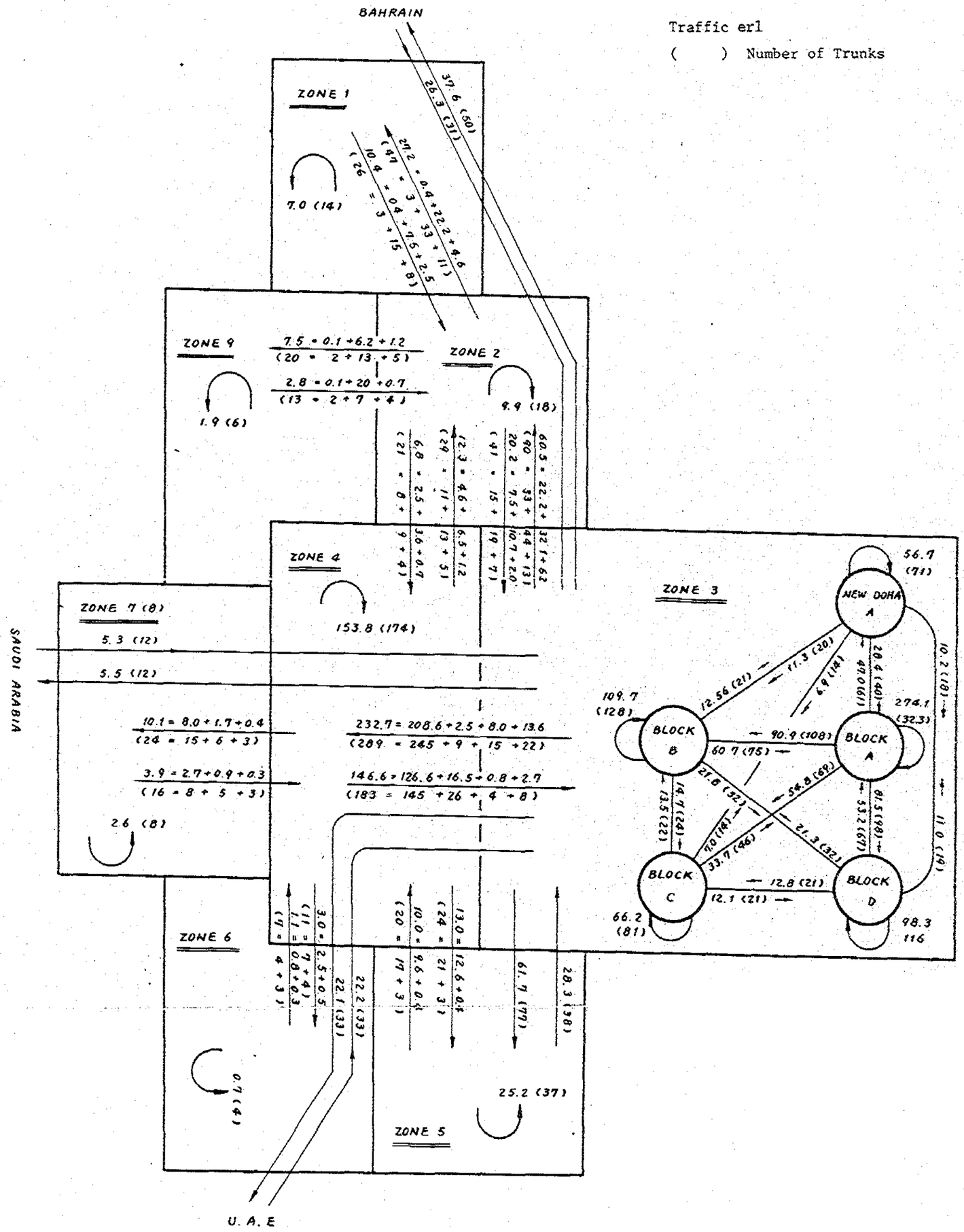
1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
2.69	8	4.58	11	6.49	13	Zone 3
8.02	15	12.08	21	14.43	23	
5.29	12	13.34	22	32.57	45	Saudi (Arabia)
5.55	12	13.99	23	34.17	46	
0.91	5	1.92	7	4.2	10	Zone 4
1.71	6	3.81	10	5.37	12	
0.27	3	0.61	4	0.92	5	Zone 5
0.39	3	1.31	5	2.02	7	
2.58	8	4.74	11	7.74	15	Zone 7 (40%)
-	-	-	-	-	-	

Zone 9

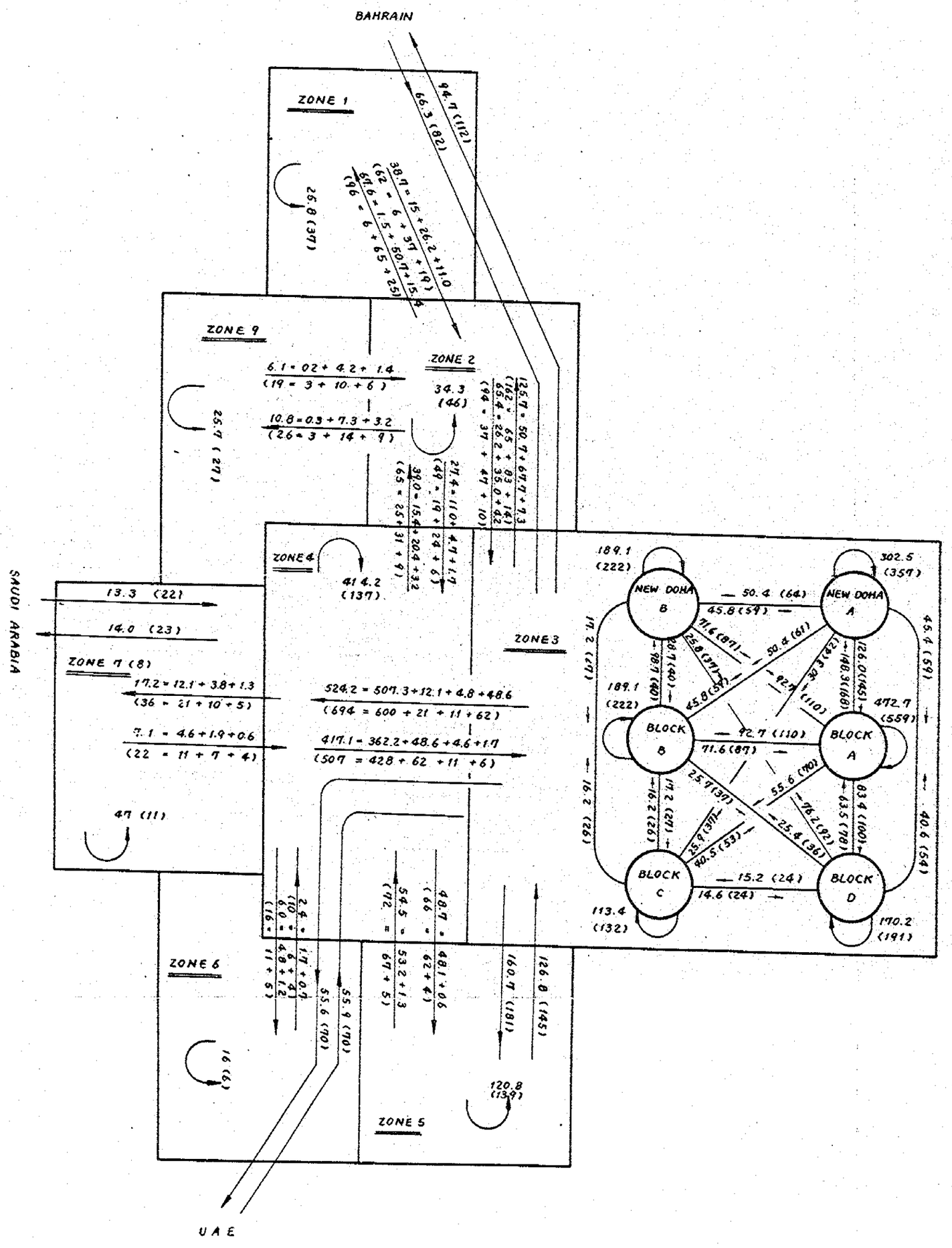
1981	Originating Calling Rate	0.015 erl
	No. of Terminals	310
	Traffic	4.65
1990	Originating Calling Rate	0.015
	No. of Terminals	680
	Traffic	10.2
2000	Originating Calling Rate	0.015
	No. of Terminals	1270
	Traffic	19.05

1981		1990		2000		
(erl) Traffic	Trunks	(erl) Traffic	Trunks	(erl) Traffic	Trunks	
0.1	2	0.23	3	0.55	4	Zone 2
0.1	2	0.24	3	0.74	4	
2.01	7	4.15	10	6.61	13	Zone 3
6.17	13	7.25	14	14.43	23	
0.68	4	1.74	6	4.27	10	Zone 4
1.24	5	3.19	9	5.37	12	
1.86	6	4.08	10	7.62	15	Zone 9 (40%)
-	-	-	-	-	-	

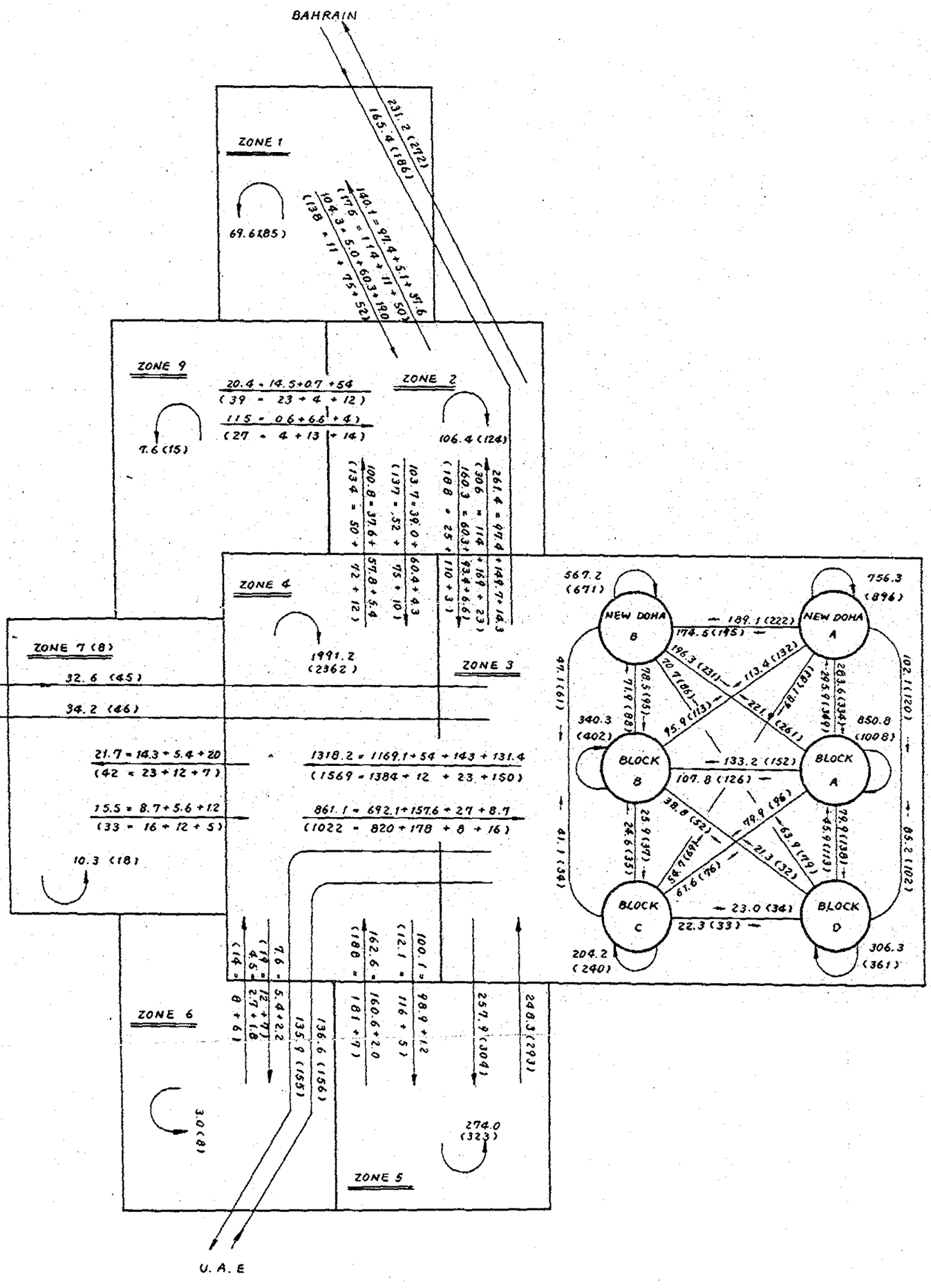
Traffic Flow Between Each Zone (1981)



Traffic Flow Between Each Zone (1990)



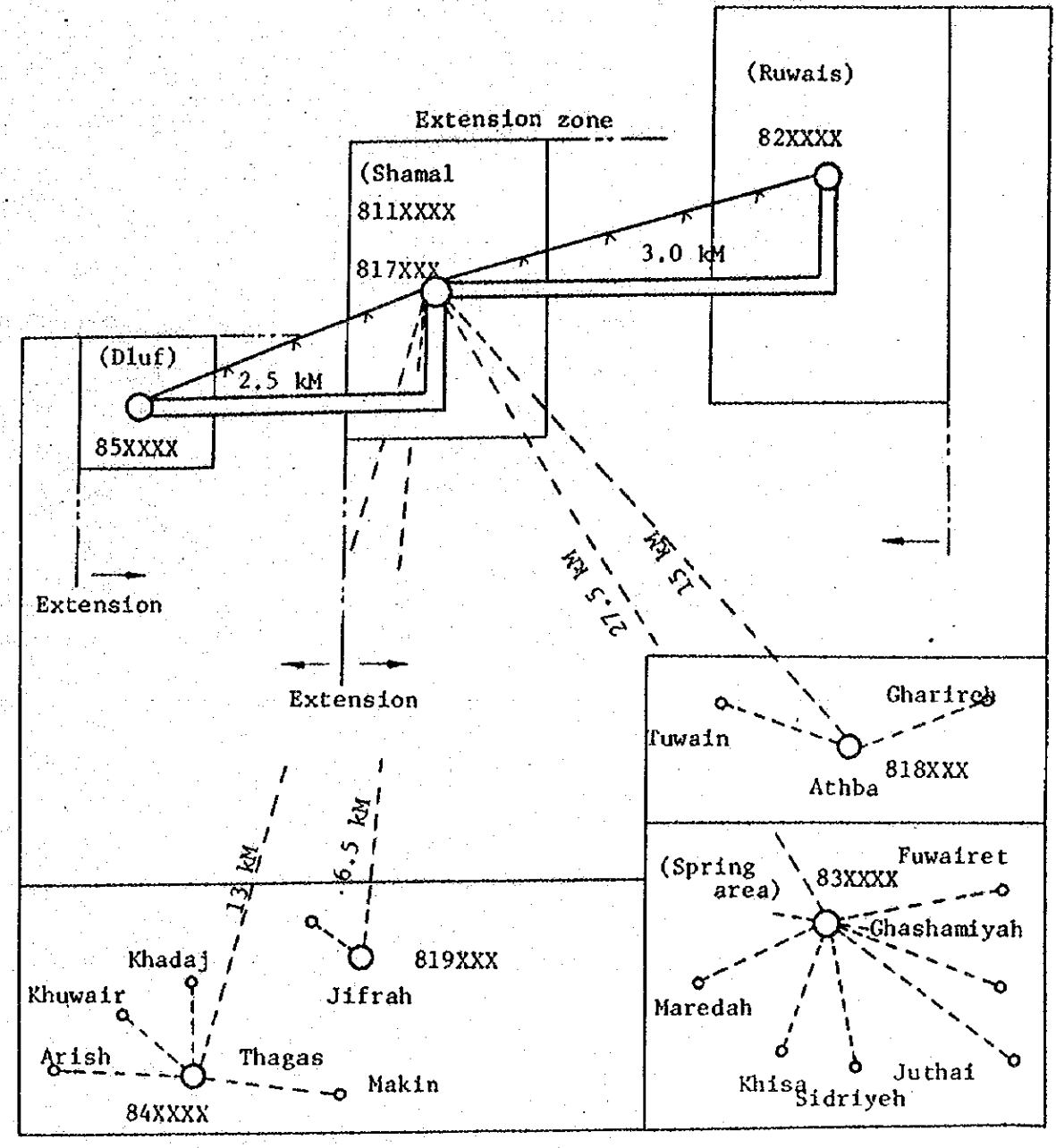
Traffic Flow Between Each Zone (2000)



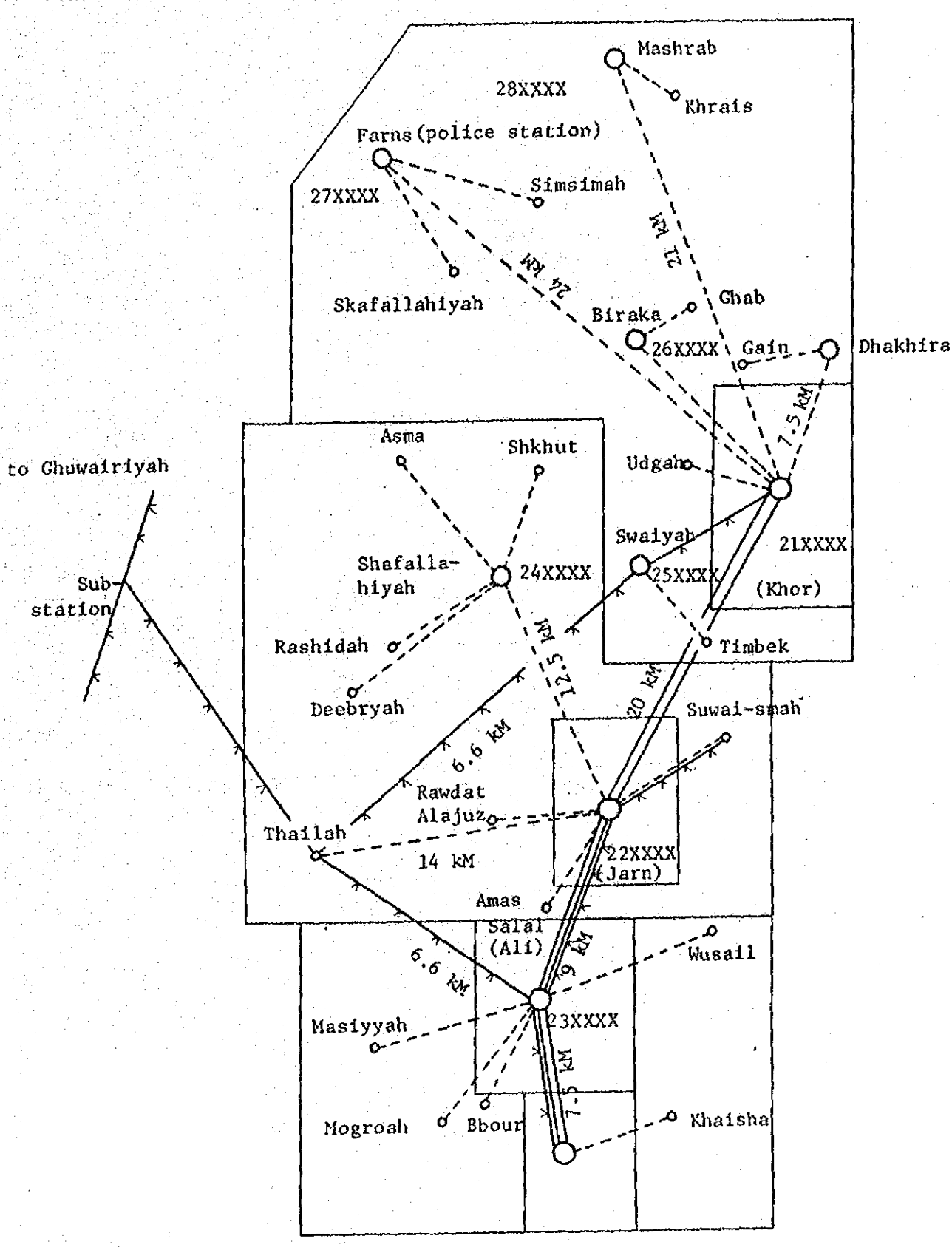
ANNEX 2

Zone Numbering plan.

Zone "1" Shamal Area

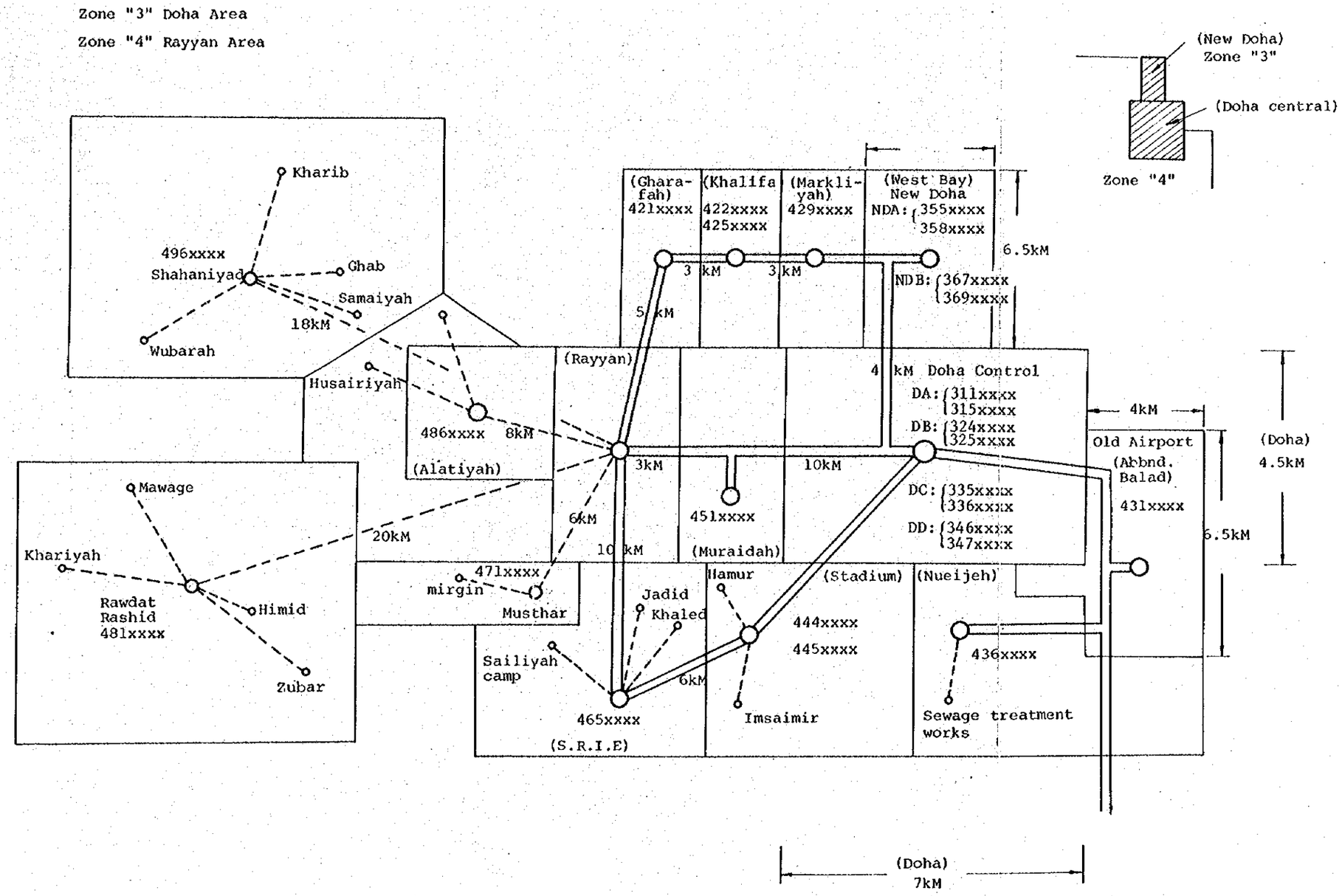


Zone "2" Khor Area

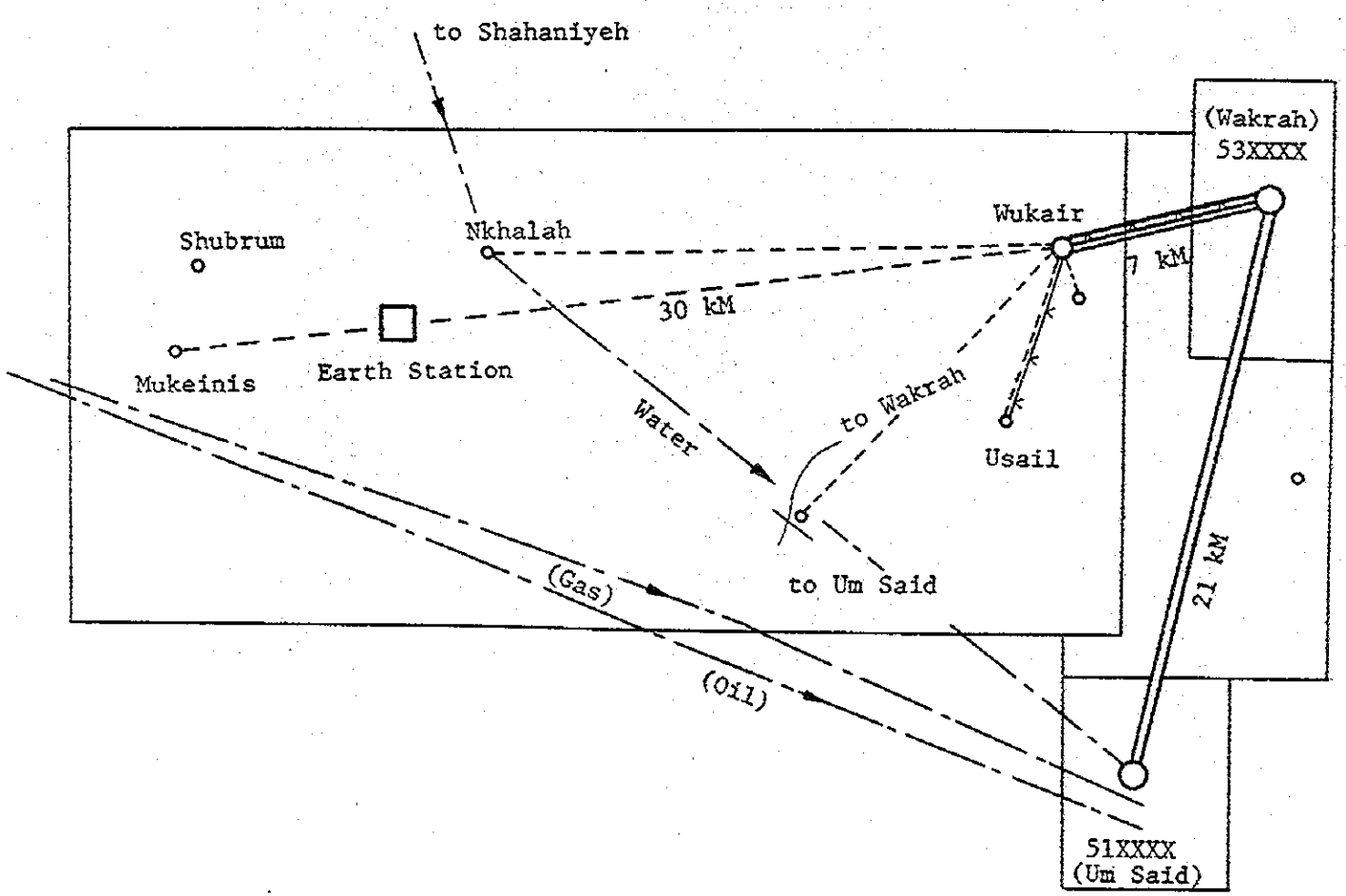


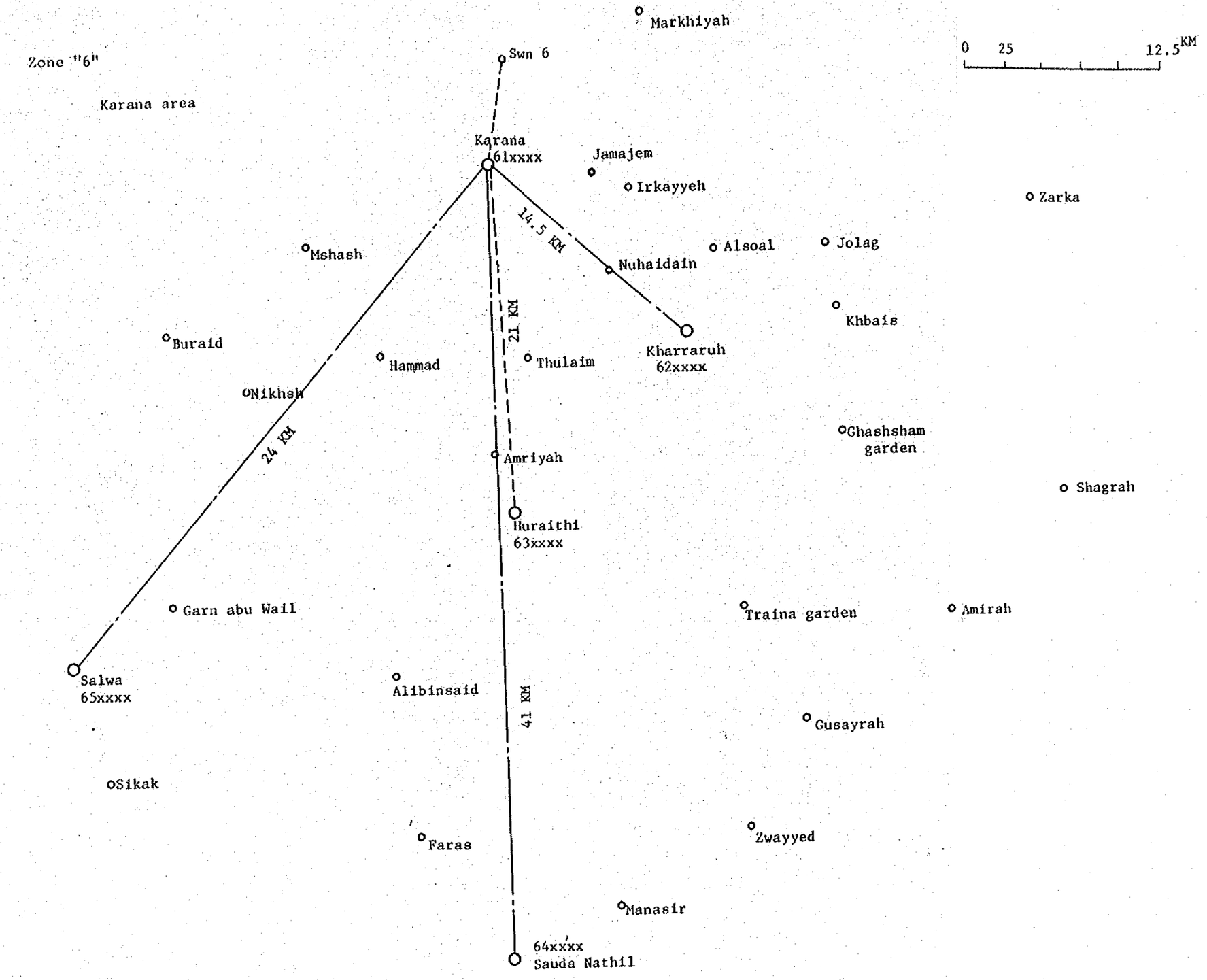
Zone "3" Doha Area

Zone "4" Rayyan Area

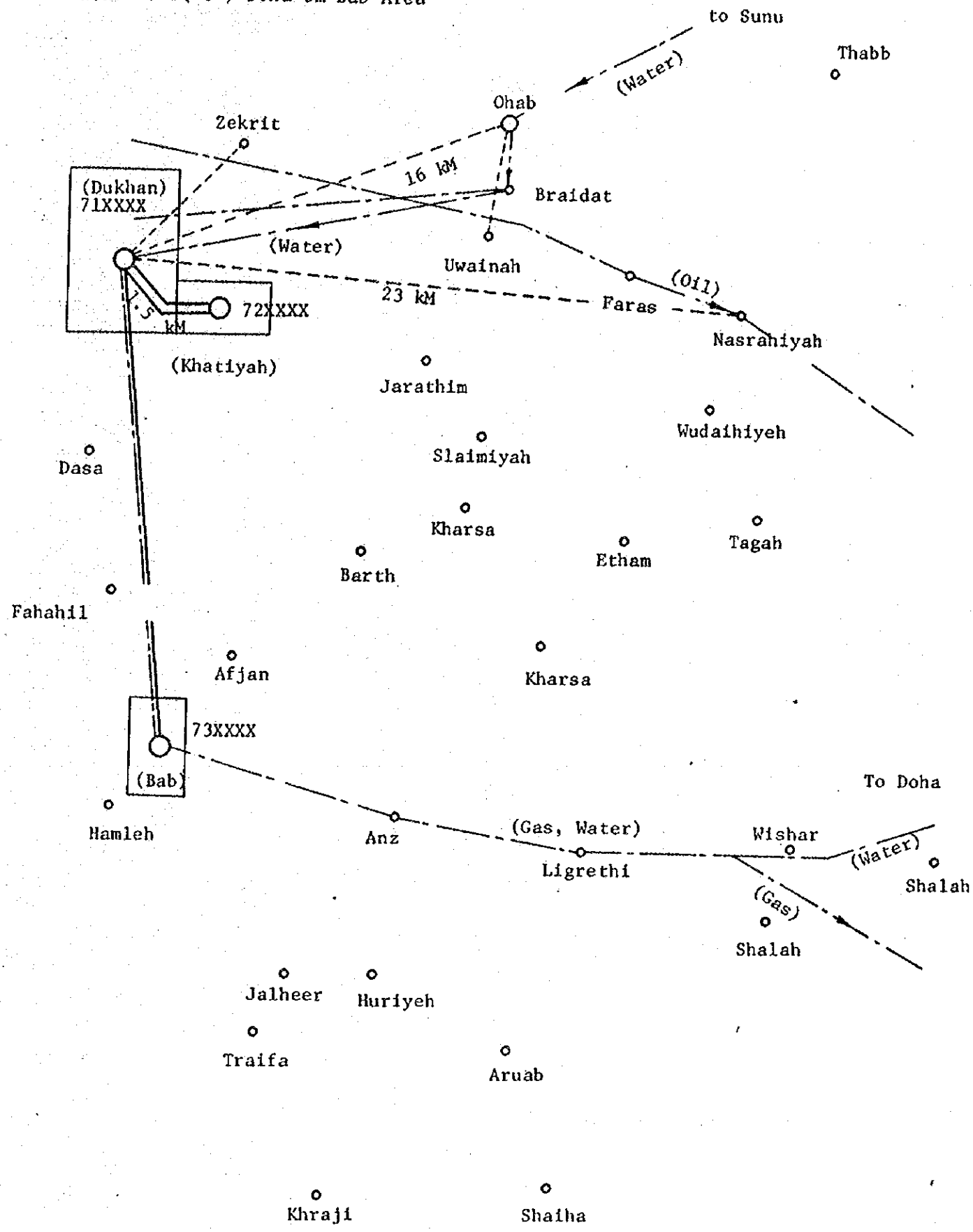


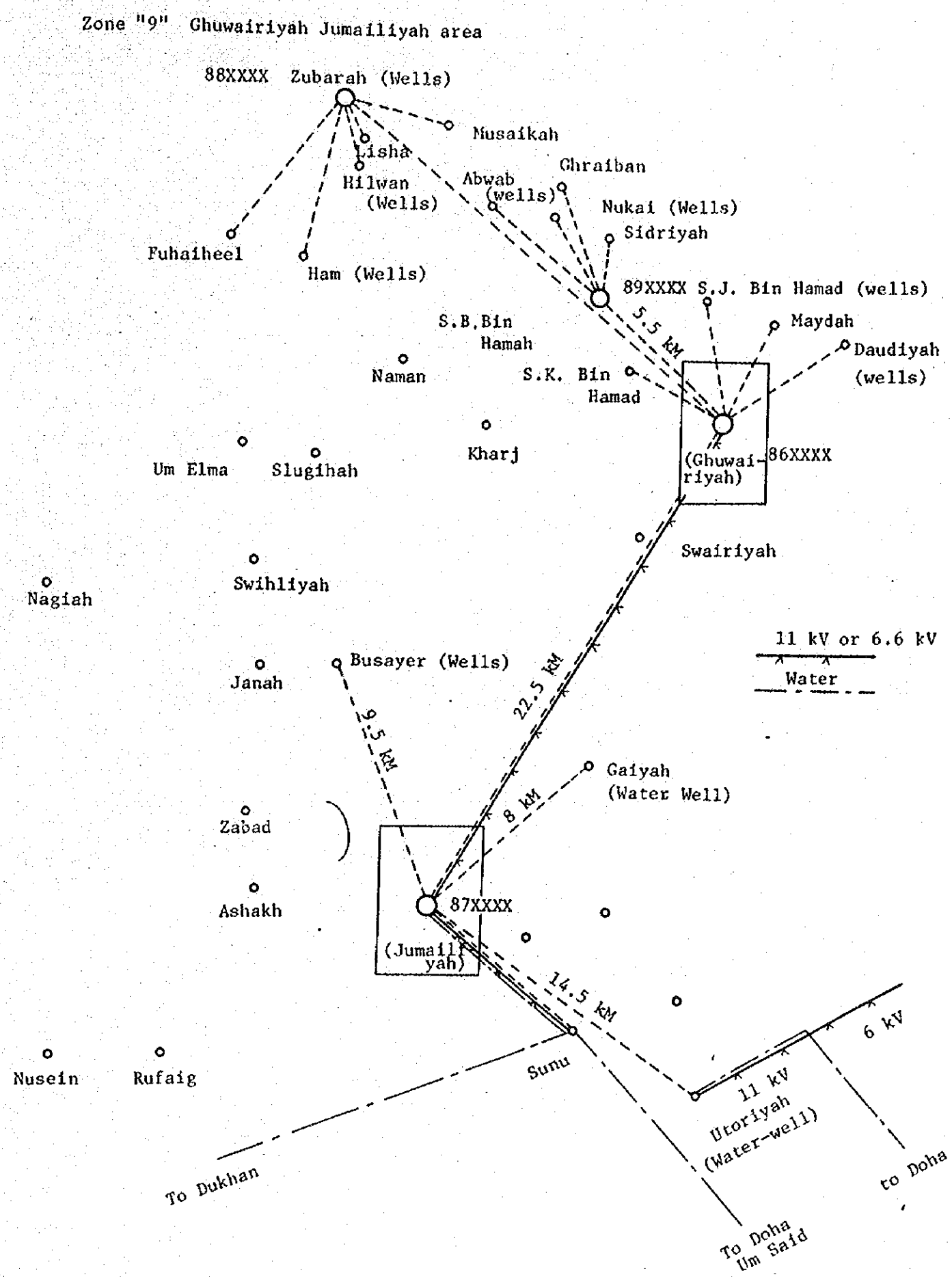
Zone "5" Um Said area




Zone "6"
Karana area
Markhiyah
Swn 6
0 25 12.5 KM
Karana
61xxxx
Jamajem
Irkayyeh
Zarka
14.5 KM
Mshash
Alsoal
Jolag
Nuhaidain
Khbais
21 KM
Buraid
Hammad
Thulaim
Kharraruh
62xxxx
Nikhsh
24 KM
Ghashsham
garden
Amriyah
Shagrah
Huraithi
63xxxx
Garn abu Wail
Traina garden
Amirah
Salwa
65xxxx
Alibinsaid
41 KM
Gusayrah
Sikak
Faras
Zwayyed
Manasir
64xxxx
Sauda Nathil

Zone "7" ("8") Doha Um Bab Area




Zone "9" Ghuwairiyah Jumailiyah area
88XXXX Zubarah (Wells)
Musaikah
Lisha
Hilwan (Wells)
Abwab (wells)
Ghraiban
Nukai (Wells)
Sidriyah
Fuhaiheel
Ham (Wells)
89XXXX S.J. Bin Hamad (wells)
5.5 kM
S.B.Bin Hamah
Maydah
Daudiyah (wells)
Naman
S.K. Bin Hamad
Kharj
Um Elma
Slugihah
(Ghuwai-riyah)
86XXXX
Swairiyah
Swihliyah
Nagiah
11 kV or 6.6 kV
Water
Janah
Busayer (Wells)
9.5 kM
22.5 kM
Gaiyah (Water Well)
8 kM
Zabad
Ashakh
87XXXX
(Jumail-yah)
14.5 kM
6 kV
Nusein
Rufaig
Sunu
11 kV Utoriyah (Water-well)
To Dukhan
to Doha
To Doha Um Said

カタール国電話関係専門家

調査報告書(1)

昭和53年2月

国際協力事業団

311/78/EXS
01798の
付録

1. 調査の目的

カタール国電気通信拡充計画の設定の際に考慮すべきトラヒック上の問題，電子交換機導入計画，その他通信網全般について調査助言を行なった。

2. 専門家の構成

藤倉 琢尉	（日本電信電話公社海外連絡室）
	SWITCHING EXPERT
小松崎 和重	（日本電信電話公社海外連絡室）
	TRAFFIC EXPERT

3. 調査日程

1977年11月1日にDohaに到着し，以降同地において同上目的に関する調査討論を行い，1977年12月27日に帰国した。

1. 専門家派遣の経緯と現地意向の実態

(1) 大使よりの連絡事項

(i) 政府機関の主流を占めるアラブ人（特にエジプト人）による活動。
現業機関の主流を占める英国人（特にC&W系）による活動。
政府機関の中の将来を嘱望されているカタール人による活動。
以上の3つの背景を十分理解した上で通信総局の中で活動を進めてほしい。

(ii) アラブの体質の吸収と理解をしてほしい。

(2) 通信運輸省（通信総局長）よりの連絡事項

(i) 政府とQNTS（現業機関）との間のパイプをスムーズにしてほしい。

(ii) QNTSで持っている資料を極力収集，整理してほしい。

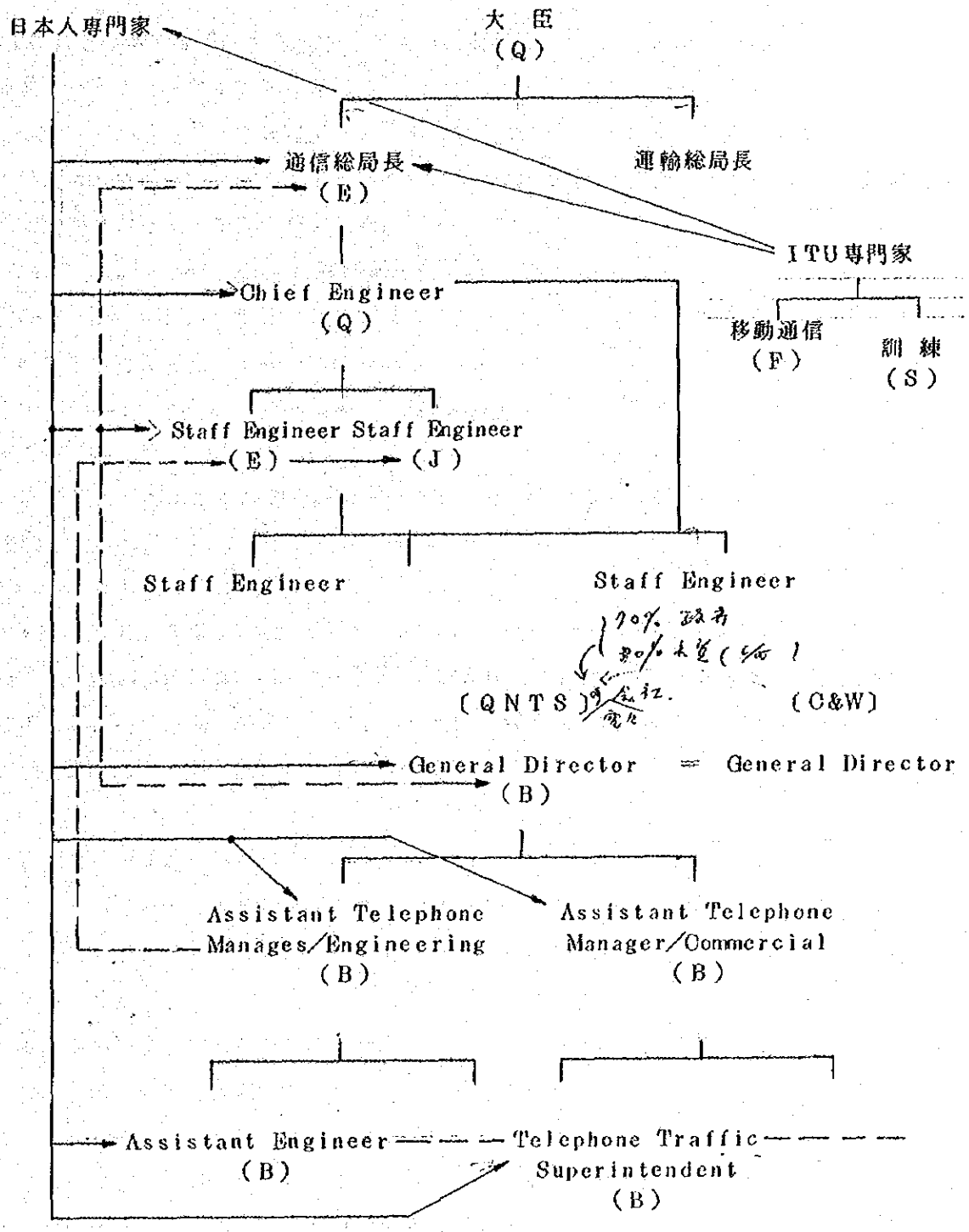
(iii) Traffic Congestionについての実態をチェックしてほしい。

(iv) QNTSの電子交換機導入に関する基本的考え方の調査とそのコメントをしてほしい。

(v) 長期的展望に立ったフィーリングを聞かせてほしい。

(vi) その他QNTSとのコンタクトを通して得たknow-how及びフィーリングを聞かせてほしい。

2. 専門家の活動ルート



(注) Q：カタール人
E：エジプト人
J：ジョルダン人
F：仏　人
S：スウェーデン人
B：英国人

3. 主な活動

(1) QNTSおよび各関係省庁から入手した資料と提言

(ア) 国家建設および電気通信関係投資

1974～77年までの資料が保管されていたが，インフラストラクチュアとしての通信投資の理解がないため望ましい投資比率を他先進国との関連で引用し，今後継続的に投資が行なわれるよう提言した。

(イ) Doha および New Doha 首都圏開発計画

Goverment Zone を除く首都圏についてはレレウィリンコンサルタントが計画中であり毎年度見直しして強力に開発を進めている。

Goverment Zone については丹下健三氏を中心とする設計コンサルタントが設計を進めている。

電子交換機導入はこの開発計画とマッチした形とすることが望ましいため今後関係機関と接触し設計にフィードバックするよう提言した。

(ウ) 電話回線容量および実装の推移

1972年6月容量11,750端子，実装8,715回線より1977年10月容量19,300端子，実装17,000回線に至る月別容量・実装推移統計資料を作った。なおこの過程で発見された設備計画上の問題について，例えば設備期間長の設定等について提言した。

(エ) 各局SXS・XB交換機器および回線不足の現状と対策

QNTSにおいて1976年9月から1977年10月までの分析がなされていた。そこで従来通信総局がいだいていたQNTSメンバーによるtraffic congestion に対する"何ら分析，アクションがなされていないという疑惑"を取り除くと共に併せて同上資料の分析結果に基づく提言たとえば"C82交換機のサービス開始時期の繰上げ"をした。

(オ) 信号方式の現状と将来計画

Gulf 沿岸各国の共同プランにより国内はMFCR2方式，国際（Gulf area を含む）はNo.5方式が計画されていた。

電子交換方式の導入に伴ない既設交換方式（SXS，XB方式）とのインターフェースについては将来の交換網ならびに既存交換機の撤去転用を考慮して既存局側で措置をとるように提言した。

注： 日本の電子交換機ではその機能が配慮されている。

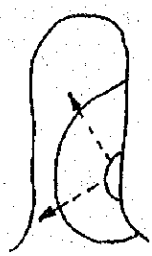
(カ) 番号計画

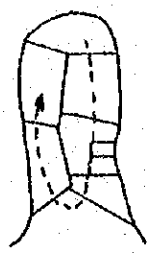
現在首都を中心として同心円上に同一番号を付与する方式をとっているが，つぎの

料金体系変更をもからめて新Zone Numberingを採用するよう提言した。
なお同案が採用され次第詳細な番号設定を進める予定である。

…… 番号付与の順序

現在案





日本案

(キ) 料金体系，課金方式

現在のカールソン方式から時期は未定であるがCAMA方式に変えるべくQNTS側で検討しており，そのZone Numbering Planeを大巾に導入すべく検討を進めているが，通信総局ではこれに対してロンドンC&W本社による検討を認めず，政府側で技術力をつけた上で方針を決め強く明言している。

西独の番号検出装置を主体とする半導体技術導入への働きかけは，将来の電子交換機導入に関連した新技術導入に深くかかわり合いを持つ丈に，この点での口答意見を求められた。

(ク) 国内伝送路計画

現在ＱＮＴＳで伝送路整備について提案している。

前項(ウ)，(エ)をとおして把握された関連業務の進め方について長期的観点から全面的な見直しをするという見解を持っており，このために後記のtraffic congestionの問題，電子交換機導入問題の中で取上げられた長期的需要予測データが利用される予定である。

(ケ) 対Gulf Area伝送路網計画

同上の伝送路計画に関連してBahrain，Saudi Arabia，UAEの伝送路網計画を上のせするという方向で進められており，今後Gulf沿岸各国の通信網関連会議の中で逐次方向が固まっていく模様であり，この点について関心を持つよう要望された。

(2) Traffic Congestionに関する提言

(ア) Traffic Congestionに関する取組み態度

Traffic Congestionの発生原因が単に交換機に存在するものでなく，通信網（線路，伝送路，交換機）及び加入者の状況により発生することの体系的説明をした。

(イ) 加入者ダイヤル習性及びトラヒックフロー

交換機用レジの記録より平均ダイヤル回数・出接続・入接続・自局内接続別トラヒック状況を計算した。その結果平均ダイヤル回数の異常な高さ（13回）は交換機器の不足もさることながら加入者習性による影響が極めて大きいため報道機関等を利用しての加入者教育に関する提言をした。

(ロ) 共通機器の過不足

前項同様にレジ記録を利用し，共通機器数を計算した結果DM, CM, OS にそれぞれ不足があることを発見し，その増設に関する提案をした。なお，これに準ずる手法により適時管理するよう提言した。

(ハ) 加入者収容フレーム相互間トラヒックのアンバランス

同様にレジ記録を利用しアンバランスを発見したが，QNTS見解により都心部から郊外への住宅移転問題に伴って生じたものであることがわかり，収容位置変更等によりこれを修正する措置を講ずるよう提言した。

(ニ) 加入者習性，トラヒック分析に必要な各種測定器

ＸＢ交換機が日本製であることよりＱＮＴＳから測定器関係資料の提供ならびに一般的説明を求められた。

上記各項についてQNTSでは報告書の提供・内容討論，更に技術提供を要望しているが，通信総局においてはまず省内における理解と実力をつけることに主眼をおいている為，その必要性を現時点では認めていない。従ってそのギャップを埋めることが急務の課題と考えられる。

（3）将来の地域発展形態および加入需要の予測

(ア) 地域発展形態の予測

前記レレウィリンならびに丹下氏の首都圏整備上のデザイン，政府機関との討論，カタール住民及び地域の指導者層（学校長，教師，地方行政官等）の意見等をもとに地域発展のマクロ的姿をスケッチした。

(イ) 長期需要予測

前記カ項Zone Numbering Plan に関連し，Zone別2,000年までの長期需要予測を行なった。

注1. 1977年の電話加入者数（潜在需要を含む）31,400，人口約204,400，2,000年の電話加入者数310,500，人口1,214,400を得た。

注2. シェイクが発言された資料によると2,000年の人口は100万人又はそれ以上と見込まれているが，その算出根拠は明らかでないため省内では一部疑問視

するむきもある。しかしコンサルタント会社等では信頼ある数値として受けとめている。

(4) 電子交換機導入計画

前記地域発展形態・長期需要予測及び通信総局の意見等を考慮して既存ＸＢ交換機の転用を含む Zone 別電子交換機導入計画をスケッチし，又，ＳＸＳ交換機の購入停止，新サービス導入に関する判断時点の予測，過疎地域の通信対策等に関して全般的提言をした。

4. 同国政府からみた評価

(1) パイプ役としての評価

業務過程での対人，対項目及び２人の専門家のコンビネーションが現環境のもとで最もよいやり方であるということを結果として受けた。

(2) レポートに関する意見

(i) Chief Engineer のバックアップ用として作成したリポート（メモ）を総局長あてのリポートとして切り替えられた。なお，総局長の意見を同リポートの中に折り込んで比較的早期に提出すること，なおその折に作成者と rigorous discussion を行ない併せて総局内 engineer の向上研修を非公式に要望された。

(ii) Volume (II) は，別に検討を進めている運用，保守，訓練の長期計画作成（ＩＴＵ専門家，スウェーデン人）の終了，大臣承認をまって日本人専門家に資料提供をする故，それを十分生かす形で作成を将来依頼すると意志表示があった。

(iii) ＵＡＥにおける電子交換機導入過程で生ずる問題を別途，通信総局で検討する。この結果をふまえて同上(ii)項の資料に反映して欲しい旨，意志表示があった。

(3) 対大臣報告

(i) 帰国に先だち総局長並びに専門家は大臣に一次報告を行った。

(ii) 別途日本より送付される印刷資料により前記 rigorous discussion のあと大臣報告をし，その指示を待ってＱＮＴＳ等に公開するためそれまでいっさい㊙扱いするよう要求された。

(4) 対大使報告

総局長より大使に対し専門家のいる席上で活動に関する感謝の電話が行なわれ，かつ長期にわたるアラブ人の中での仕事の労苦に対し大使よりねぎらいの言葉を受けた。

(5) そ の 多

(i) 同国に対する技術協力形態は２国間ベースによる２ケ月又は３ケ月２名方式が６ケ月又はそれ以上１名のＩＴＵ専門家方式よりも質的に格段に良く，今後この形態をとるであろうという総局長個人の見解が出された。

(ii) 政府並びに職員（ chief engineer を含むカタール人２名）よりそれぞれ我々の業