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Infrastructure Briefing Memorandum

IRAQ

18 January 2002

DEFENCE INTELLIGENCE ANALYSIS STAFF

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INFRASTRUCTURE BRIEFING MEMORANDUM

IRAQ

IBMs are intended to provide a summary of information on subjects of use for operational staff in outline planning and briefing. This IBM has been produced in response to the requirement to maintain and update as appropriate databases to support possible future operations. The intelligence cut-off date is November 2001.

Where more information on specific subjects is required, this should be sought from the Defence Intelligence Staff, DI Infrastructure Branch, which should always be consulted for the latest available information for detailed planning purposes.

This IBM supersedes all earlier editions, which should be destroyed.

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A grid has been added to the maps to assist in locating place names mentioned in the text, e.g. Baghdad (G5)

All place names are shown in accordance with the US Board of Geographic Names (BGN) gazetteers, with conventional alternatives shown in parenthesis as appropriate.

Intelligence cut-off date: Nov 2001

EXECUTIVE SUMMARY

Airfields and Fixed Air Defences

There are listed airfields, landing grounds and helicopter landing areas dispersed throughout Iraq. airfields have paved or hard runways of varying length. airfields/helicopter landing areas are presently in use by Iraqi military and/or civilian aircraft.

Iraq has a large number of mainly old Soviet air defence SAM systems such as the SA-2, SA-3, SA-6, SA-8, SA-9 etc and also Roland and Skyguard tactical air defence systems. Iraq also has a large number of old Russian AAA systems.

Ports

Most of the information about Iraqi ports is based on data available before the outbreak of the Iran-Iran war in 1980 and should be viewed with caution. Due to lack of up-to-date reliable information, many of the port facilities may not be operational, or their use is severely limited. Few international ships have entered Iraqi ports since the UN imposed sanctions in August 1990 following Iraq's invasion of Kuwait.

The port of Al Basrah, originally Iraq's main commercial port, has been closed to international shipping since 1980 and activity is restricted to movements of coastal tankers and dhows. The port of Umm Qasr was fully utilised after hostilities ceased in 1988, becoming Iraq's principal commercial port. Both Umm Qasr and the new port of Az Zubayr were in the process of being expanded and improved until they were effectively closed following the imposition of UN sanctions. Activity at both ports was restricted to local movements until November 1993, when foreign-flagged vessels started arriving at Umm Qasr. There is a minor port at Al Faw, which is used only by local traffic.

The only oil-loading facility allowed to operate by the UN under the "Oil for Food" (OFF) programme is the Mina al Bakr offshore deepwater terminal. The other offshore oil tanker terminal at Khawr al Amaya is non-operational.

Roads

Iraq has a good, modern system of two or three lane roads covering the whole country. The roads are generally in good condition, in part because they have been under used in recent years. There are good all-weather connections to Iraq's neighbours Kuwait, Saudi Arabia, Jordan, Syria, Turkey and Iran. The Iraqi road network is vulnerable to interdiction, particularly on the major highways extending over the expansive Euphrates and Tigris Rivers.

Railways

The Iraqi rail network consists of 2,603 km of standard gauge (1,435 mm) single track,

EXECUTIVE SUMMARY (Cont.)

plus 122 km of double track between Baghdad and Ar Ramadi. There has been clear evidence of regeneration with the Iraqi authorities investing heavily in rail infrastructure, particularly in the reconstitution of international links to Syria and Turkey.

Inland Waterways

Iraq has three principal navigable waterways; the River Tigris, the Shatt Al Arab and the Shatt al Basrah.

Telecommunications and Broadcasting

Telecommunications services are operated by the Iraq Telecommunications and Posts Company (ITPC) on behalf of the Ministry of Transport and Communications. The relatively modern telecommunication facilities that existed in 1990 were all subjected to considerable disruption caused by allied bombing during Operation Desert Storm. This reduced the effectiveness of them all to the extent that the telex (national and international) and the international telephone services ceased to function. An internal telephone service of sorts did survive although it is likely that many calls were operator assisted and that certain areas, where exchanges were destroyed, had no service at all. In 1998 the United Nations (UN) asked the International Telecommunications Union (ITU) to investigate the state of the Iraqi telecommunications infrastructure with a view to enhancing the effectiveness of the UN's humanitarian "Oil for Goods" programme. The ITU report stated that the telecommunications network was "extremely poor and requires urgent attention", and noted that the rehabilitation of the entire network would require US$ 1 billion and would take seven to ten years to be implemented fully.

Oil and Gas

Iraq has the second largest proven oil reserves in the world, equating to 11% of the world total and 2% of the world total gas reserves. There are potentially larger reserves as many areas are currently undeveloped. The oil and gas industry suffered substantial damage during the Iran-Iraq and Gulf Wars, and recovery has been slow, especially as UN sanctions imposed after the Gulf War are still in force. A recent UN report stated that the general state of the Iraq oil and gas industry has declined seriously over the last 18 months and that urgent measures need to be taken to avoid yet more deterioration of oil wells and the petroleum infrastructure. All oil and gas related business is overseen by The Oil Ministry.

Electric Power

The generation, transmission and distribution of electric power in Iraq are the responsibility of the Electricity Commission. It is subordinate to the Ministry of Industry and Mining, and headed by a Minister who sits on the Council of Ministers. The General

EXECUTIVE SUMMARY (Cont.)

Company for Electrical Projects (GCEP) is responsible for construction and repair projects. Additionally, municipalities and private industrial enterprises control some local facilities. Iraq's National Installed Capacity (NIC) is approximately 10,000 MW but in reality, due to the poor state of the system, the practical limit for generation and transmission is 4500-5000 MW. The shortfall for even the most basic demand is estimated to be 1800 MW and power cuts are widespread and prolonged. Electricity is generated from a conventional mix of oil-fired thermal, gas turbine and hydroelectric plants. Power is controlled and balanced by a National Control Centre and three regional control centres, and transmitted to main centres of population via a national 400 kV Super High Voltage (SHV) network. This supplies a more comprehensive 132 kV system that connects major power plants, provincial centres of population and the principal industrial complexes. The power system was badly damaged during the Gulf War and 70% of the national power sector was seriously degraded. Since then, most of the damaged plants have been restored to partial operation and temporary repairs to the transmission grid have allowed supplies to reach most areas.

Water Resources

Water resources for Iraq are drawn from surface water, ground water and desalination. Principal sources of fresh water are the winter rainfalls and headwaters of the Tigris and Euphrates Rivers. Cities are served by a mains water supply, but minor townships and villages possess only rudimentary systems. Water from the larger municipal systems is treated, but supplies from all other sources are liable to contamination. UN sanctions prohibit the access to necessary chemicals to treat and purify water, and the shortage of essential filtering membranes and spare parts seriously restrict the effectiveness of desalination and sewage treatment plants. With raw sewage contaminating water resources, reliable sources of safe, potable water remain one of Iraq's most pressing problems.

SECTION 1

AIRFIELDS AND FIXED AIR DEFENCES

AIRFIELDS

1. There are known airfields and landing strips in Iraq, of which have paved runways of varying lengths. airfields/helicopter landing areas within the central flying zone are presently in regular Iraqi Air Force (IAF) use by either fixed wing aircraft or helicopters. Most of the remaining airfields/landing strips throughout Iraq have either oiled sand or natural surfaced runways.

2. In 1991, during the Desert Storm campaign, the majority of operational Iraqi airfields suffered a high degree of infrastructure damage. Throughout the past decade most of those airfields located in the central region of Iraq have been extensively repaired.

3. Prior to the opening of Basrah International, the only airfield within Iraq that was used by international civil air traffic was Baghdad/Saddam International. Basrah International was completed in 1989 and was only used by domestic air traffic for a limited time after opening and before the imposition of the Southern No Fly Zone (SNFZ). Prior to the Desert Storm campaign most of Iraq's civilian aircraft and some of its military aircraft were dispersed to countries such as Jordan, Iran and Tunisia. In 1994 stated that Iraq was maintaining six Boeing aircraft in Jordan and that 3,500 staff were ready to commence operations should UN sanctions be lifted. These sanctions have yet to be lifted but in early 2001 some foreign civil aircraft began operating, in defiance of the sanctions, into and out of Saddam International airport. Since 1999 Iraq has also been operating an internal air service with its limited number of indigenous passenger aircraft.

4. Details of the principal airfields are given in **Annex A**. Their locations and those of other selected airfields are shown on the accompanying topographic map.

Fixed Air Defences

5. Iraq has a sizeable number of mainly old Soviet air defence SAM systems which include SA-2, SA-3, SA-6, SA-7, SA-8, SA-9, SA-13, SA-14 and SA-16. It also has a smaller number of western systems, such as Roland and Skyguard, and a large number of old Russian AAA. Iraqi fixed air defence systems, such as SA-2 and SA-3, have employed a policy of increased mobility and camouflage and deception techniques as well as attempts to improve their "target kill" capability by modification to existing systems. It is unlikely, however, that the effect of any improvements would significantly increase the overall effectiveness of the Iraqi Air Defence network.

ANNEX A TO SECTION I

SECTION 2

PORTS

SHATT AL ARAB WATERWAY

1. **General.** The Shatt al Arab waterway is located in the northern Persian Gulf. It was originally dredged to accommodate vessels of up to 10.6 m draught, but there has been no significant dredging since 1979, and silt has reduced the depth in the fairway. The waterway would require considerable dredging before modern ships can be accommodated. Current hazards to shipping may still include unexploded munitions and many wrecked or abandoned vessels. The Iran-Iraq border lies along the centre of the waterway.

Al Basrah (K2)

2. **General.** The port of Al Basrah is situated 114 km from the mouth of the Shatt al Arab waterway. Since July 1993, several sunk or stranded vessels at Al Basrah have probably been removed. Due to the present depth in the Shatt al Arab, the majority of activity is local traffic.

3. **Approach and Anchorage.** The approach to the port is via the Shatt al Arab waterway, which extends from the head of the Persian Gulf to the port. The Karun Bar (between Khorramshar and Abadan), 38 km below Al Basrah, controls the draught of vessels using the port, where the depth varies from 5.8 m at low water to 8.8 m at high water. Pilotage is compulsory. There are moorings south of the port for six vessels up to 183 m length overall (LOA), in depths of 9 m.

4. **Berthing Accommodation:**

a. **General and Bulk Cargo.** The Maqal Wharves have a continuous frontage of over 2,000 m, with depths of up to 9.1 m, which can accommodate 12 vessels simultaneously. There is also a 500 m lighterage quay at Ashar Pier with depths of 2.6 m, and 13 mooring buoys, each 220 m apart.

b. **Tanker Terminal.** The Muftiya Jetties handle crude and refined oil for local consumption and oil exports. There is one wooden and one concrete jetty, and vessels up to 175 m LOA can be accommodated.

5. **Port Services:**

a. **Towage and Harbour Craft.** Up to 12 tugs and lighters are available.

b. **CHE.** There are numerous quayside cranes of 1.5 – 15 t capacity, one of 60 t, and two self-propelled floating cranes of 20 t and 100 t capacity.

c. **Storage.** There are 38 warehouses and large transit sheds providing 94,360 m^2 of covered storage for 120,000 – 160,000 t of cargo. There are also bonded storage

facilities, cold storage for up to 1,800 t and a 60,000 t capacity open storage area.

d. **Supplies.** Fresh water and bunker fuel oil is available.

e. **Repair Facilities.** There is a floating dock with a lift capacity of 4,000 t and a slipway, which can accommodate ships up to 700 t.

6. **Clearance.** The port is cleared by road, rail and canal and is connected to Baghdad by the Tigris river.

7. **Naval Facilities.** A naval base containing the Iraqi Naval HQ is located within the port area.

KHAWR ABD ALLAH WATERWAY

8. The Khawr Abd Allah waterway is situated in the northern Persian Gulf. Major dredging to a depth of approximately 13 m took place in 1990, but the maximum acceptable draught for vessels is now only 10 m. Current hazards to shipping in the waterway may still include unexploded munitions and several wrecked or abandoned vessels.

Umm Qasr (K2)

9. **General.** The port of Umm Qasr, situated at the southern end of the Khawr az Zubayr where it joins the Khawr Abd Allah waterway, is now Iraq's principal commercial port. It has seen little infrastructure enhancement since 1997 and struggles to service the few vessels that call there. Iraqi port officials still claim an alongside berthing depth of 11 m, but the fallacy of these claims is reflected in the port's inability to handle vessels over 35,000 dwt.

10. **Approach and Anchorage.** The approach to the port is through the Khawr Abd Allah navigation channel. Pilotage is compulsory. Mooring buoys are situated about 2.4 km north of the general cargo berths.

11. **Berthing Accommodation:**

a. **General and Bulk Cargo.** There are three 183 m long berths with an alongside depth of 9.75 m at low water. There are two mooring buoys 247 m apart, situated about 2.4 km north of the general cargo berths in depths of 12 m and 14 m. There is also a sulphur loading berth for vessels of 170 m LOA.

b. **Container and Ro-ro Facilities.** Containers and ro-ro vessels can be handled at a 250 m long berth and may also be worked at a further three general berths.

12. **Port Services:**

a. **Towage and Harbour Craft.** Two tugs are available.

b. **CHE.** There are ten quayside cranes of 3 – 15 t capacity, several mobile cranes, including two 15 t mobile container cranes and a 40 t container handling crane. There are two floating cranes of 100 t and 150 t capacity. Fork-lift trucks, tractors and trailers are available.

c. **Storage.** A free zone is available in the vicinity of berth 3, comprising a transit shed, a stacking yard and a warehouse. Storage space totals 117,400 m², including two 1,500 m² sheds and a 200 m² shed, six transit sheds and warehouses totalling over 31,000 m². There is fenced open storage capacity of 150,000 t.

d. **Supplies.** Bunker fuel oil is not usually available. Fresh water of poor quality is available direct from mains on the wharves.

13. **Clearance.** The wharves are directly connected to roads and standard gauge railway lines to allow quick delivery of goods to all parts of the country.

14. **Naval Facilities.** There is a small naval facility about 1 km south of the port.

15. **Development.** Port officials have stated their intention of acquiring two additional gantries for the port and that dredging work is planned, but these enhancements have yet to materialise.

Az Zubayr (K2)

16. **General.** The port of Az Zubayr is located almost 18 km north of Umm Qasr.

17. **Approach and Anchorage.** The approach is through a 12 m depth buoyed fairway, although the current maximum acceptable draught for vessels entering the port is 9 m. Anchorage is available off the quays.

18. **Berthing Accommodation.**

a. **General and Bulk Cargo.** Up to 12 berths provided at the 540 m long deep water quay. There are also two 244 m long berths, which serve the local steel works.

b. **Tanker Terminal.** There are two berths for petrochemical products tankers.

19. **Port Services:**

a. **Towage and Harbour Craft.** Tugs are available.

b. **CHE.** There are four 8 t capacity electric cranes, conveyors and other ship loading equipment.

c. **Storage.** There is a covered storage area for phosphates and urea with a 370,000 t capacity.

c. **Supplies.** Fuel and water are available.

20. **Clearance.** The berths are connected to the railway system.

OIL TERMINALS

Al Faw (L1)

21. **General.** Al Faw is a crude oil terminal situated on the southwest bank of the Shatt al Arab waterway, about 24 km from its entrance. Large tankers are currently unable to use this facility due to depth restrictions in the waterway.

22. **Berthing Accommodation.** The facility consists of four loading jetties each with a depth of 10.95 m at low water. Each pier can accommodate vessels up to 205 m LOA and 10.65 m draught.

23. Port Services.

a. **Towage and Harbour Craft.** Tugs are available.

b. **CHE.** Each jetty has a 60 cm crude oil delivery line with four 24 cm flexible hoses. There are four 3 t cranes.

c. **Supplies.** Water is available at the jetties, rate approximately 10 t/h.

d. **Repair Facilities.** There are limited facilities for minor emergency repairs.

Khawr Al Amaya

24. **General.** Khawr al Amaya is a deep sea crude oil loading terminal situated about 15 km southeast of the entrance to the Shatt al Arab waterway. It was destroyed by the Iranians during the Iran-Iraq war.

25. **Approach and Anchorage.** The facility is approached via the buoyed Khawr al Amaya channel. There are three designated anchorage areas for tankers and one for lighters.

26. **Berthing Accommodation.** The terminal comprises 12 connected platforms with a total length of 951.6 m and is 73.2 m wide at the centre. The depth of water ranges from 17.1 – 22.3 m. Two 120,000 dwt tankers can be accommodated simultaneously and also a 320,000 dwt tanker.

27. **Port Services:**

a. **Towage and Harbour Craft.** Tugs are available.

b. **Supplies.** Water is available.

Mina Al Bakr

28. **General.** Mina al Bakr is the only operational deep sea oil tanker terminal and is located about 10 km south of the Khawr al Amaya terminal.

29. **Approach and Anchorage.** The facility is accessed through the Khawr al Kafka buoyed channel. Pilotage is compulsory. There are two designated deepwater anchorages northeast of the Khawr al Kafka fairway.

30. **Berthing Accommodation.** There is 975.4 m of berthing space that can accommodate four tankers from 35,000 – 350,000 dwt, in water depths of 29 – 30 m.

31. **Port Services.**

a. **Towage.** Tugs up to 4,000 hp are always available.

b. **Supplies.** Water can be supplied by barge or small water tankers. Fuel is supplied direct by small bunker tanker or barge, but only when the tanker is waiting to berth or after loading and unberthing.

SECTION 3

INLAND TRANSPORTATION

Roads

1. **General.** There are approximately 47,400 km of motorable roads and tracks, of which about two thirds are asphalted. Iraq has a good, modern system of two or three lane roads covering the whole country. It is overlaid on a skeleton of dual carriageways radiating from Baghdad (G5). The roads are generally in good condition, in part because they have been under used in recent years, although they can be prone to flooding during the rainy season where the camber is insufficient.

2. There are two main highways north from Baghdad, the first through Al Mawsil (Mosul) (F8) towards the Syrian and Turkish borders and the second to Karkuk (Kirkuk) (F8). Two major highways extend south from Baghdad towards Al Basrah. The first runs via Al Kut (H4) and Al Amarah (K3), the second via An Nasiriyah (J3). These major highways vary between two and four lanes, have good asphalted surfaces and are capable of dealing with sustained traffic from heavy transport vehicles.

3. There are good all-weather connections to Iraq's neighbours, Kuwait, Saudi Arabia, Jordan, Syria, Turkey and Iran. A major programme has been undertaken to improve and expand international road connections, particularly to Syria and Turkey. There are two major crossing points into Syria, along National Route 1 from Al Mawsil (Mosul) to Tall Kujik (E8), and along Route 12 from Baghdad to the At Tanf (A3) border crossing via Ar Ramadi (F5). These are both fully metalled roads with a large weight bearing capacity.

4. The expansion of trade with Turkey has determined the need for a second border gate in order to relieve pressure on the Habur Bridge Crossing. Work to improve the roads is currently being carried out in northern Iraq in order to prepare for this new crossing point.

5. The Iraqi road network is vulnerable to interdiction, particularly on the major highways extending over the expansive Euphrates and Tigris Rivers. During the Gulf War, lines of communication were extensively targeted, causing major damage to many road bridges, particularly on the two main routes between Baghdad and Al Basrah. Despite on-going sanctions, these key commercial and military routes have been repaired and are now capable of carrying large volumes of traffic.

Railways

6. The Iraqi rail network consists of 2,603 km of standard gauge (1,435 mm) single track, plus 122 km of double track between Baghdad and Ar Ramadi. The Iraqi Republic Railways (IRR) controls the railway network. The network extends from the Persian Gulf ports of Umm Qasr and Al Basrah, through to the hub at Baghdad, extending west to the Syrian border at Al Qaim, and north via Al Mawsil (Mosul) to the Syrian border at Tall Kujik. The Iraqi rail network suffered serious disruption during the 1991 Gulf

War and subsequent international sanctions. However, despite the on-going sanction regime, there has been clear evidence of regeneration with the Iraqi authorities investing heavily in rail infrastructure. The development of the Iraqi railway network has been supported internationally by Pakistan and China.

7. There is a main rail route from Baghdad to Al Basrah. The line runs through Al Hillah (G4) and An Nasiriyah, over a distance of about 580 km. Work to maintain and strengthen the Baghdad-Al Basrah line was completed in 1996. The track in the Baghdad-Fallujah-Ar Ramadi area was reported to be in good condition and has recently been improved to allow speeds of 140 km per hour. Improvement to this line is being made in preparation for the planned connection to the Syrian rail network at Al Qaim. It is assessed that the main Al Mawsil (Mosul)-Baghdad-Al Basrah line is also in good operational condition and has recently opened an international extension into Syria at Tall Kujik, allowing significant freight movement. The line north from Baghdad to Karkuk (Kirkuk) via Tuz Khurmatu (G6) is reported to be no longer operational. Tracks have been removed and on many sections the former line has been built over. It is assessed that line will not be brought back into service.

8. The rail network in Iraq is recognised as a major means in the movement of military personnel and equipment within the Iraqi borders, as well as offering an important option for the movement of commercial goods. The railway was efficiently operated during the run up to Desert Storm and, although sanctions have impeded maintenance, the railway is still capable of moving large quantities of bulk goods. Regional disputes and the pressure of the international community had meant that for some years the rail network did not offer international connections to allow the cross border movement of goods.

9. In April 1982 Syria closed its international rail link with Iraq in response to the Iran/Iraq War. It was therefore a major breakthrough in August 2000, when the Al Mawsil (Mosul) to Halab (Aleppo) railway link reopened. The rail link offers both a passenger service and bulk goods movements, particularly the transportation of oil (suspected to be in illegal quantities) into Syria. The reopening of the line provides Iraq with access to the Syrian rail network and the capacity to move south at Al Qamishli towards Dayr az Zawr and eventually Damascus, via Halab (Aleppo). This is by no means a direct rail route; nevertheless, it does provide Iraq with the capability to move troops from Northern Iraq toward Israel via rail.

10. The Nusaybin-Baghdad railway line linking Iraq and Turkey officially resumed service in early May 2001, having been closed 19 years ago due to the Iran/Iraq war. This line is an extension of the Al Mawsil (Mosul)-Halab (Aleppo) line whereby the Turkish and Iraqi rail networks are linked via the Syrian network. The reconstitution of this line gives further scope for the transportation of goods for trade (particularly oil) and offers a gateway into Europe.

11. There are plans to operate a further international rail link to Syria from Baghdad via Al Qaim and Abu Kamal to Dayr az Zawr. This link would require major work on the Syrian side in order to connect Dayr az Zawr to the border at Abu Kamal. This work is

reported to be underway, however the track laying is extensive and will take some time to complete.

12. Further possible future developments include the extension of the rail network into Iran, from Al Basrah to Khorramshahr. Survey work has been carried out although no building work has yet commenced. In parallel with the international links, expansion and development of the national rail system is also being carried out. Work has been undertaken to modernise the rail infrastructure by replacing old rails in order to increase train speeds. Work is underway on the Al Hillah to As Samawah railroad and the section between Baghdad and Al Mawsil (Mosul).

13. In 1999, the rail network was reported to be operating 161 diesel-electric locomotives, 283 passenger cars and 9,412 freight wagons. During 2000-01 spare parts for IRR's fleet of 100 Class DES 3100 Co-Co diesel-electric locomotives were supplied by the Czech company Diesel International. The locomotives were originally delivered by CKD Praha in 1979-82.

Inland Waterways

14. Iraq has three principal navigable waterways; the River Tigris, the Shatt Al Arab, and the Shatt al Basrah.

a. The River Tigris is navigable from Al Basrah to Baghdad. From Al Basrah to Al Qurnah (K3), the permissible draught at low water is about 2 m and from Al Qurnah to Baghdad about 1 m. At Baghdad, freight can then be transhipped to road or rail.

b. The Shatt al Arab links Al Basrah with the Persian Gulf. It is navigable by ocean-going shipping, but is blocked by wrecks and mines left over from the Iran/Iraq War. Efforts are underway to clear the waterway.

c. The Shatt al Basrah canal provides an alternative link between Al Basrah and the Persian Gulf. The canal is not navigable by ocean going vessels.

SECTION 4

TELECOMMUNICATIONS AND BROADCASTING

Telecommunications

1. **General.** Telecommunications services are operated by the Iraq Telecommunications and Posts Company (ITPC) on behalf of the Ministry of Transport and Communications. The relatively modern telecommunication facilities that existed in 1990 were all subjected to considerable disruption caused by allied bombing during Operation Desert Storm. This reduced the effectiveness of them all to the extent that the telex (national and international) and the international telephone services ceased to function. An internal telephone service of sorts did survive although it is likely that many calls were operator assisted and that certain areas where exchanges were destroyed had no service at all. In 1998 the United Nations (UN) asked the International Telecommunications Union (ITU) to investigate the state of the Iraqi telecommunications infrastructure with a view to enhancing the effectiveness of the UN's humanitarian "Oil for Goods" programme. The ITU reported that the telecommunications network to be "extremely poor and requires urgent attention" and noted that the rehabilitation of the entire network would require US$ 1 billion and would take seven to ten years to be implemented fully.

2. **Rehabilitation.** Under this initial plan the ITU proposed six major telecommunications projects to be financed by Phase 5 of the "Oil for Goods" programme.

a. Interconnection network between local exchanges in Baghdad, using digital microwave system Synchronous Digital Hierarchy (SDH) at a rate of 155 Mbps.

b. International communications, a new Standard A (18.9m diameter) Earth Station for 750 digital channels, a microwave link, and an international exchange.

c. Digital microwave link between Baghdad and Al Basrah with an extension to the port of Umm Qasr, including stations in the cities and on route, using SDH 155 Mbps, and the replacement of four old Crossbar exchanges.

d. Replacement of three Baghdad exchanges damaged during Desert Storm.

e. Introduction of a small mobile telecommunications network for 25,000 subscribers in the Baghdad area.

f. Introduction of a Data Communications network consisting of 22 nodes with five in Baghdad and two in Karkuk (Kirkuk), Al Mawsil (Mosul) , and Al Basrah respectively, and one each in the remaining 11 other Governorate capitals.

3. The UN sanctions committee approved the first four of these projects in August 2001, awarded to Alcatel of France (Alcatel helped build much of Iraq's original

telephone network in the 1980s). With a value of US$ 69 million, these projects will give Iraq new exchanges with the capacity of 280,000 lines.

4. The project outlined at para 2e was awarded to 'Huawei', a Peoples Republic of China company, but this firm pulled out of the US$ 28 million deal in September 2001, and it is not known which company will be offered the contract instead.

5. The project outlined at para 2f was not approved by the sanctions committee due to concerns about potential 'Dual Use' of this system for military as well as civil purposes. These 'Dual Use' concerns have also been the reason why a large number of contracts relating to Fibre Optic systems have been blocked. Other recent developments at the UN have seen US$ 80 million of Chinese telecommunications contracts approved under later phases of the sanctions programme. These include SDH microwave radio relay systems to replace the existing analogue network.

6. **Internal Services.** Prior to 1991 the national total exchange capacity was 770,000 lines, giving a telephone density of 5.6 %. Due to the loss of 206,000 lines during the Gulf war and the increase in population, this figure had dropped to 3.3% by 1998 and 3% by 2001. The service was provided via 207 exchanges, of which 81 were manual, 27 were mechanical cross bar type and 99 were stored programme controlled (SPC) digital. Circuits are conveyed over the national transmission media comprised mostly of microwave radio relay systems and coaxial cables. The capacity of the Frequency Division Multiplexing (FDM) microwave radio relay systems is in the range of 960 – 1,260 voice channels. The coaxial cable routes have a similar capacity range except for the North Eastern cable - Baghdad - Ba'qubah - Jalawla - Karkuk (Kirkuk) - Al Mawsil (Mosul) which has 2400 channels, and the Western cable - Baghdad to the Jordanian border - which has 480 channels. A relatively modern (1980s) coaxial cable network extended southwards from Baghdad to Al Basrah with an offshoot branching out at Al Kut extending southwards to An Nasiriyah. This coaxial cable follows the path of the existing radio relay network. A Telex service with a capacity of 2,000 subscribers from operates a single (Eltex 2) exchange.

7. **International Services.** International telephone and telex calls were routed over circuits contained in the national terrestrial transmission media or via circuits contained in satellite links. Until Operation Desert Storm, all international telephone and telex calls had to be placed via an operator who used the international telephone or telex exchange to establish it. Both of these exchanges were housed in the Sinek International Communication Centre building, on Rashid Street, Baghdad, which was heavily damaged during the operation. Due to this damage at Sinek the international exchanges were moved to the Mamoun Exchange.

8. The Iraqi terrestrial transmission network is interconnected with the networks of adjacent countries as follows; Syria - radio relay 240 channels, Jordan and Turkey - radio relay 960 channels each.

9. A range of satellite links are currently available through the two satellite earth station complexes at Ad Dujayl and Latafiya. The earth station complex located at Ad Dujayl possesses two Standard A (32 m diameter) antennae which are operated with

INTELSAT's Atlantic and Indian Ocean satellites, and one 11 m diameter antenna that operated with the INTERSPUTNIK system. The earth station located at Latafiya operates with a satellite of the ARABSAT organisation providing a communication path to countries in the Middle East.

10. Both satellite earth station complexes were put out of action during Operation Desert Storm. It is understood that Iraq has managed to repair the earth station at Latifiya and has, since September 1998, recommenced services with ten Middle East countries with a total of 104 telephone circuits. One of the two Standard A earth stations, located in the Ad Dujayl complex, is operational with the INTELSAT Atlantic Ocean satellite whilst the Indian Ocean satellite link is believed to be non-operational.

11. The new satellite earth station and associated equipment to be installed by Alcatel should alleviate many of the problems with Iraq's satellite communications system although it is unclear whether the earth station will be placed at one of the established sites or in a site nearer Baghdad.

12. Iraqi's will continue to use their INMARSAT land mobile satellite earth stations for international communication purposes. Iraq is also in the 'footprint' of new Mobile Satellite Services (MSS) such as THURAYA and GLOBALSTAR and therefore has the potential to utilise these services.

Other Communications Systems:

13. **Military.** The civil trunk network (previously described), is known to be used by the military forces who are believed to have exclusive use of a proportion of the channels, on both the radio relay and the coaxial cable systems. Circuits contained in the coaxial cable system interconnect the military secure voice exchanges.

14. **The Ministry of the Interior and Directorate of Police.** These organisations operate an extensive mobile radio network in the High Frequency (HF), Very High Frequency (VHF) and Ultra High Frequency (UHF) bands. They are also thought to operate an exclusive Tele-printer and facsimile network in addition to the voice facilities.

15. **State Organisation for Oil Projects.** A network comprising radio relay, HF, VHF and UHF radio systems supports the oil operations and pipeline requirements. Each pipeline has its own end to end communications. These facilities were affected by allied actions during Operation Desert Storm, but since the Iraqi state is exporting oil again, it is likely that these have been repaired, especially the communication link associated with the oil pipeline exiting through Turkey.

16. **Railways.** The Iraqi Railways General Company routes have a comprehensive, if ageing, communications system with train/train, track/train, wayside station, mobile and hand-held services. This, as far as is known, remains operational but is becoming increasing difficult to maintain due to age of many of the lines. A Fibre Optic system has

been requested but 'Dual Use' concerns exist over the use of such a system to speed up transport and deployment of Iraqi ground forces.

17. **Roadside Communications.** Roadside emergency communications linked to the national network are available on major roads connecting Baghdad with Syria and Jordan.

18. **The State Organisation for Electricity.** The electricity authority has its own communications network, which provides electricity command and control system to all power stations.

19. **River Traffic Communications.** An HF radio system is available for shipping on the River Tigris by means of four shore stations located at Baghdad, Al Kut, Al Amarah and Al Basrah. These HF/VHF radio systems are assessed as operational.

20. **Aeronautical Fixed Telecommunications Network (AFTN).** The International Civil Aeronautical Organisation (ICAO) AFTN extended to the Saddam Hussein International airport in Baghdad, although ICAO had an arrangement with Iraq whereby ICAO messages to other airfields recognised by ICAO, would be onward relayed to the airfield concerned via national means. The current outdated AFTN communication system is due to be replaced
and will support international flights at the reactivated Saddam Hussein International airport.

21. **Societe Internationale de Telecommunications Aeronautiques (SITA).** SITA services are available through airfield agents at Baghdad (Saddam International) and Basrah airports. The service was suspended at the beginning of Operation Desert Storm and is likely to recommence now that international flights to/from Iraq have resumed.

22. **Maritime.** A maritime service is provided under the direction of the State Organisation of Iraqi Ports. The service is provided through maritime coastal stations. These are Al Basrah Control (YIR) (30°33'N 047°47'E) which operates a 24 hour watch on VHF Channels 16 & 14 and MF with set times of traffic on HF, and Umm Qasr (YIU) (30°02'N 047°57'E) 24 hour watch on VHF Channels 16 & 20 and MF.

23. **UN.** The UN has installed its own satellite communications facilities in order to communicate directly with their offices in New York. There are satellite dish antennas and associated equipment located immediately adjacent in the UN buildings in Baghdad and at their sites in the Northern Governates.

Broadcasting

24. Radio and television services are provided and operated by the Iraqi Broadcasting and Television Establishment (IBTE), which is subordinate to the Ministry of Information. Iraq's radio and TV broadcasting capability was considerably impaired during the Gulf war, since when Iraqi broadcasting services have been struggling to return to a pre-war condition. Most programmes are produced in Baghdad radio and television studios and

broadcast from fixed (and in time of crisis, mobile) transmitters throughout Iraq.

25. **Radio.** In the 1980s Iraqi Radio could be heard reliably on several Short Wave (SW) and Medium Wave (MW) frequencies but that is not now the case. Currently, Iraqi radio broadcasts on MW are difficult to receive much beyond the borders of Iraq itself. SW transmissions, which can sometimes be heard further afield, are highly erratic and the audio quality is sometimes so bad that programming may be unintelligible. The domestic radio service uses a mixture of MW, SW and Frequency Modulation (FM) transmitters to broadcast its programmes to an estimated 3.7 million listeners countrywide. Republic of Iraq General Programme, Voice of the Masses, and Voice of Youth broadcast in Arabic, with broadcasts in Kurdish from Nineveh. The FM service is restricted to the Baghdad area. Radio Iraq International on MW and SW broadcasts provides international services, which are primarily in Arabic with some English and French programming.

26. **Television.** Before the Gulf War, Iraq had a two-channel colour television service, which was transmitted, using Sequential Couleur a Mémoire (SECAM) System B, to an estimated one million viewers. The transmitters were all relatively powerful, falling within the 144 - 360 kW ranges. The television service ceased to function towards the end of the war, but it has since resumed operations with two terrestrial (official Iraq TV and Youth TV) and one satellite channel. Reception of terrestrial TV is believed to be confined to major population centres.

27. **Satellite TV and Radio.** Iraq is in the 'footprint' of a number of satellite services such as Arabsat, HotBird, Eutelsat and Nilesat. These could be received anywhere in Iraq using appropriate satellite receiving dish and associated equipment. The Iraqi satellite channel was inaugurated in July 1998. This was initially aimed at the Arab states but has since been extended to Europe. There is some ambiguity as to whether satellite dishes are in fact legal in Iraq. Reporting has suggested that if legal, the cost would be prohibitive for the man in the street thereby reinforcing the fact that satellite TV is the preserve of the regime elite. Radio programmes are transmitted on satellite sub carrier frequencies and can be listened to by those with satellite receiver equipment

28. **Rehabilitation of TV and Radio Broadcasting Services.** As of August 2001, a large number of goods contracts pertaining to broadcasting equipment have been approved under the UN "Oil for Goods" programme. These will allow the Ministry of Education to provide 'Educational TV and Radio' services from numerous low power transmitters falling within the range 3-25 kW throughout Iraq. How these services will operate in relation to the established systems of the IBTE is not fully understood at this time.

29. **Kurdish Radio and Television.** The Patriotic Union of Kurdistan (PUK) broadcasts from As Sulaymaniyah (H7) as the Voice of the People of Kurdistan, and it also broadcasts the KurdSat television channel via the Eutelsat W2 satellite. The Kurdistan Democratic Party (KDP) broadcasts as the Voice of Iraqi Kurdistan on SW/MW and as Kurdistan TV from Salah Ad Din. The Kurdish Worker's Party (PKK) broadcasts a satellite TV channel called Medya TV from Europe.

30. **External Broadcasts to Iraq.** The US–backed broadcaster Radio Free Europe/Radio Liberty (RFE/RL) broadcasts to the Middle East region. The BBC World Service also broadcasts in Arabic to the region. This and Radio Monte were popular with the Iraqi public due to there perceived truthfulness and objectivity. Iraq appears not to attempt jamming of these frequencies.

SECTION 5

OIL AND GAS

1. **General.** Iraq has approximately 115 billion barrels of crude oil, the second largest proven oil reserves in the world, equating to 11% of the world total. It has over 3,000 billion cubic metres (m^3) of natural gas reserves, which equates to 2% of the world total. There are potentially larger reserves as many areas are undeveloped. All imports and exports of oil and gas are carried out under UN supervision. The oil and gas industry suffered substantial damage during the Iran-Iraq and Gulf Wars, and recovery has been slow, especially as UN sanctions imposed after the Gulf War are still in force. A recent UN report stated that the general state of the Iraq oil and gas industry has declined seriously over the last 18 months and that urgent measures need to be taken to avoid yet more deterioration of oil wells and the petroleum infrastructure. There are twelve oil refineries in Iraq in a position to be utilised but only three are currently in operation. All oil and gas related business is overseen by The Oil Ministry.

Oil

2. **Crude oil reserves.** Iraq has approximately 115 billion barrels of crude oil reserves, the second largest in the world. Some oil experts believe that there may be reserves of up to 190 billion barrels. The major oilfields are shown on the map.

3. **Crude oil production.** Oil production in Iraq currently stands in the region of 2.8 million barrels per day (bpd).

4. **Crude oil imports.** Iraq does not import crude oil.

5. **Crude oil pipelines.** Crude oil is transported from the oilfields to the various storage sites, refineries and for export via pipelines. There are three significant pipelines for the export of crude oil and one for internal transportation of crude oil. Three of these four pipelines are currently operational. **Annex A** lists these pipelines and the design and current estimated operating capacities.

6. Iraq is constantly looking to improve its current practices to enable increased output and more flexibility. Plans are being made to construct a new export pipeline between Hadithah (E6) in Iraq and the Zarqa refinery in Jordan, with the intention of replacing the road tankers currently used. Work was planned to start towards the end of 2001 and there may be an option to continue the line to the port at Aqaba for the export of Iraqi crude oil.

7. **Oil exports.** Due to sanctions imposed after the Gulf War, oil exports are carried out under the UN Oil-for-Food (OFF) programme. Iraq currently exports around 2.4 million bpd under this UN programme.

8. **Export pipelines.**

a. **The Iraq-Turkey Pipeline (ITP)** is currently exporting under the UN "OFF" programme and has undergone some repairs to damage sustained during the Gulf War. It is currently operating slightly below design capacity but work is in hand to increase its capacity beyond the original design capacity to 1.6 million bpd.

b. **The Iraq-Syria Pipeline (Baniyas)** was closed by Syria in 1982. Both countries agreed in principle to reopen the line in 1998 and, in November 2000, Iraq started to export crude oil to Syria through this pipeline at a rate of approximately 150,000 bpd. This pipeline is not an approved route under the UN "OFF" programme although negotiations are currently in hand. Plans have been announced to construct a new pipeline between Iraq and Syria due to leakage and corrosion problems with the existing pipeline. The first stage will be completed in Syria, with the second stage in Iraq to be completed once it can secure the finance. Estimated capacity of this new pipeline is 1.4 million bpd. Additionally, another pipeline has been constructed in the north of Iraq which links the Iraqi and Syrian oilfields in that area, crossing the border near the Suwaydiyah oilfield in Syria. It enables Iraqi crude to be exported to Syria. Capacity of this pipeline is small, estimated at 17,000 bpd, and is exporting oil outside of UN control.

c. **The Iraq Pipeline to Saudi Arabia (IPSA)** has been closed since Iraq's invasion of Kuwait in 1990. It was used to export Iraqi crude via the terminal at Yanbu in Saudi Arabia. In June 2001 Saudi Arabia 'seized' the section of the pipeline that is on its territory. The Saudi Arabian Government stated that this was a result of continuing threats of Iraqi aggression since the Gulf War.

d. Not shown on the map is an old oil and gas pipeline that was used to carry crude oil and gas to fuel the pipeline pump stations to Jordan. This was closed in 1948. (The pipeline portion in Jordan is however used for internal distribution of petroleum and water.)

9. **Internal pipelines.**

a. **The Strategic Pipeline** is of significant importance as it is a reversible pipeline. It enables oil to be pumped from the oilfields in the south up to the north for export to Turkey, and oil from the fields in the north to be pumped south for export through the Gulf. This pipeline suffered considerable damage during the Gulf War and although repairs have been carried out its efficiency is an issue due to pipeline leaks and pump reliability.

b. In addition to the four major pipelines there are other smaller lines that feed into the major pipelines from oil fields for distribution or feed direct to refineries for processing.

10. **Pump Stations.** Crude oil is pumped through the pipelines by a series of large pumps positioned at various points along the pipelines. The significant pipeline pump stations are shown on the map.

11. **Crude oil storage.** There are approximately 30 known storage sites for crude oil currently utilised in Iraq, with a total storage capacity of approximately 24 million barrels. The largest single sites are positioned in the vicinity of the pipeline pump stations.

12. **Refining.** Before the Gulf War, Iraq had 12 operational oil refineries, with a combined refining capacity of about 717,000 bpd. Only the three national level refineries at Bayji, Baghdad and Al Basrah are currently producing significant amounts of oil products, approximately 440,000 bpd. These products tend to be of relatively poor quality, as the refineries are not running efficiently or reliably due to problems caused by a lack of spares, resulting in poor maintenance and operating procedures. The refinery complex at Bayji consists of one large and two smaller refineries within close proximity. Refineries that were damaged during the Gulf War or deemed non-essential have been stripped of spares to keep the major refineries in operation. Smaller modular type refineries (10,000 bpd capacity) are reportedly under construction to supply regional areas with refined products and there are plans to build a new larger refinery with a 290,000 bpd capacity close to Babil (Babylon) (G4). **Annex B** provides details of the national level refineries.

13. **Refined product imports.** Iraq does not currently import refined oil products.

14. **Refined product storage.** There are approximately 120 refined product storage sites currently operational in Iraq. Their combined storage capacity is in the order of 29 million barrels. The largest of these facilities tend to be in the area of the oil refineries. The more significant storage sites are shown on the map.

15. **Refined product pipelines/distribution.** Refined products are distributed mostly by road tanker. There was a network of refined product pipelines but these were severely damaged during the Gulf War and have not been repaired. Reports suggest that these pipelines will be repaired or replaced in the future once Iraq's financial position has improved. The construction of more refined product pipelines has been planned for many years to reduce the dependence on distrubution by relatively expensive road tankers. The map shows the routes of the last known significant pipelines for refined products.

16. **Export Terminals.** Iraq has four export terminals on the Persian Gulf that are capable of handling oil tankers. They are Mina al Bakr, Khawr al Amaya, Khawr az Zubayr and Al Faw. Mina al Bakr is the only terminal currently in operation, although reports state that Khawr al Amaya will be ready for use again very soon once repairs carried out to damage caused during the Iran-Iraq War are complete. Khawr az Zubayr mainly handles dry goods and Al Faw is non-operational (see section 2, Ports). Another export terminal at Umm Qasr, which currently handles dry goods, is being outfitted to handle crude tankers.

Natural Gas

17. **Gas reserves/production.** Iraq has over 3,000 billion m³ of natural gas reserves, the majority of which is associated gas (gas produced in conjunction with oil). In 2000 Iraq produced 4.2 billion m³ of gas. As with many other hydrocarbon rich countries, Iraq intends to further exploit its gas reserves in the future and encourage its industries and general population to make gas their fuel of choice. As a result of self sufficiency, Iraq does not import any gas.

18. **Gas exports.** Iraq does not export gas due to the UN sanctions currently imposed. Some gas was exported in the past and facilities are still in place for this purpose, with plans to export once UN sanctions are lifted (see paragraph 19).

19. **Gas pipelines.** Gas is distributed from the gas fields by pipeline. The map shows the major gas pipelines in Iraq which are used to supply power stations and pipeline pumping stations. Smaller pipes branch from these major pipes to provide gas for domestic use. The Iraqi Government plans to expand its gas system. Future projects include building an export line to Turkey and the construction of new pipelines to improve internal distribution.

20. **Gas storage.** There are approximately 15 storage sites for Liquefied Petroleum Gas (LPG) in Iraq with combined storage capacity of around 3.5 million barrels. These sites are mostly located in and around major cities.

Annex A to Section 5

Crude Oil Pipelines

	Pipeline Name	Design Capacity ,000 (bpd)	Current Capacity ,000 (bpd)	Operational Status
1	Iraq-Turkey (ITP)	1,100	900	Operational
2	Iraq-Syria (Baniyas)	700	150	Operational
3	Iraq Pipeline to Saudi Arabia (IPSA)	1,650	0	Non-Operational
4	Strategic Pipeline	1,350	500	Operational

Annex B to Section 5

Refineries

	Refinery Name	Design Capacity ,000 (bpd)	Current Capacity ,000 (bpd)	Operational Status
1	Al Basrah	170	170	Operational
2	Baghdad (Daura)	140	70	Operational
3	Bayji South	20	20	Operational
4	Bayji North	20	20	Operational
5	Bayji Petref	310	160	Operational

SECTION 6

ELECTRIC POWER

1. **General.** The generation, transmission and distribution of electric power in Iraq are the responsibility of the Electricity Commission. It is subordinate to the Ministry of Industry and Mining, and headed by a Minister who sits on the Council of Ministers, thus reflecting the increased status of the sector. The General Company for Electrical Projects (GCEP) is responsible for construction and repair projects. Additionally, municipalities and private industrial enterprises control some local facilities. Power cuts are widespread and prolonged. Little accurate data is available on the power infrastructure in Iraq due to the nature of the regime's information policy and the desolate state of the industry The power system was badly damaged during the Gulf War and the national power sector was seriously degraded. Since then, most of the damaged plants have been restored to partial operation and temporary repairs to the transmission grid have allowed supplies to reach most areas. Power supplies and the grid are regulated by the National Control Centre co-located in the regional control centre in south-central Baghdad. It is linked with the two other regional centres in Karkuk (Kirkuk) and Az Zubayr. The original system was well designed, and contains a strong element of in-built redundancy. Despite considerable damage during the Gulf War and a serious lack of maintenance since, the system remains integrated. A list of significant electricity facilities is at **Annex A**.

2. **Generation.** Iraq's National Installed Capacity (NIC) is in theory approximately 10,000 MW but in reality, due to the poor state of the system, the practical limit for generation and transmission is approximately 5000 MW. The shortfall for even the most basic demand is estimated at 1800 MW. Electricity is generated from a conventional mix of oil-fired thermal, gas turbine and hydroelectric plants. There are no nuclear powerplants.

a. **Thermal.** Oil-fired steam powerplants account for 3495 MW (37.8% NIC), gas turbine plants 1704 MW (18.4% NIC) and combined cycle plants 1799.5 MW (19.5% NIC). Iraq is especially dependent on five large oil-fired thermal (TPP)/gas turbine plants (GTPP) which together provide 4480 MW (48.5%) of Iraq's NIC: Bayji TPP, Al Musayyib TPP, An Nasiriyah TPP, Al Basrah Hartha TPP and Baghdad Daura TPP/GTPP. All were damaged during the Gulf war; Al Musayyib and Al Basrah Hartha were virtually destroyed and the latter is still on very limited production. 32 other thermal and gas turbine plants have a total NIC of 4766 MW. 32 diesel plants (DPP) with a NIC of 212.5 MW (2.3% NIC) serve rural areas and industrial locations. Three 29 MW DPP have been inaugurated recently in the Kurdish regions in the north, along with numerous smaller units in villages and small towns. Many smaller generating plants in the kilowatt range are known to have been supplied to local areas; they are mobile to a limited degree, being deployed where there is a need for power generation, but their exact locations and status are very difficult to establish. Many households have been acquiring commercial generators in the 500 W range in an effort to overcome the frequent power outages, which can last up to 18 hours per day. The UN Development Programme provided about 1000 small and medium generators to supply electricity to hospitals, water pumping stations and other vital amenities.

b. **Hydroelectric.** 14 hydroelectric plants, all in the north of Iraq, account for 2122.5 MW (23% NIC). A prolonged drought in the region has reduced hydroelectric generation in the north of the country to a fraction of the potential.

3. **Transmission and Distribution.** Power is controlled and balanced by a national control centre in Baghdad and three regional control centres at Baghdad, Karkuk (Kirkuk) and Az Zubayr. It is transmitted to main centres of population via a national 400 kV Super High Voltage (SHV) network, which spans the country from Umm Qasr in the south to Al Mawsil (Mosul) in the north. It also connects the main towns along the Euphrates, as far as Al Qaim on the Syrian border; in addition an eastern branch links Al Basrah with Al Amarah, Baghdad and Karkuk (Kirkuk). This supplies a more comprehensive 132 kV system, which connects major power plants, provincial centres of population and the principal industrial complexes. The grid is capable of operating at only 40% of its capacity. This is wholly inadequate, despite lower demand from industrial consumers. The UN has initiated considerable work on rehabilitating the transmission network, but this has been hampered by the fact that long stretches of the grid system pass through uncleared minefields. Distribution is via transformer stations, reducing voltage from the transmission levels to 66 kV, 11 kV and 3.3 kV. In the larger towns, primary distribution is by means of 3-phase, 50 Hz, alternating current at 11 kV. Consumer distribution is carried out at 220/230 V 50 Hz, single-phase alternating current.

4. **Long Term Aims.** There are plans to exploit other, so far untapped, hydroelectric sources. Only sustained and expensive rehabilitation and investment will overcome the serious problems facing the electricity infrastructure, and economic and social recovery cannot take place without it. Iraq has at least one advantage in its plentiful and cheap supply of fuel for its power stations, and many foreign firms are showing interest in bidding for electric power contracts, among them Russian, Indian, European and Japanese companies. Expansion and upgrading of the electrical system is a priority. Furthermore Iraq intends to join the Mashreq electric grid being developed by other countries in the region with a major switching and transformer station to be built or upgraded, possibly in Al Mawsil (Mosul).

5. **Cross Border Connections.** A 400 kV transmission link exists between Zakho and Cizre in Turkey.

6.

a.

b. The Badush Dam complex, on the River Tigris 20 km north-west of Al Mawsil (Mosul), is the site for a new 169 MW hydroelectric power plant. Dam construction started in 1988 but very little work had been done on the turbine hall before the Gulf War. It is likely to be some years before it is completed.

c.

d.

e.

f. Iraq, Jordan, Egypt, Syria and Turkey have continued with the cross-border inter-connection of their power grids, known as the grid. Agreement had already been reached to link the national electricity networks of Turkey and Iraq. The first phase was to modify the existing 132 kV transformer station at the border town of Zakho by installing step-up transformers to link the Iraqi 132 kV network with Turkey's 154 kV grid. This was subsequently upgraded to 400 kV and the link has a capacity of 500 MW and 22.9 million kWh per month. A second 400 kV cross-border connection has been planned between Cizre in Turkey and Kesek in Iraq, with a 500 MW capacity.

g. Construction has begun on the Al Ubid hydroelectric project in the Al Anbar Governate. It will hold 50 million cubic metres of water and generate up to 22 MW of electricity.

h. Three new 29 MW diesel power stations (DPP) have been inaugurated in Arbil, Dahuk and As Sulaymaniyah under UN auspices, to alleviate the severe power shortage in the Kurdish regions. A large number of small diesel generators in the kilowatt range have similarly been installed throughout the country at village level but there is no information on their exact locations.

i. The Al Shemal power station is to be upgraded by the installation of four 350 MW oil-fired steam units and a 400/132 kV GIS substation. Work is unlikely to be completed before 2006.

j. Eight sub stations in As Sulaymaniyah and one in east Dahuk are to be rehabilitated by Swiss and French companies.

k. 70 new sub stations are planned as part of the repair of the transmission system in

addition to 2700 km of overhead lines.

l. Work recently completed at An Nasiriyah, Daura, and Al Mawsil (Mosul) and new generators at Mullah Abdallah have added 412 MW to the network.

Annex A to Section 6

SECTION 7

WATER RESOURCES

1. **Administration.** The General Establishment for Water and Sewage is the national body responsible for the collection, treatment and distribution of water supplies in Iraq. The Baghdad Water Supply Authority is responsible for the capital city. The General Organisation for Irrigation and Reclamation Projects carries out irrigation projects throughout the country.

2. **Resources.** The principal sources of Iraq's fresh water are the winter rainfall and the headwaters of the Tigris and Euphrates Rivers, both of which originate in Turkey. The heavier rainfalls in the north-east Kurdistan region provide ample surface water and replenish underground sources. In the plains and deserts of the south and west, rainfall diminishes sharply, and water absorbed underground is frequently made brackish by the mineralised strata through which it permeates. Good quality aquifers exist in the foothills of the mountains in the north-east of the country and in the area along the east bank of the Euphrates, where salinity is low in comparison to the rest of the country. Elsewhere, water supplies obtained from underground sources are scant, and generally of poor quality. In the north-west Al Jazirah region, supplies are available only from widely scattered wells and boreholes, yielding small quantities of brackish water. In the central lowlands, there are abundant supplies for areas close to the Tigris and Euphrates from surface and groundwater resources. In the dry season, yields diminish and the water becomes increasingly brackish. In the south-western deserts and south-eastern marshes, water resources are very scarce, with virtually no surface sources and only widely separated wells and boreholes providing meagre, brackish supplies.

3. The flow of the Euphrates into Syria and Iraq has been seriously reduced by the construction of dams and irrigation projects in Turkey. In 1990, the filling of the reservoir behind the Ataturk Dam, an integral part of the Greater Anatolian Project (GAP), resulted in a month-long water supply stoppage to Syria and Iraq, causing significant hardship and highlighting the vulnerability of downstream countries. Under a 1987 agreement, Turkey is committed to maintaining a flow of 500 million m^3 per second into Syria, but Iraq and Syria want this figure increased to 600 million m^3 per second. These water sharing arrangements remain a concern.

4. The need for desalination is becoming increasingly important, but is severely hindered by UN sanctions imposed after the 1991 Gulf War. The major water treatment plant in Al Basrah, a 25,000 m^3 desalination plant, is severely restricted in its production capacity, as a result of a shortage of essential filtering membranes and other spare parts.

5. **Utilities.** Despite recent heavy investment into modernisation and extension of municipal water systems, the water supply and sanitation sectors in Iraq are in a state of continuous deterioration. Principal towns are served by a mains water supply, but minor townships and villages possess only rudimentary systems. Water from the larger municipal systems is treated; however, supplies from all other sources are liable to contamination. As a result of pipe damage and power outages, 40% of piped water is

reportedly lost and infiltration of sewage occurs, encouraging microbial growth within the system. Many water treatment plants lack chlorine and alum, necessary to treat and purify water, as they are declared military items and sanctions prevent access to the these chemicals.

6. The 'Karkh' Water Supply Scheme, completed in 1990, has the largest water treatment plant in Iraq. It draws from the Tigris River, some 35 km upstream of Baghdad and has increased water supplies to the population on both banks of the Tigris in the Baghdad area. The 'Karkh' supply scheme provides over 1.3 million m^3 of water per day, about 70% of the capital's water requirement.

7. The major centre of population in the south-east, Al Basrah, is chronically short of potable supplies. The city's main supply, the Shatt al Arab, and much of its other ground and surface water, is becoming increasingly brackish and contaminated. To remedy the water shortage situation, the 'Loyalty to the Leader' water system was constructed, to supply towns from An Nasiriyah to Al Basrah with fresh water from the Shatt al Gharraf. In southern/central Iraq, water is supplied through a system of 230 water treatment plants and 1,300 compact water treatment plants, connected by thousands of kilometres of pipes. All plants are working at some 50-60% of their designed capacity.

8. UNICEF and the World Health Organisation (WHO) assess that 96% of the urban population and 48% of the rural population has access to safe, potable water. The quality of untreated water throughout the country varies widely, but is generally poor. Heavy mineralisation, suspended solids and high salinity characterise Iraq's water supply. The suspended solids, primarily silt in the Tigris and Euphrates, combine with biological materials and pollutants to laden the rivers with bacteria, which instigate epidemics of cholera, hepatitis and typhoid. Water-borne infections and diseases have increased significantly as a result of the degradation of the water infrastructure.

9. With raw sewage contaminating water resources, reliable sources of safe water remain one of Iraq's most pressing problems. Sewage treatment is virtually non-existent in Baghdad. Of its four sewage treatment plants, two are non-operational and two are operating at only 30% efficiency, with sewage water flooding residential areas because of inoperative pumping stations. An estimated 250,000 million m^3 a year of untreated wastewater is being returned to the Tigris from Baghdad, along with untreated industrial and medical waste. Sewage disposal in Baghdad is via pipes, but beyond the city, it is collected in septic tanks. In southern / central Iraq, the 11 sewage treatment plants intended to serve three million of the urban population are non-functioning, thus untreated sewage is disposed of into rivers, the main source of drinking water.

10. UNICEF and WHO assess that 93% of the urban population and 31% of rural population have access to adequate sanitation. Sanitary conditions continue to deteriorate as indiscriminate dumping of sewage occurs on the outskirts of cities.

11. **Development.** The most important future project is the construction of the Makhul Dam on the Tigris in northern Iraq. The purpose of the project is water

storage, irrigation, industrial and power generation. The project is expected to take approximately 5 years.

12. Another significant scheme underway is the Wafa al-Qa'id project, intended to supply Al Basrah, An Nasiriyah and Suq ash Shuyukh, increasing the quality and quantity of water in southern Iraq. Water pumped from the Shatt al Gharraf will be treated and distributed along a 231 km canal and 32 km of pipeline. The project began supplying water to Al Basrah in December 1997.

13. Development at Al Faw has been approved, with funds allocated to develop several water network projects plus the establishment of new potable water desalination networks.

14. New water supply projects have been planned at Karkuk (Kirkuk) , Al Basrah, Al Amarah and Al Mawsil (Mosul), although many were delayed following the onset and repercussions of the Gulf War. Priority was given to the An Najaf/Al Kufah unified scheme, which would have provided 200,000 m^3 of potable water a day for some 300,000 people. The project should have been completed in 1993, but was reported in September 1996 as being 80% complete.

15. **Implications for deployed UK forces.** Sanitation is poor throughout the country with water supplies contaminated by pathogenic bacteria, parasites and viruses. Given the shortages of essential treatment chemicals, deployed forces could not rely on local water supplies as a source of safe, potable water.

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