

5. 9 Tansen

5. 9. 1 需要水量の推計

(1) 給水区域

Tansen 町はLumbini 県Palpa 郡に位置し、郡の行政本部となっている。東西ハイウェイと交叉して、Bhairahawa とPokhara を結ぶ西部開発地域における南北幹線道路に近接し、周辺地域における政治、教育、文化等の中心地として重要な位置をしめている。

本町には日本の無償資金協力により1978年に完成した上水道施設がある。施設概要は1,000 m^3 /日の取水量を4段のポンプアップにより550 m 揚水し、約15,000人の住民に給水している。しかしながら工事完成後9年を経過しているため、施設の故障、老朽化、スペアパーツの欠如等に加えて、ネパール国政府の財政資金不足による維持・補修費の配分も期待できないような状況下で稼働率は日給水量ベースで60%である。

給水区域は本町の人口増加率は1975～87年の12年間において殆どゼロであるので、既存の給水区域のままでよいと考えられる。

(2) 給水人口

表 5.02に示した通り、MSTPプロジェクトで推計した計画目標年次1996年における町総人口は約13,500人である。これに周辺部への給水人口1,500人を考慮（当初から算入されていた）して15,000人と設定する。

(3) 給水量

Tansen 上水道整備計画の経済協力評価調査報告書によれば、1975年から1986年まで計画給水人口15,000人に対し計画給水量は1,364 m^3 /日となっている。現在給水量が800 m^3 /日であることから計画増加給水量は564 m^3 /日となるが、

Bhulke給水システム(日本協力システム)のみの改修であり、現在給水量の600 m^3 /日が完全に改修されたとしても1,200 m^3 /日である。

(4) 水源の評価

Batase Danda の貯水池には次亜塩素酸ナトリウムによる滅菌装置が取り付けられており(現在故障中)、水質的に問題あり。今回既存施設の部分補修であり、量については考慮しないで良いものと思われる。

5. 9. 2 施設計画

(1) 取水施設

水源は表流水を利用しており、既存の取水施設の改修である。

(2) 水処理施設

故障中の次亜塩素ナトリウムによる滅菌装置の電気分解装置が補修可能かの調査が必要と思われる。

(3) 給水施設

本プロジェクトは給水施設の拡張計画はないので、既存施設の部分補修のみである。

Tansen 町の給水システムの概略は図 5.21 に示した通りである。

表 5.01 現況人口及び計画人口

プロジェクト名	F/S 時点(1983)		現況(1987)		目標年(1996)	
	総人口	給水人口	総人口	給水人口	総人口	給水人口
1. Mahendranagar	45,000	5,080	65,000	7,000	91,000	27,000
2. Dhangadhi	28,000	2,450	30,000	10,000	56,000	30,000
3. Bharatpur	30,000	15,100	38,000	25,000	64,000	38,700
4. Gaushala	9,000	0	9,800	0	13,200	11,600*
5. Lahan	16,000	4,000	26,000	7,000	62,000	52,500
6. Rajbiraj	19,000	10,700	25,000	13,000	49,000	39,100
7. Bhadrapur and Chandragadhi	22,200	5,700	30,000	15,000	57,500	51,700
8. Ilam	9,700	8,000	12,000	8,000	17,000	15,000
9. Tansen	13,100	15,000	13,200	15,000	13,500	15,000
合計	192,000	66,030	249,000	100,000	423,200	280,600

* 1997 年の計画人口

表 5.02 Management Support for Town Panchayat (MSTP) Project 計画人口及び修正計画人口

(1) M S T P Project 計画人口

プロジェクト名	増加率 ^{1/}	1981年 ^{2/}	1984年	1987年	1991年 ^{3/}	1996年
1. Mahendranagar	109.39% ^{2/}	43,834	57,378	75,106	107,544	168,452
2. Dhangadhi	107.18% ^{2/}	27,274	33,581	41,346	54,562	77,171
3. Bharatpur	105.70% ^{2/}	27,602	32,596	38,494	48,050	63,397
5. Lahan	111.25%	13,775	18,967	26,115	40,003	68,170
6. Rajbiraj	107.85%	16,444	20,629	25,878	35,011	51,087
7. Bhadrapur ^{4/}	106.83%	9,761	11,901	14,510	18,898	26,296
8. Ilam	103.65%	9,773	10,883	12,118	13,987	16,773
9. Tansen	100.08% ^{2/}	13,125	13,157	13,188	13,230	13,283

注) ^{1/} 年平均人口増加率は1981年又は1984年のセンサス人口と1991年の推定人口から計算

^{2/} 人口増加率 : Central Bureau of Statistics

^{3/} 1981年センサス人口 : Central Bureau of Statistics

^{4/} 1991年推定人口 : Water Supply and Sanitation Sector Study

^{5/} Chandragadhi Village Panchayat 及び Mahoshpur Village Panchayat を含まず

(2) 事前調査時修正人口

プロジェクト名	増加率	1981年	1984年	1987年	1991年	1996年
1. Mahendranagar	104.25%	-	57,378	65,000	76,800	94,500
2. Dhangadhi	106.52%	20,542	24,800	30,000	38,600	53,000
4. Goushala ^{6/}	103.00%	-	9,000	9,800	11,000	13,200 ^{7/}

注) ^{6/} Goushala 水道整備計画 F/S 報告書

^{7/} 1997年の計画人口

表 5.03 水質分析結果

Substance	unit	Mahendra-	Mahendra-	Dhangadhi	Bharatpur	Gaushala	Lahan	Rajbiraj	Bhadrapur	Chandrakadi	Potable water	
		nagar	nagar (treated)								WHO Standard	Japanese Standards
Temperature	°C				15.5	15.5						
Appearance	-	clear	clear	clear	clear	clear	Hazy	clear	clear	clear		
PH	-	6.6	6.7	6.6	6.5	6.1	5.8	6.2	5.9	6.0	7.0-8.5 (6.5-9.2)	5.8-8.6
Colour	Pt	5	5	<5	<5	<5	15	<5	<5	<5	15 TCC *	5
Conductivity	S/cm at 25°C											
Total Hardness	mg/l as CaCO ₃	534	489	208	128	97	163	163	73	73	100-500 *	300
Calcium	mg/l	130	98	49	40	20	32	35	11	11	188(500)	
Magnesium	mg/l	50	59	20	6	11	19	11	10	10	205(615)	
Sodium	mg/l										200 *	
Potassium	mg/l											
Iron	mg/l	0.575	0.225	0.01	0.34	0.01	0.46	0.46	0.575	0.35	0.3 *(1.0)	0.3
Manganese	mg/l	0.05	0.005	0.005	0.02	0.01	0.0775	0.0675	0.05	0.005	0.1 *(0.5)	0.3
Silica	mg/l	50	40	30	40	30	30	60	50	50		
Sulphate	mg/l										400 *	
Chloride	mg/l	5.76	5.76	3.84	3.84	3.84	4.8	4.8	3.84	5.76	200(400)	200
Phosphate	mg/l	0.02	0.02	0.02	0.01	0.01	0.02	0.2	0.3	0.25		
Ammonia Total	mg/l	0.04	0.04	0.04	0.02	0.02	0.2	0.2	0.28	0.04	0.5	

* For Guide line

()Max. allowable values

表 5.01 事業計画 (Mahendranagar)

	現 況 (1987)	計 画 (1996)
1. 人口及び給水量		
1) 総人口	65,000	91,000
2) 給水人口	7,000	27,000
3) 一日最大給水量(m ³ /d)	* 900	5,300
4) 時間最大給水量(m ³ /d)	* 900	8,100
2. 水道施設		
1) 水 源	深井戸 1井	深井戸 2井
2) 送水管	φ150 50m	φ300 200m
3) 水処理施設	除鉄 2,200m ³ /d	塩素滅菌除鉄 3,800m ³ /d
4) 貯水槽	高架水槽 1基 180m ³ 水処理施設水槽 90m ³ 累 計 (270m ³)	地上水槽 1基 1,000m ³ 累 計 (1,270m ³)
5) 高揚程ポンプ	水処理施設ポンプ3000m ³ /d 累 計 (3000m ³ /d)	ポンプ2台 (4500m ³ /d) (@4,500m ³ /d 1台予備) 累 計 (7,500m ³ /d)
6) 配水管	φ125 3,740m 100 140 75 240 65 920 50 2,720 40 1,480 25 50 合 計 9,290 累 計 (9,290m)	φ400 880m 300 1,680 200 2,640 150 2,060 125 990 100 1,400 75 1,710 65 170 50 2,790 合 計 14,320 累 計 (23,610m)
7) 水量メーター	—	3,680ヶ所
8) 共用栓	18ヶ所	10ヶ所

*供給 5.5時間

表 5.05 事業計画 (Dhangadhi)

	現 況 (1987)	計 画 (1996)
1. 人口及び給水量		
1) 総人口	30,000	56,000
2) 給水人口	10,000	30,000
3) 一日最大給水量(m ³ /d)	* 2,100	5,900
4) 時間最大給水量(m ³ /d)	* 2,100	9,000
2. 水道施設		
1) 水 源	深井戸 1井	深井戸 2井
2) 送水管	φ150 50m	φ200 300m
3) 水処理施設	-	塩素滅菌 1式
4) 貯水槽	高架水槽 1基 180m ³ 累 計 (180m ³)	地上水槽 1基 600m ³ 累 計 (780m ³)
5) 高揚程ポンプ	-	ポンプ2台 7000m ³ /d (@3,500m ³ /d, 25HP) ポンプ2台 3900m ³ /d (@3,900m ³ /d, 30HP, 1台予備) 累 計 (10,900m ³ /d) 発電機2台 (@110HP, 1台予備)
6) 配水管	φ150 200m 100 1,130 75 410 65 800 50 7,540 40 390 合 計 10,470 累 計 (10,470m)	φ600 260m 450 750 400 490 300 4,630 250 3,170 150 5,190 100 490 75 880 50 1,700 合 計 17,560 累 計 (28,030m)
7) 水量メーター	-	5,100ヶ所
8) 共用栓	9ヶ所	30ヶ所

* 供給 10時間

表 5.06 事業計画 (Bharatpur)

	現 況 (1987)	計 画 (1996)
1. 人口及び給水量		
1) 総人口	38,000	64,000
2) 給水人口	25,000	38,700
3) 一日最大給水量(m ³ /d)	1,800	8,300
4) 時間最大給水量(m ³ /d)	1,800	12,800
2. 水道施設		
1) 水 源	表流水	深井戸 5井
2) 送水管	φ200 7,000m φ250 2,500m	φ200 750m φ300 1250m
3) 水処理施設	塩素滅菌(おし粉)	塩素滅菌装置
4) 貯水槽	地上水槽 1基 900m ³ 累 計 (900m ³)	地上水槽 1基 1,200m ³ 累 計 (2,100m ³)
5) 高揚程ポンプ	—	ポンプ3台 (12,000m ³ /d) (06,000m ³ /d, 100HP, 1台予備) 累 計 (12,000m ³)
6) 配水管	φ200 1,680m 150 8,940 125 2,330 100 1,510 75 6,250 65 1,890 50 3,790 合 計 26,390 累 計 (26,390m)	φ450 1,290m 400 2,300 350 2,350 300 2,600 200 5,240 150 2,830 100 2,550 75 6,330 合 計 25,490 累 計 (51,880m)
7) 水量メーター	500ヶ所	7,500ヶ所
8) 共用栓	12ヶ所	10ヶ所

表5 事業計画 (Gaushala)

	現 況 (1987)	計 画 (1996)
1. 人口及び給水量		
1) 総人口	9,800	13,200
2) 給水人口	0	11,600
3) 一日最大給水量(m ³ /d)	0	1,420
4) 時間最大給水量(m ³ /d)	0	2,150
2. 水道施設		
1) 水 源	-	深井戸 2井
2) 送水管	-	φ200 150m
3) 水処理施設	-	塩素滅菌装置
4) 貯水槽	-	高架水槽 1基 360m ³
5) 高揚程ポンプ	-	-
6) 配水管	-	φ300 690m 250 1,060 150 2,090 100 560 75 380 65 540 50 590 40 260 30 270 25 410 20 1,100 合 計 7,950
7) 水量メーター	-	730ヶ所
8) 共用栓	-	80ヶ所

表 5.08 事業計画 (Lahan)

	現 況 (1987)	計 画 (1996)
1. 人口及び給水量		
1) 総人口	26,000	62,000
2) 給水人口	7,000	52,500
3) 一日最大給水量(m ³ /d)	* 1,800	11,320
4) 時間最大給水量(m ³ /d)	* 1,800	17,200
2. 水道施設		
1) 水 源	深井戸 1井	深井戸 5井
2) 送水管	φ150 150m	φ200 200m φ300 220m
3) 水処理施設	-	塩素殺菌 1式 (除鉄について検討)
4) 貯水槽	高架水槽 1基 450m ³ 累 計 (450m ³)	地上水槽 2基 2,000m ³ (@100m ³) 累 計 (2,450m ³)
5) 高揚程ポンプ	- 累 計 (3000m ³ /d)	ポンプ 4台 (21,900m ³ /d) (@7,300m ³ /d, 50HP, 1台予備) 累 計 (21,900m ³ /d)
6) 配水管	φ200 460m 150 460 100 2,270 65 3,400 50 3,010 合 計 9,600 累 計 (9,600m)	φ450 160m 400 1,520 300 4,020 250 2,100 150 2,140 100 2,440 合 計 12,380 累 計 (21,980m)
7) 水量メーター	-	8,900ヶ所
8) 共用栓	21ヶ所	30ヶ所

* 供給 2時間

表 5.09 事業計画 (Rajbiraj)

	現 況 (1987)	計 画 (1996)
1. 人口及び給水量		
1) 総人口	25,000	49,000
2) 給水人口	13,000	39,100
3) 一日最大給水量(m ³ /d)	* 1,600	8,500
4) 時間最大給水量(m ³ /d)	* 1,600	12,900
2. 水道施設		
1) 水 源	深井戸 1井	深井戸 2井
2) 送水管	φ150 150m	φ200 500m φ300 400m
3) 処理施設	3,300m ³ /d 故障中	7,600m ³ /d (既存の補修検討要有り)
4) 貯水槽	高架水槽 1基 450m ³ 累 計 (450m ³)	地上水槽 1基 650m ³ 累 計 (1,100m ³)
5) 高揚程ポンプ	ポンプ2台 6,600m ³ /d (Ø3,300m ³ /d, 25HP) (計画では2台とも予備)	ポンプ3台 6,200m ³ /d (Ø3,100m ³ /d, 35HP, 1台予備) ポンプ1台 6,200m ³ /d (35HP) 累 計 (12,000m ³)
6) 配水管	φ300 110m 200 910 150 880 125 4,100 75 1,830 65 1,540 50 7,630 40 1,580 合 計 18,610 累 計 (18,610m)	φ450 60m 400 670 300 2,530 250 1,190 150 2,070 100 1,530 50 840 合 計 8,890 累 計 (27,500m)
7) 水量メーター	225ヶ所	5,670ヶ所
8) 共用栓	10ヶ所	10ヶ所

*供給 3時間

表 5.10 事業計画 (Bhadrapur及びChandragadhi)

	現 況 (1987)	計 画 (1996)
1. 人口及び給水量		
1) 総人口	30,000	57,500
2) 給水人口	15,000	51,700
3) 一日最大給水量(m ³ /d)	* 4,400	11,000
4) 時間最大給水量(m ³ /d)	* 4,400	16,700
2. 水道施設		
1) 水 源	深井戸 2井	深井戸 3井
2) 送水管	φ1200 400m	φ150 250m φ200 500m
3) 水処理施設	-	塩素滅菌
4) 貯水槽	高架水槽 2基 900m ³ (@450m ³) 累 計 (900m ³)	地上水槽 2基 1,200m ³ (@600m ³) 累 計 (2,100m ³)
5) 高揚程ポンプ	-	ポンプ2台 6,100m ³ /d (@6,100m ³ /d, 1台予備) 累 計 6,100m ³ /d
6) 配水管	φ300 110m 250 940 200 880 150 4,100 125 1,830 100 1,540 75 7,630 65 1,580 50 1,990 40 2,360 30 300 25 1,120 合 計 22,890 累 計 (22,890m)	φ400 700m 300 930 250 760 150 4,090 100 2,140 75 1,120 50 500 合 計 10,240 累 計 (33,130m)
7) 水量メーター	-	8,340ヶ所
8) 共用栓	30ヶ所	20ヶ所

*供給 7時間

表 5.11 事業計画 (Ilan)

	現 況 (1987)	計 画 (1996)
1. 人口及び給水量		
1) 総人口	12,000	17,000
2) 給水人口	8,000	15,000
3) 一日最大給水量(m ³ /d)	740	2,200
4) 時間最大給水量(m ³ /d)	740	2,500
2. 水道施設		
1) 水 源	表流水	表流水
2) 送水管	φ50 50m φ75 7,673m φ110 2,712m	φ250 19,000m
3) 水処理施設	-	沈砂地, 緩速濾過, 塩素滅菌
4) 貯水槽	地上水槽 1基 50m ³ 地上水槽 3基 236m ³ 累 計 (286m ³)	地上水槽 1基 300m ³ (@ 150m ³) 累 計 (586m ³)
5) 高揚程ポンプ	-	-
6) 配水管	φ100 1,650m 75 2,620 65 6,770 50 5,580 40 2,530 25 2,830 20 790 15 1,280 合 計 24,050 累 計 (24,050m)	φ200 860m 150 1,640 100 2,800 75 1,340 50 1,010 合 計 7,650 累 計 (31,700m)
7) 水量メーター	278ヶ所	1,320ヶ所
8) 共用栓	69ヶ所	30ヶ所

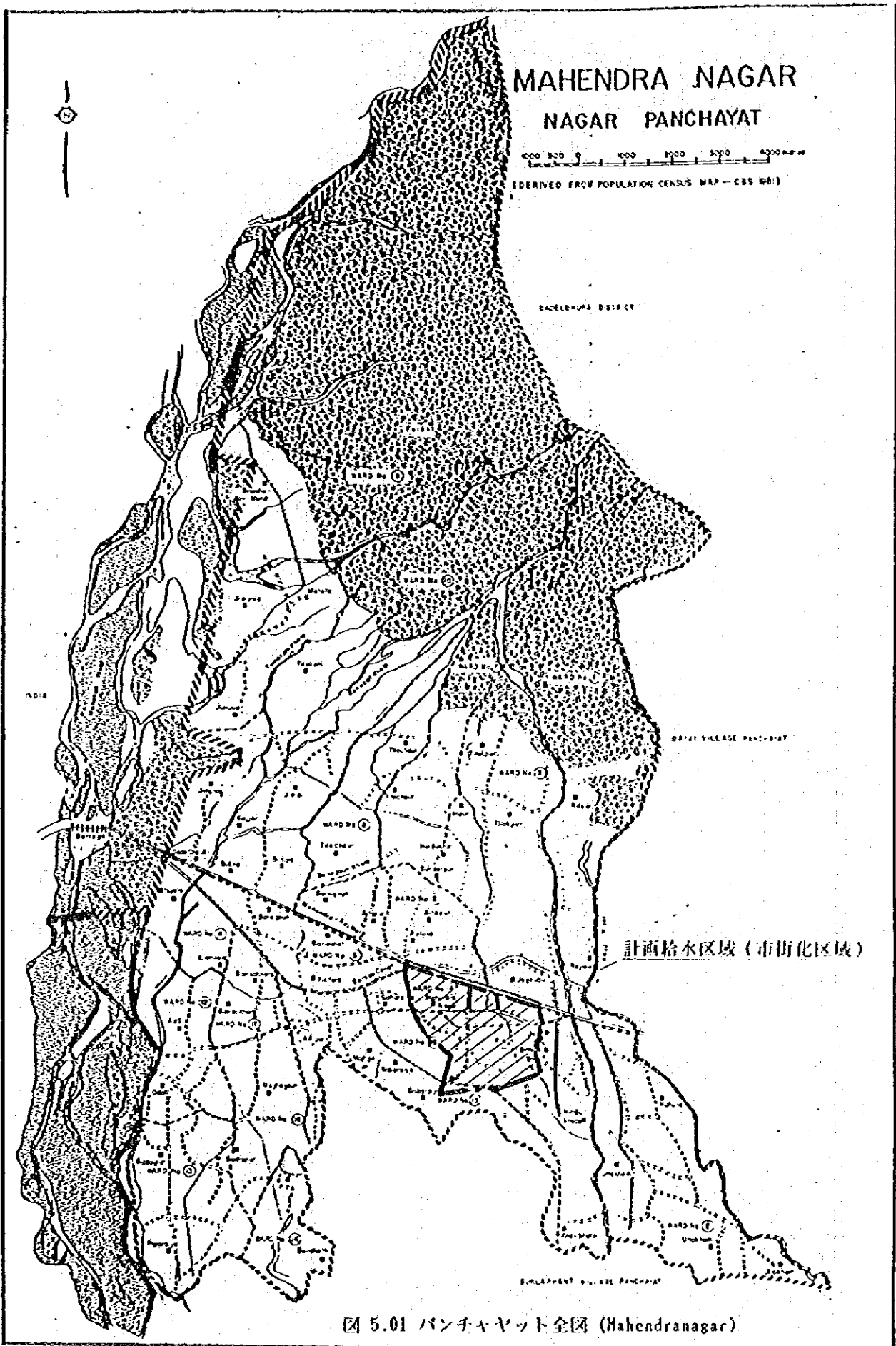
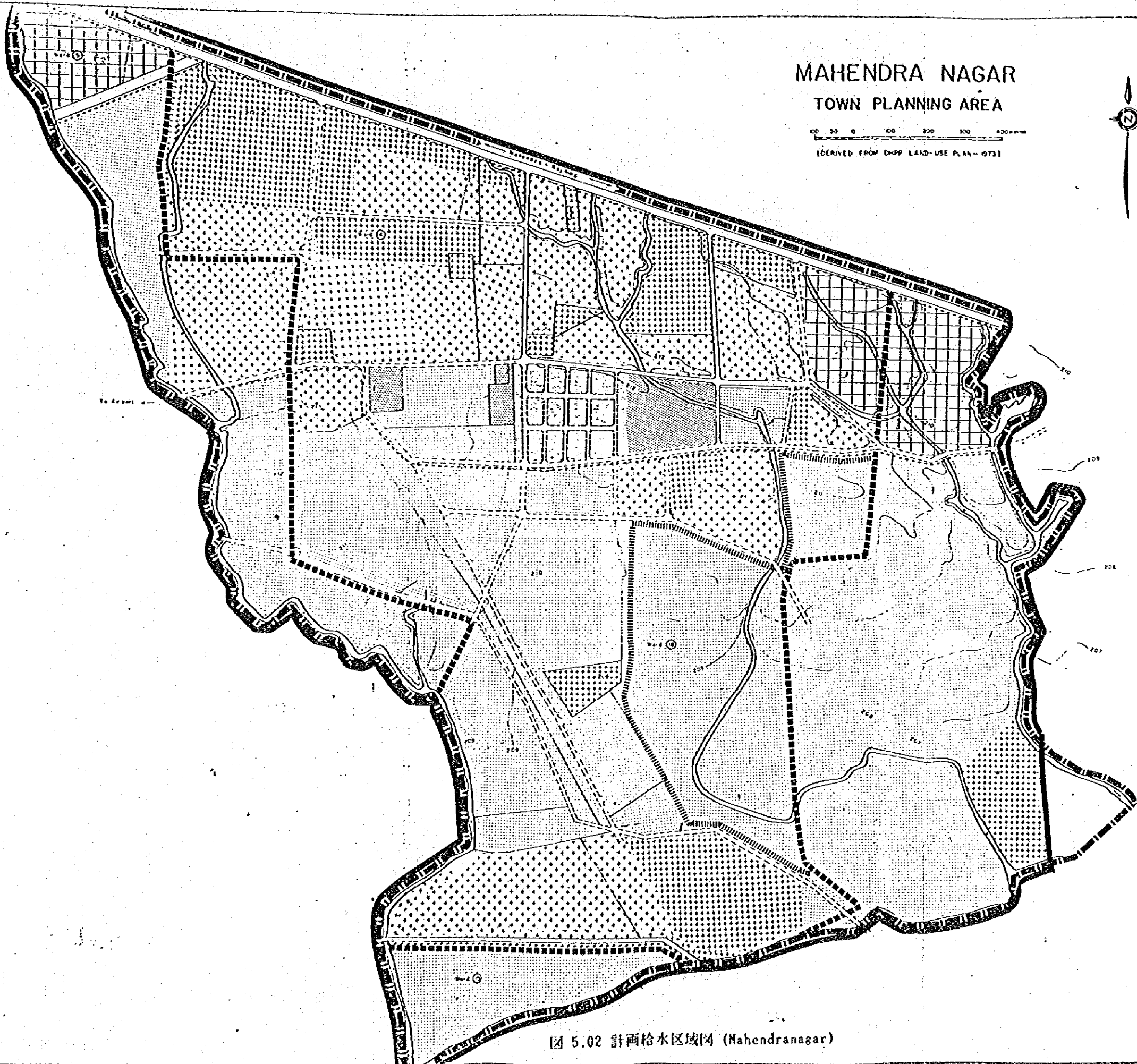


図 5.01 パンチャヤット全図 (Mahendranagar)

MAHENDRA NAGAR TOWN PLANNING AREA

100 200 300 400 METERS
DERIVED FROM DNDP LAND-USE PLAN - 1973



WATER SUPPLY AND SANITATION STUDIES (FOURTH PROJECT)

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

LAND USE

LEGEND	
International Boundary	//////
Nepal Panchayat Boundary	-----
Town Planning Area Boundary in Nepal Panchayat	-----
Town Planning Area Boundary	-----
Ward Boundary	-----
Ward Number	⊙
Forest	⊘
River Bed	⊘
Pond	⊘
Settlement	⊘
Contour	---
Stream	---
Irrigation Canal	---
Roads - Metalled	---
Unmetalled	---
Proposed	---
Core Residential Existing	⊘
Residential Existing	⊘
Residential Future	⊘
Industrial Existing	⊘
Industrial Future	⊘
Institutional Existing	⊘
Institutional Future	⊘
Urban Boundary 1991	⊘
Urban Boundary 1996	⊘
Urban Boundary 2001	⊘

Figure No.
1

Scale
As shown in the Drawing

Proctor & Rudra
International Limited
Toronto Canada
In association with
East Consult. Pvt. Ltd.
Kathmandu Nepal

Drawn by - J. B. Masrader
Date - March 1984.

图 5.02 計畫给水区域图 (Mahendranagar)

DHANGADI NAGAR PANCHAYAT

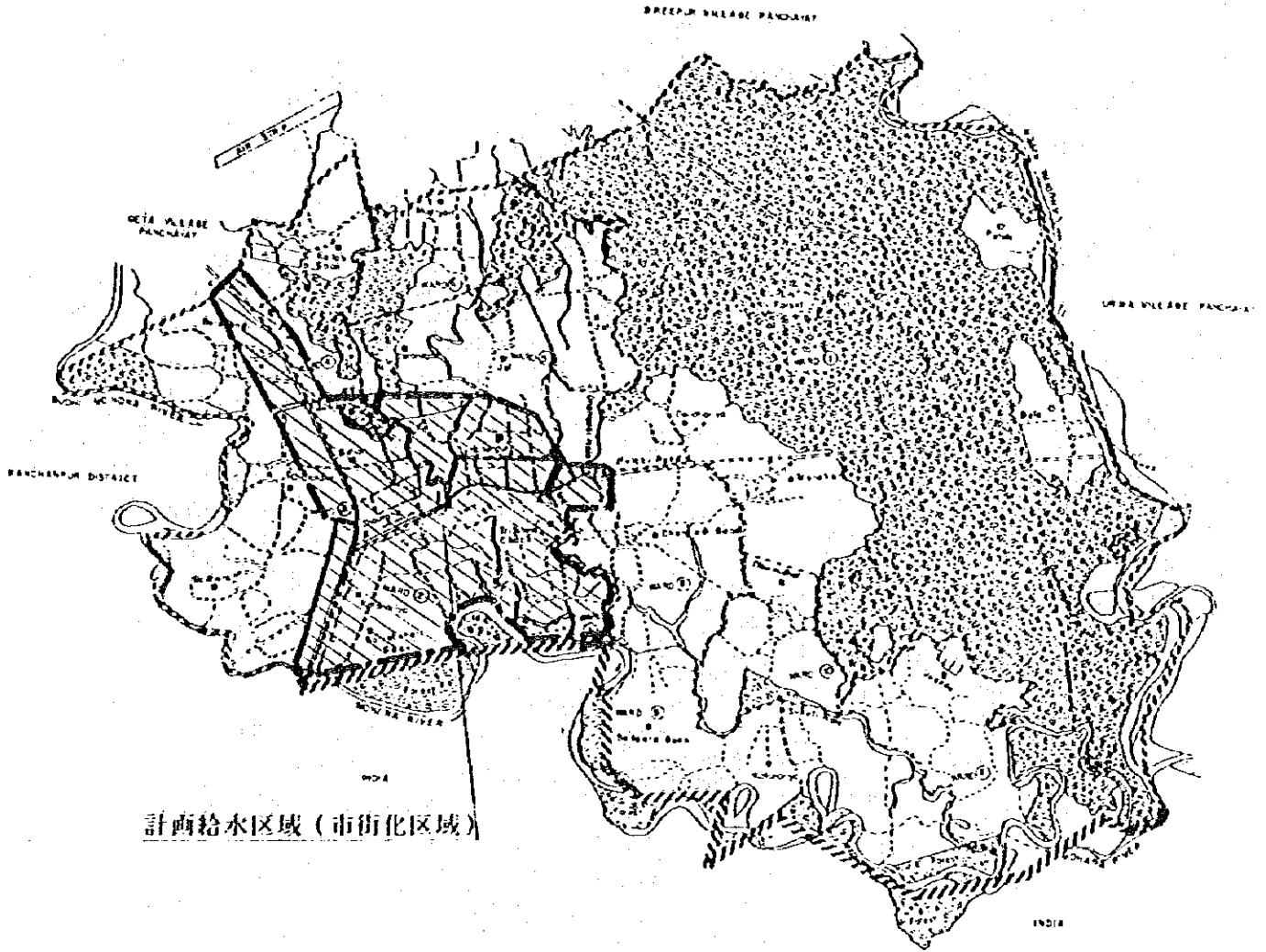
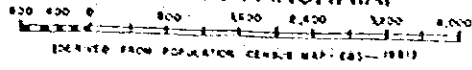
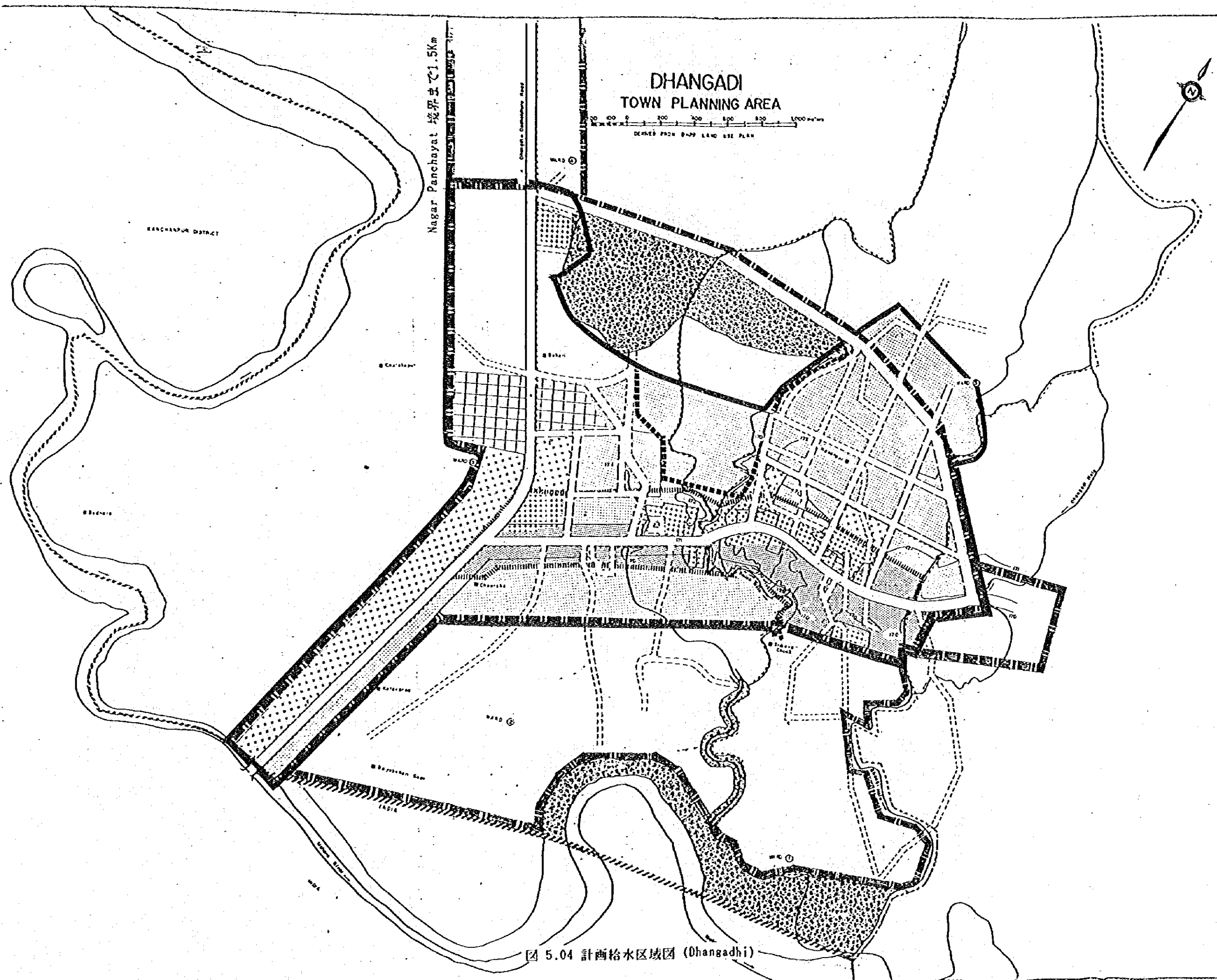


図 5.03 パンチャヤット全図 (Dhangadhi)



Nagar Panchayat 境界まで1.5Km

DHANGADI
TOWN PLANNING AREA

0 200 400 600 800 1000 meters
DERIVED FROM 1:50,000 LAND USE PLAN

WATER SUPPLY AND
SANITATION STUDIES
(FOURTH PROJECT)

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

LAND USE

LEGEND

International Boundary	-----
Nagar Panchayat Boundary	-----
Town Planning Area Boundary of Nagar Panchayat	-----
Town Planning Area Boundary	-----
Ward Boundary	-----
Ward Number	①
Forest	.....
River Bed	-----
Ford	-----
Settlement	.....
Contour	-----
Stream	-----
Irrigation Canal	-----
Roads - Metalled	-----
Unmetalled	-----
Proposed	-----
Core Residential Existing	.....
Residential Existing	.....
Residential Future	.....
Industrial Existing	.....
Industrial Future	.....
Institutional Existing	.....
Institutional Future	.....
Urban Boundary 1991	-----
Urban Boundary 1996	-----
Urban Boundary 2001	-----

Figure No.
1

Scale
As shown in the drawing

Prector & Redfern
International Limited
Toronto, Canada
in association with
East Consult Pvt. Ltd
Kathmandu, Nepal

Drawn by - Mrs U Shrestha
Date - March 1986

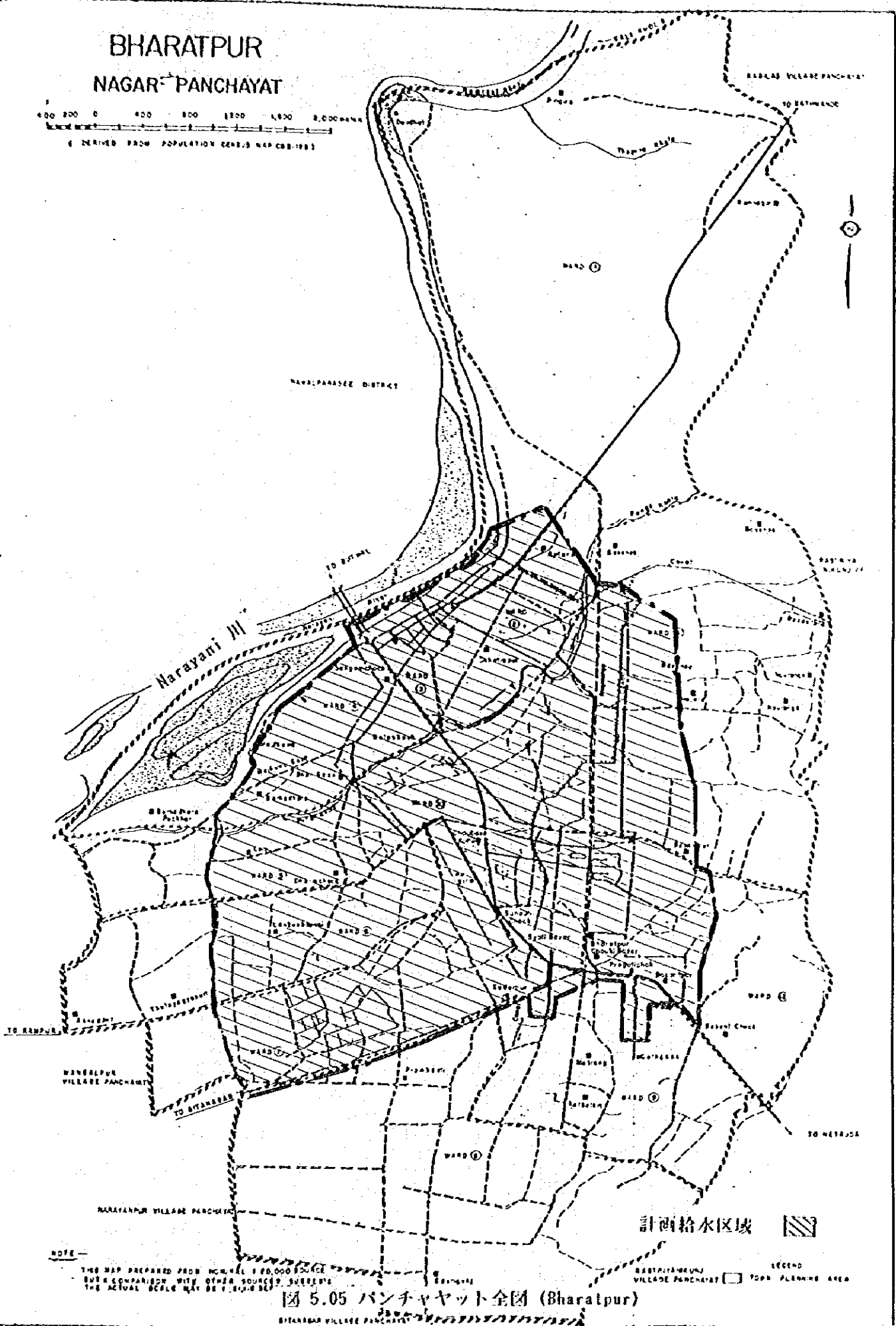
图 5.04 計画給水区域图 (Dhangadi)

BHARATPUR

NAGAR PANCHAYAT

400 800 1200 1600 2,000 Meters

(DERIVED FROM POPULATION CENSUS MAP CBE-1981)



NOTE -

THIS MAP PREPARED FROM SCALE 1:50,000 SOURCE
BUT COMPARED WITH OTHER SOURCES THERE'S
THE ACTUAL SCALE MAY BE 1:50,000

図 5.05 パンチャヤット全図 (Bharatpur)

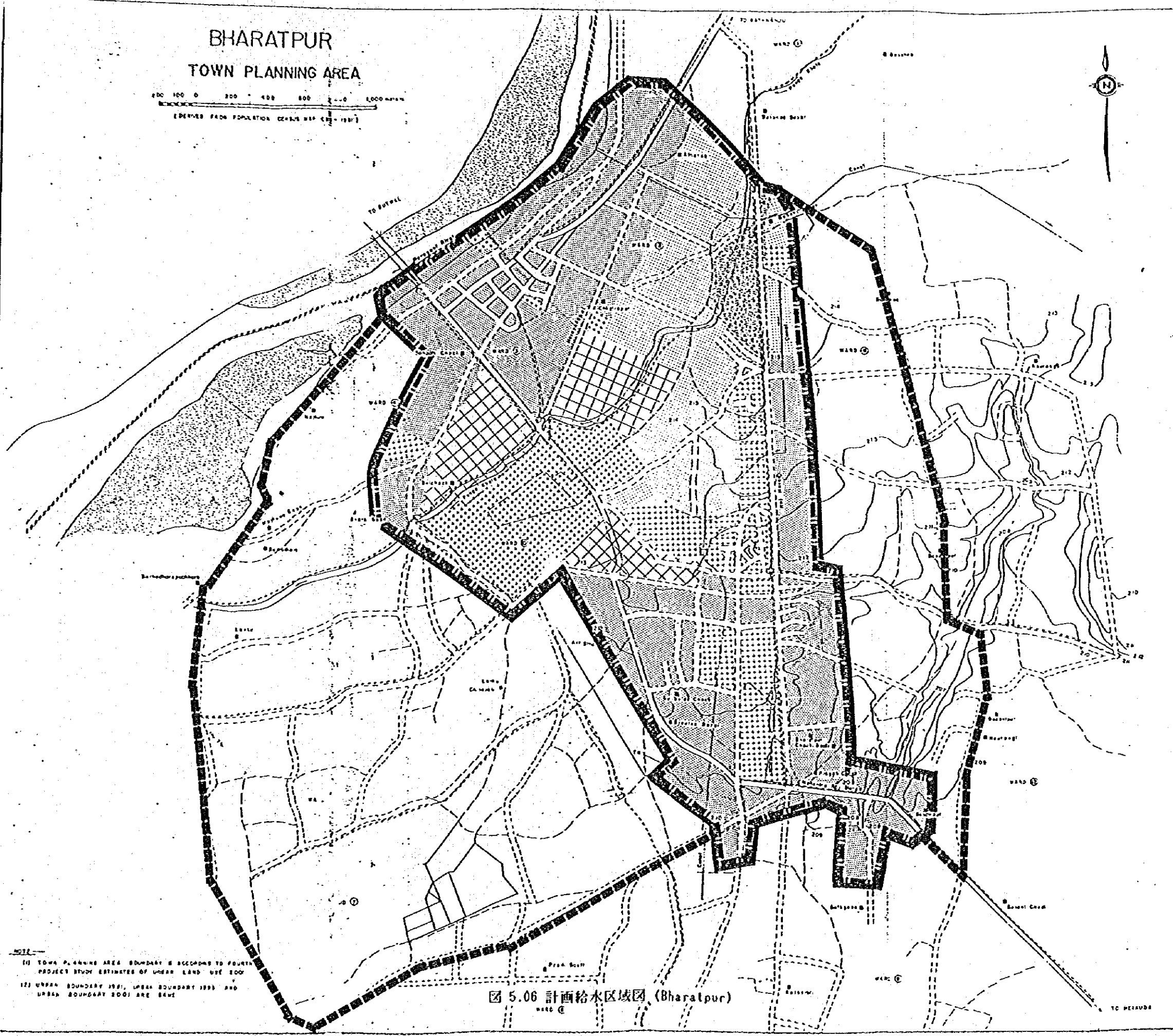
BHARATPUR VILLAGE PANCHAYAT

計画給水区域

LEGEND
TOWN PLANNING AREA

BHARATPUR TOWN PLANNING AREA

0 100 200 300 400 500 METERS
 DERIVED FROM POPULATION CENSUS MAP (1971-1981)



WATER SUPPLY AND SANITATION STUDIES (FOURTH PROJECT)

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

LAND USE

LEGEND

International Boundary	//////
Nagar Panchayat Boundary	-----
Town Planning Area Boundary in Nagar Panchayat	-----
Town Planning Area Boundary	-----
Ward Boundary	-----
Ward Number	①
Forest	▨
River Bed	~~~~~
Ford	.....
Settlement	•••••
Contour	---
Stream	~~~~~
Irrigation Canal	-----
Roads - Metalled	=====
Unmetalled	-----
Proposed	-----
Core Residential Existing	▨
Residential Existing	▨
Residential Future	▨
Industrial Existing	▨
Industrial Future	▨
Institutional Existing	▨
Institutional Future	▨
Urban Boundary 1981	-----
Urban Boundary 1996	-----
Urban Boundary 2001	-----

Figure No. 1
 Scale: As shown in the drawing

Prepared by: Proctor & Redfern International Toronto in association with East Consult Pvt. Ltd. Kathmandu, Nepal

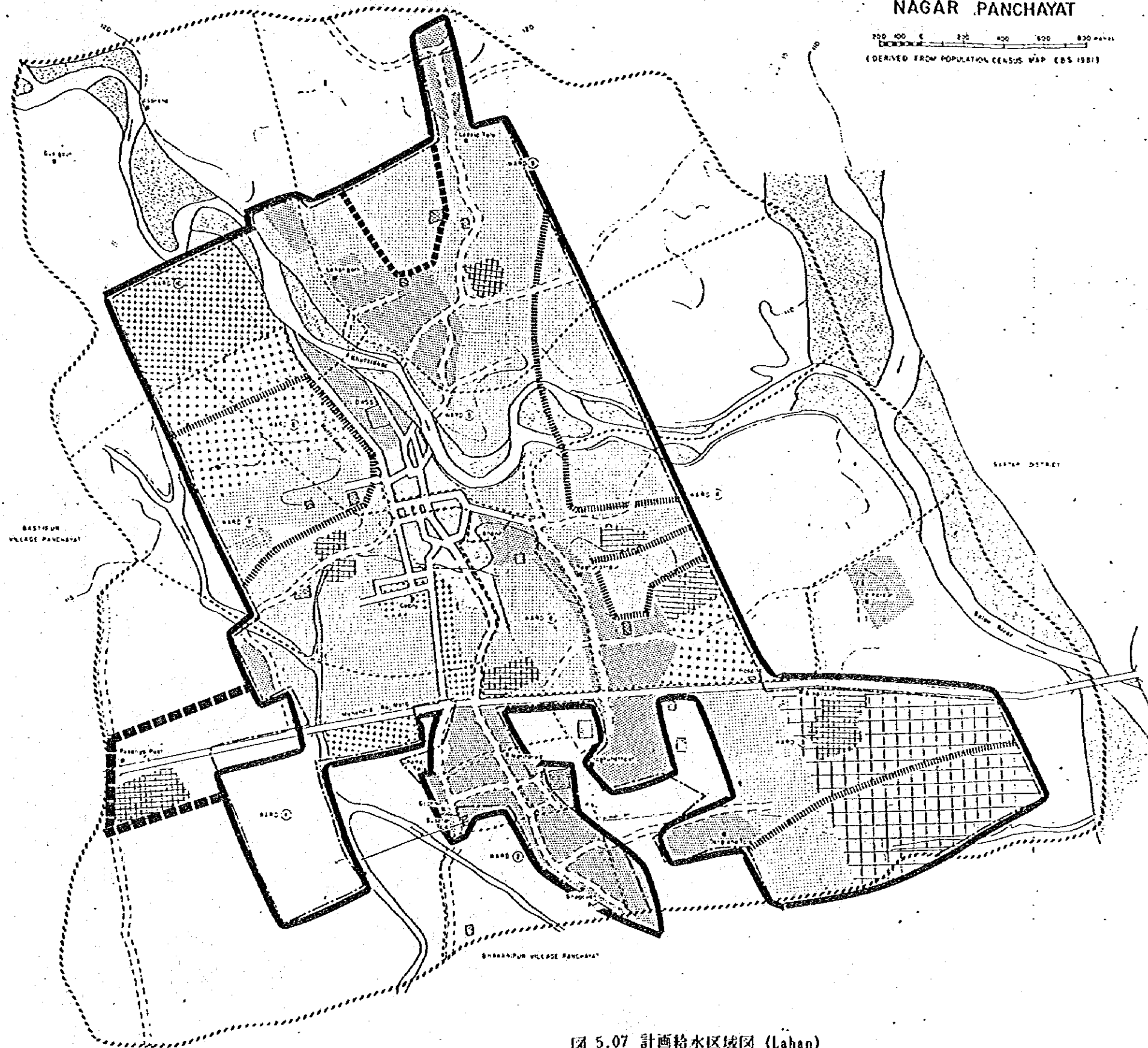
Drawn by: Mrs. U. Shrestha
 Date: March 1984

NOTE:
 (1) TOWN PLANNING AREA BOUNDARY IS ACCORDING TO FOURTH PROJECT STUDY ESTIMATES OF URBAN LAND USE 2001
 (2) URBAN BOUNDARY 1981, URBAN BOUNDARY 1996 AND URBAN BOUNDARY 2001 ARE SAME

图 5.06 計画給水区域图 (Bharatpur)

LAHAN NAGAR PANCHAYAT

700 400 200 0 200 400 600 800
 (DERIVED FROM POPULATION CENSUS MAP CBS 1981)



WATER SUPPLY AND SANITATION STUDIES (FOURTH PROJECT)

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

LAND USE

LEGEND

International Boundary	//////
Nagar Panchayat Boundary	-----
Town Planning Area Boundary in Nagar Panchayat	-----
Town Planning Area Boundary	-----
Road Boundary	-----
Map Number	2
Forest	|||||
River/Sea	~~~~~
Canal	-----
Settlement	■
Urban	■
Stream	~~~~~
Irrigation Canal	-----
Roads - Metalled	-----
Unmetalled	-----
Proposed	-----
Core Residential Existing	■
Residential Existing	■
Residential Future	■
Industrial Existing	■
Industrial Future	■
Institutional Existing	■
Institutional Future	■
Urban Boundary 1981	-----
Urban Boundary 1956	-----
Urban Boundary 2001	-----

Figure No
1

Scale
As shown in the Drawing

Prepared by
Proctor & Redfern
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East Consult Pvt. Ltd.
Kathmandu, Nepal

Drawn by: E. Mondre
Date: March 1984

图 5.07 计划供水区域图 (Lahan)

RAJBIRAJ NAGAR PANCHAYAT

200 100 0 100 200 300 400 500 600
DERIVED FROM POPULATION CENSUS MAP - CBS 1991

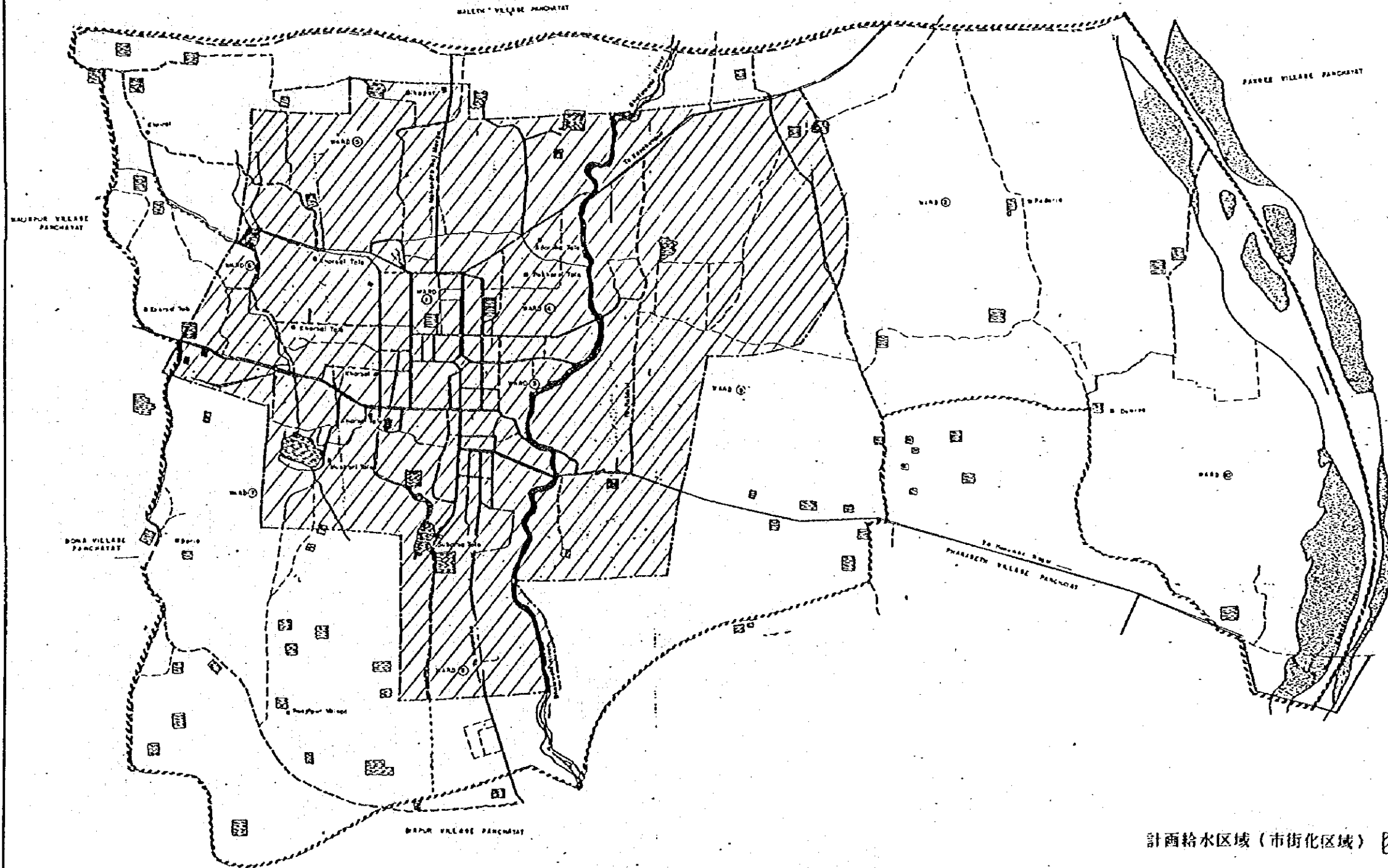
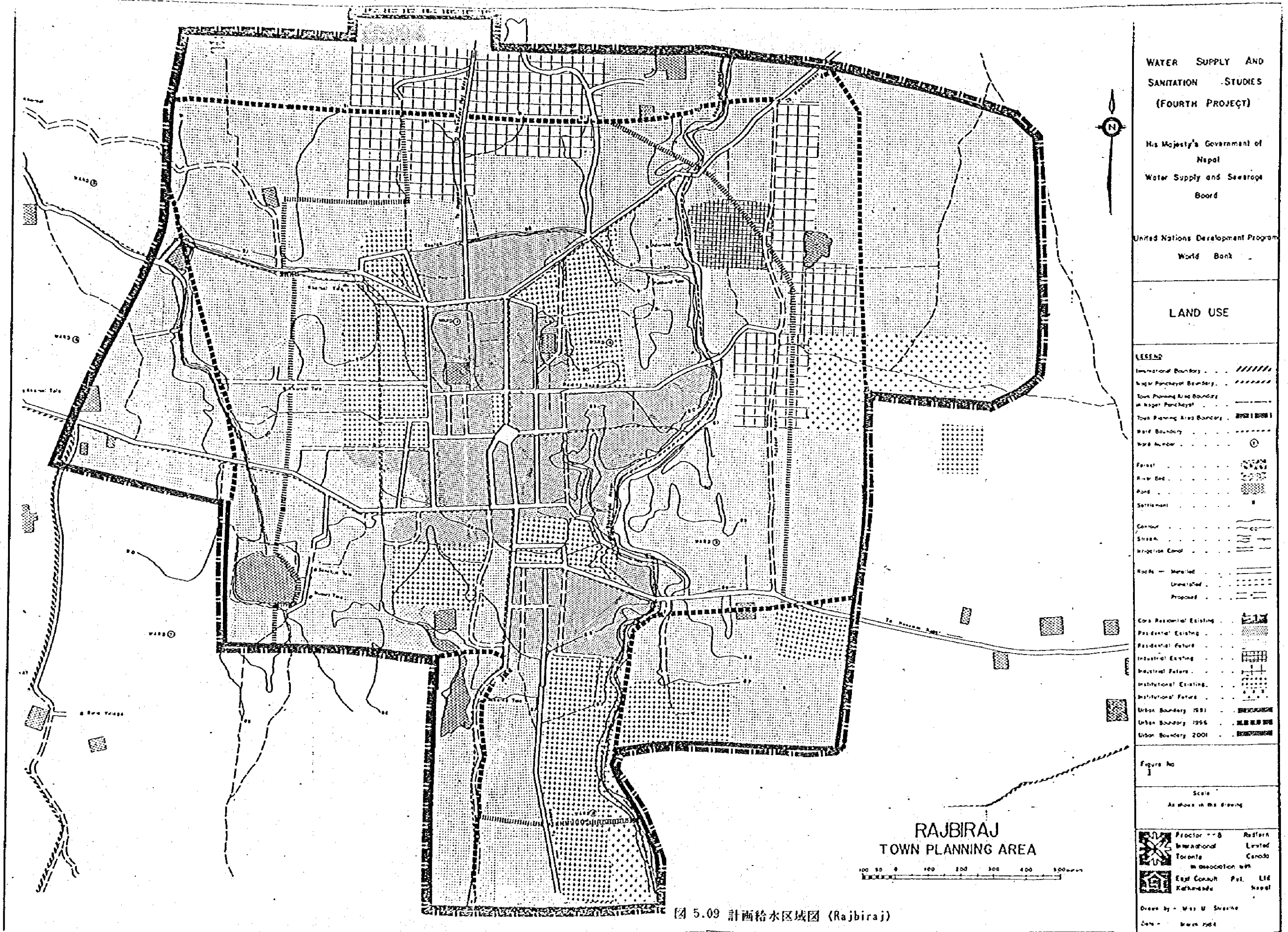


図 5.08 パンチャヤット全図 (Rajbiraj)

計画給水区域 (市街化区域)

LEGEND
 TOWN PLANNING AREA



WATER SUPPLY AND
SANITATION STUDIES
(FOURTH PROJECT)

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

LAND USE

- LEGEND**
- International Boundary
 - Nagar Panchayat Boundary
 - Town Planning Area Boundary in Nagar Panchayat
 - Town Planning Area Boundary
 - Ward Boundary
 - Ward Number
 - Forest
 - River Bed
 - Pond
 - Settlement
 - Contour
 - Stream
 - Irrigation Canal
 - Rocks - Metalled
 - Unmetalled
 - Proposed
 - Core Residential Existing
 - Residential Existing
 - Residential Future
 - Industrial Existing
 - Industrial Future
 - Institutional Existing
 - Institutional Future
 - Urban Boundary 1981
 - Urban Boundary 1986
 - Urban Boundary 2001

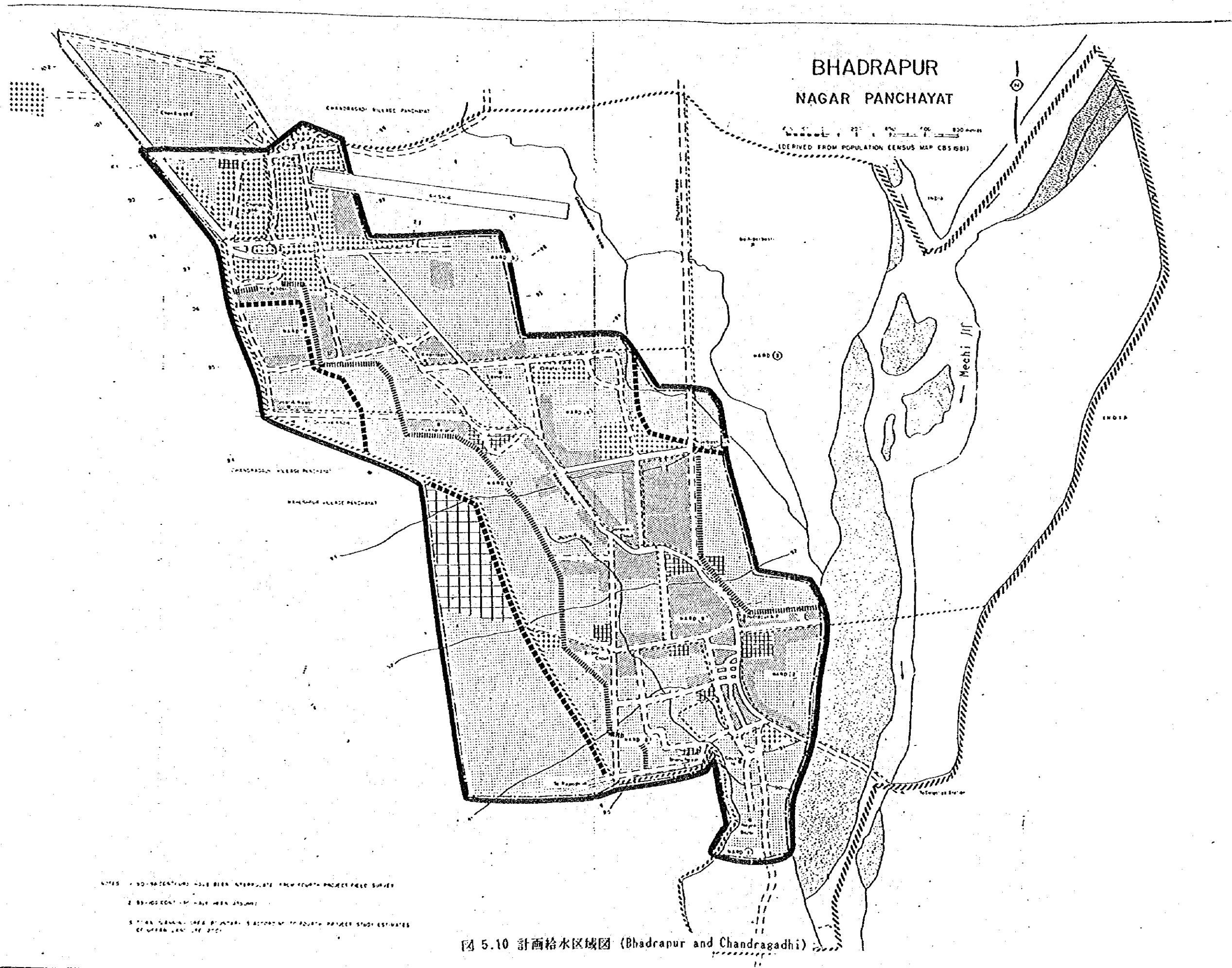
Figure No.
1

Scale
As shown in the drawing

Prepared by: Practor -- B International Limited Toronto Canada
in association with
Egji Consult Pvt. Ltd. Kathmandu Nepal

Drawn by: Miss U. Shrestha
Date: March 1984

图 5.09 计划给水区域图 (Rajbiraj)



**BHADRAPUR
NAGAR PANCHAYAT**

(DERIVED FROM POPULATION CENSUS MAP CBS 1981)

**WATER SUPPLY AND
SANITATION STUDIES
(FOURTH PROJECT)**

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

LAND USE

LEGEND

International Boundary	-----
Nagar Panchayat Boundary	-----
Town Planning Area Boundary in Nagar Panchayat	-----
Town Planning Area Boundary	-----
World Boundary	-----
World Number	-----
Forest	-----
Water Bed	-----
Canal	-----
Settlement	-----
Contour	-----
Stream	-----
Water Line	-----
Woods - 100-40	-----
Uncultivated	-----
Fields	-----
Core Residential Existing	-----
Residential Existing	-----
Residential Future	-----
Industrial Existing	-----
Industrial Future	-----
Institutional Existing	-----
Institutional Future	-----
Urban Boundary 1981	-----
Urban Boundary 1986	-----
Urban Boundary 2001	-----

Figure No. 1
Scale: As shown in the drawing

Prepared by: B. Redfern
International Limited
Toronto, Canada
in association with
East Consult Pvt. Ltd.
Kathmandu, Nepal

Drawn by: J. B. Manchar
Date: March 1984

NOTES: 1. SO-BORDERED HAVE BEEN APPROXIMATE FROM FOURTH PROJECT FIELD SURVEY
2. SO-BORDERED ARE HAVE BEEN ASSUMED
3. TOWN PLANNING AREA BOUNDARY IS ACCORDING TO FOURTH PROJECT STUDY ESTIMATES OF URBAN GROWTH OF 2001

图 5.10 計画給水区域图 (Bhadrapur and Chandragadhi)

ILAM

REGIONAL MAP

1 km 0.5 km 1.5 km 2 km 3 km 4 km
DRAWN FROM TOPOGRAPHICAL MAP

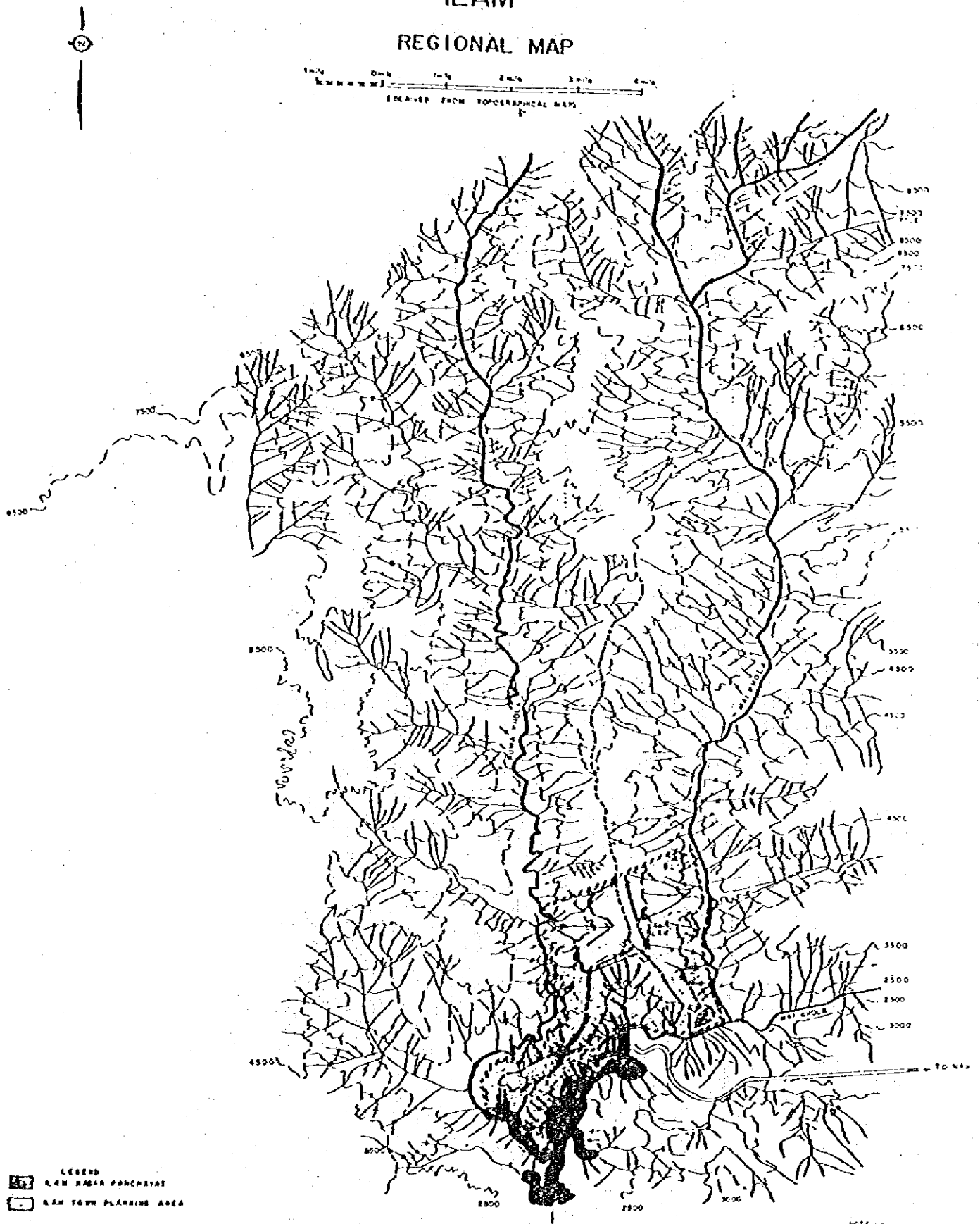
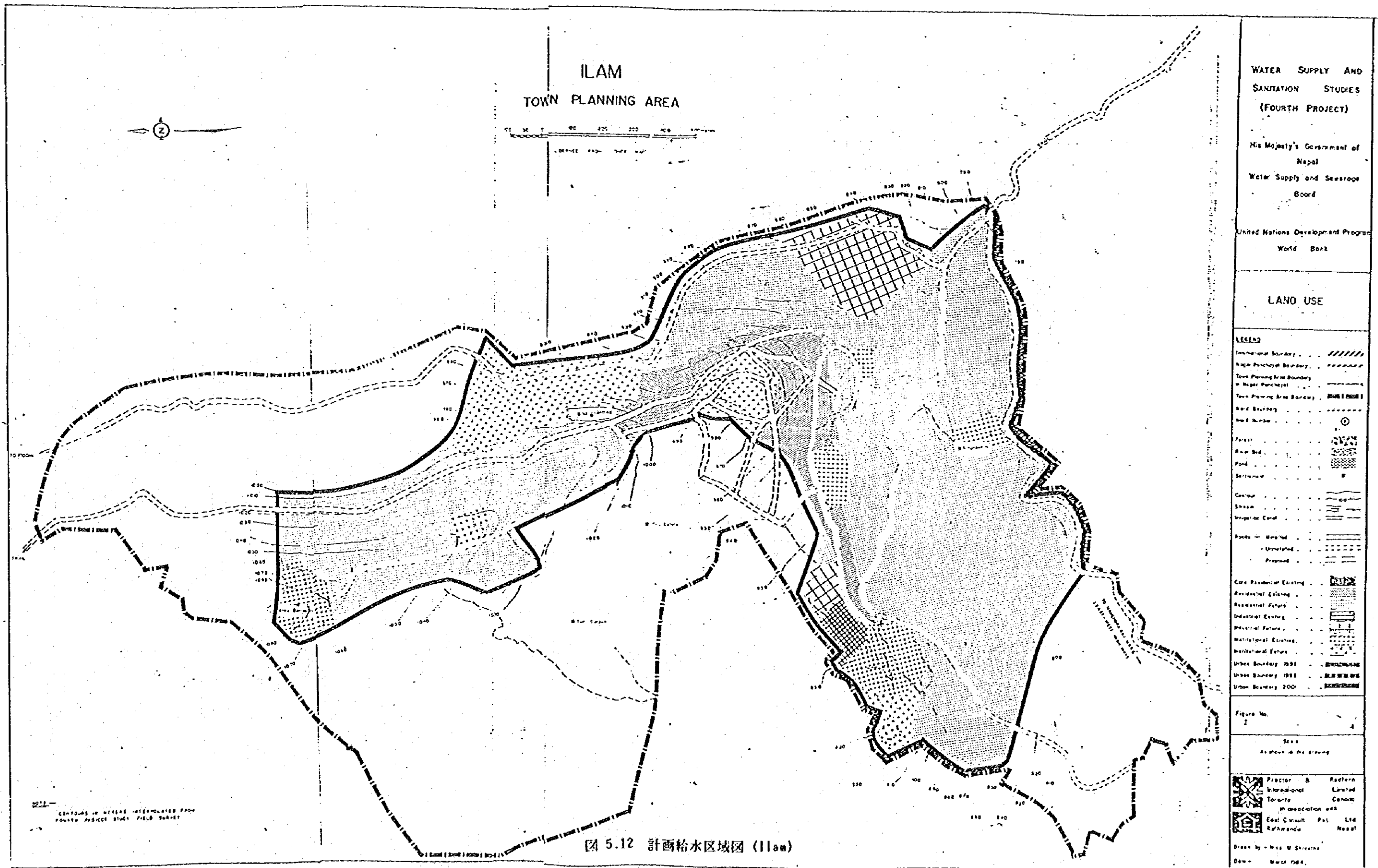


図 5.11 リージョン全図 (Ilam)

516-
CONTOUR IN FEET



ILAM
TOWN PLANNING AREA

WATER SUPPLY AND
SANITATION STUDIES
(FOURTH PROJECT)

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

LAND USE

- LEGEND
- International Boundary
 - Regional Boundary
 - Town Planning Area Boundary
in Nepal Panchayat
 - Town Planning Area Boundary
 - Ward Boundary
 - Ward Number
 - Forest
 - Open Field
 - Pond
 - Settlement
 - Contour
 - Stream
 - Irrigation Canal
 - Roads - Metalled
 - Unmetalled
 - Proposed
 - Core Residential Existing
 - Residential Existing
 - Residential Future
 - Industrial Existing
 - Industrial Future
 - Institutional Existing
 - Institutional Future
 - Urban Boundary 1931
 - Urban Boundary 1955
 - Urban Boundary 2001

Figure No. 1

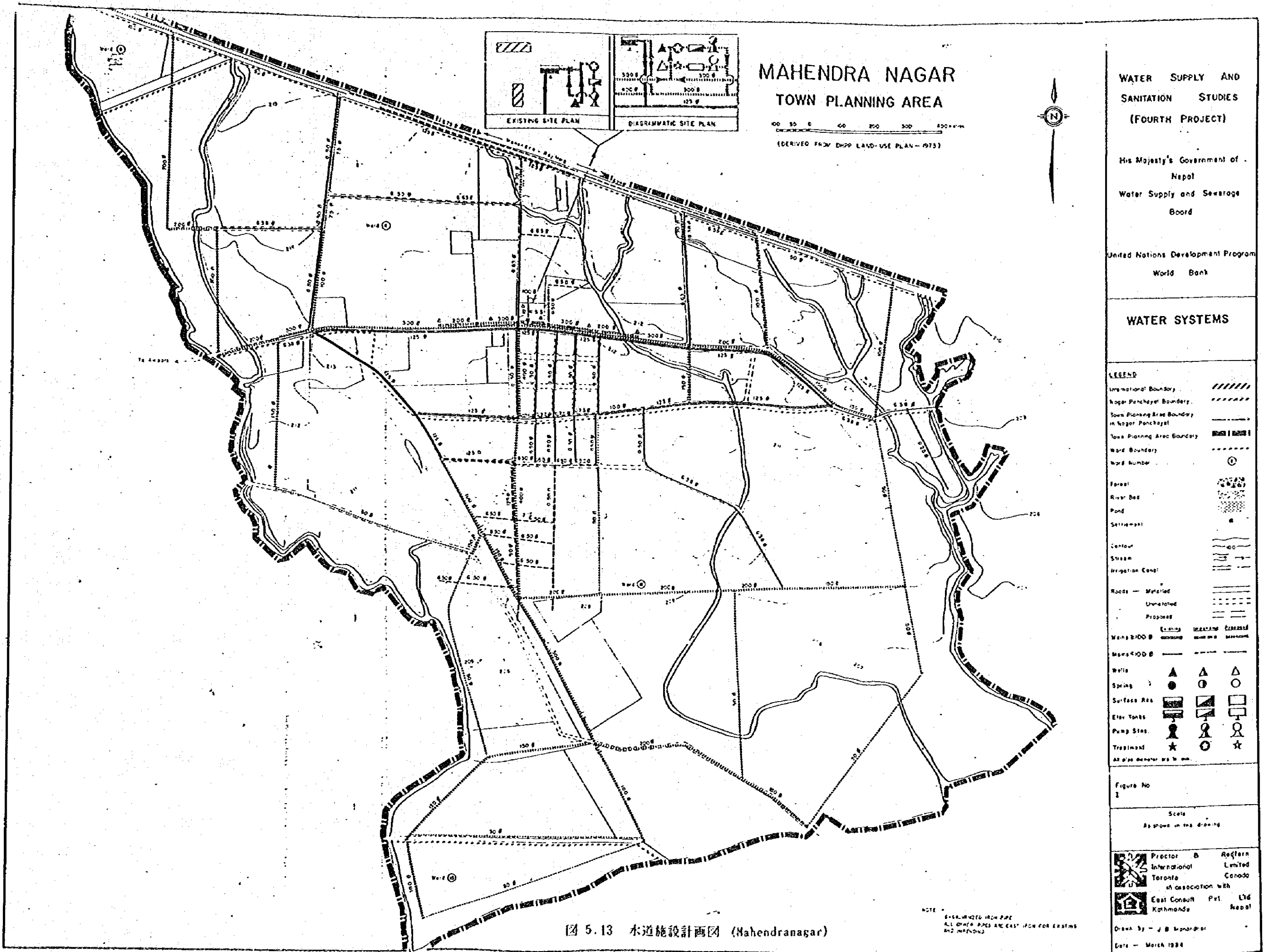
Scale
As shown in the drawing

Prepared by
Practor & Radfern
International Limited
Toronto
Canada
in association with
East Consult Pvt. Ltd
Rathnada
Nepal

Drawn by - Mrs. W. Stevens
Date - March 1964

NOTE -
CONTOURS IN METERS INTERPOLATED FROM
FOURTH PROJECT STUDY FIELD SURVEY

图 5.12 計畫供水区域图 (Ilam)



MAHENDRA NAGAR TOWN PLANNING AREA

0 50 100 200 300 400 METERS
(DERIVED FROM DPPP LAND-USE PLAN - 1973)

WATER SUPPLY AND SANITATION STUDIES (FOURTH PROJECT)

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

WATER SYSTEMS

LEGEND

International Boundary	//////
Nagar Panchayat Boundary	-----
Town Planning Area Boundary in Nagar Panchayat	-----
Town Planning Area Boundary	|||||
Ward Boundary	-----
Ward Number	⊙
Forest	⊘
River Bed	⊘
Pond	⊘
Settlement	⊘
Contour	~
Stream	~
Irrigation Canal	~
Roads - Metalled	==
Unmetalled	---
Proposed	---
Main 1000 B	---
Main 500 B	---
Main 200 B	---
Main 100 B	---
Main 50 B	---
Well	⊙
Spring	⊙
Surface Res.	⊙
Elev. Tanks	⊙
Pump Stns.	⊙
Treatment	⊙

All pipe diameters are in mm.

Figure No.
1

Scale
As shown in the drawing

Prepared by
Proctor & Reifern
International Limited
Toronto Canada
in association with
East Consult Pvt. Ltd
Kathmandu Nepal

Drawn by - J. B. Singhania
Date - March 1984

图 5.13 水道施設設計圖 (Mahendranagar)

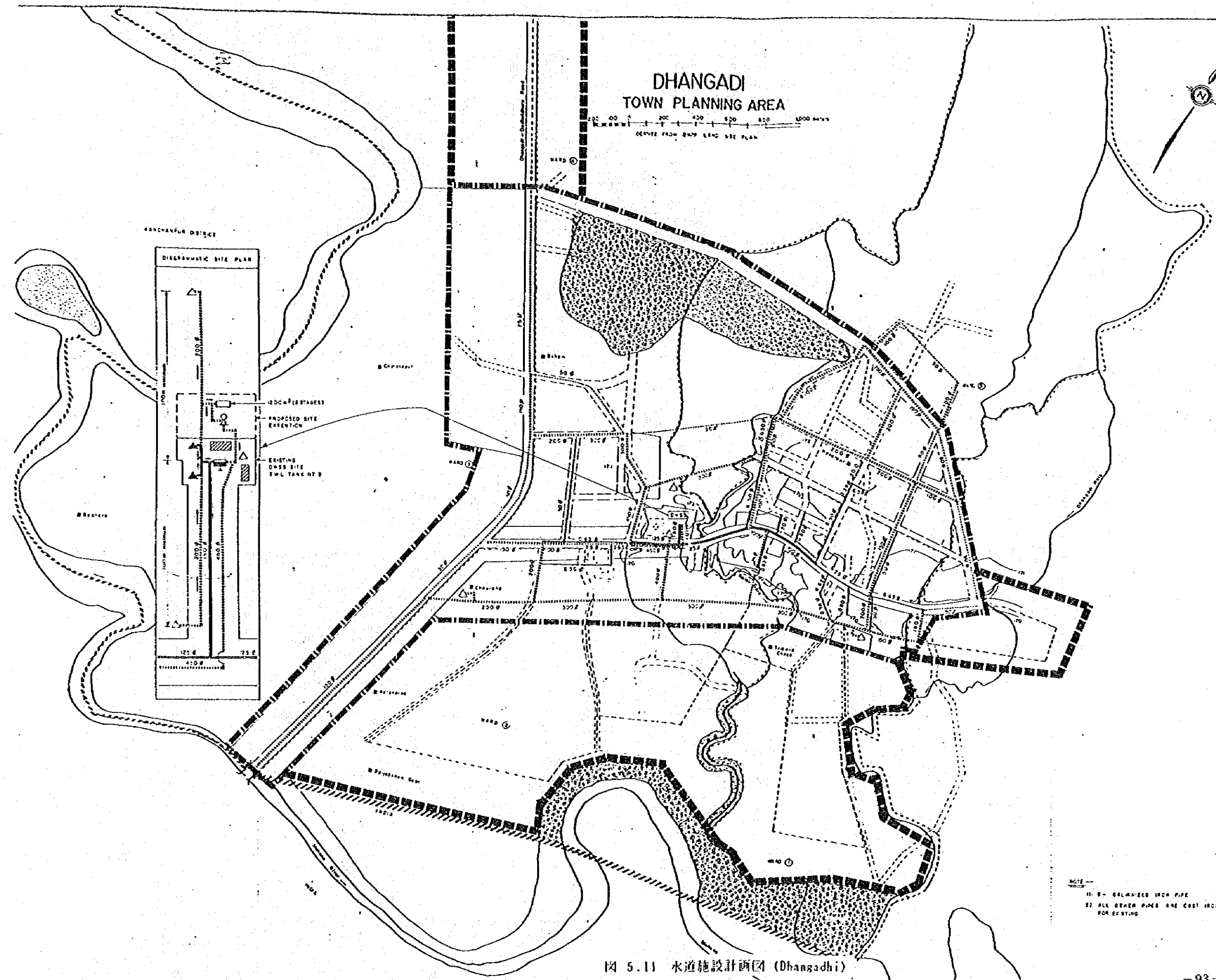
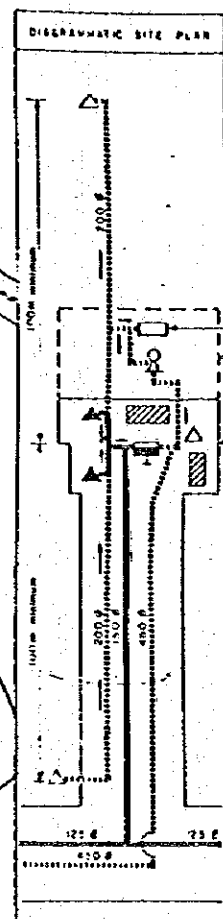
NOTE -
ELEVATIONS FROM P.M.S.
ALL OTHER DATA ARE EAST-ASIAN FOR EXISTING
AND PROPOSED

DHANGADI TOWN PLANNING AREA

200 400 600 800 1000 METERS
DERIVED FROM 1:5000 SCALE SITE PLAN



BARANCHANPUR DISTRICT



WATER SUPPLY AND SANITATION STUDIES (FOURTH PROJECT)

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

WATER SYSTEMS

LEGEND

- International Boundary
- Nagar Panchayat Boundary
- Town Planning Area Boundary in Nagar Panchayat
- Town Planning Area Boundary
- Ward Boundary
- Ward Number
- Forest
- River Bed
- Pond
- Settlement
- Contour
- Stream
- Irrigation Canal
- Roads — Metalled
- Unmetalled
- Proposed
- Water 800 B
- Water 400 B
- Wells
- Spring
- Surface Res.
- Elev. Tanks
- Pump Stas.
- Treatment

Figure No. 1

Scale
As shown on the drawing

Prepared by: Practor B. Redfern
 Intelligence Limited
 Toronto, Canada
 in association with
 East Consult. Pvt. Ltd.
 Kathmandu, Nepal

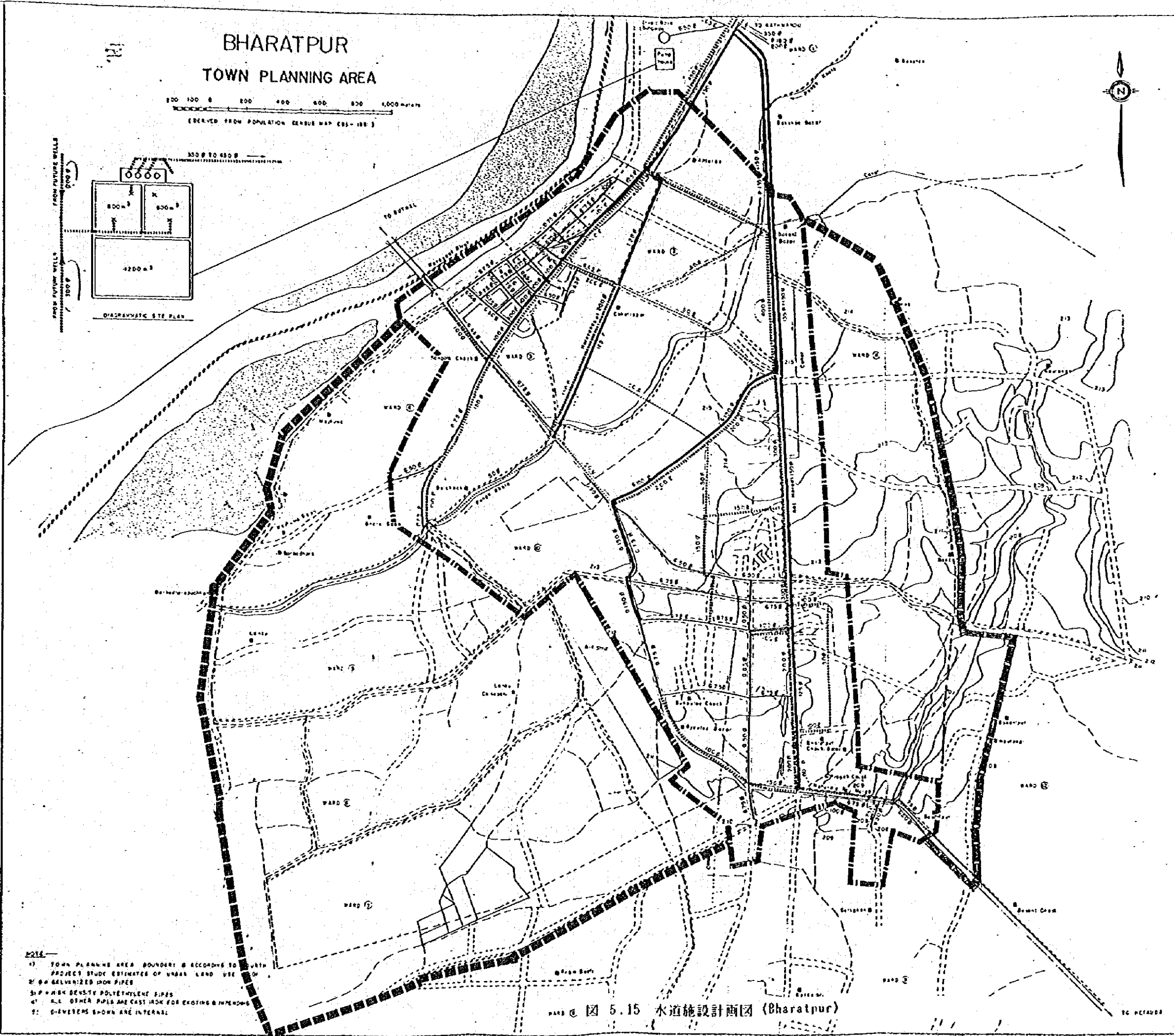
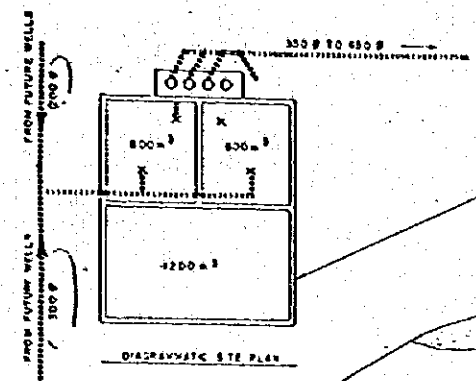
Drawn by: Max U. Sreelina
Date: March 1968

NOTE —
1) 8" — GALVANIZED IRON PIPE
2) ALL OTHER PIPES ARE CAST IRON
FOR EXISTING

图 5.11 水道施設設計圖 (Dhangadhi)

BHARATPUR TOWN PLANNING AREA

100 200 400 600 800 1,000 meters
(DERIVED FROM POPULATION DENSITY MAP CBS-100)



**WATER SUPPLY AND
SANITATION STUDIES
(FOURTH PROJECT)**

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

WATER SYSTEMS

LEGEND:

International Boundary	//////
Nepal-Pakistan Boundary	-----
Town Planning Area Boundary	-----
Water Supply Pipe	-----
Sanitation Pipe	-----
Well	▲
Spring	○
Surface Res.	▭
Elev. Tank	▭
Pump Sta.	⊙
Treatment	★

As per drawing

Figure No
I

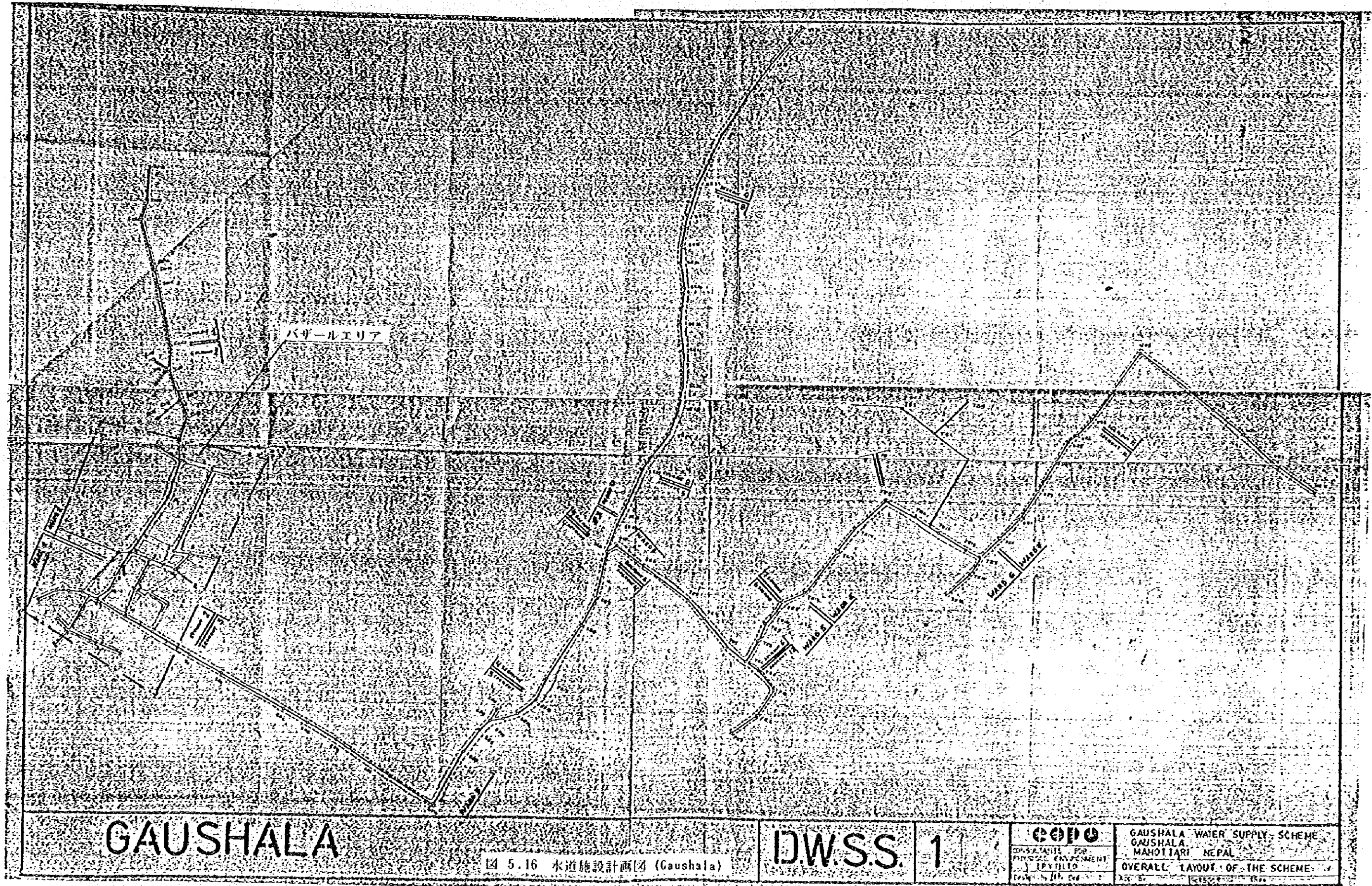
Scale
As shown in the drawing

Proctor & Redfern
International
Toronto
Canada
in association with
East Conault Pvt Ltd
Kathmandu
Nepal

Drawn by - M. V. Swastha
Date - March 1984

1) TOWN PLANNING AREA BOUNDARY IS ACCORDING TO
PROJECT STUDY ESTIMATES OF URBAN LAND USE
2) 8" GALVANIZED IRON PIPES
3) 12" HIGH DENSITY POLYETHYLENE PIPES
4) ALL OTHER PIPES ARE CAST IRON FOR EXISTING & IMPENDING
5) DIAMETERS SHOWN ARE INTERNAL

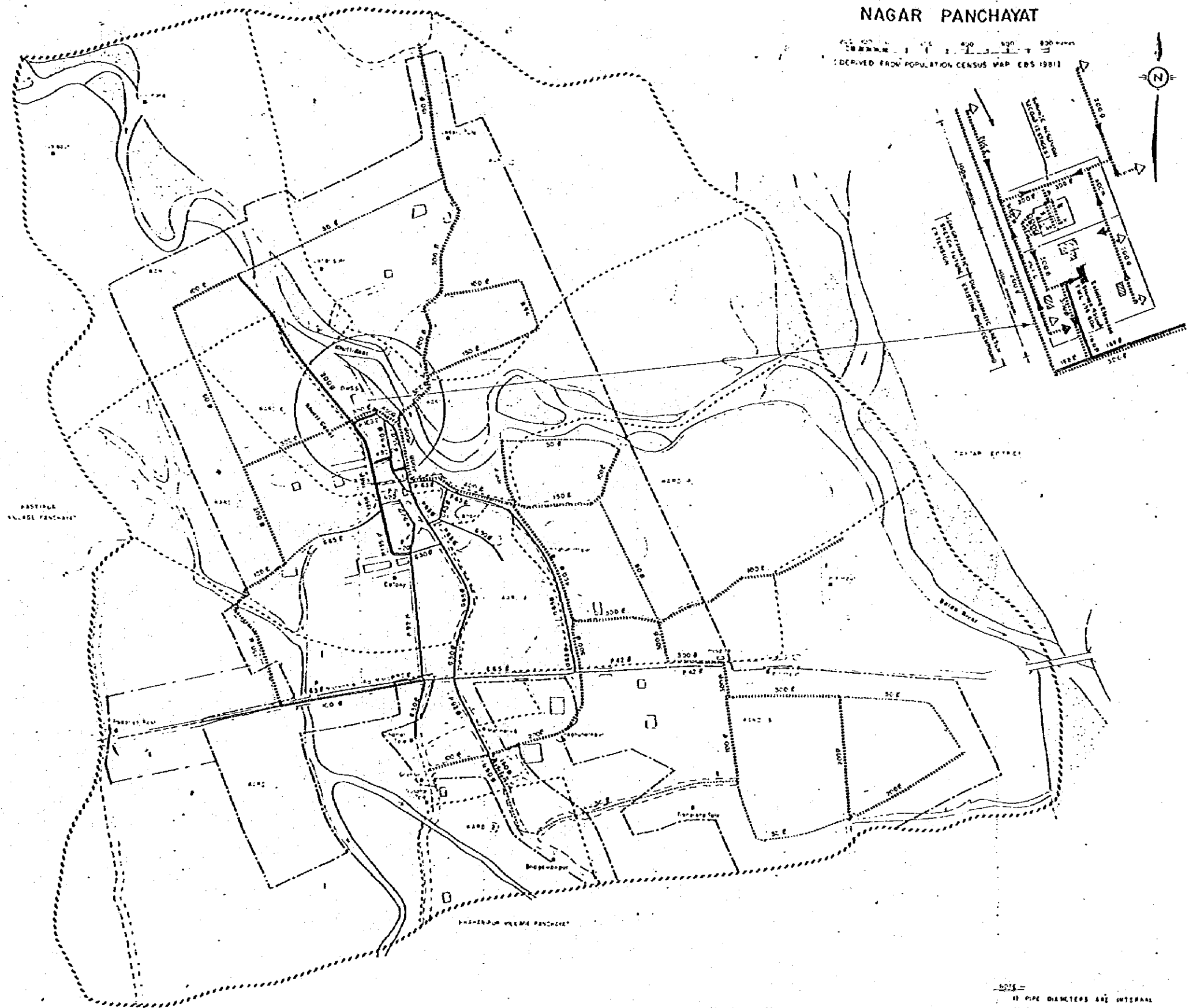
图 5.15 水道施設設計圖 (Bharatpur)



1/1

LAHAN NAGAR PANCHAYAT

DERIVED FROM POPULATION CENSUS MAP CBS 1981



WATER SUPPLY AND SANITATION STUDIES (FOURTH PROJECT)

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

WATER SYSTEMS

LEGEND

International Boundary	//////
Nagar Panchayat Boundary	-----
Town Planning Area Boundary in Nagar Panchayat	-----
Town Planning Area Boundary	-----
Road Boundary	-----
Road Number	1
Forest	|||||
River Bed	-----
Pore	-----
Settlement	•
Contour	-----
Stream	-----
Wigation Canal	-----
Roads - Metalled	-----
Unmetalled	-----
Proposed	-----
Work 2:00 E	-----
Work 4:00 E	-----
Bells	▲
Spring	○
Surface Res	□
Elev Tanks	□
Pump Sta	○
Treatment	★

Figure No
I

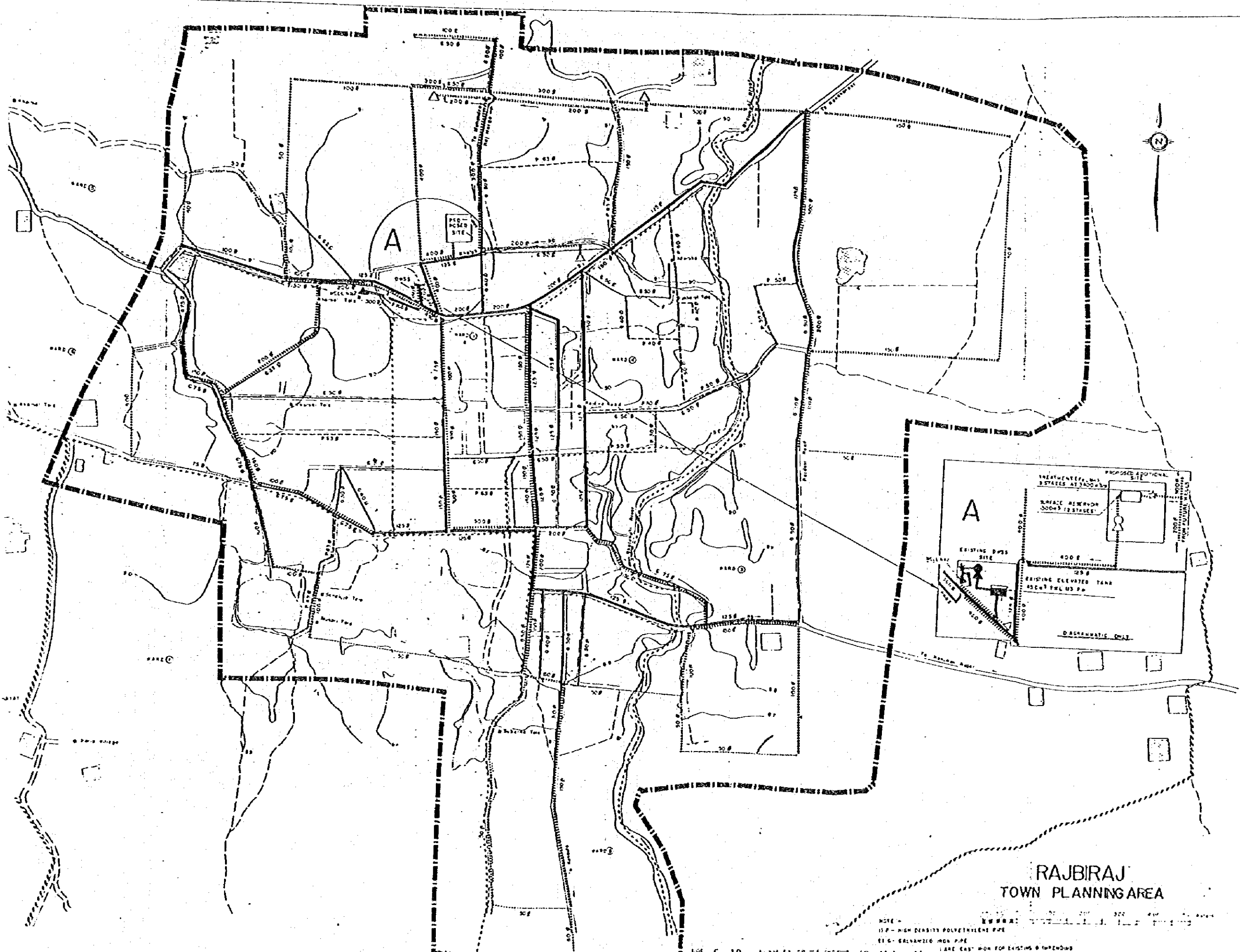
Scale
As shown in the drawing

Proctor & Redfern
International Limited
Toronto Canada
in association with
East Consult Pvt. Ltd
Kathmandu Nepal

Drawn By - J. B. MANANCHAR
Date - March 1984

图 5.17 水道施設設計圖 (Lahan)

NOTE -
1. PIPE DIAMETERS ARE INTERNAL
2. P - HIGH DENSITY POLYETHYLENE
3. I - GALVANIZED IRON PIPE



**WATER SUPPLY AND
SANITATION STUDIES
(FOURTH PROJECT)**

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

WATER SYSTEMS

LEGEND

- International Boundary:
- Nagar Panchayat Boundary:
- Town Planning Area Boundary in Nagar Panchayat:
- Town Planning Area Boundary:
- Ward Boundary:
- Ward Number:
- Forest:
- River Bed:
- Pond:
- Settlement:
- Contour:
- Stream:
- Irrigation Canal:
- Roads - Metalled:
- Unmetalled:
- Proposed:
- Mains 2100 E:
- Mains 1500 E:
- Wells:
- Spring:
- Surface Res:
- Elev. Tank:
- Pump Stn:
- Treatment:
- At-grade sewer as in plan:

Figure No. 1

Scale
As shown in the drawing

Prepared by: Proctor & Redfern
International Limited
Toronto, Canada
in association with
 East Consult Pvt Ltd
Kathmandu, Nepal

Drawn by: Miss A. Nakarmi

Date: March 1984

**RAJBIRAJ
TOWN PLANNING AREA**

NOTE -
1) P - HIGH DENSITY POLYETHYLENE PIPE
2) G - GALVANIZED IRON PIPE
3) ARE EAST FOR EXISTING & PROPOSED
AREA IS ACCORDING TO BOUNDARY
ESTIMATED BY USAN, 1981, 1:50,000

图 5.18 水道施設設計圖 (Rajbiraj)

BHADRAPUR NAGAR PANCHAYAT

DERIVED FROM POPULATION CENSUS MAP CBS (1981)

WATER SUPPLY AND SANITATION STUDIES (FOURTH PROJECT)

His Majesty's Government of
Nepal
Water Supply and Sewerage
Board

United Nations Development Program
World Bank

WATER SYSTEMS

LEGEND

International Boundary	//////
Nagar Panchayat Boundary	-----
Town Planning Area Boundary in Nagar Panchayat	-----
Town Planning Area Boundary	-----
Ward Boundary	-----
Ward Number	①
Forest	•••••
River Bed	-----
Pond	□
Settlement	■
Contour	---00---
Stream	~~~~~
Irrigation Canal	-----
Roads - Metalled	=====
Unmetalled	-----
Proposed	-----
Main 8" 100 g	-----
Main 4" 100 g	-----
Wells	▲
Spring	○
Surface Res.	□
Elev. Tanks	□
Pump Stns.	⊙
Treatment	★

Figure No. 1

Scale: As shown in the drawing

Proctor & Redfern
International Limited
Toronto Canada
in association with
East Consult Pvt. Ltd.
Kathmandu Nepal

Drawn by: J. B. Manandhar

Date: March 1984

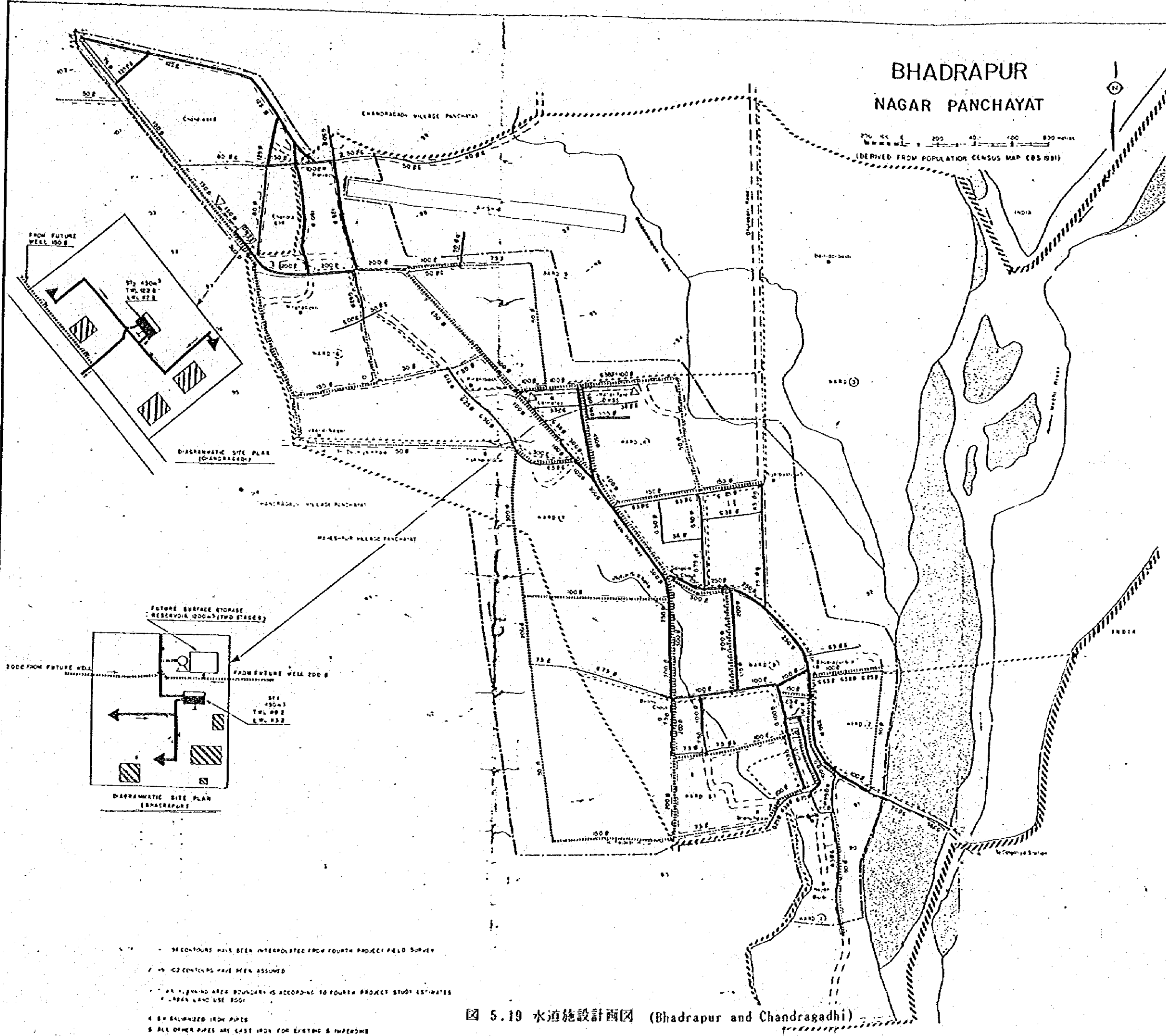


图 5.19 水道施設設計圖 (Bhadrapur and Chandragadhi)

- 1. CONTOURS HAVE BEEN INTERPOLATED FROM FOURTH PROJECT FIELD SURVEY
- 2. 4% SLOPES HAVE BEEN ASSUMED
- 3. ALL PLANNING AREA BOUNDARY IS ACCORDING TO FOURTH PROJECT STUDY ESTIMATES
- 4. 8" SALVAGED IRON PIPES
- 5. ALL OTHER PIPES ARE CAST IRON FOR EXISTING & IMPROVING

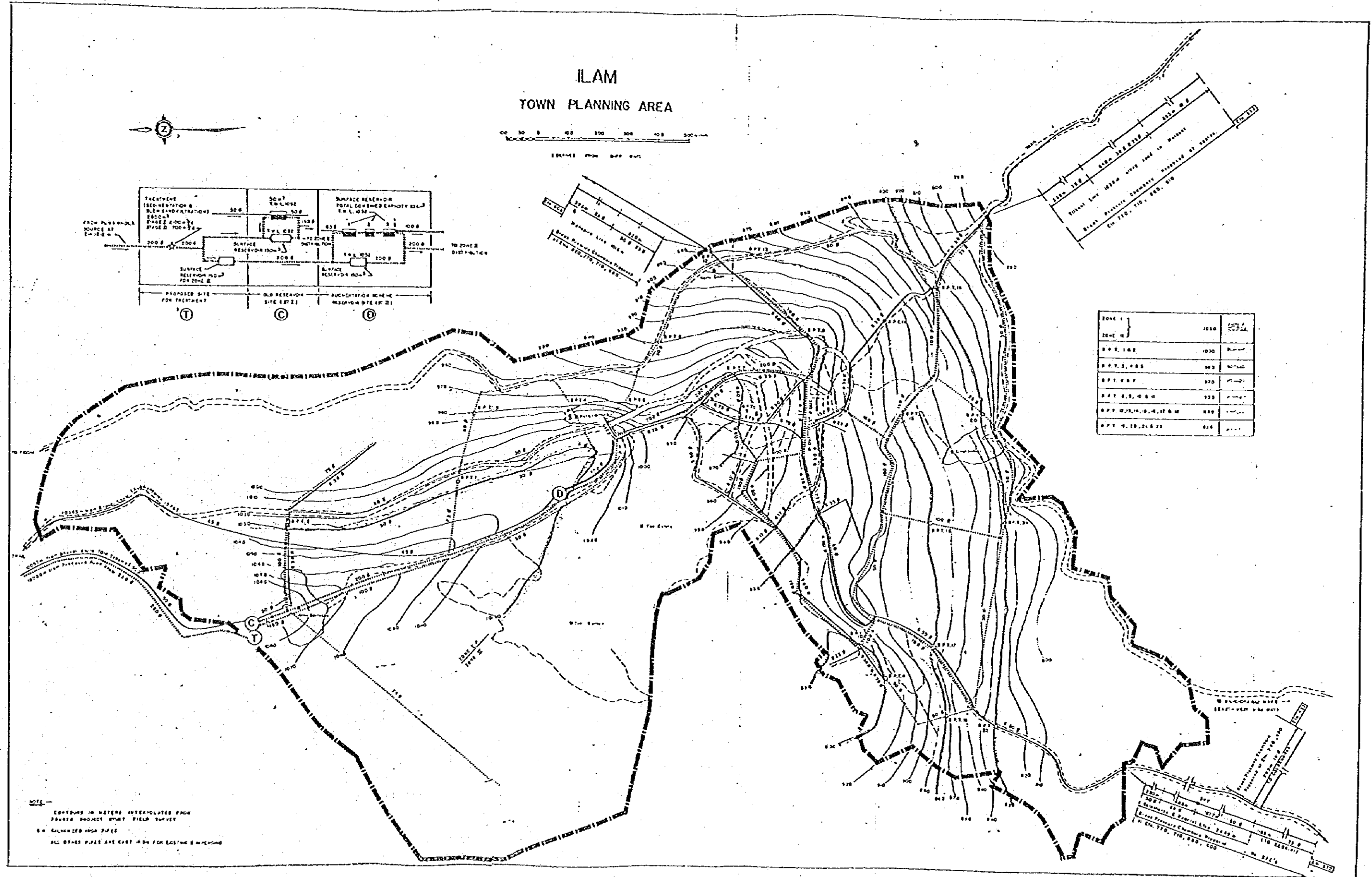


图 5.20 水道施設設計圖 (Ilam)

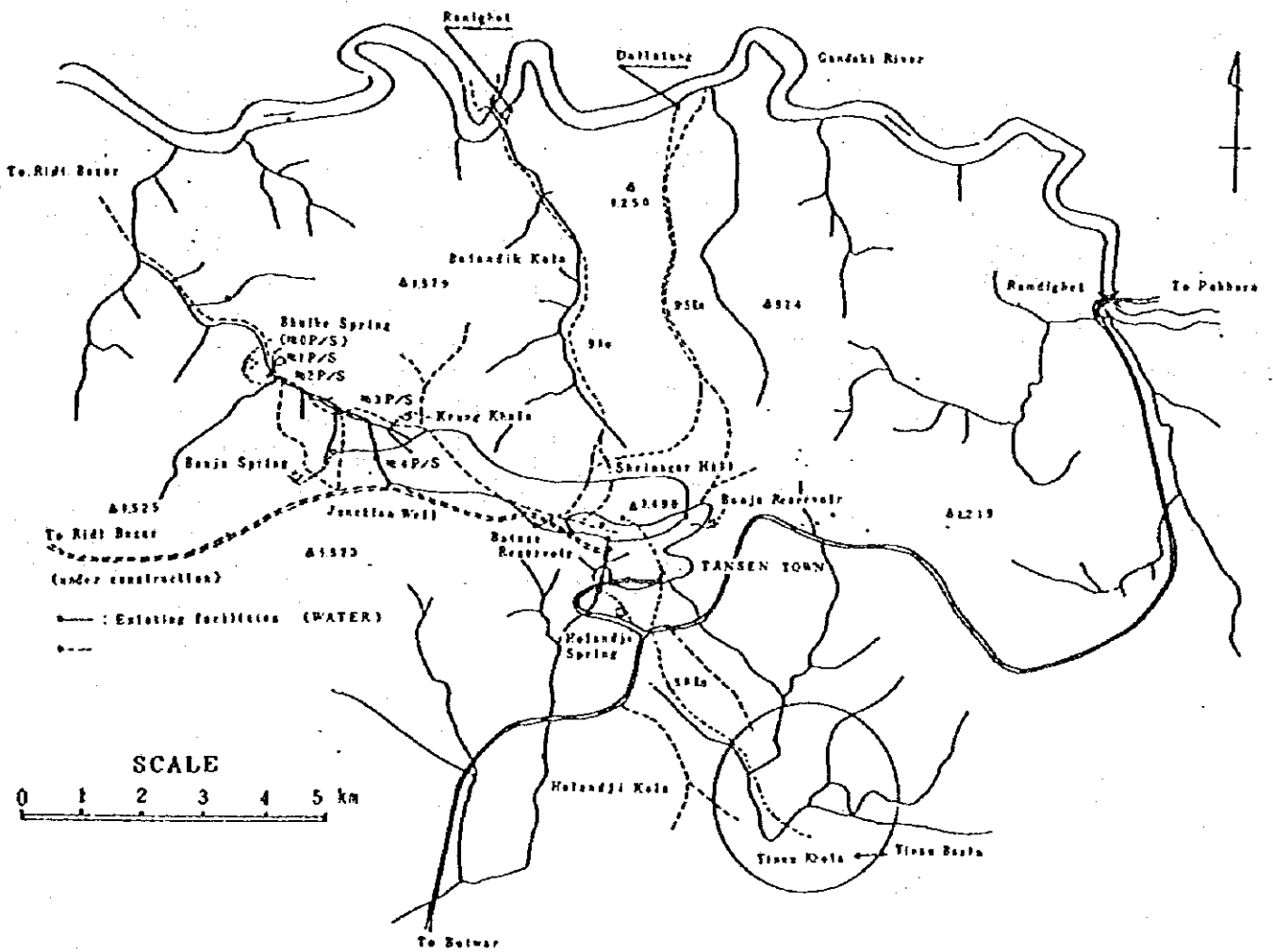


図 5.21 水道施設設計図 (Tansen)

MINUTES OF DISCUSSIONS
FOR THE PRELIMINARY STUDY
ON THE WATER SUPPLIES TO URBAN & SEMI-URBAN CENTRES
IN THE KINGDOM OF NEPAL

In response to the request from His Majesty's Government of Nepal, the Government of Japan decided to conduct a Preliminary Study on the Water Supplies to Urban and Semi-urban Centers (herein-after referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to the Kingdom of Nepal a study team headed by Mr. Tadanori SUZUKI, Grant Aid Planning and Survey Department, JICA, for 41 days from November 29, 1987 to January 8, 1988.

The team had a series of discussions and exchanged views with the officials concerned of His Majesty's Government of Nepal led by Mr. S.N. SHARMA, Chief Engineer, Department of Water Supply and Sewerage, Ministry of Water Resources, and observed the proposed project sites.

As the result of the discussions and the observation, both sides agreed to recommend to their respective governments that the major points of understandings reached between them, attached herewith, should be examined towards the realization of the project. Signed this document on December 11, 1987 in Kathmandu, Nepal.

Tadanori Suzuki

Mr. Tadanori SUZUKI
Leader of Japanese
Preliminary Study Team
JICA

S.N. Sharma

Mr. S. N. SHARMA,
Chief Engineer,
Department of Water
Supply & Sewerage,
Ministry of Water
Resources.

ATTACHMENT

1. Objective

The objective of the project is to construct and to rehabilitate the Water Supply facilities in order to supply safe and adequate water to the inhabitants in 8 urban and semi-urban centres.

2. Executing Agency

Department of Water Supply and Sewerage, Ministry of Water Resources, is responsible for the technical and administrative matters of the Project.

3. Undertaking of the Government of Japan

The team will convey to the government of Japan the intention of His Majesty's Government of Nepal that the former takes necessary measures to cooperate in construction and rehabilitation of water supply facilities in urban and semi-urban centres listed in ANNEX I within the scope of Japanese grant aid program.

4. Understanding of Japan's Grant Aid System

The Nepalese side has understood Japan's Grant Aid System explained by the team.

5. Undertaking of His Majesty's Government of Nepal

His Majesty's Government of Nepal will take the necessary measures listed in ANNEX II, as proposed by the team on condition that the grant aid would be extended to the project.

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ANNEX I

Recommended construction sites for the project

1. Package for Tubewell

- * Mahendranagar
- * Dhangadhi
- * Bharatpur
- * Gaushala
- * Lahan
- * Rajbiraj
- * Bhadrapur and Chandragadi

2. Package for Surface Water

- * Ilam

MSD

59

ANNEX II

UNDERTAKING OF HIS MAJESTY'S GOVERNMENT OF NEPAL

1. To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement as provided in the Mechanism of the Grant Aid Program of the Japanese Government.
 1. Advising commission of Authorization to pay
 2. Payment of commission
2. To ensure prompt unloading, tax exemption, custom clearance for the products purchased under the grant at a port of disembarkation in Nepal. Arrangement for prompt internal transportation to be paid under the grant shall be made for the products.
3. To exempt Japanese nationals engaged in project activities from custom duties, income taxes and other fiscal levies which may be imposed in Nepal with respect to the import of the products and services under the verified contracts. These exemptions shall be subject to the existing Nepalese rules and regulations which are applicable to similar grant aid programmes.
4. To accord Japanese national whose services may be required in connection with the supply of the products and the services under the verified contract, such facilities as may be necessary for their entry into Nepal and stay therein for the implementation of their work within the scope of the Nepalese rules and regulations.
5. To use and maintain properly and effectively the equipment purchased under the grant.
6. To bear all the project expenses other than those to be borne by the grant as will be provided for in the Exchange of Notes between the two Governments.

MM

[Signature]

JICA

