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Sana'a, 15 June 1991

**Report of the Fourth Monitoring Mission**  
**9 - 15 June 1991**

**Rada Water Supply and Sanitation Project**  
**Republic of Yemen**

Republic of Yemen  
Ministry of Electricity and Water  
National Water and Sewerage  
Authority

Kingdom of The Netherlands  
Ministry of Foreign Affairs  
Directorate General of  
Development Cooperation  
Africa Department



International Institute for  
Hydraulic and Environmental  
Engineering

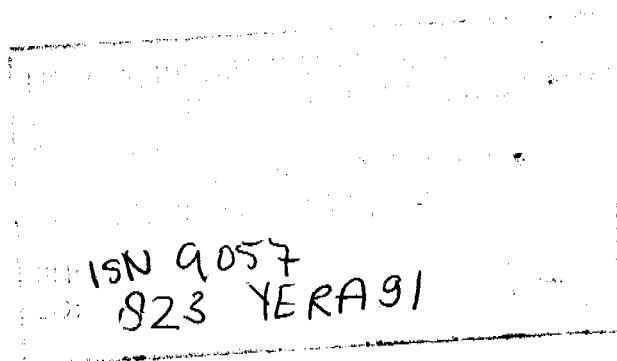
Delft, The Netherlands

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## Foreword

This report presents the findings of the monitoring mission for the Rada Water Supply and Sanitation Project in the Republic of Yemen. The mission was carried out from 9 to 15 June 1991, on request of the Netherlands Ministry of Foreign Affairs. The Terms of Reference of the mission are attached in annexure 1.

The mission consisted of Mrs. M.T. Boot (IRC, International Water and Sanitation Centre, the Hague), Mr. M.W. Blokland (International Institute for Hydraulic and Environmental Engineering, Delft), and Mr. C.D. van der Wildt (Ministry of Transport and Public Works, Rijkswaterstaat, Lelystad).

The mission had extensive and fruitful discussions on the project with the Governor of Al Baydah, the National Water and Sewerage Authority, the Ministry of Urban Planning and Housing, the project staff, and with the Royal Netherlands Embassy (see annexures 2 and 3). The mission hereby expresses its gratitude to all those who contributed their valuable time and energy to enhance the quality of the work of the mission.

On 12 and 13 June 1991, the findings of the mission were discussed with and agreed by the National Water and Sewerage Authority, the Ministry of Urban Planning and Housing and the management of the project.

## Abbreviations

Dfl	Netherlands Guilder
DGIS	Netherlands Government, Directorate General for International Cooperation
E&T	Extension and training
GOY	Government of Yemen
GON	Government of the Netherlands
HTC	High Tender Committee
NWSA	National Water and Sewerage Authority
MUPH	Ministry of Urban Planning and Housing
O&M	Operation and Maintenance
RIRDP	Rada Integrated Rural Development Project
RNE	Royal Netherlands Embassy
RWSSP	Rada Water Supply and Sanitation Project
YR	Yemen Rial

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## Summary in English

The Rada Water Supply and Sanitation project addresses sanitary conditions in the rapidly growing town of Rada, a trading centre of approx. 30,000 inhabitants in the Governorate of Al Baydah. The hardware components of the project include water supply, sanitation, drainage, and solid waste collection and disposal. The project also includes community information and participation, environmental health education directed at the urban population and institutional development activities aimed at the authorities that will operate the various systems, i.e. the future Rada Branch of the National Water and Sewerage Authority under the Ministry of Electricity and Water, and the Rada Municipal Offices under the Ministry of Urban Planning and Housing.

At present the conceptual and design phases of the water supply, sanitation and drainage components have been completed, and construction activities are about to start. The solid waste, community information and participation, and institutional development components are in progress.

Monitoring missions have been fielded from time to time to assess the progress of the project and to identify and analyze major constraints that hamper the progress and/or quality of the project. The findings of this, 4th monitoring mission may be summarized as follows:

1. The contract and tender documents for water supply, sanitation and drainage have been very thoroughly prepared in good cooperation with the NWSA and MUPH.
2. The communication and cooperation between management and staff of the Project, and of NWSA and MUPH is very much improved and may be considered to be good.
3. Communication with the Rada authorities and population should be improved. Now that the implementation of major construction activities is imminent, it is of utmost importance that communication lines are reopened.
4. The exchange of information and knowledge between the members of the team should be seriously reconsidered. All members should feel it as their duty to support all components of the integrated project, even if this is not their specific task.
5. The contract and tender documents will be amended, and the prequalified contractors notified accordingly, on the following:
  - (i) the desired sequence of the execution of the civil works for water supply and sewerage should not be 'strongly advised' as stated, but be binding on the contractor. This means that each contractor has to prepare his tender based on this predetermined sequence;
  - (ii) the operation and maintenance of the electro-mechanical equipment for a period of 2 years at an estimated cost of dfl 1.0 mln is new, and additional to the agreed Plan of Operations. The mission is the opinion that this item should be replaced by a provisional sum of dfl 350,000.Both proposed amendments were discussed and agreed upon by the Director General of NWSA.
6. The transfer of the solid waste activities to the Rada Municipality should be initiated and for that reason a detailed programme of transfer should be jointly prepared. The programme should propose a time frame and list all needs and conditions for the transfer.

7. The extension and training activities have been adequately formulated, but the operationalisation is not yet fully developed. In view of the forthcoming construction activities emphasis is now rightly being shifted to water supply, sewerage and rain water drainage.
8. The acquisition and fencing-in of the various sites is in full progress. The mission is convinced that with the assurances received at the highest level (Governor of Al Baydah) this activity will be successfully completed. The Governor also promised to guarantee the security and safety of the contractors and project staff when implementation will start.
9. The counter value funds are used by the project as agreed, i.e. for land acquisition and minor civil works such as the fencing of the various project sites.
10. A special fund will be created that will allow the application of connection fees enabled by the project to finance Rada system extensions. It appears that a likely system is in preparation for the Ibb project.
11. The cost of the water and sewerage contracts is now provisionally estimated at YR 229 mln (dfl 36.9 mln), i.e. excluding contingencies. As the concerned part of the allocated funds amounts to only YR 224 mln (dfl 36.2 mln), this means that the provision for contingencies has been more than exhausted. The expected cost increase is attributable mainly to inflation and to the financial conditions of contract, and to a lesser extent to the revision of quantities and the inclusion of some operation and maintenance expenditure.
12. The time schedule has been revised. The contractors are expected to start work from September 1991 onwards, and the project is now scheduled for completion by May 1994.

قام مشروع مياه ومجاري وتصريف القمامة برداع بتوجيه الشروط الاصاحيه بمدينة رداع

- محافظة البيضاء ذات النمو السكاني السريع كمركز تجاري يبلغ عدد سكانها حوالي ٣٠٠٠٠٠ نسمة

إن الادوات المكونه للمشروع تشتمل علي شبكة مياه والصرف الصحي والتصريف وجمع وتصريف القمامة

كما يشمل المشروع كذلك ارشاد ومشاركة الجمهور • تقديم توعيه بيئيه لسكان المدينة وتطوير الانشطة

الموعسيه التي توجه للجهات العامله في الانظمه المختلفه مثل فرع الموعسه الوطني للمياه والمجاري

فرع رداع المستقبلي - وزارة الكهرباء والمياه وكذلك مكتب الاسكان فرع رداع التابع لوزارة الاسكان

والتخطيط الحضري •

في الوقت الراهن ، تم الانتهاء من الدراسات ومراحل التصميم لمكونات شبكتي المياه والصرف الصحي

وكذلك فإن أنشطة الانشاءات علي وشك البدء فيها • جمع وتصريف القمامة وارشاد ومشاركة الجماهير

ومكونات التطوير الموعسي في تقدم •

يتم إرسال بعثات للتقييم بغرض تقييم مدى التقدم الذي احرزه المشروع لمطابقة وتحليل المعوقات

الرئيسيه التي تعترض تقدم المشروع وتقييم المشروع من الناحيه النوعيه • وقد كان ملخص النتائج

لهذه البعته التقييميه الرابعه هو كما يلي :-

١ - وثائق التعاقد والمناقصه الخاصه بشبكة المياه والصرف الصحي تم اعدادها بشكل كامل وتام وقد كان

التعاون مع موعسه المياه والمجاري والاسكان تعاوناً جيداً .

٢ - الاتصال والتعاون بين إدارة المشروع والموظفين وتعاونها كذلك مع موعسه المياه والمجاري

والاسكان والتخطيط الحضري قد تحسن كثير أ ويمكن اعتباره في مستوى جيد الآن •

٣ - يجب تحسين الاتصال وتبادل المعلومات مع الجهات المسئوله بالمدينه وكذا المواطنين •

تنفيذ المنشآت الرئيسيه الآن وشيك الحدوث وعليه فان إعادة فتح قنوات الاتصال وتبادل المعلومات

يعتبر امر عظيم الاهميه •

٤ - مسألة تبادل المعلومات بين اعضاء الفريق يجب إعادة النظر فيها بشكل جدي • يجب ان يشعر

كل عضو بواجبه نحو دعم مكونات المشروع المتكامله حتي وان لم يكن الامر من مهامه الخاصه •

٥ - سيتم اجراء تعديلات علي وثائق المناقصه ويتم إشعار المقاولين بالاتي :-

أ - ان التسلسل المرغوب للاعمال المدينه لشبكتي المياه والمجاري يجب ان لاتتم ( التوصيه عليه

بقوة ) كما هو موضح ولكن يرجع الامر للمقاول • هذا يعني انه علي كل مقاول اعداد عطاءه

علي ان يكون مبنيا علي هذا التحديد للتسلسل مبدئياً •

ب - ان التشغيل والصيانه للمعدات الكهربائيه - الميكانيكيه لمدة سنتين بتكلفه تقدر ببلغ واحد مليون

جلدر جديدة لإضافه الي خطه العمليات المتفق عليها • رأي البعته التقييميه هو أن يتم إستبدال

ذلك بمبلغ ٣٥٠ و ٠٠٠ جلدر هولندي مؤقتاً •

نوقش اقتراحي التعديل الاثنين وتمت الموافقه علي ذلك مع مدير عام موعسه المياه والمجاري



- ٦ - تحويل خدمات جمع وتصريف القمامة الي مكتب الاسكان برداع بحيث يتم الاعداد لذلك وعليه لابد من عمل برنامج مفصل بهذا التحويل من الجانبين • علي ان يشمل البرنامج المقترح الهيكل الزمني وقائه بكل الاحتياجات والشروط اللازمه لهذا التحويل •
- ٧ - صيغ الارشاد والانشطة التدريبية بشكل كافي إلا أن جانب العمليات لم يتطور بعد بالقدر الكافي • بالنظر الي التركيز علي أنشطة الانشاءات الوشيكة فقد تحولت تماما الآن الي شبكة المياه والمجار وتصريف مياه الامطار •
- ٨ - ان الحيازه والتصوير في مختلف المواقع في تقدم كامل والبعثه التقييميه مقتنعه بأنه بناءً علي التأكيدات التي تلقتها من اعلي المستويات بالمحافظة ( محافظ لواء البيضاء ) سوف تكتمل الانشطه بنجاح • كما وعد المحافظ بضمان توفير الأمن للمقاولين وموظفي المشروع عند البدء في التنفيذ •
- ٩ - يمكن استخدام الميزانيه المتفق عليها لمسألة حيازة الارض والاعمال المدنيه الصغيره كتصوير مواقع المشروع المختلفه •
- ١٠ - يتم خلق ميزانيه خاصه لتطبيق رسوم التوصيلات بواسطة المشروع لدعم امتدادات شبكة رداع • يبدو ان شبكة مشابيه يتم الاعداد لها بمشروع اب •
- ١١ - تكاليف عقود المياه والجاري تم تقديرها بشكل موقت ببلغ ٢٢٩ مليون ريال ( ٣٦ و٩ مليون جلد ) هذا المبلغ لايشتمل علي ميزانيه الطوارئ • ان المبالغ التي خصصت لهذا الجزء هي فقط ٢٢٤ مليون ريال ( ٣٦ و٢ جلد ) وذلك يعني ان رسوم الطوارئ المقدره بشكل موقت كانت تفوق ما يتم إستهلاكه • ان الزيادة في التكلفة نتجت بشكل اساسي عن التضخم والشروط الماليه للعقد وبدرجه اقل لمراجعة الكميات وإشتمالها علي نفقات مرتبطه بالتشغيل والصيانه •
- ١٢ - تمت مراجعة الجدول الزمني • من المتوقع ان يبدأ المقاولين العمل في سبتمبر ١٩٩١ م • والجدول الزمني المبرمج لهذا المشروع ينتهي في مايو ١٩٩٤ م

## 1. General

The project is now reaching the stage that the implementation of the physical works can start within half a year. This is absolutely necessary to regain the belief of the people of Rada. Although the project staff is under heavy workload, especially during the last couple of months, the capacity of the team seems sufficient for the coming period.

## 2. Land and water rights

Land and water rights comprise the following:

- land acquisition for the well sites, the NWSA compound, the treated water reservoir site, the waste water treatment plant site, and the waste disposal site;
- right of way for the main pipelines to be laid in private property outside the Rada urban area;
- water rights allowing for the abstraction of ground water from the designated wellfield area.

With the exception of the well sites, all land acquisition has been completed or is being finalized. The compound site (2.0 ha) and the reservoir site (1.7 ha) have been walled in, and around the waste water treatment plant site (43.2 ha) a 2.6 km long wall is under construction. The contract for the preparation of the waste disposal site (1,5 ha) has been awarded. The land acquisition of the 6 well sites (11 x 12 m each totalling 0.08 ha) is not expected to be a problem in view of the extremely small area requirement.

Concerning the water rights in the protected well field area, there is a decree issued by the Prime Minister declaring that no wells shall be drilled in this area, other than those for the use of the Rada water supply, as implemented by the Rada Water Supply and Sanitation Project. The enforcement of the decree was guaranteed by the Governor of the Albaydah Province, in a meeting with the Mission, officials from NWSA and the Rada Municipality, and the Consultant (see also Annexure 4). In this meeting the Governor also guaranteed the protection of the project staff and the contractors and said he will do all he can to promote the progress of the project, if necessary through his personal presence.

Concerning the right of way for pipelines, there is now one case where a make-shift house was erected in the axis of the pipe route after the land owner had been informed about the intended route.

When presented with this case, the Governor spoke out that such practices are not acceptable, and will be adequately dealt with by him.

## 3. Tenders

The contract and tender documents are fully completed and have been discussed with the prequalified contractors. Some of the contractors have made some remarks and questions. These are answered in a formal letter (annexure 5) that will have the status of addition/amendment to the tender documents, that will be forwarded to the contractors. This letter also contains the information that the desired sequence of the execution of the civil works for water supply and sewerage is not 'strongly

advised' as stated in the tender document, but 'binding' on the contractor, meaning that each contractor has to prepare his tender based on a predetermined sequence. This sequence will allow the gradual commencement of water and sewerage services. In addition, the letter states that the operation and maintenance of the electro-mechanical equipment that was foreseen for a period of 2 years in the tender documents should be replaced by a provisional sum of dfl 350,000.

Submission of tenders for the well drilling will be on July 1, and for the civil works and the electro-mechanical equipment will be on July 21st. The evaluation of the tenders will be done by the consultant and discussed with NWSA and MUPH staff. The award of the contracts will be done by the High Tender Committee, if necessary after approval by the Cabinet. The time required by the HTC to decide on the award of the tenders is 1 month for the well drilling and the electro-mechanical works and 2 months for the civil works. As the recommendations will be submitted to the High Tender Committee on August 1 for the well drilling, and on September 1, for both the electro-mechanical works and the civil works, the award of the tender is now expected on August 1 for the well drilling, on October 1 for the electro-mechanical works, and on November 1, 1991 for the civil works.

The support of the Minister of Finance, the Governor of Al Baydah and the Director General of NWSA is absolutely necessary to meet the above time schedule.

#### **4. Water supply and Sewerage**

In the proposed wellfield one well was drilled by a farmer prior to the issue of the decree that secures the wellfield area for the water supply of Rada. The well produces clear and odourless water of good taste, and the opportunity should be taken to obtain a sample for full analysis of the water in order to assess compliance with drinking water quality standards and to see about the possibly corrosive character of the water. According to the consultant the 5000 water and 4500 sewerage connections foreseen in the tender documents will be sufficient to connect all houses in the project area.

#### **5. Waste water treatment and re-use of effluent**

During the site visit to the waste stabilization ponds of Al Baydah, the mission drew Consultants attention again to the phenomena of the red colouring of the water in the ponds, that is caused by a dominance of algae or other organisms or substances. This problem is hampering the working of the ponds in such a way that the quality of the effluent appears very poor; as such the effluent may have a negative impact on the environment and certainly requires extreme caution in the present practise of application for irrigation purposes. A thorough study including analysis of flows, loading and pond design should indicate both the cause of the problem and its solution.

Since water is becoming a scarcer resource in Yemen, the need for reuse of effluent is increasing. It is understood that the matter of the agricultural reuse of the Rada ponds effluent has the attention of the

Ministry of Agriculture and Fisheries, and it is suggested that, upon formal confirmation with the Ministry, the development of reuse is proposed as an activity of the RIRDP project. This project is already working in the field of reuse development in the Rada area, be it on a much smaller scale than intended here.

## **6. Rain water drainage**

The design of the rain water drainage is slightly changed. Instead of the concave road profile proposed earlier, now a slightly convex profile has been chosen, after discussion with the authorities. It is understood that the design of the structures at the discharge points is yet to be made.

The whole system will be executed under the civil works contract, after which the maintenance will be carried out by the municipality.

## **7. Solid waste collection and disposal**

The transfer of the solid waste component from the project to the Municipality has been in discussion since 1989. It was agreed with the project and MUPH to set this transfer into motion according to a jointly prepared plan in which the conditions for the transfer are laid down, together with a time schedule. The conditions may include organization, training, equipment, etc., as deemed relevant. After the transfer, the project will remain available for support, if necessary.

Recently, more attention has been paid to the improvement of the solid waste programme. Organization and supervision have been improved and experiments have been carried out to minimize the garbage around the containers by new sweepers schedules and by providing smaller garbage containers to make them more accessible for children who often have to throw away the household garbage. When the solid waste collection has shown to be able to provide a regular service, a new extension programme will be carried out, to reinforce proper waste disposal practices.

The contract for the preparation of the new disposal site has been awarded. The works include an access road, fencing, a trash rack, and a guardhouse. The existing site will be covered with soil and trimmed.

## **8. Extension**

The extension activities are part of the activities of the Extension and Training Section. This is the new name for the former Environmental Health Education Section and better reflects that the section is not only responsible for environmental health education, but also for communication and information exchange between the project and the Rada population on the planning and implementation of the technical components, and for the organization of training of staff.

Between the start of the project and the end of 1990 the Environmental Health Education programme has been focussed mainly on extension in relation to the solid waste disposal component of the project. Activities included separate information sessions with men and women, with the women

of the Rada' Non-Formal Training Centre, hygiene improvement activities with specific target groups such as restaurant owners and butchers, the start of a school programme, and cleaning campaigns. As of the beginning of this year the emphasis of the extension activities has been shifted towards the water supply component of the project, whereas the sewerage and rain water drainage components still have to be taken up.

With the more general aim to promote communication and information exchange between the project and the various population groups, contacts were established with local authorities and some 5 to 10 district coordinators have been selected in each of the ten districts of Rada. In the beginning these coordinators were actively involved in the activities of the section, but for various reasons they no longer function as link between the people in their neighbourhood and the project.

In support of the extension activities a number of video's, posters, leaflets and a newsletter are being produced. The tenth issue of the newsletter has been issued this month, and seems to be well received.

The plan of action for the extension activities has been updated in December 1990. The plan outlines a systematic approach to the development of the extension programme, but operationalization of this approach seems to leave scope for improvement. The team still lacks a clear idea about the technical and community related aspects of the water supply and sewerage components and the in-house implications of the new services. It is understood that the section is considering to create neighbourhood based water committees, mainly with the same function of the coordinators. The draft report of the baseline survey, carried out in Oct-Nov. 1989, was only received this month and the outcomes have not yet been incorporated in the development of the extension programme. Message development seems to be rather office based. As the extension activities in relation to the forthcoming construction of water supply, sewerage and rainwater drainage facilities cannot be effective without a network of relationships with the various population groups, this issue should get more attention.

MUPH suggested to evaluate the extension activities related to the solid waste programme, to get more insight in the target groups reached and the relevance of the programme for the population. This might be particularly useful when the outcomes are fed into the development of the extension programme related to water supply and sanitation. In the plan of operation of December 1989 it was already stated that monitoring and evaluation of the extension activities would be a continuous activity.

## **9. Institutional aspects**

This activity is aimed to help establish the future Rada Branch of the NWSA and the relevant sections in the Rada Municipal Offices. Earlier, organograms for the different services were drawn up, and relevant training programmes were identified. The mission was pleased to note that of late, in view of the imminent transfer of responsibilities, notably to the municipality, a local consultant has been engaged to assist with the definition of the municipal task and organisational structure, the preparation of job descriptions and the identification of training needs.

The solid waste collection programme has been hampered by budget constraints and it is expected that this will continue in the immediate future. Both budget availability and the timely disbursement thereof are problematic. Progress has been made to get the collection of fees for garbage disposal legalized. The proposal hereto will be based on the positive experience in Sana'a where fees are collected as part of the electricity bill. In addition, a seminar is planned on the decentralization of municipal services in which the introduction of cost recovery for local services and revenue collection for direct use at the local level will be covered.

At present, five of the staff members of the projects E&T section are employed by the project, whereas the other four staff members are seconded by MUPH. Within NWSA the interest is growing to pay more attention to consumer related aspects of the water supply and sanitation services, and some preliminary thoughts have been given to have staff assigned in the operation and maintenance section of the new NWSA branch office with the responsibility for public relations. Aim would be to increase cost recovery, to prevent damages and to promote a proper use of the services. The mission supports this idea and hopes that the staff concerned will join the extension section as soon as possible to gain experience.

#### **10. Training**

The projects recent training programme seems to be well underway. The chosen order of preference for training possibilities is much appreciated by the mission, and is as follows: in-house training, in-country training, training within the Arab speaking region, and training outside the region. Special mention should be made of the initiative of the project to organize together with a number of other projects and MUPH a tailor made course on public and environmental health at the Amin Nassr Higher Institute. The mission did not view the details of the course programme, and cannot comment on the content of the course.

#### **11. Women participation**

Due to time constraints the mission was not able to sufficiently discuss the involvement of women in the project activities. Nonetheless it seems safe to say that women involvement is increasing in the extension activities. At present, the Extension and Training Section includes four female staff, including the head of section and two Yemeni women. All female staff is paid from the project budget. The age and level of education of the female Yemeni staff is still rather low and the turn over rate in female staff is still very high. This is not uncommon, nor easy to overcome, but at the same time a real constraint for progress. In the general project activities and in decision making, women involvement seems to be virtually non existent, and more attention and support is required to make this happen in the next project phases. In this respect the mission welcomes the initiative of the Netherlands Embassy to organize a workshop on the involvement of women in water and sanitation projects within the Yemeni context.

## **12. Coordination and integration of project activities**

It is very important that the project is an integrated one. This means that the many linkages between the various components must be managed with utmost care. To the community this is much more acceptable and the project can only gain from it. The project team plays a very important role in this integration. Therefore the coordination and exchange of information of the various components should have a high priority in the team. Weekly meetings with the team might be one of the ways to achieve this.

## **13. Cost of the Financial Assistance component**

The cost of the Financial Assistance component of the project comprises the Netherlands contribution to the capital investments in water supply, sewerage, drainage and solid waste. This contribution consists of 80% of the costs of the works for water supply and sewerage, and 100% of the costs of the works for drainage and solid waste. The funds allocated to the project by the Netherlands Government on this basis amount to dfl 33 mln. The Yemeni Government's contribution will be 20% of the costs of the works for water supply and sanitation; the concerned amount, payable in Yemeni Real, will be equivalent to dfl 7.1 mln.

The cost figures that were used to decide the above allocation were taken from the estimates prepared by the Consultant for the Plan of Operations (1989), and are broken down over the various contracts as follows: well drilling dfl 0.7 mln, electro-mechanical works dfl 2.3 mln, civil works (water and sewerage) dfl 29.4 mln, civil works (drainage) dfl 4.1 mln, solid waste dfl 0.3 mln and contingencies dfl 3.6 mln (10%).

The Consultant is preparing an Engineers estimate (based on bills of quantities in the tender documents) for the tenders that have now been called, i.e. the drilling and electro-mechanical works and the civil works (water and sewerage). These calculations have been completed for the drilling and electro-mechanical works and are being made for the civil works (water and sewerage). From the intermediate results it would appear that the relevant part of the contingencies for these items (dfl 3.3 mln) have been more than exhausted. The cost increases concerned are due mainly to inflation and the rather strict financial conditions of contract (+ dfl 3.02 mln), and to a lesser extent to additional items or increased quantities (+ dfl 0.96 mln). It would therefore seem likely that the works can not be realized within the originally estimated dfl 36.2 mln, meaning also that the relevant part of the Netherlands allocation may not suffice (see also Annexure 6). At this point in time however, the available information is still of a too provisional nature to advise on a course of action.

## **14. Disbursements**

The Consultant, on the basis of information at his disposal as per end of April 1991, prepared several scenarios for the disbursement of project expenditure. On the basis of latest information it would now appear that the scenario selected in preparation for the Mid-Term Review of Netherlands development assistance to Yemen for 1991 is largely valid, be

it that in the later years expected disbursements may need revision in view of expected cost increase and the delayed completion date. As regards 1991 disbursements, the expected dates of tender awards reported in chapter 3 above would allow the estimated sum for the 1991 Financial Assistance to be realized.

#### **15. Application of Counter Value Funds**

Counter Value Funds (CVF) were earmarked for the purpose of land acquisition (YR 12 mln) and the execution of minor civil works such as the fencing of the various project sites (YR 10 mln). These funds are now being made available to NWSA and MMH, and it would appear that to date YR 9.8 mln has become available for land acquisition, that civil works to a value of YR 6.5 mln are in progress, whilst works to a value of another YR 2.1 mln are in preparation. The latter concerns the construction of some offices at the site of the solid waste workshop in Rada, for which separate approval is being sought as this application is in deviation from the original list of works.

#### **16. Special fund**

It was agreed earlier that a special fund be created to separately administer the approximately YR 15.5 mln on connection fees that will arise from the 5000 water and 4500 sewerage connections funded by the project. The funds thus received will be used exclusively to finance the first extensions of the Rada system after the completion of the project. The creation of such fund is in preparation, and the mission was informed that a similar fund is in being set-up for the Ibb project.

#### **17. Time schedule**

The time schedule of the construction activities as prepared by the Consultant has not been revised since late 1990, and a revision is due soon.

The mission had a discussion with the Director General of NWSA on the time required for the award of the tenders by the High Tender Committee and where necessary, the Cabinet. The Director General stated that this time requirement would be one month for the well drilling and the electro-mechanical works contracts, and two months for the civil works contract.

From the above, together with the available information on dates for the submission of the tenders, the required tender evaluation periods and the time set for the implementation of the works, some important dates can be derived that are presented below. The schedule shows that the first parts of the water and sewerage system are expected to become operational by December 1, 1992, and that the works are expected to be fully completed by the middle of May, 1994, i.e. 4.5 months later than foreseen thusfar.



Contract	Date of award	Completion date
1. Well drilling	September 1, 1991	January 15, 1992
2. Electro-mechanical works	October 1, 1991	November 15, 1992
3. Civil works, water supply and sanitation	November 1, 1991	May 15, 1994
- pumping stations, compound, reservoir		November 1, 1992
- sewage treatment		
- phase 1		December 1, 1992
- phase 2		August 1, 1993
- transmission mains		December 1, 1992
- reticulation		
- area 1		December 1, 1992
- area 2		June 1, 1993
- area 3		December 1, 1993
- area 4		May 1, 1994
4. Civil works, drainage	November 1, 1993	May 15, 1994

ANNEXURES

## TERMS OF REFERENCE

## 4th MONITORING MISSION RWSSP, 8-15 June 1991

**Introduction**

The Rada Water Supply and Sanitation project addresses sanitary conditions in the rapidly growing town of Rada, a trading centre of approx. 30,000 inhabitants in the Governorate of Al Bayḍah. The hardware components of the project include water supply, sanitation, drainage, and solid waste collection and disposal. The project also includes community information and participation, and environmental health education directed at the urban population and institutional development activities aimed at the authorities that will operate the various systems, the future Rada Branch of the National Water and Sewerage Authority under the Ministry of Electricity and Water, and the Rada Municipal Offices under the Ministry of Municipalities and Housing.

At present the conceptual and design phases of the water supply, sanitation and drainage components have been largely completed, and construction activities are about to start. The solid waste, community information and participation, and institutional development components are being implemented.

The project is being implemented by the Yemeni Authorities mentioned above, assisted by a consortium of Dutch Consultants led by Euroconsult. For the monitoring of the Project, the Netherlands Government avails of a 3-member team of advisors, consisting of ir. C.D. van der Wildt (chairman), ir. M.W. Blokland (secretary), and drs. M.T. Boot (member).

The progress of the project since 1986 may be illustrated by the reports issued since:

Jul 1986	Project Formulation Mission	Blokland/van der Wildt
Feb 1987	Invitation to Tender	DGIS
Mar 1987	Technical Proposal	Euroconsult/DHV/AVH
Jul 1988	Inception Report	Euroconsult/DHV/AVH
Jan 1989	Inception Report-addendum	Euroconsult/DHV/AVH
Feb 1989	1st Monitoring Mission	Blokland/Boot/vd Wildt
Aug 1989	2nd Monitoring Mission	Blokland/Boot/vd Wildt
Nov 1989	3rd Monitoring Mission	vd Wildt
Dec 1989	Plan of Operations	Euroconsult/DHV/AVH
Dec 1989	Final Design Report	Euroconsult/DHV/AVH

**Objective and Tasks of the Mission**

The objective of the mission is to obtain an independent view of the project achievements to date, by conducting discussions with the relevant Yemeni national and local authorities, with the beneficiary population and their representatives, with the staff of the Consultant and with representatives of the Netherlands Embassy, and by the study of relevant project- and other documents.

The tasks of the Mission are:

- to make available her knowledge and experience to all project parties in order to further the objectives of the project;
- to assess the overall progress of the project and to identify and analyze major constraints, if any, that hamper the progress and/or quality of the project;
- to review the progress made by the Yemeni Government in fulfilling the commitments stated in her communication to the Netherlands Embassy dated 11 August 1990 (ref. 3-95-202-2939);
- to review the application of the Counter Value Funds for specific expenditures beneficial to the project;
- to assess the progress made in the different project components;
- to assess the mechanisms that promote, where necessary, coordinated action towards different components, and to evaluate the desired and actual degree of mutual influencing of these components;
- to review the planning and implementation of the Environmental Health Education and Solid Waste Programmes, and to assess if and when a transfer of responsibilities to local authorities would be possible and desirable;
- to review the institutional development of the Rada Branch of the National Water and Sewerage Authority, and of the relevant sectors of the Rada Municipal Offices;
- to review the relationships maintained by the project and the formal and informal communication and decision making procedures that have been developed;

The Mission will discharge her tasks by investigating, amongst others the specific points mentioned in the Annexure to this Terms of Reference.

### **Logistics**

The Mission will consist of the members of the Monitoring Group, and, where time allows, drs. P.S.H. Brandt, desk officer for Yemen.

The Mission will arrive in Yemen on the 8th of June, to start her work in on Sunday 9 June 1991, and will return to the Netherlands on Saturday 15 June.

A report on the Monitoring Mission will be submitted to the Netherlands Government on or before 14 July 1991. A summary of the report will be available at the end of the Missions stay in Yemen, and will prior to her departure be discussed with NWSA, MMP, Consultant and the Netherlands Embassy.

**TOR, 4th MONITORING MISSION RWSSP, 8-15 June 1991**  
**ANNEXURE**

**To review the Water Supply Programme paying special attention to:**

- the progress in the tender procedures and the ensuing work, if any, by the contractors in well construction, electro-mechanical works, reservoir and compound, and the procurement of pipe materials;
- the arrangements made to secure the various sites for permanent use by NWSA, and specifically the arrangements to secure the intended yield of the wellfield for public water supply purposes;
- the drilling of the production wells;
- the testing and supply of the electro-mechanical equipment;
- the construction of reservoir and compound;
- the supply and delivery of pipe materials.

**To review the Pipe Laying Programme paying special attention to:**

- the progress in the tender procedures and the ensuing work, if any, by the contractors in pipe laying;
- the approach to be followed in and the schedules prepared for pipelaying;
- the arrangements designed and the progress achieved to secure the anticipated progress (i.e. with authorities, local leaders and population)
- the activities related to the securing of the anticipated number of connections to the water and sewerage systems.
- the integration of the Pipe laying programme with the other project components.

**To review the Sewage Treatment Plant Programme paying special attention to:**

- the progress in the tender procedures and the ensuing work, if any, by the contractors in plant construction;
- the arrangements made to secure the site for the treatment plant;
- the interest, if any, shown by Yemeni Authorities, individuals or others, regarding the re-use of the effluent of the waste water treatment plant, and the scope for further action in this regard.

**To review the Environmental Health Education Programme paying special attention to:**

- the immediate and intermediate objectives
- the intended and actual target groups
- present and future programme planning and implementation;
- specific studies, monitoring and evaluation and subsequent programme adaptations;
- manpower needs, availability and organisation;
- costs of the IHE programme
- the integration of EHE programme with other project components.

**To review the Solid Waste Collection and Disposal Programme paying special attention to:**

- siting and use of garbage containers;
- garbage collection schemes and services;
- functioning and use of the new sanitary landfill;
- closing down of the previous, unsanitary landfills;
- health aspects of present garbage collection and disposal system;
- operation, maintenance, and replacement of equipment;
- functioning of the workshop;
- monitoring and evaluation and subsequent programme adaptations;
- manpower needs, availability and organization;

- income and expenditure pattern;
- integration of the Solid waste programme with the other project components.

**To review the Staffing situation and the Institutional Development Programme paying special attention to:**

- the expatriate and local professional staff required by the Consultant over the remainder of the project period;
- the demand for counterpart staff and the actual situation regarding the availability of NWSA and MMH staff during the present phase of the project;
- the progress made in the preparation and execution of the Institutional Development Programme;
- the commitments and preparations by NWSA and MMH regarding the present and future, operational (post-implementation) phase of the project.

**To review the process of women participation in project development and implementation.**

## Itinary

## Saturday 8 June

13.40 Departure of mission members from the Netherlands

## Sunday 9 June

01.00 Arrival in Yemen

11.00 Briefing with:

Mr. Carl Jurrjens

Mr. Dirk de Gier

11.30 Meeting on general project matters with:

Mr. Jan Wijenberg

11.45 Meeting on the objectives of the mission:

Mr. Mohamed Alfusail

Mr. Abdurahman A. Elmoassib

Mr. Al Arusi

Mr. Saif Mokbil

Mr. Dirk de Gier

14.30 Transfer Sana'a - Rada

18.00 Informal meeting with Consultants' staff

## Monday 10 June

08.00 Meeting on general progress of the project with:

Mr. Robert van Schagen

Mr. Dirk de Gier

Mr. Najib al Maktari

Mr. Abdul Aziz Al Homikany

Mr. Ali Ahmed Al Haraath

Mrs. Chrisje van Schoot

Mr. Hagos Gidey

Mr. Hans van Ooyen

Head of Security

11.00 Site visit of Messrs van der Wildt and Blokland to the proposed well field, the NWSA compound site, the reservoir site and the waste water treatment plant site

11.00 Meeting of Mrs. Boot with the staff of the E&T section:

Mrs. Chrisje van Schoot

Mrs. Amina Mohammed

Mrs. Baraka

Mrs. Fatima Ahmed

Mr. Tala'at Al Tayyib

Mr. Yusuf Duale

13.00 Lunch in the prize-winning restaurant

14.00 Informal meeting with project staff

## Tuesday 11 June

07.45 Transfer Rada - Al Baydah

09.00 Meeting on acquisition of land and water rights, and the safeguarding of physical progress with:

Mr. Ali Ahmad Al-Harazi, Governor

10.30 Site visit to the waste stabilization ponds of Al Baydah

Tuesday 11 June (cont'd)

- 14.00 Meeting on progress of the project components with:
  - Mr. Robert van Schagen
  - Mr. Dirk de Gier
  - Mr. Najib Al Maktari
  - Mr. Abdul Aziz
  - Mrs. Chrisje van Schoot
  - Mr. Hagos Gidey
  - Mr. Hans van Ooyen
  - Mr. Khaled Al Sooki, local consultant
- 20.30 Meeting on financial issues with:
  - Mr. Robert van Schagen
  - Mr. Dirk de Gier
- 21.30 Informal meeting with RWSSP, RIRDP, PHC staff, and members of the Southern Yemen pre-identification mission, Embassy staff and Head DGIS-DAF/NF

Wednesday 12 June

- 08.30 Transfer Rada - Sana'a
- 11.00 Meeting on the findings of the Mission with:
  - Mr. Mohamed Alfusail
  - Mr. Al Arusi
  - Mr. Saif Mokbil
  - Mr. Robert van Schagen
  - Mr. Dirk de Gier
  - Mr. Carl Jurrjens
- 13.00 Lunch on invitation of the Director General NWSA
- 16.00 Report writing
- 18.00 Meeting on the findings of the Mission with:
  - Mr. Abdurahman A. Elmoassib
- 19.30 Report writing
- 20.30 Meeting on the findings of the Mission with:
  - Mr. Robert van Schagen
  - Mr. Dirk de Gier
- 21.30 Informal meeting with the ambassador, members of the Southern Yemen pre-identification mission, Embassy staff and Head DGIS-DAF/NF

Thursday 13 June

- 03.00 Departure of Mr. van der Wildt
- 08.00 Meeting on extension with:
  - Mr. Abdurahman A. Elmoassib
- 11.00 Debriefing with:
  - Mr. Jan Wijenberg
  - Mr. Carl Jurrjens
- 13.00 Report writing

Friday 14 June

- 09.00 Report writing

Saturday 15 June

- 08.00 Departure of Mrs. Boot and Mr. Blokland



## List of authorities/persons visited

## Royal Netherlands Government:

## Royal Netherlands Embassy,

Mr. Jan Wijenberg	- Ambassador
Mr. Jan Gijs Schouten	- Councillor
Mr. Carl Jurrjens	- First secretary
Mr. Alex Bartelink	- First secretary

## Directorate general for Development cooperation,

Mr. Wim van der Kevie	- DGIS, Head, DAF/NF
Mr. Patrick Brandt	- DGIS, Yemen desk officer, DAF/NF

## Ministry of Electricity and Water, National Water and Sewerage Authority

Mr. Mohamed Al Fusail	- Director General
Mr. Al Arusi	- Technical Manager
Mr. Saif Mokbil	- Project Director
Mr. Yasin Ismail	- Training Officer

## Ministry of Urban Planning and Housing:

Mr. Abdurahman A. Elmoassib	- Director General, Environmental Health
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## Governorate of Al Baydah:

Mr. Ali Ahmad Al-Harazi	- Governor
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## Consultant and NWSA/MUPH staff seconded to the project:

Mr. Robert van Schagen	- Project Director
Mr. Dirk de Gier	- Project manager
Mr. Najib Al Maktari	- Co-manager NWSA
Mr. Abdul Aziz Al Homikany	- Co-manager MUPH
Mr. Ali Ahmed Al Harath	- Manager environmental division
Mrs. Chrisje van Schoot	- Head extension and training section
Mr. Hagos Gidey	- Head engineering section
Mr. Hans van Ooijen	- Project engineer
Mr. Yusuf Duale	- Health educator
Mr. Tala'at Al Tayyib	- Translator E&T section
Mrs. Amina Mohammed	- Health educator
Mrs. Baraka	- Assistant health educator
Mrs. Fatima Ahmed	- Assistant health educator
Mr. Abdul Malik Asayaqi	- Supervisor NWSA

### Summary of the Minutes of Meeting with the Governor of Al Baydah

- From our side we will put all our efforts to solve any problem which might appear during the implementation phase.
- Concerning the treatment plant, the subject was discussed already with NWSA when claimants had appeared. We held meeting with them and requested them to prepare their documents, documents to prove their ownership of the land should be submitted to the court to be thoroughly examined. NWSA made the comensatory money available and even transferred to Rada. The problem is solved.
- The ownership of lands in Yemen Republic is respectable and lands can never be taken unless for public benefits where the Republic have got the right to take it after paying the legal compensation. This is clearly stated in the constitution. Regarding mountain lands, there is a law defining certain percentages for both government and citizens.
- I want to assure you that I myself will be there in Rada to solve any problem in time during the implementation of the project.

(( مقتطفات من ما قاله الاخ/ محافظ اللواء اثناء اجتماعه بلجنة التقييم الهولنديه ))

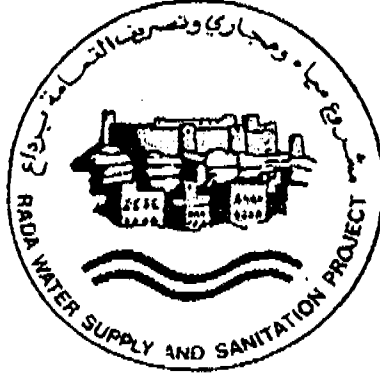
- من جانبنا سنحل أي مشكله تظهر اثناء التنفيذ وبكل امكانياتنا .
- فيما يتعلق بمحطة المعالجه هذا الموضوع نوقش مع الموء سسه العامه للمباري حيث ادعي عدد من المواطنين ملكية الارض فاجتمعنا معهم وطلبنا منهم احضار وثائق ملكياتهم الى المحكمه لفحصها ووقرت الموء سسه العامه للمياه والمباري مبلغ التعويض وانتهت المشكله وحول المبلغ الى رداع .
- قضية ملكية الارض في الجمهوريه اليمنيه الملكيه الخاصه ممانه لاتنزح الا لمصلحه عامه وبتعويض عادل يعوجب نص الدستور وعندما تحتاج الدوله الارض لمصلحه يحق لها اخذها على ان تدفع التعويضات الماليه العادله ... وفيما يخص الاراضي الجبلية يوجد قانوناً يحدد نسبة منها للحكومه ونسبه اخرى للمواطنين .
- اطمئنكم بأنه عند الشروع في العمل ساكون متواجداً في رداع لحل أي مشكله تزامن التنفيذ .

## Relevant Sections of the Letter to the Tenderers

Ministry of Housing and Urban Planning  
 Ministry of Electricity and Water  
 The National Water and Sewerage Authority

**RADA WATER SUPPLY  
 AND SANITATION PROJECT**

P.O. Box 12467, Sana'a  
 Republic of Yemen



وزارة الاسكان والتخطيط الحضري  
 وزارة الكهرباء والمياه  
 مؤسسة المياه والمجاري  
 مشروع مياه ومجاري وتصريف النفايات  
 بمرادع  
 ص - ب - ١٢٤٦٧ صنعاء  
 الجمهورية اليمنية

Euroconsult / DHV / Agro Vision Holland

شركة آيزكو نيلت - دي اتش في - أجرو فيزيون

Rada , 15-6-1991  
 Ref : HG/ AvO/ RWSSP-D-187  
 File : General  
 Subject : Minutes of meeting field visit

Att. The Managing Director/  
 President  
 BS-Watersystems BV.  
 P.O. Box 7811  
 1008 AA Amsterdam  
 The Netherlands

Dear Sir,

Please find herewith the following:

1. Minutes of meeting of the field visit and answers to the questions forwarded during the field visit.
2. Queries by Archirodon Construction Co. S.A.
3. Answers to queries by Archirodon Construction Co. S.A.
4. Amendments to Contract 2, Civil Works, Volume 2, page-GPD 8, item 1.8, (Sequence of Execution of Works).
5. Amendments to Contract 3, M/E, Volume 2, section 1200 "Operation and Maintenance":
  - Clause 1, Duties; and Clause 2, materials; are totally deleted.
  - Clause 3, Staffing  
third line, "operate and maintain the Works", is deleted.
  - Clause 4, Training of Employers Staff, item 4.1.  
The last line, "period of operation and maintenance" shall be replaced by Defects Liability Period.
6. Bill of Quantities M/E, Volume 2, Division 7000  
Bill no. 10 operation and maintenance and summary of bills M/E, are amended as shown and attached.

## 1.8 Sequence of Execution of Works

For a number of reasons it will neither be possible nor advisable to start pipe laying for water supply and sewerage at once all over the city of Rada:

- it would disturb normal life, traffic and business, if roads all over the city were dug up at random;
- beginning of supply of drinking water can only take place after a considerable part of the whole system would have been completed;
- the manpower requirements for the project would become too high;
- investments could not be spread in time, and would be ineffective until the whole system is completed.

In view of the above the Contractor shall spread the (pipe laying and construction) activities over the various districts of Rada in a well-planned sequence of 5 phases. These are indicated in Figs. 5.1.A - 5.5.A for the water supply component, and in Figs. 5.1.B - 5.5.B for the sewerage component, with the following objectives

- implementation shall start at the downstream side of Rada so that immediate use can be made of the sewage collection system and sewage transport line out of the city;
- the district(s) where implementation will start, must be located not too far from the point where the water supply transport main enters the city of Rada;
- water supply and sewage collection service together shall be given to one of the most densely populated area's (see also Fig. 5.6.) of the city of Rada first;
- pipe laying for water supply and sewage collection shall be done together.

The schedule implies that districts II and III are first served (phase 2).

For this purpose during phase 1 the primary water main shall be constructed from node 3491, where it joins the transmission main from the reservoir, up to the feeder point 5475 that feeds district III. At the same time the primary sewer is laid in this road. The primary sewer is extended, by means of the transmission sewer, up to a temporary discharge point.

Water supply from the well field and reservoir should be possible when the systems in the districts II and III are completed.







The districts that are to be served during phase 3, are VI, IV and XII. These districts too are either densely populated or of high economic value. By selecting districts divided over the city of Rada in this manner, disturbance of traffic can be minimized. Furthermore a minimum of primary water supply pipes and primary sewers will thus have to be laid in areas where a large number of inhabitants has already been served.

During phase 4 the districts I, XI, V, VII, and large parts of the districts VIII, IX and X are to be completed, plus the area along the Juban road.

During phase 5, the last districts VIII, IX, X shall be implemented.

 PHASE 1

**LEGEND**

-  PRIMARY DISTRIBUTION NETWORK
-  SECONDARY DISTRIBUTION NETWORK
-  PRIMARY DISTRIBUTION NETWORK EXTENSION
-  FEEDER POINT SECONDARY SYSTEM
-  FEEDER POINT SECONDARY SYSTEM (EXTENSION)
-  FIRE HYDRANT

20

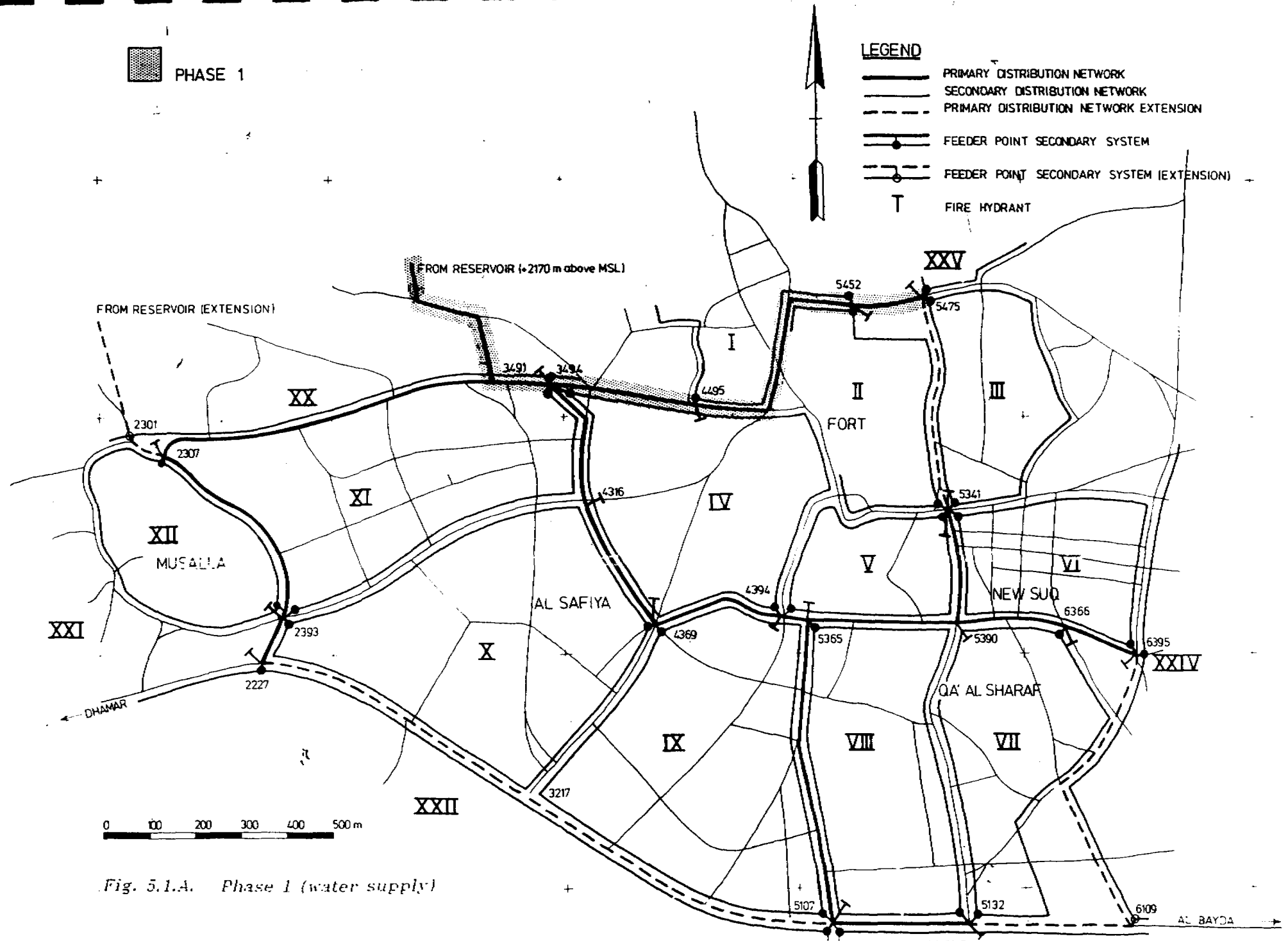


Fig. 5.1.A. Phase 1 (water supply)



PHASE 1

**LEGEND**

ROAD

200 SURFACE CONTOUR WITH ELEVATION IN m ABOVE MSL

PRIMARY SEWER

21

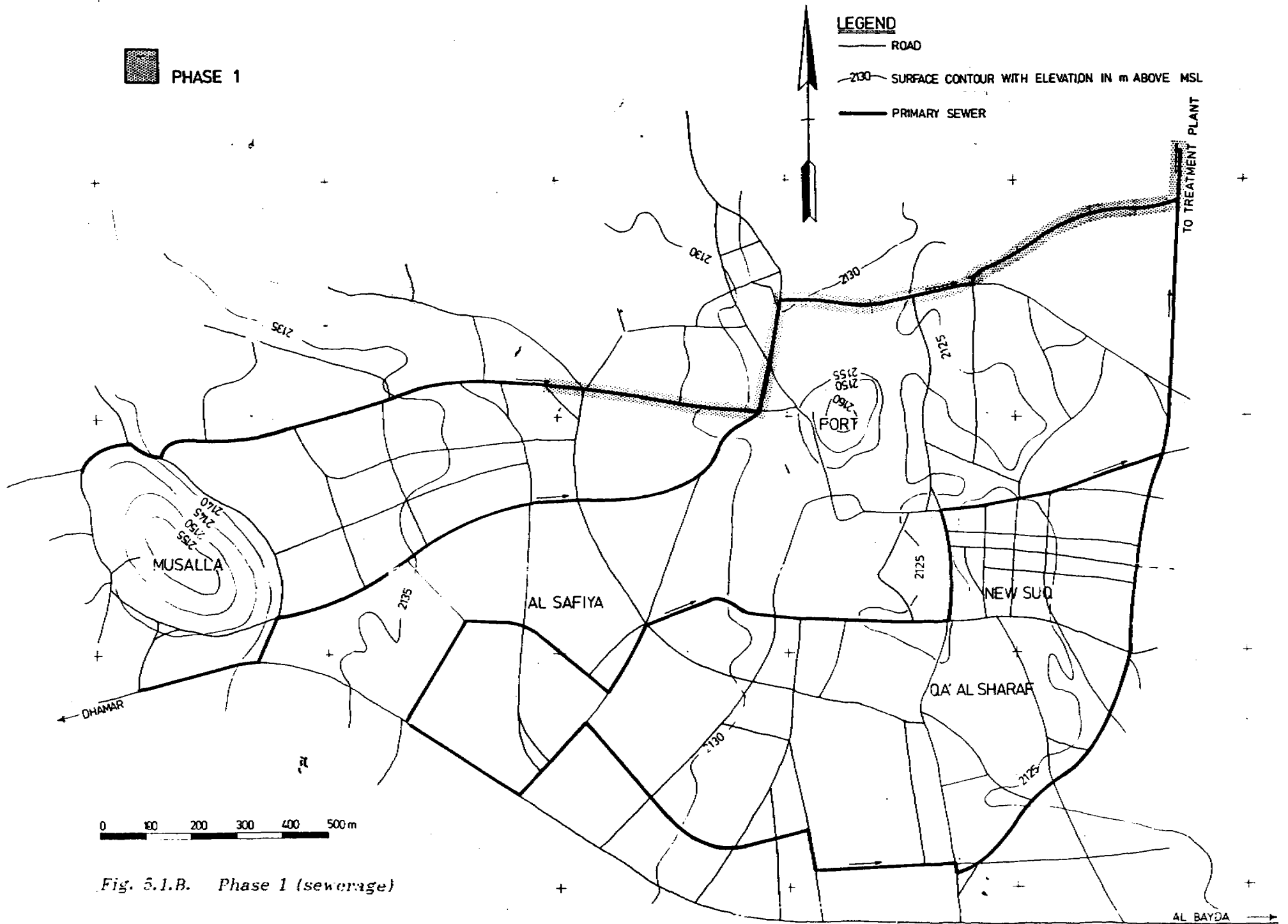


Fig. 5.1.B. Phase 1 (sewerage)

AL BAYDA

PHASE 2

COMPLETED PHASE

- PRIMARY DISTRIBUTION NETWORK
- SECONDARY DISTRIBUTION NETWORK
- - - PRIMARY DISTRIBUTION NETWORK EXTENSION
- FEEDER POINT SECONDARY SYSTEM
- - -●- - FEEDER POINT SECONDARY SYSTEM (EXTENSION)
- T FIRE HYDRANT

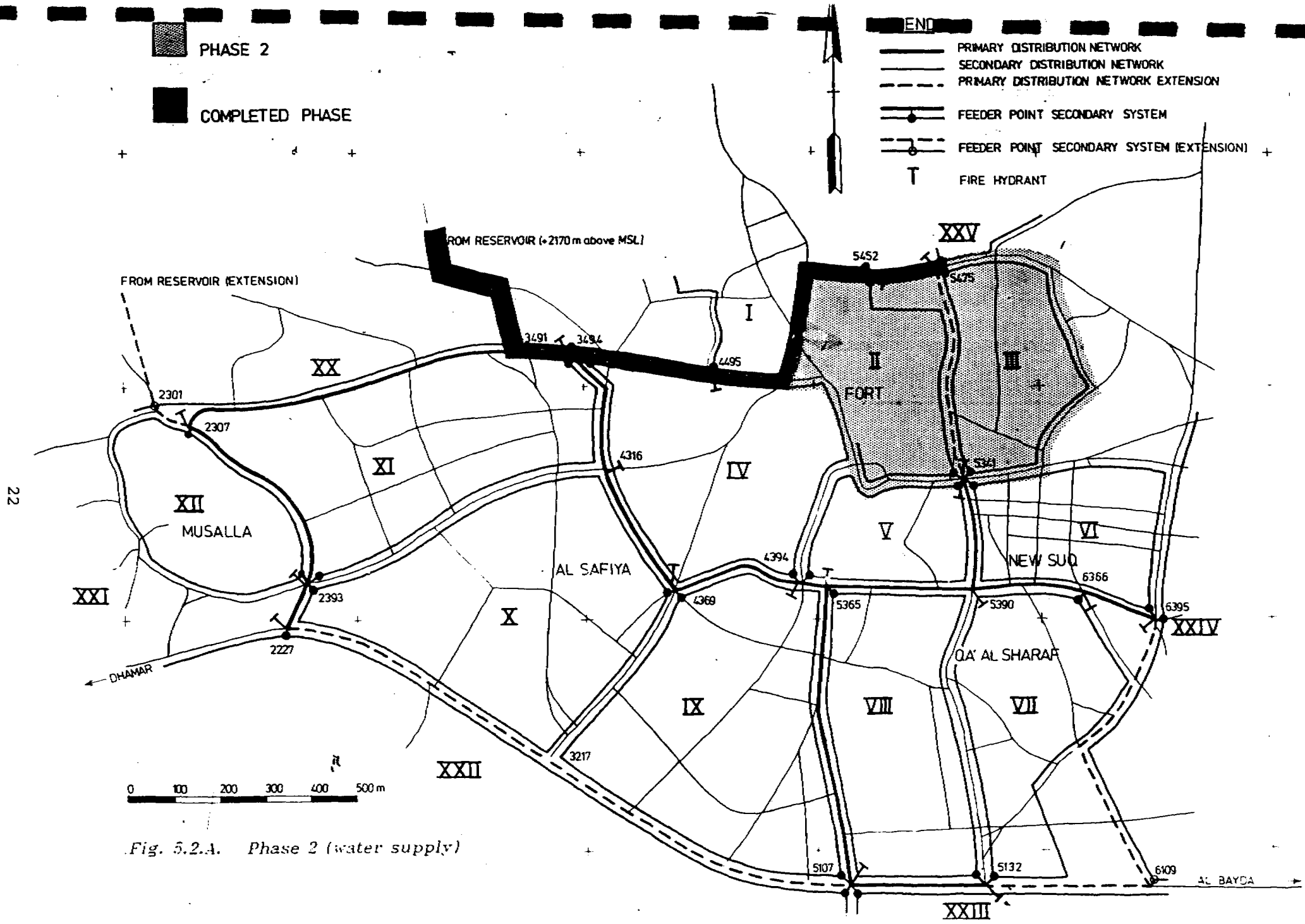


Fig. 5.2.A. Phase 2 (water supply)

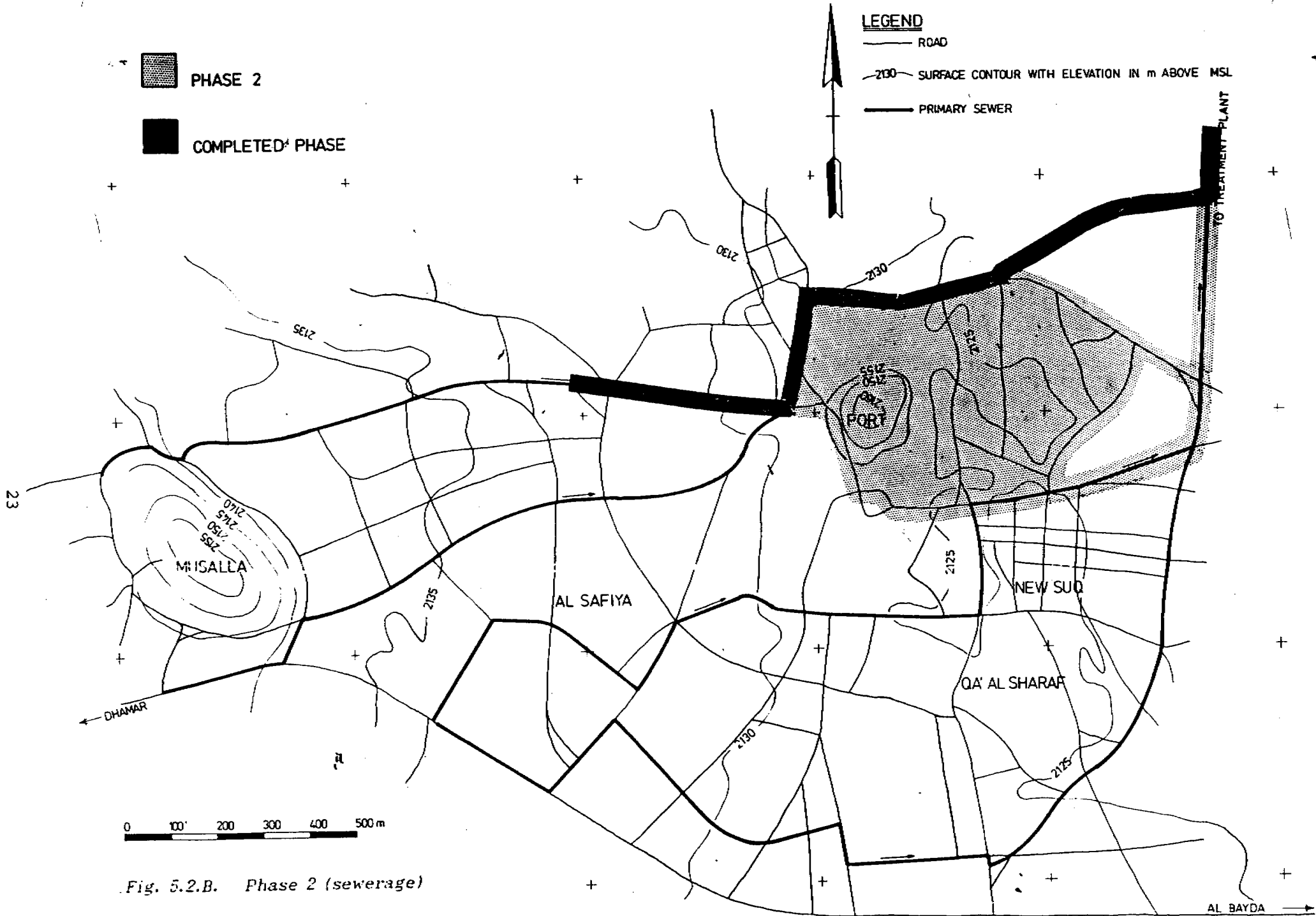


Fig. 5.2.B. Phase 2 (sewerage)



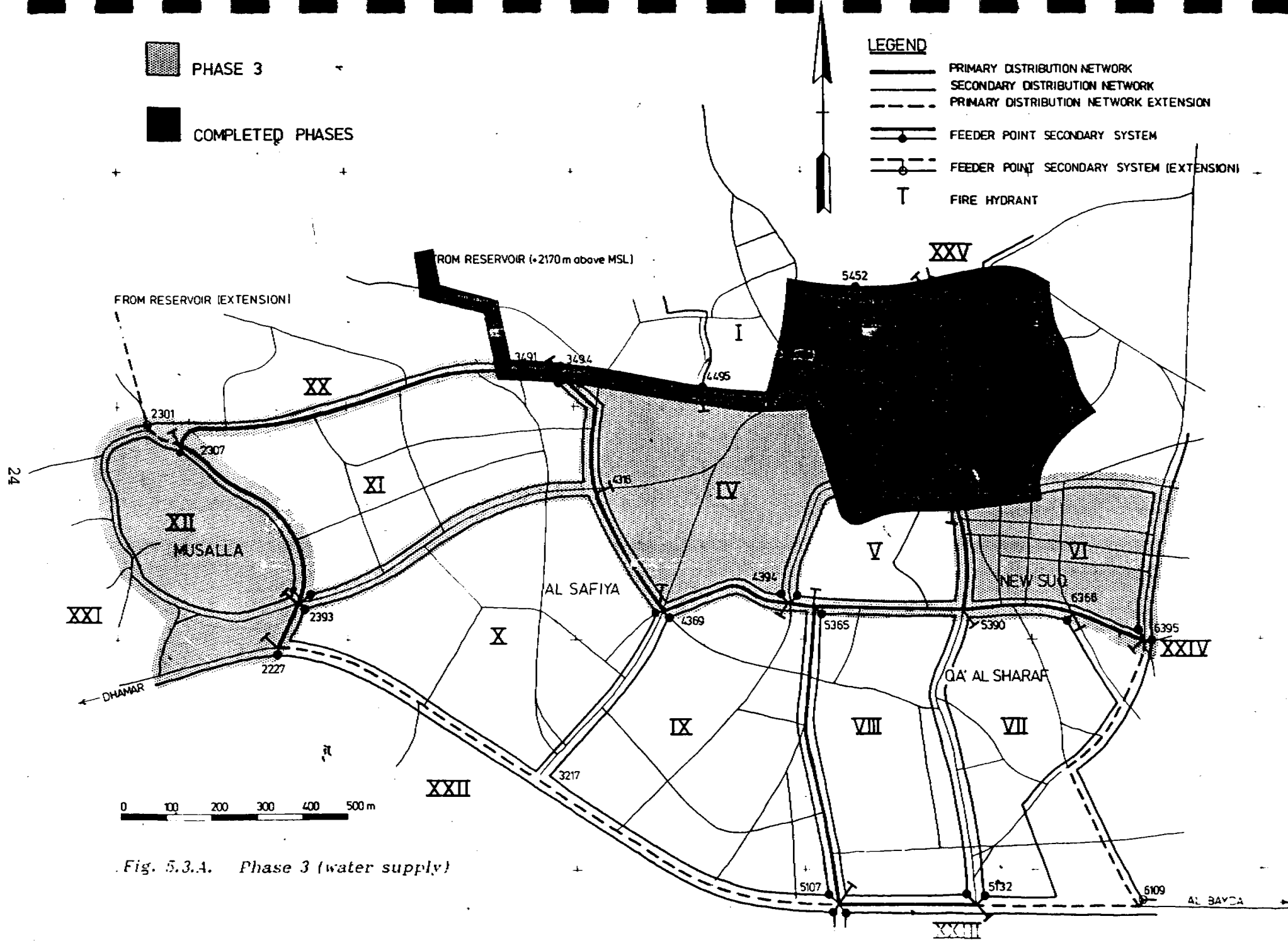


Fig. 5.3.A. Phase 3 (water supply)

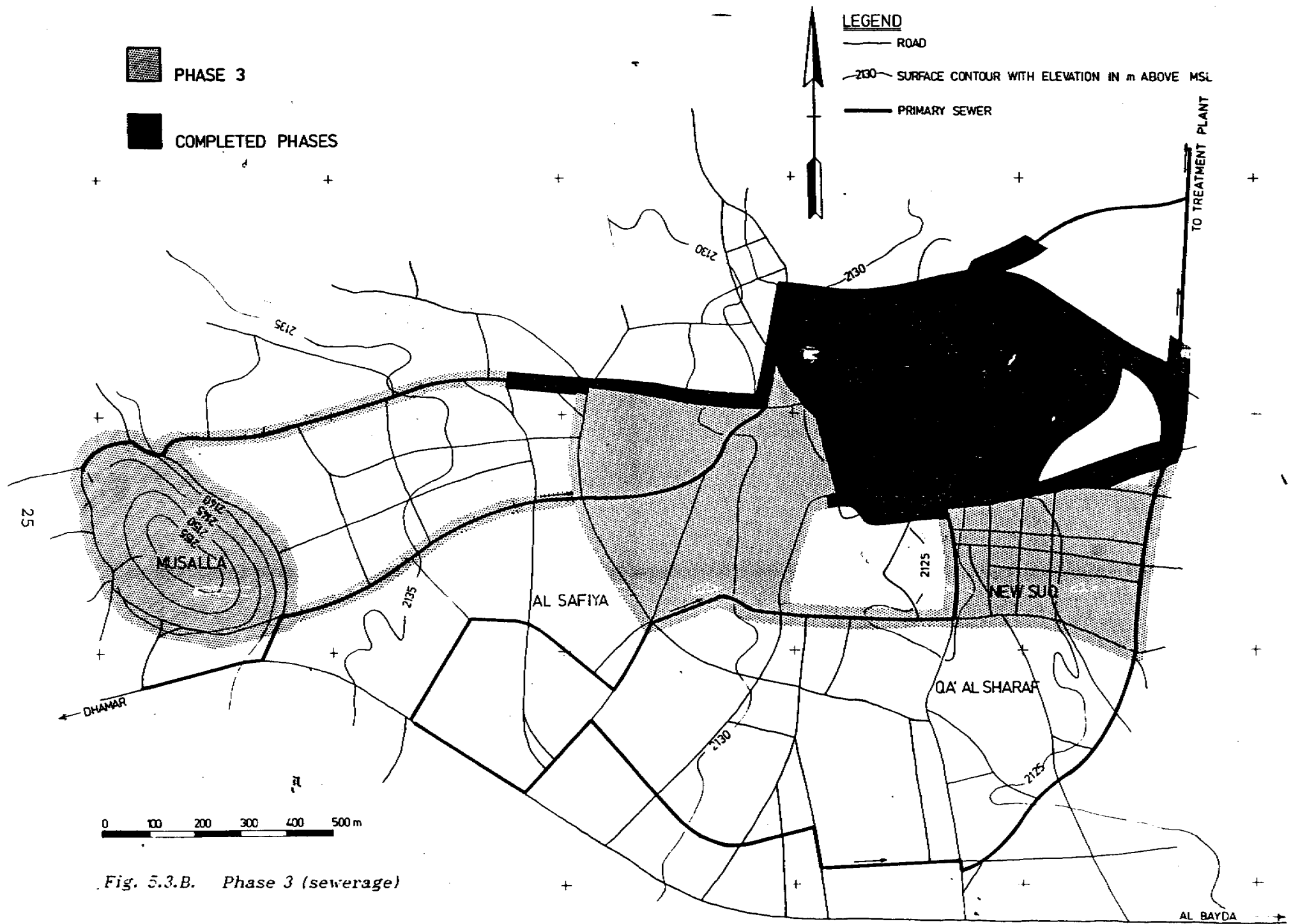


Fig. 5.3.B. Phase 3 (sewerage)

PHASE 4

COMPLETED PHASES

LEGEND

- PRIMARY DISTRIBUTION NETWORK
- SECONDARY DISTRIBUTION NETWORK
- PRIMARY DISTRIBUTION NETWORK EXTENSION
- FEEDEr POINT SECONDARY SYSTEM
- FEEDEr POINT SECONDARY SYSTEM (EXTENSION)
- FIRE HYDRANT

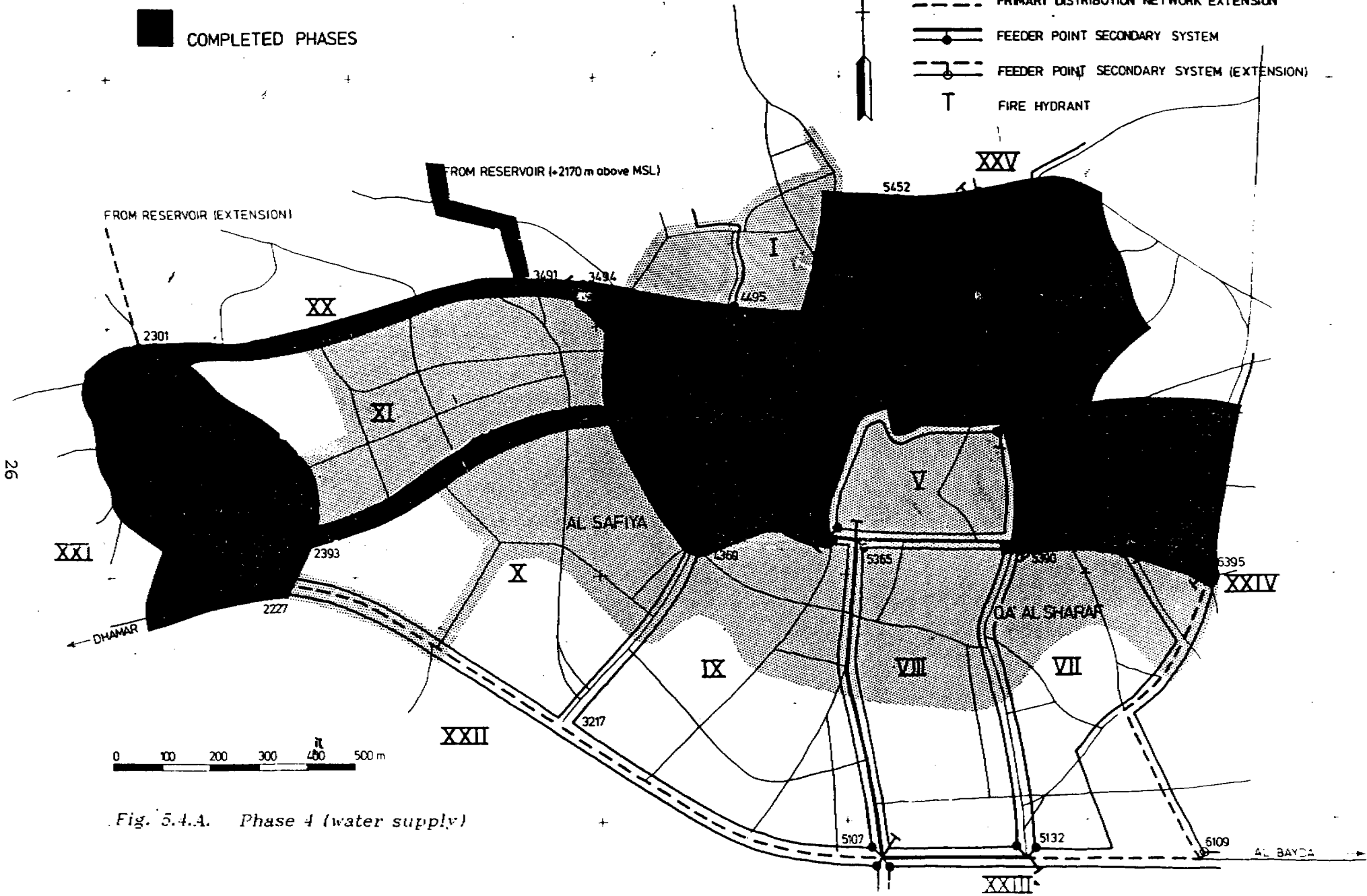


Fig. 5.4.A. Phase 4 (water supply)

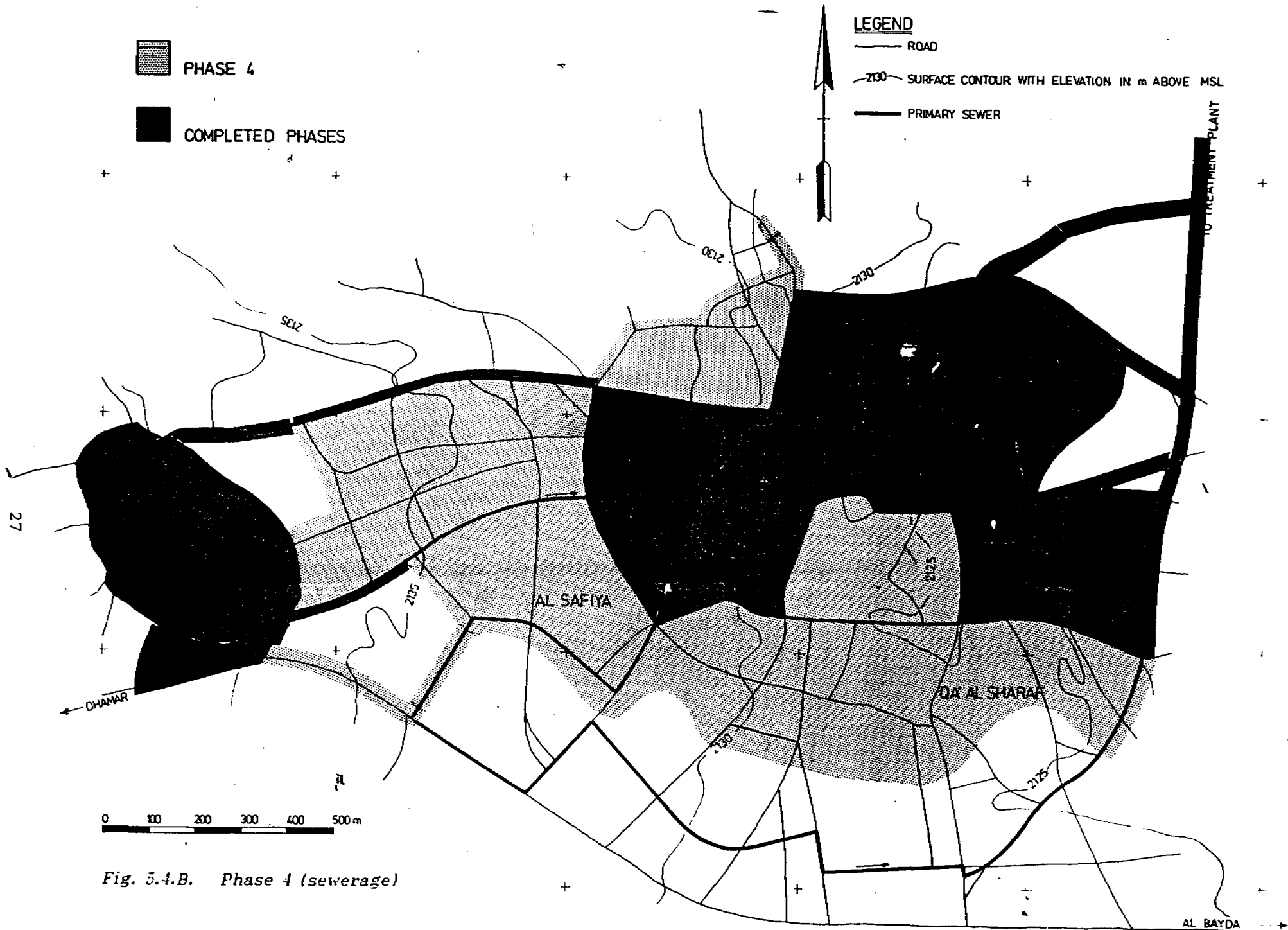








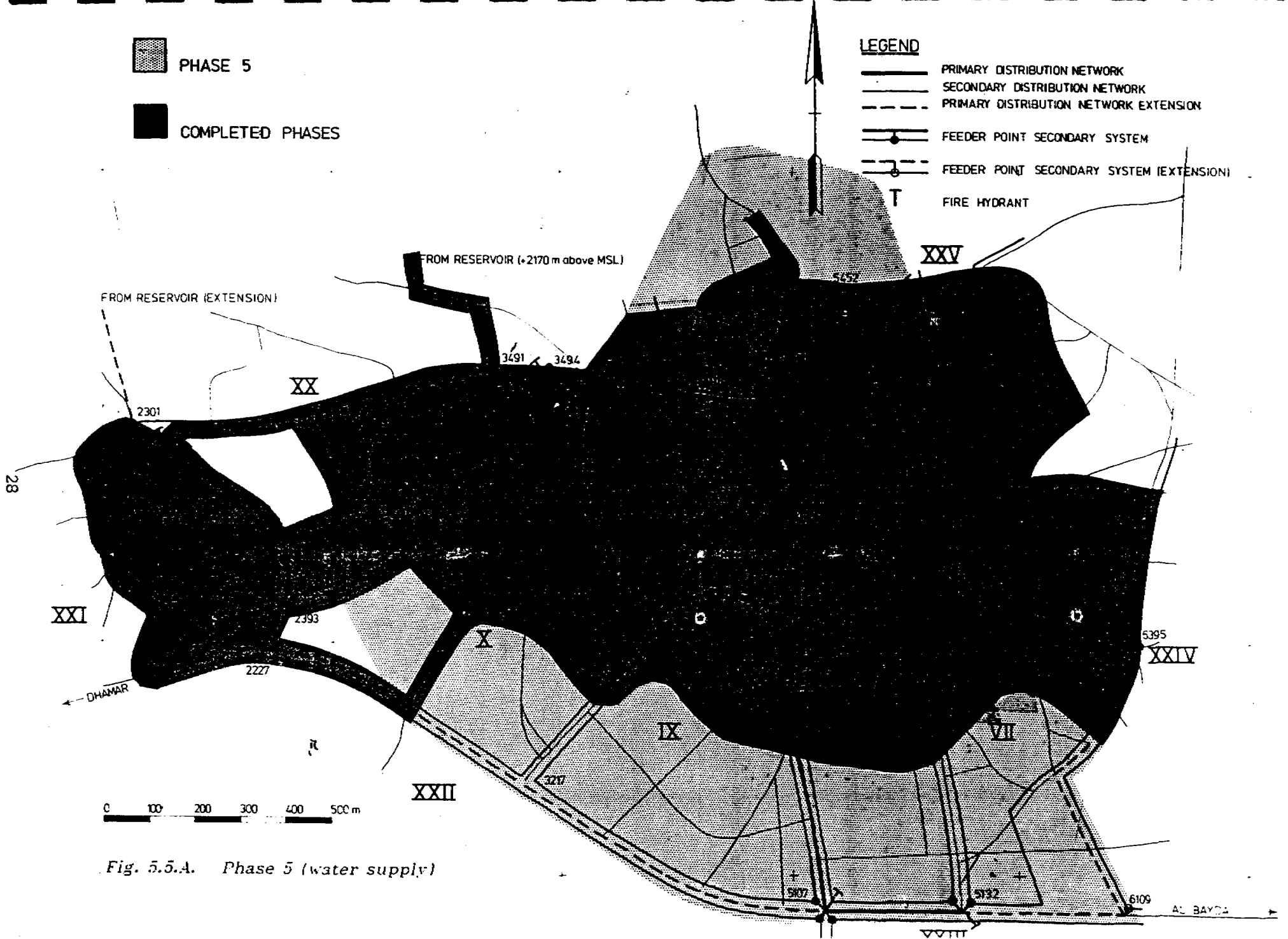


Fig. 5.4.B. Phase 4 (sewerage)

 PHASE 5  
 COMPLETED PHASES

**LEGEND**  
 PRIMARY DISTRIBUTION NETWORK  
 SECONDARY DISTRIBUTION NETWORK  
 PRIMARY DISTRIBUTION NETWORK EXTENSION  
 FEEDER POINT SECONDARY SYSTEM  
 FEEDER POINT SECONDARY SYSTEM (EXTENSION)  
 FIRE HYDRANT



0 100 200 300 400 500 m

Fig. 5.5.A. Phase 5 (water supply)

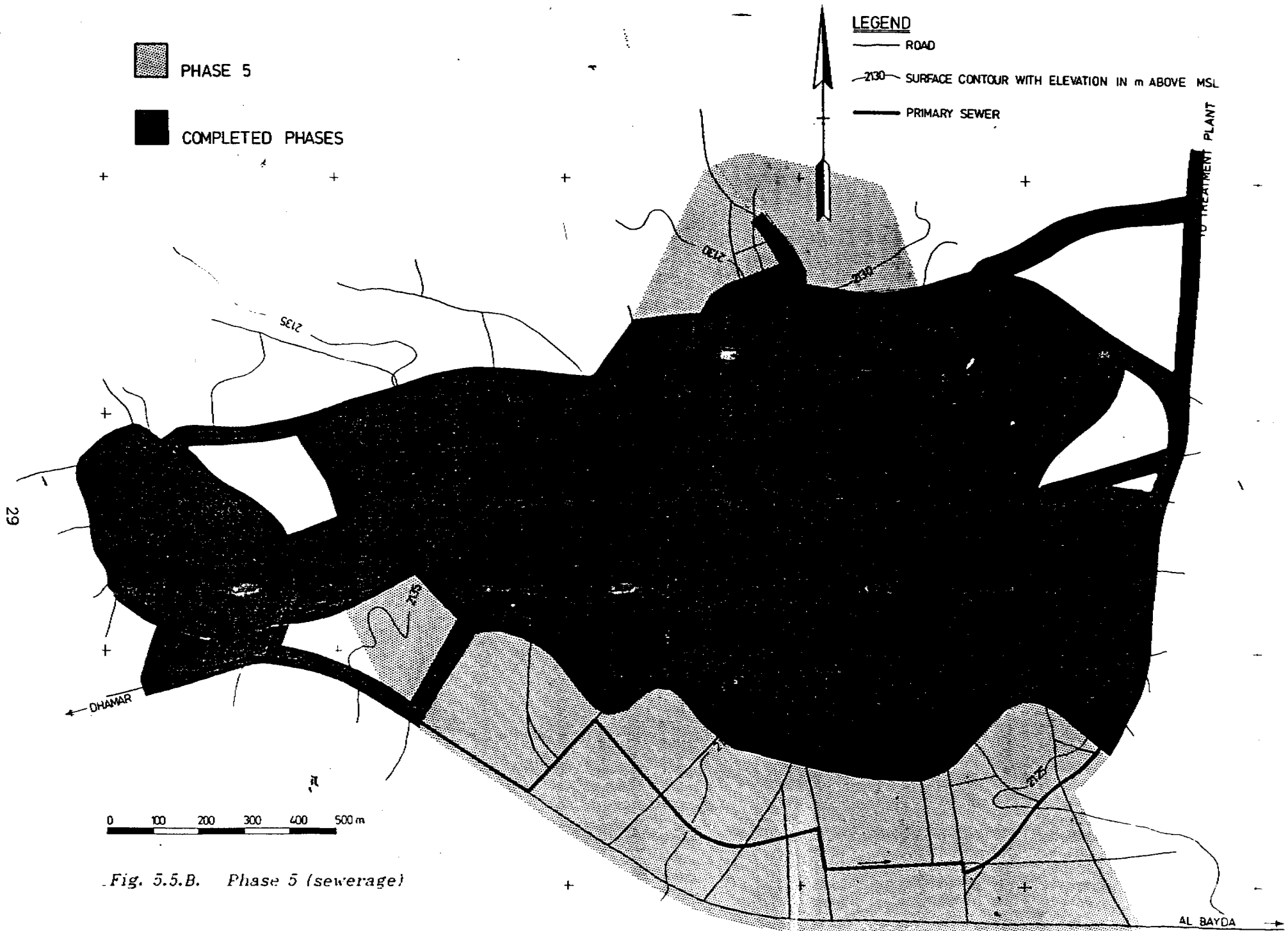


Fig. 5.5.B. Phase 5 (sewerage)



MOST DENSELY POPULATED AREA'S

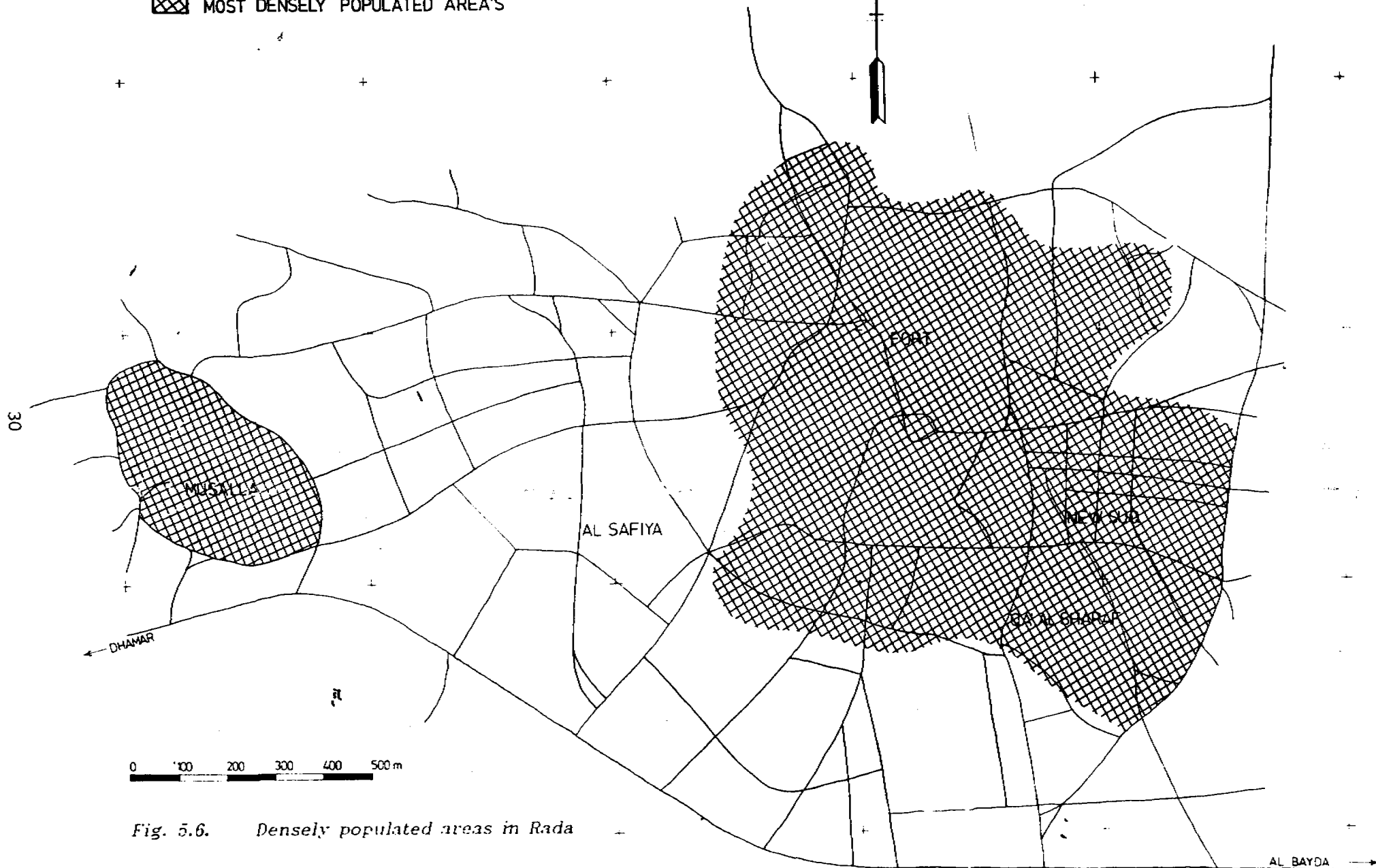


Fig. 5.6. Densely populated areas in Rada

AL BAYDA →

BILL No. 10 OPERATION AND MAINTENANCE					
Item	Description	Unit	Qty	Yemen Riyals Unit rate	Yemen Riyals Amount
	Provisional Sum for Operation and Maintenance shall be 350,000 NG (three hundred and fifty thousand Netherlands Guilders) and shall be filled in in this bill in YR (Yemen Riyals) in accordance with ITT 6, Clause 12 !				
TOTAL BILL No. 10, carried to Summary of Bills:					

=====  
Name of Tenderer

Date

=====  
Signature Tenderer



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SUMMARY OF BILLS MECHANICAL AND ELECTRICAL WORKS CONTRACT 3		
Bill No.	Title	Amount in Yemen Riyals
1	Sewage pumping station	
2	Deep well pumps	
3	Chlorination	
4	Main control centre	
5	Generator sets	
6	M.V. Installations	
7	L.V. Distribution	
8	Lightning protection and grounding	
9	Spare parts and special tools	
10	Operation and maintenance (Provisional Sum)	
--	Provisional sum for power supply sewage pumping station	125,000
CONTRACT PRICE for Contract 3		
Provisional sum for taxes, import duties 10% of Contract price		
TOTAL SUM		

TOTAL SUM in written, moved to Form of Tender:

.....

=====

Name of Tenderer

Seal

Date

Signature Tenderer

Currently Estimated Project Cost and Yemeni/Dutch Contributions

table 1: Plan of Operations, December 1989

	yr		df1	
	no con	in con	no con	in con
water	69917000	76908700	16080910	17689001
sewerage	73688500	81057350	16948355	18643191
drainage	24336000	26769600	5597280	6157008
solid waste	3127000	3439700	719210	791131
total	171068500	188175350	39345755	43280331

note: yr = yemeni real, df1 = netherlands guilder

tables 1 to 8 use 1989 exchange rate yr 1 = df1 0.23

tables 9 to 11 use 1991 exchange rate yr 1 = df1 0.1613

no con = excluding contingencies, in con = incl. contingencies

table 2: proposed Netherlands contribution: 80% water/sewerage (w/s)  
100% drainage/solid waste (d/sw)

	yr		df1		
	no con	in con	no con	in con	
water	55933600	61526960	12864728	14151201	
sewerage	59039100	64943010	13578993	14936892	item 2.5: 100%
drainage	24336000	26769600	5597280	6157008	
solid waste	3127000	3439700	719210	791131	
total	142435700	156679270	32760211	36036232	

table 3: Netherlands contribution from Financial Assistance allocation  
step 1: reduce contribution to df1 35 mln by cutting back cost  
of the drainage works

	yr		df1		
	no con	in con	no con	in con	
water	55933600	61526960	12864728	14151201	
sewerage	59039100	64943010	13578993	14936892	
drainage	20240221	22264243	4655251	5120776	reduction by 17%
solid waste	3127000	3439700	719210	791131	
total	138339921	152173913	31818182	35000000	

table 4: Netherlands contribution from Financial Assistance allocation  
step 2: reduce contribution further to df1 33 mln by taking out  
all equipment items (these are brought to Technical Assistance)

	yr		df1		
	no con	in con	no con	in con	
water	55933600	61526960	12864728	14151201	
sewerage	58597600	64457360	13477448	14825193	remove item 2.5
drainage	14468581	15915439	3327774	3660551	remove item 3.2
solid waste	1473000	1620300	338790	372669	
total	130472781	143520059	30008740	33009614	

table 5: Yemeni contribution to the project, calculated on the basis  
of the Netherlands contributions as shown in table 4:  
20% of cost of w/s (equalling 25% van nl allocation voor w/s)  
0% of cost of d/sw

	yr		df1	
	no con	in con	no con	in con
water	13983400	15381740	3216182	3537800
sewerage	14649400	16114340	3369362	3706298
drainage	0	0	0	0
solid waste	0	0	0	0
total	28632800	31496080	6585544	7244098

table 6: Total allocation (nl+yem) for water and sewerage (from tables 4 and 5)

	yr		df1		
	no con	in con	no con	in con	
water	69917000	76908700	16080910	17689001	
sewerage	73247000	80571700	16846810	18531491	contingencies (df1)
total	143164000	157480400	32927720	36220492	3292772

table 7: Total allocation (nl+yem) water, sewerage, drainage, solid waste

	yr		df1	
	no con	in con	no con	in con
water	69917000	76908700	16080910	17689001
sewerage	73247000	80571700	16846810	18531491
drainage	14468581	15915439	3327774	3660551
solid waste	1473000	1620300	338790	372669
total	159105581	175016139	36594284	40253712

table 8: Revised estimate (1991) based on Engineers estimate water and sewerage contracts (well drilling, e/m works, civil works) and original estimate drainage and solid waste contingencies w/s reduced from 10 to 5%, d/sw retained at 10%

	yr		df1		changes from table 7 estimate in df1
	no con	in con	no con	in con	
well drilling	5499440	5774412	887060	931413	+ 15% financial+ 5% physical (f 35,000)
e/m works	18805952	19746249	3033400	3185070	+ 15% financial+11% physical (f 576,000)
civil works	204542321	214769438	32992676	34642310	+ 8.5% financial+ 0% physical+ f 346,000
total	228847713	240290099	36913136	38758793	
drainage	20630959	22694054	3327774	3660551	+ 0% financial+ 0% physical
solid waste	1473000	1620300	338790	372669	+ 0% financial+ 0% physical
total	250951672	264604453	40579700	42792013	

table 9: Revised estimate (1991) based on Engineers estimate water and sewerage contracts (well drilling, e/m works, civil works) and original estimate drainage and solid waste contingencies at 10% but reduced with the amount of physical contingencies used up i.e. f 35,000 wells, f 576,000 e/m en f 347,000 civils

	yr		df1	
	no con	in con	no con	in con
well drilling	5499440	5830188	887060	940409
e/m works	18805952	17115561	3033400	2760740
civil works	204542321	222845283	32992676	35944944
total	228847713	245791032	36913136	39646093
drainage	20630959	22694054	3327774	3660551
solid waste	1473000	1620300	338790	372669
total	250951672	270105387	40579700	43679313

table 10: Newly calculated Yemeni and Netherlands contributions on the basis of table 8

	yem contribution		netherl contribution	
	yr		df1	
	ex con	in con	ex con	in con
well drilling	1099888	1154882	709648	745130
e/m works	3761190	3949250	2426720	2548056
civil works	40908464	42953888	26394141	27713848
drainage	0	0	3327774	3660551
solid waste	0	0	338790	372669
total	45769543	48058020	33197073	35040254
in excess of allocation	allocation unknown		197073	2040254

note: detailed calculation may yield slightly higher amount for netherlands contribution as the contract for civil works for which Dutch contribution is calculated at 80% in fact contains some drainage components also for which the agreed contribution is 100%

table 11: Newly calculated Yemeni and Netherlands contributions on the basis of table 9

	yem contribution		netherl contribution	
	yr		df1	
	ex con	in con	ex con	in con
well drilling	1099888	1166038	709648	752328
e/m works	3761190	3423112	2426720	2208592
civil works	40908464	44569057	26394141	28755955
drainage	0	0	3327774	3660551
solid waste	0	0	338790	372669
total	45769543	49158206	33197073	35750095
in excess of allocation	allocation unknown		197073	2750095

note : as for table 10